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28 January 2020

Ms. Katrina Higgins-Coltrain
Task Order Monitor
1201 Elm St; Ste 500
Mail Code: SEDRL
Dallas, Tx 75270-2102

RE: Screening Level Ecological Risk Assessment Report, Revision 01
Wilcox Oil Company Superfund Site
Remedial Investigation/Feasibility Study
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order 0128-RICO-06GG

Dear Ms. Higgins-Coltrain:

This letter serves to notify EPA that EA Engineering, Science, and Technology, Inc., PBC (EA) has uploaded the Screening Level Ecological Risk Assessment Report, Revision 01 for the above-referenced Task Order to its SharePoint site. EA will email access instructions for the SharePoint site to EPA.

An electronic copy is also being emailed to Mr. Todd Downham at Oklahoma Department of Environmental Quality (ODEQ).

Please do not hesitate to contact me at (972) 459-5038 if you have any questions.

Sincerely,

Patrick Appel
Project Manager

cc: Cora Stanley, EPA Contracting Officer (letter only)
Todd Downham, ODEQ (via email)
Tim Startz, EA Program Manager (letter only)
Luis Vega, Alternate Project Manager
File

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TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA		DATE: 28 January 2020	TRANSMITTAL NO.: **0014**
TO: **Ms. Katrina Higgins-Coltrain** **U.S. Environmental Protection Agency Region 6**		FROM: **Patrick Appel** **EA Engineering, Science, and Technology, Inc., PBC**	
SUBTASK NO.	DELIVERABLE	NO. OF COPIES	
7.3	FINAL Screening Level Ecological Risk Assessment, Revision 01 Wilcox Oil Company Superfund Site Remedial Investigation/Feasibility Study Bristow, Creek County, Oklahoma	EPA: Electronic Copy via SharePoint ODEQ: 1 Electronic Copy via email	
ACCEPTANCE ACTION			
DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)		NAME/TITLE/SIGNATURE OF REVIEWER DATE	

Screening Level Ecological Risk Assessment

Remedial Investigation/Feasibility Study

Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma
EPA Identification No. OK0001010917

Remedial Action Contract 2 Full Service
Contract: EP-W-06-004
Task Order: 0128-RICO-06GG

Prepared for
U.S. Environmental Protection Agency
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January 2020
Revision: 01
EA Project No. 14342.128

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LIST OF ACRONYMS AND ABBREVIATIONS

95UCLM	95 percent upper confidence limit of the mean
µg/L	Micrograms per liter
µmoles/g_{oc}	Micromoles per gram organic carbon
AVS	Acid volatile sulfide
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factors
bgs	Below ground surface
BRAPF	Baseline Risk Assessment Problem Formulation
BSAF	Biota-Sediment Accumulation Factor
CN-	Free cyanide
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
EA	EA Engineering, Science, and Technology, Inc., PBC
Eco-SSL	Ecological Soil Screening Level
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
FI	Food ingestion rate
HCN	Hydrogen cyanide
HMW	High molecular weight
HQ	Hazard Quotient
kg/kg bw-d	Kilograms per kilogram of body weight per day
LMS	Lockheed Martin SERAS
LMW	Low molecular weight
LOAEL	Lowest Observed Adverse Effect Level
mg/kg	Milligrams per kilogram
mg/kg bw-d	Milligrams per kilogram of body weight per day
mg/L	Milligrams per liter
NAWQC	National Ambient Water Quality Criteria
ND	Non-detect
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level

ODWC	Oklahoma Department of Wildlife Conservation
ONHI	Oklahoma Natural Heritage Inventory
OWRB	Oklahoma Water Resources Board
PAH	Polycyclic aromatic hydrocarbon
PEL	Probable Effects Level
RAIS	Risk Assessment Information System
RI	Remedial Investigation
SEM	Simultaneously extracted metals
site	Wilcox Oil Company Superfund Site
SLERA	Screening Level Ecological Risk Assessment
SQL	Sample quantitation level
SVOC	Semivolatile organic compound
TEL	Threshold Effects Level
TOC	Total organic carbon
TRV	Toxicity reference value
UF	Uptake factor
UPL	Upper prediction limit
USACHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compound
yd^3	Cubic yard

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract Number EP-W-06-004, Task Order 0128-RICO-06GG, to conduct a Remedial Investigation (RI) at the Wilcox Oil Company Superfund Site (site). EA has prepared this Screening Level Ecological Risk Assessment (SLERA) in accordance with: (1) specifications provided in the EPA Statement of Work (EPA 2015) and (2) the EPA-approved EA Work Plan (EA 2015).

1.1 SCOPE AND DOCUMENT ORGANIZATION

The purpose of this SLERA is to characterize and quantify potential environmental impacts from residual chemicals in soil, sediment, and surface water from site activities. The assessment was conducted in accordance with the process outlined in the document *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997) and other relevant EPA guidance.

The process for ecological risk assessment (ERA) outlined in EPA guidance includes eight steps (EPA 1997, 1998), and this document presents the first three steps of the ERA process (Figure 1-1). Steps 1 and 2 represent the SLERA. The SLERA uses precautionary assumptions regarding exposure and toxicity to develop a Conceptual Site Model (CSM) and identify Chemicals of Potential Concern (COPCs). The CSM defines complete and significant exposure pathways and identifies assessment and measurement endpoints. The screening level evaluation relies on chemical analytical data.

Step 3 of the SLERA process is the Baseline Risk Assessment Problem Formulation (BRAPF). The BRAPF draws from the risk evaluation performed in the SLERA to identify COPCs, exposure pathways, assessment endpoints, and risk questions requiring further consideration. The BRAPF often includes a refinement of the screening level risk calculations through more realistic or more relevant exposure and toxicity data. The goal of the BRAPF is to provide a clear definition of the potential ecological risks for the site. This problem formulation forms the basis for either further assessment or, in cases where sufficient data are available, risk management if necessary. In the case of this site, SLERA and BRAPF refinement of risk calculations were performed.

This document is organized as follows:

- Chapter 1 presents the scope, site history, and a summary of data used in the SLERA.
- Chapter 2 presents the ecological CSM for the site.
- Chapter 3 presents Step 1 and Step 2 of the ERA process, the SLERA. This includes the development of the screening level problem formulation, the ecological effects evaluation, the screening level exposure, and the screening level risk calculation based on media of concern.

- Chapter 4 presents the methodology of Step 3 of the ERA process, the BRAPF. As part of the BRAPF, refined risk calculations and a weight of evidence approach based on site-specific information are used to refine the list of COPCs and better define the ecological endpoints that require further attention.

- Chapters 5 and 6 present the results of the risk characterization for terrestrial and aquatic receptors respectively. The results for all measurement endpoints are combined in a qualitative weight of evidence approach to provide a preliminary risk characterization for each assessment endpoint.

- Chapter 7 presents the uncertainties that may impact the assessment of risks.

- Chapter 8 presents the conclusions of the SLERA.

- Chapter 9 presents the references used in the SLERA.

1.2 SITE BACKGROUND AND DESCRIPTION

The site is an abandoned and demolished oil refinery and associated tank farm located north of Bristow, Creek County, Oklahoma (Figure 1-2) (EPA 2013, 2015). The approximate geographic coordinates for the site are 35°50'31" North latitude and 96°23'02" West longitude. The site spans approximately 140 to 150 acres.

The site consists of contaminated areas, including surface water bodies, due to releases from the former Lorraine and Wilcox Refineries (Figure 1-3) (EPA 2013, 2015). Properties where refinery waste is present at the surface are fenced and secured to deter trespassing and potential contact with the waste. These refineries were located in the N ½ of the NW ¼ of S29 T16N R9E and the SW ¼ of the SW ¼ of S20 T16N R9E in Creek County, Oklahoma. Two refinery process facilities and storage tank areas once operated at the two facilities. Historical investigations indicate the presence of contamination from former activities.

A detailed title search in the Creek County Clerk office confirms that the property was used in oil refinery operations from 1915 until November 1963 (EPA 2013, 2015). A skimming and cracking plant was constructed in 1929. The main components of the plant consisted of a skimming plant, cracking unit, and re-distillation battery with a vapor recovery system and treatment equipment. The Wilcox Oil Company expanded when it acquired the Lorraine Refinery in 1937, which was located west of the railroad. Oil refining began in 1915 at the Lorraine Refinery. A 1956 aerial photograph illustrating historic site features is presented in Figure 1-4. Wilcox sold the property to a private individual in 1963. Most of the equipment and storage tanks were auctioned or salvaged for scrap metal by the new property owners. Wilcox Oil Company no longer operates in Oklahoma. Based on information from the Oklahoma Secretary of States' office, the company merged with Tenneco Oil Company in 1967.

A skimming and cracking plant was constructed in 1929 (EPA 2013, 2015). The upgraded facility had an operating capacity of 4,000 barrels of crude oil per day. The main components of

the system consisted of a skimming plant, cracking unit, and re-distillation battery with a vapor recovery system and continuous treating equipment. The crude oil was brought directly from the field, eliminating storage and handling facilities, but resulted in crude oil with high sediment and water.

Sanborn Fire Insurance Maps can be used to understand historical property usage (EPA 2013). The Wilcox Oil and Gas Company and Lorraine Refining Company Sanborn Insurance Maps (provided as Appendix E of the Sampling and Analysis Plan [EA 2016a]) indicate that the properties contained approximately 80 storage tanks of various sizes, a cooling pond, and approximately 10 buildings that housed refinery operations. The maps also indicate that crude oil, fuel oil, gas oil, distillate, kerosene, naphtha, and benzene (petroleum ether) were stored on the property.

After the refinery operations ceased and most of the tanks and buildings were demolished and sold for scrap, the property was sold to private interests (EPA 2013, 2015). Beginning in 1975 with the construction of the church, private residences were constructed on six parcels of land that were part of the former refinery operations, with the most recent constructed in 2004. One former building associated with the refinery was repurposed as a residence. As a result, there are seven residences on the site located within former tank or refinery operation areas. Three of the residences that are located on the eastern portion of the site (East Tank Farm) are known to use water from domestic/private wells.

The location of the releases from the two refineries is a single site composed of a co-mingled release from the combined refinery operations threatening the same targets (Lockheed Martin SERAS [LMS] 2016; EPA 2013, 2015). The site is composed of a release from the combined facility operations.

The site includes remnants of former oil refining operations and tank farms (LMS 2016; EPA 2013, 2015). The facility can be divided into five major former operational areas (Figures 1-3 and 1-4): the Wilcox and Lorraine Process Areas, the East and North Tank Farms, and the Loading Dock Area. An active railroad divides the two former process areas and product storage areas.

- Wilcox Process Area – The Wilcox Process Area is fenced and spans approximately 26 acres (Figure 1-3). Most of the equipment and storage tanks that remained onsite in 1963 were auctioned and salvaged for scrap iron by private landowners; any remaining structures are in ruins. Four aboveground storage tanks (12,500-gallon capacity each) remain standing, in addition to a number of discarded drums and pieces of scrap iron and piping. A former lead additive area is present, that is barren. There are multiple areas of stressed vegetation, barren areas, and visible, black tarry waste of a hydrocarbon nature. A building in the northern part of the former refinery has been converted to a residence. This building is currently vacant, as is a residence located in the eastern portion of the process area; however, the occupancy status of the residences onsite may change at any time. An intermittent creek (West Tributary) flows southward across the eastern portion of the refinery process area through a small pond in the southeast corner of the Wilcox

Process Area into Sand Creek. Hydrocarbon waste has also been observed in several drainage channels that empty into Sand Creek.

- Lorraine Process Area – The Lorraine Process Area spans approximately eight acres and covers the southwestern portion of the site, south of West 221st Street South (formerly Refinery Road) and west of the railroad tracks. No refinery structures remain in either the processing area or refined product storage area. The First Assembly of God Church (currently vacant), a playground, and a vacant residence (parsonage) are located in this area. Sand Creek borders the western boundary of the Lorraine Process Area. A drainage feature is located near the northwestern corner of the former process area that drains south into Sand Creek. There are multiple areas of stressed vegetation, barren soil, and visible, black tarry waste of a hydrocarbon nature. For the purposes of the RI, a portion of the North Tank Area has been re-designated as part of the Lorraine Process Area (Figure 1-3); the triangular-shaped section is south of Refinery Road and is located within the fenced compound that comprises the vacant First Assembly of God Church.

- East Tank Farm – The East Tank Farm spans approximately 80 acres and includes pits, ponds, and a number of circular berms that surrounded former tank locations. The former crude oil storage tanks have been removed; however, remnants of the former tank locations remain visible. It is not known if piping associated with the tanks remains in place underground or was removed. Many of the berms surrounding the pits, ponds, and former tanks have been breached or leveled. The three residences are occupied and are located on or directly next to former tank locations in the East Tank Farm. There are multiple areas of stressed vegetation, barren soil, and visible, black tarry waste of a hydrocarbon nature. The East Tributary is located along the eastern boundary of the East Tank Farm and perennially flows south through a series of ponds to Sand Creek. Magellan Midstream Partners, LP operates a pumping station in the north-central portion of the East Tank Farm Area, as well as an active pipeline that transects the East Tank Farm, Loading Dock, and North Tank Farm Areas from the southeast to the northwest. Magellan Midstream Partners, LP has been known to pump several different petroleum products through the active pipeline, including kerosene, gasoline, jet fuel, and diesel.

- North Tank Farm – The North Tank Farm is located north of Refinery Road and west of the railroad tracks and spans approximately 20 acres. The North Tank Farm included crude oil and fuel oil storage tanks associated with the Lorraine Refinery. The tanks and other structures have since been removed. An occupied residence is located in the center of the North Tank Farm. There are areas of stressed vegetation, and visible, black tarry waste of a hydrocarbon nature.

- Loading Dock Area – The triangular-shaped Loading Dock Area spans approximately seven acres and is located north of Refinery Road and east of the railroad tracks. The Loading Dock Area was used for loading and unloading product by rail. There are multiple areas of stressed vegetation, barren areas, and visible black tarry waste of a hydrocarbon nature.

The vacant First Assembly of God Church and seven residences are presently located on the facility. The seven residences are located on former crude oil storage tank or refinery operations areas. The three occupied residences located on the East Tank Farm are known to use water from domestic/private wells located onsite; the occupied residence in the North Tank Farm has a private well but uses city water. The site is flanked by Route 66 to the west; a residential area and Turner Turnpike to the northwest and north; Sand Creek to the southwest; and residential, agricultural, and wooded areas to the east and south. The topography in the vicinity of the site slopes to the south. The drainage pattern of the property is primarily towards Sand Creek, which borders the western and southwestern boundaries of the property. An intermittent stream (West Tributary), a perennial stream (East Tributary), and several drainage channels transect the property east of the railroad (Wilcox Process Area and East Tank Farm), all of which flow into Sand Creek.

1.2.1 Interim Response Action

In September 2018, EPA issued a Source Control Record of Decision for cleaning up the refinery tank waste and the lead additive area source materials at the site (EPA 2018a). The interim response actions will remove source material while EPA continues to investigate the nature and extent of contamination and implement a site-wide remedy.

The major components for the interim response action include the following:

- Approximately 2,269 cubic yards (yd^3) of lead additive area source material and 28,093 yd^3 of tank waste source material will be excavated for a total of approximately 30,362 yd^3.

- Approximately 2,269 yd^3 of lead additive area source material will be treated through stabilization/solidification.

- Excavated and treated source material will be transported to an offsite permitted and regulated disposal facility.

- Excavated areas will be sampled, backfilled with clean soil from an offsite location, and re-vegetated.

- Excavated areas will be graded for drainage.

This action is considered an early final action for the tank waste due to the complete removal of the tank waste source material. This action is considered an interim action for lead because only source material in the lead additive area is being addressed. Final site-wide remediation, including lead, will be addressed in the final remedy selected for the site (EPA 2018a).

1.2.2 Summary of Data Used in the SLERA

EA conducted RI activities according to the Sampling and Analysis Plan (EA 2016a) under this Task Order from 2016 through 2018. Objectives in the Sampling and Analysis Plan relating to this SLERA included providing data to identify and delineate the extent of COPCs in environmental media, identify potential and complete exposure pathways, and provide data for completion of human health and ecological risk assessments. Surface soil samples collected from residential properties during June 2015 assessment activities were also used in this SLERA. Table 1-1 presents the samples that were used in this risk assessment. The validated data from the RI were found to be representative and usable to achieve the project objectives.

For purposes of the SLERA, the Wilcox Process Area and Lorraine Process Area (where the highest soil concentrations are present) will be evaluated as one exposure area. The remaining former operational areas (East Tank Farm, North Tank Farm, and Loading Dock Area) will also be evaluated as one exposure area. Additionally, the sediment and surface water samples collected from ponds and streams will be evaluated separately.

1.2.3 Soil

Surface and subsurface soil samples were collected from each of the former operational areas during the RI. Background soil samples were collected in October 2017 (Figure 3-1). Background data are evaluated in the BRAPF to aid in risk management decisions. Surface soil samples from 0 to 0.5 feet below ground surface (bgs) and subsurface soil samples greater than 0.5 feet bgs were collected during the field investigation. For the purposes of the SLERA, surface soil is defined as the top 0 to 2.0 feet bgs. This is considered the zone of greatest potential exposure for ecological receptors.

1.2.4 Sediment and Surface Water

Sediment samples and corresponding surface water samples were collected from the onsite ponds, Sand Creek, the west tributary of Sand Creek, and the east tributary of Sand Creek (Figure 3-2). Background samples were collected to evaluate whether site concentrations are significantly greater than background.

1.2.5 Data Reduction and Summary Statistics

This section describes the approach that was followed to evaluate the available analytical data in the media of concern. The following list summarizes the approach:

- Analytical results with “R” qualifier (indicating that the data were rejected during the validation process) were not used in the SLERA and BRAPF.

- Analytical results with a “U” or “UJ” qualifier indicate that the analyte was not detected at the sample quantitation level (SQL). These data were considered non-detects (NDs) and were retained in the data set. In the calculation of the 95 percent upper confidence

limit of the mean (95UCLMs), each ND was assigned a numerical value of one-half its SQL.

- Analytical results with a "J" qualifier indicate that the reported values were estimated because the analyte was detected at a concentration below the SQL. These data were considered detections and were retained in the data set at the measured concentration.

- Analytical results with a "K" qualifier (indicating potential for high bias) were considered detections and were retained in the data set at the measured concentration.

- Organic analytes with "L" qualifiers (reported concentration between the reporting limit and the method detection limit) were retained in the data set at the measured concentration.

- Analytical results for organic analytes with a "B" or "UM" qualifier (blank-related data) were treated as NDs.

In accordance with EPA (1989) guidance, the following steps were first used to summarize the chemical analytical data for the SLERA:

- Sample data were compared to blank (laboratory, equipment rinse, and field) concentration data. If the chemical concentration detected in a site-related sample was less than 10 times (for common laboratory chemicals) or 5 times (for all other compounds) the concentration detected in the corresponding blank sample, the sample was treated as an ND. The identification and validation of sampling or laboratory artifacts were performed prior to data summarization.

- The maximum concentration of a pair of duplicate or split samples (taken from the same location on the same date) if both parent and duplicate were detected, the maximum ND concentration if both parent and duplicate were ND, and the detected value if either parent or duplicate were detected were used to represent the concentration for that location.

- Frequency of detection was calculated as the number of samples in which the chemical was detected over the total number of samples analyzed.

There are a number of uncertainties associated with the chemical analytical data associated with sample coverage and study design. Uncertainties associated with the data used in the SLERA are discussed in Section 8.

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2. ECOLOGICAL CONCEPTUAL SITE MODEL

The SLERA is based on the CSM presented in the 2016 CSM Technical Memorandum (EA 2016b), which defines the potential source area, suspected COPCs, media of concern, habitats and possible receptors, and complete exposure pathways. In this SLERA, the CSM is used to define the assessment and measurement endpoints.

As part of the CSM, potential sources of chemicals and exposure pathways are characterized for the site (Figure 2-1). The model illustrates the pathways through which receptors may be exposed to sources of COPCs. Sources and exposure pathways are discussed further below.

2.1 ECOLOGICAL SETTING

The site is located in Central Oklahoma within the Central Lowland physiographic province, which is an area of rolling plains and low hills extending across the central portion of the United States from north-central Texas to Kansas. Creek County is also within the Osage plains of the Central Lowlands physiographic province. This part of the Central Lowlands is an area of well dissected-sandstone hills covered primarily with prairie grasses and select areas with remnants of Cross Timber and scrubby forests (USDA 1959).

The site is approximately 140-150 acres and consists of 75 percent open, grassy areas with the remaining 25 percent of the site being covered with various tree species. There are barren areas that may be indicative of plant stress due to contamination. In Creek County, the principal tree species are blackjack oak, post oak, and hickory, which are often found on upland areas consisting of sandy soil. Tree species often found in bottomland areas or along stream channels include elm, hackberry, pecan, and cottonwood (USDA 1959).

During the site visit in December 2015, the only wildlife observed were birds; however, portions of the site likely offer suitable habitat for deer, small mammals, and birds. Deer, bobcat, and turkey have been observed onsite during past field events. Frogs, minnows, turtles, and snakes have been observed in Sand Creek. In addition to Sand Creek, the following water features have been identified onsite: East and West Tributaries (intermittent), intermittent drainage pathways, wetlands, and small ponds. Four wetland areas were identified in the Wetland Delineation Report (EA 2017). The wetlands are discussed further in Section 2.2.

2.2 PHYSICAL HABITAT

The published soil survey data indicates there are six different soil units encompassing the site (USDA 2019). The soil units are summarized in the following table:

Map Unit Symbol	Map Unit Name	Site Distribution
BBgD3	Bartlesville-Bigheart complex, 1 to 8 percent slopes, severely eroded	South-central portion of East Tank Farm

Map Unit Symbol	Map Unit Name	Site Distribution
BNRD	Bigheart-Niotaze-Rock outcrop complex, 1 to 8 percent slopes	All of Loading Dock Area, and most of the North Tank Farm, a large portion of the East Tank Farm, a large portion of the Lorraine Process Area, and the extreme north portion of the Wilcox Process Area
Ga	Ashport silt loam, 0 to 1 percent slopes, frequently flooded	Extreme south portions of Lorraine Process Area and Wilcox Process Area along Sand Creek
Ma	Dale clay loam, 0 to 1 percent slopes, rarely flooded	Southeast corner of the Wilcox Process Area and the southwest Corner of the East Tank Farm
Oa	Oil waste land-Huska complex, 1 to 8 percent slopes	Most of the Wilcox Process Area, and a small portion of the north-central portion of the North Tank Farm.
Vd	Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded	East portion of East Tank Farm in area along the East Tributary of Sand Creek

Soil samples collected from the process areas were analyzed for pH. The pH of soils collected from the Lorraine Process Area range from 4.55 to 7.12, with an average pH of 5.9. The pH of soils collected from the Wilcox Process Area range from 6.64 to 9.26, with an average pH of 8.0.

A brief description of the physical habitat is presented below. Additional details are provided in the RI Report.

2.2.1 Wilcox Process Area and Lorraine Process Area

The Wilcox Process Area and Lorraine Process Area have four remaining aboveground storage tanks onsite. The Former Lead Additive Area is barren of vegetation. Two unoccupied residences are present on the Wilcox Process Area. The vacant First Assembly of God Church and residence are present in the Lorraine Process Area. The West Tributary flows across the Wilcox Process Area that feeds into Sand Creek. Sand Creek is considered a "habitat limited aquatic community" that is fish and wildlife propagation beneficial and recreational beneficial (Weston 1997; EPA 2013). Approximately 80 percent of the Wilcox Process Area and 30 percent of the Lorraine Process Area are covered with trees. The majority of the area is covered with native grasses. There are multiple areas of stressed vegetation, barren soil, and visible, black tarry waste of a hydrocarbon nature.

Two wetland areas were identified in the Wilcox Process Area (Figure 2-2), which are identified in the Wetland Delineation Report as Wetland 1 and Wetland 2 (EA 2017). Wetland 1 is in the southeastern portion of the Wilcox Process Area. The primary source of hydrology for Wetland 1 is believed to be surficial runoff. Wetland 2 is in line with the West Tributary of Sand Creek (Figure 2-2). Wetland 2 was likely man made in order to create a farm pond. Further details are included in the Wetland Delineation Report (EA 2017).

2.2.2 East Tank Farm, North Tank Farm, and Loading Dock Area

Three occupied residences and a herd of beef cattle are present on the East Tank Farm, and one occupied residence is located on the North Tank Farm. The East Tributary flows south across

the East Tank Farm to Sand Creek. Small ponds are present on the East Tank Farm. One wetland area was identified in the North Tank Farm, which is identified in the Wetland Delineation Report as Wetland 3 (Figure 2-2) (EA 2017). Wetland 3 is a system of vegetated drainage ditches that connect to Sand Creek. One wetland was identified in the East Tank Farm, which is identified in the Wetland Delineation Report as Wetland 4. Wetland 4 is a small area along the East Tributary in the northeast portion of the East Tank Farm (Figure 2-2). Further details are included in the Wetland Delineation Report (EA 2017). The majority of the areas are covered with native grasses. Approximately 30 percent of the Loading Dock Area, 60 percent of the North Tank Farm, and 30 percent of the East Tank Farm are covered with trees. There are multiple areas of stressed vegetation, barren areas, and visible black tarry waste of a hydrocarbon nature. Hydrocarbon waste was also observed in several drainage channels that empty into Sand Creek on the East Tank Farm.

2.3 POTENTIAL SOURCE AREAS

Potential source areas include the skimming and cracking plant, re-distillation battery, stills, cooling ponds, a lead additive area, approximately 10 buildings that housed refinery operations, storage tanks, and other related refinery structures historically located on the Lorraine and Wilcox Process Areas. Other potential source areas include former locations of approximately 80 bulk storage tanks of various sizes located at the Lorraine and Wilcox Process Areas, as well as the East and North Tank Farms. Surficial waste material was also identified and sampled at the Loading Dock Area.

Crude oil, fuel oil, gas oil, distillate, kerosene, naphtha, and benzene (petroleum ether), acids, and other refined products were reportedly stored on the property (EA 2016a). Periodic releases of crude oil, sludge, and refined product occurred in these areas during operations. These releases may have been discharged to surface and subsurface soil, and subsequently migrated to groundwater, surface water, and sediment. Volatile organic compounds (VOCs) may have also migrated into the vadose zone as soil gas.

2.4 FATE, TRANSPORT, AND MEDIA OF CONCERN

A number of fate and transport pathways are expected to influence the transfer of COPCs between environmental media in the site. Chemicals in surface soil may have been transferred vertically to subsurface soil by leaching beyond the zone of exposure for ecological receptors, or horizontally to soil further from the source. Given the tendency for some of the COPCs at the site (metals and polycyclic aromatic hydrocarbon [PAHs]) to bind to soil, horizontal transport is expected to be limited for those analytes.

Contaminant transport of particulates and dissolved phase contaminants via surface water transport may occur in Sand Creek, the East Tributary, and the West Tributary. Dissolved phase contaminants in shallow groundwater could be transported to surface water. Sediment containing chemicals may be eroded and deposited farther downstream. Chemicals carried in surface waters from the site source areas have the potential to adsorb onto sediment particles. Chemicals may also desorb from the sediment and released back into the surface waters. These

processes concern ecological receptors in that they allow chemicals from low quality habitats to be redistributed to high quality habitats utilized by wildlife.

Bioaccumulation is also a relevant transport pathway. Plants and animals that come into contact with contamination in soil, sediment, or water may uptake chemicals. Dependent upon the chemical and the organism, these chemicals may accumulate in tissue.

It is important to note that transport pathways are dependent upon factors that influence the forms of chemicals in environmental media and their bioavailability. This is especially important for metals. Metals are present in nature in a wide range of chemical forms. Soluble forms of some metals are highly mobile in soil, sediment, and water, facilitating higher transport rates and making them more bioavailable, meaning that they are taken up more easily by plants and animals. Metals such as barium, copper, chromium, lead, nickel, vanadium, zinc, and others are more soluble in acidic or highly alkaline environments, and less soluble in circum-neutral or moderately alkaline environments. Many of the mineral forms of metals found in naturally occurring rocks and soils are relatively insoluble and are not readily taken up by wildlife. Changes in the chemistry of soil, sediment, or water may make metals more or less soluble, and thus determine their ultimate mobility and bioavailability.

Based on the above discussion of potential habitats, sources, and fate and transport; soil, sediment, and surface water were considered the primary media of concern (Figure 2-1).

2.5 MEDIA OF CONCERN AND POTENTIAL RECEPTORS OF CONCERN

The expected media of concern include site surface and subsurface soil less than 2 feet bgs, site groundwater, sediment and surface water in the ponds, and sediment and surface water in the East Tributary, the West Tributary, and Sand Creek. Ecological receptors are not expected to encounter subsurface soil. Complete, significant exposure pathways for receptors are expected to be limited to exposure to surface soil, sediment, surface water, and terrestrial and aquatic food chains.

Potential receptors evaluated in the SLERA for the site include plants, soil invertebrates, amphibians and reptiles, birds, mammals, benthic invertebrates, and aquatic organisms. Potential ecological receptors are shown in the CSM (Figure 2-1).

2.6 IDENTIFICATION OF EXPOSURE PATHWAYS

Based on the ecological setting and media of concern discussed above, ecological receptors potentially present at the site include plants, terrestrial invertebrates, wildlife (birds, mammals, reptiles/amphibians), and aquatic and benthic organisms. Media of concern and ecological receptors are evaluated to determine potential exposure routes linking the two and to determine which pathways are complete and significant. The sections below identify the major routes of exposure and their applicability to each of these receptor groups.

2.6.1 Terrestrial Plants and Invertebrates

Terrestrial plants and invertebrates may be exposed to environmental media through direct contact. Plants may absorb chemicals from surface and subsurface soil via their roots. They may also absorb chemicals from air or airborne particles through their leaves, although the waxy surfaces of leaves limit this exposure. Soil invertebrates may be exposed to chemicals in soil through direct contact, and chemicals may be absorbed from soil through the skin. Because the most organic matter is found in surface soil, plant and invertebrate exposures are expected to occur primarily in surface soil. Therefore, exposure pathways linking plants and soil invertebrates to surface soil are complete and thus relevant for assessment.

2.6.2 Wildlife (Birds and Mammals)

The most significant exposure route for wildlife is ingestion of chemicals in contaminated media (EPA 2003a). Wildlife may ingest chemicals in environmental media by incidentally ingesting soil or sediment while grooming or foraging. As discussed above, chemicals may bioaccumulate in animal tissues. Therefore, wildlife may also ingest chemicals through the plants or animals that they consume as food. Ingestion of chemicals in sediment, surface water, and/or food is considered a complete and potentially significant exposure pathway for wildlife.

Wildlife may be exposed to chemicals in air, soil, sediment, or water via direct contact during foraging or burrowing. Most wildlife have protective outer coverings such as fur, feathers, or scales that prevent or limit the dermal absorption of chemicals from environmental media (U.S. Army Center for Health Promotion and Preventative Medicine [USACHPPM] 2004). EPA guidance identifies that, in most cases, dermal exposures are likely to be less significant than exposures through ingestion and their evaluation involves considerable uncertainty (EPA 2003a, USACHPPM 2004). Given that many metals demonstrate relatively low dermal absorption, this exposure route is considered complete but relatively insignificant for wildlife.

Inhalation is a potentially complete pathway for both soil invertebrates and wildlife. These animals may inhale chemicals that have volatilized or that are adsorbed to airborne particulates. EPA guidance indicates that, in general, inhalation pathways are likely to be insignificant compared to ingestion pathways (EPA 2003a).

Exposure to groundwater and subsurface soil are considered incomplete pathways. Aquatic receptors are expected to receive most of their exposure in the top 2 feet of sediments and terrestrial receptors in the top 2 feet of surface soil. However, subsurface soil and groundwater contamination may contaminate surface media, which ecological receptors will be exposed to, via exfiltration and seeps. The subsurface soil and groundwater are considered potential sources but not exposure media.

In summary, ingestion of chemicals in surface soil, sediment, surface water, and food are considered complete and significant exposure pathways for wildlife assessment in this SLERA.

2.6.3 Aquatic and Benthic Organisms

Aquatic and benthic organisms may be exposed to chemicals in surface water and sediment respectively through direct contact and absorption through the skin and gills. Direct exposure to these media is considered a complete and significant pathway for aquatic and benthic organisms, and therefore relevant for the assessment of sediment and water exposures.

2.6.4 Reptiles and Amphibians

Reptiles and amphibians are exposed to chemical contaminants from surface water, sediment, soil, airborne dust, and prey. These receptors are exposed to contaminants via direct contact with and ingestion of sediment, surface water, airborne dust, and soil as well as ingestion of food (prey tissue). All of these represent complete pathways but only the ingestion of food and the ingestion of and direct contact with sediment and soil are considered significant (Figure 2-1).

2.7 SELECTION OF REPRESENTATIVE RECEPTORS

Ecological receptors that could possibly utilize the site include plants, soil invertebrates, wildlife (birds, mammals, reptiles, and amphibians,), benthic invertebrates, and aquatic organisms. Selection of representative receptor species is based on several factors:

(1) Likelihood of a species to use the site and the area immediately surrounding the site;
(2) Potential for exposure to site-related contaminants based on the feeding habits and life history of the organisms/guild represented by the receptor species;
(3) Availability of life history and exposure information for the selected receptor species; and
(4) Availability of toxicity information for the representative receptor species.

Potential representative receptors were evaluated based on these criteria and based on the applicability of available toxicity benchmarks to the terrestrial plant community, soil invertebrate community, populations of wildlife, benthic invertebrates, and aquatic organisms. The receptors of concern (and representative receptor species) included in this SLERA are:

- Terrestrial plants (multiple species)
- Soil invertebrates (earthworm)
- Terrestrial herbivorous mammals (white-footed mouse) (*Peromyscus leucopus*)
- Livestock (beef cattle)
- Terrestrial insectivorous mammals (southern short-tailed shrew) (*Blarina carolinesis*)
- Predatory mammals (red fox) (*Vulpes vulpes*)
- Aquatic herbivorous mammals (muskrat) (*Ondrata zibethicus*)
- Aquatic insectivorous mammals (raccoon) (*Procyon lotor*)
- Piscivorous mammals (river otter) (*Lutra canadensis*)
- Terrestrial insectivorous birds (American robin) (*Turdus migratorius*)
- Predatory birds (red-tailed hawk) (*Buteo jamaicensis*)
- Aquatic herbivorous birds (Canada goose) (*Branta canadensis*)

- Piscivorous birds (great blue heron [*Ardea herodias*], green heron [*Butorides virescens*])
- Benthic invertebrates (multiple species)
- Aquatic organisms (multiple species)
- Amphibians and reptiles (multiple species).

2.7.1 Terrestrial Plants

Based on the general nature of available plant toxicity data, no specific plant species are selected for evaluation. Instead, the assessment evaluates the potential for adverse effects to herbaceous plant populations.

2.7.2 Soil Invertebrates

Earthworms were selected as the receptor species for evaluating the potential for adverse effects to soil invertebrates for several reasons. Earthworms are an ideal receptor because they are in constant contact with the soil, have a significant lipid content that may accumulate organic chemicals, and do not have an exoskeleton; as such, they represent a conservative estimate of exposure. Furthermore, earthworms serve an important ecological role in aerating soils and cycling of nutrients and are an important food source for some soil invertebrate-eating species (e.g., robins and shrews). Lastly, toxicity data for earthworms are available in scientific literature.

2.7.3 Wildlife

Although results of the SLERA provide conclusions regarding the potential for adverse effects to individual organisms, the objective is to be protective of the populations that may use the site. However, few methods are available to extrapolate the potential for adverse effects from the individual level to the population level. Therefore, it is assumed that if there is no potential for direct adverse effects to individual organisms, then it is also unlikely for there to be the potential for direct adverse effects to populations. Similarly, it is assumed that if there is the potential for adverse effects to individual organisms, then there is also the potential for adverse effects to populations. The following sections provide a summary of the avian and mammalian representative receptor species identified for evaluation.

Terrestrial Herbivorous Mammals

The white-footed mouse (*Peromyscus leucopus*) was selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous mammals. The white-footed mouse is an appropriate receptor species because it is likely to occur at the site, it is a potential food source for other animals, and it has a life history similar to that of many other small mammals. Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures.

In addition, a herd of cattle occupy a portion of the East Tank Farm. Therefore, cattle will also be evaluated as a potential herbivorous mammalian receptor. For the purposes of the SLERA, it will be assumed that 100 percent of the cattle's diet will be from the site.

Terrestrial Herbivorous Birds

The song sparrow (*Melospiza melodia*) was selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous birds. Song sparrows are an appropriate representative receptor because they are expected to be present at the site and have a life history similar to that of many other songbirds. Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures.

Terrestrial Invertebrate-Eating Wildlife

The American robin (*Turdus migratorius*) was selected as the representative receptor species to evaluate the potential for adverse effects to insectivorous birds. The American robin is an appropriate receptor because it occurs in a wide range of habitat types, is expected to be present at the site, feeds primarily on invertebrates, and has a life history similar to that of many other passerine birds. The American robin has an average home range of 1 to 2 acres (Young 1951, Pitts 1984). Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures.

The southern short-tailed shrew (*Blarina carolinensis*) was selected as the representative receptor species to evaluate the potential for adverse effects to insectivorous mammals. The shrew is an appropriate receptor species because it is a potential food source for other animals, is likely to occur at the site, and has a life history similar to that of many other small mammals. Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures.

In addition to the ingestion of chemicals in food items, the incidental ingestion of chemicals in surface soil was considered for the above species.

Higher Trophic Level Predatory Wildlife

The red-tailed hawk (*Buteo jamaicensis*) was selected as the representative receptor for predatory birds because it is likely to be present at the site. The red-tailed hawk is selected as a suitable representative for a predatory bird receptor because it feeds predominantly on small mammals (such as mice, shrews, voles, rabbits, and squirrels). Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures. Furthermore, small mammals are present throughout the site and are likely to provide a plentiful food source, thus completing this potential exposure pathway. As well as the ingestion of chemicals in food items, the red-tailed hawk may be exposed through the ingestion of chemicals in surface water. However, incidental ingestion of soil is considered unlikely (Sample and Suter 1994).

Red fox (*Vulpes vulpes*) was selected as the representative receptor for predatory mammals because it was observed at the site during 2015 field activities, feeds primarily on small mammals, has a high potential for exposure due to bioaccumulation though the food chain, and is a valuable component to ecosystem structure by regulating the abundance, reproduction, distribution, and recruitment of lower trophic level prey (EPA 1999b). Also, sufficient data are available for this species to support a quantitative evaluation of food web exposures. The red fox could be exposed to chemicals through ingestion of a variety of food items as well as through the ingestion of surface water and the incidental ingestion of soil while foraging or grooming.

Amphibians and Reptiles

The assessment of risks to amphibians and reptiles is limited by the lack of sufficient literature-based exposure and toxicity information. Also, there are currently no assessment methods for evaluating these receptors. Because potential risks to these receptors cannot be quantitatively dismissed, the amphibian and reptile receptor endpoints will be carried forward through the SLERA and evaluated qualitatively.

Aquatic Herbivorous Wildlife

Herbivorous birds and mammals are exposed to chemical contaminants from surface water, sediment, and vegetative matter, chiefly during foraging. These receptors are exposed to contaminants via direct contact with and ingestion of surface water and sediment and the ingestion of food (plant tissue). All of these represent complete pathways, but only the incidental ingestion of sediment and the consumption of food will be considered significant (Figure 2-1).

The muskrat *(Ondatra zibethicus*) is selected as the mammalian receptor species for evaluating potential adverse effects to herbivorous mammals from the ingestion of plants. The muskrat's diet can include significant amounts of plant food items (EPA 1993). Therefore, the muskrat is selected as the indicator species for the evaluation of potential adverse effects to mammals from feeding on plants at the site.

The Canada goose (*Branta canadensis*) is selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous birds from the ingestion of chemicals in plant material. Birds can be more sensitive to certain contaminants, such as dichlorodiphenyltrichloroethane (DDT) (Sample et al. 1996), and it is therefore more conservative to include an avian receptor. The Canada goose is selected as a representative receptor species because its diet consists mostly of plant material (EPA 1993) and this species can be an important part of the diet of predatory mammals.

Aquatic Invertebrate-Eating Wildlife

The raccoon (*Procyon lotor*) is selected as the mammalian receptor species for evaluating potential adverse effects to mammals from the ingestion of benthic and aquatic invertebrates. The raccoon has a varied diet that can include over 60 percent aquatic or benthic food items

(EPA 1993). Therefore, the raccoon is selected as the indicator species for the evaluation of potential adverse effects to aquatic invertebrate-eating mammals.

Piscivorous Wildlife

Given that the existence of sediment-bound contaminants and the potential for release of contaminants into the overlying water may result in the pelagic community bioaccumulating contaminants, piscivores (both birds and mammals) may be exposed to contaminants in their diet. In addition, these species may be exposed to contamination through the incidental ingestion of sediment and surface water that occurs during foraging activities, and through the deliberate ingestion of surface water.

The great blue heron (*Ardea herodias*) is selected as the avian receptor species for evaluating potential adverse effects to birds from the ingestion of fish, amphibians, and crayfish from the area. The great blue heron is selected for evaluation, because a large proportion of the diet is comprised of fish (including game fish) and larger aquatic invertebrates, and the heron may forage in the areas bordering these sites. In some areas, game fish (such as large-mouth bass) can comprise one-quarter of a heron's diet (Cottam and Uhler 1945).

The green heron (*Butorides virescens*) is selected to evaluate the potential adverse effects to small piscivorous birds. Green herons eat mainly small fish such as minnows but can also feed on small insects, spiders, and crustaceans. They usually forage among thick vegetation in water that is less than 4 inches deep (Cornell Lab of Ornithology 2019).

The North American river otter (*Lutra canadensis*) was selected as the mammal species for evaluating potential adverse effects to mammals from the ingestion of fish and benthic and aquatic invertebrates at the site. Since a large proportion of their diet is comprised of fish, the river otter was selected as the representative piscivorous mammal.

2.7.4 Aquatic Organisms

No specific aquatic organisms are selected for surface water evaluation; instead, the assessment evaluates the potential for adverse effects to aquatic animal and plant populations. Potential risks to aquatic organisms are evaluated by comparing chemical concentrations measured in surface water with available water quality standards.

Direct exposure to chemicals in sediment represents potential risk to the aquatic benthic community. Additionally, invertebrates serve as a vector of chemical uptake and transport to other invertebrates and vertebrates (e.g., fish, birds) that may feed on them. Because benthic macroinvertebrates are exposed to contaminated sediments and COPCs potentially bioaccumulate in these organisms, higher trophic level organisms (e.g., fish, birds) can be exposed to contamination through the ingestion of larval stages and emerging, adult insects. In addition to benthic macroinvertebrates, aquatic invertebrates can accumulate contaminants from the sediment and surface water column and serve as prey for higher organisms.

As with aquatic organisms exposed to surface water, the toxicity data being used in the SLERA were designed to evaluate the potential for adverse effects to benthic organism populations exposed to sediment containing those contaminants. No individual species were selected for evaluation, and the assessment evaluates the potential for adverse effects to the overall benthic community. Potential risks to benthic organisms are evaluated by comparing concentrations of COPCs in sediment to applicable sediment quality toxicity values.

2.7.5 Wetland and Aquatic Plants

These receptors are exposed to chemical contaminants by direct contact with sediments and surface waters; these are the only complete exposure pathways identified (Figure 2-1). The roots of wetland and aquatic plants are in continuous contact with bottom sediments, and active uptake of contaminants by roots can occur. Stems and other immersed tissues could uptake contaminants from surface water through stomata. There are limited benchmarks available for surface water exposure to plants (Suter and Tsao 1996, Efroymson et al. 1997a). Wetland and aquatic plants can be assumed to be protected in the event that no phytotoxicity data are available if it can be shown that surface water concentrations meet water quality standards. No other exposure pathways are complete, because root systems are not deep enough to penetrate to subsurface layers or groundwater. Transfer of particulates from air to the surface of the plant is expected but not likely to be a route of exposure because of the relatively impermeable nature of plant cell walls.

2.8 THREATENED AND ENDANGERED SPECIES

An important consideration in forming an ecological CSM is the presence of endangered, threatened, and rare species on the site. According to the USFWS Environmental Conservation Online System, or ECOS (USFWS 2016a), there are two threatened bird species, one endangered bird species, and one bird species in recovery status that are known or believed to occur in Creek County. The endangered American Burying Beetle has been observed in Creek County, approximately two miles from the site. The table below is a full list of species that are currently state or federally listed as endangered or threatened, and rare and vulnerable in Creek County, Oklahoma (Oklahoma Department of Wildlife Conservation [ODWC] 2016; USFWS 2016a; Oklahoma Natural Heritage Inventory [ONHI] 2016a,b). The listed species may occur within Creek County; however, there have been no known documentation of the species or their habitat identified at the site (Weston 1997).

Species	Scientific Name	Federal Status	State Status
Vertebrate Species			
Least tern	*Sterna antillarum*	Endangered	Endangered
Piping plover	*Charadrius melodus*	Threatened	Threatened
Red knot	*Calidris canutus rufa*	Threatened	Threatened
Arkansas River Shiner*	*Notropis girardi*	Threatened	Threatened
American peregrine falcon	*Falco peregrinus anatum*	Recovery	Recovery
Invertebrate Species			
American burying beetle	*Nicrophorus americanus*	Endangered	Endangered
Plant Species			
Hammock Sedge	*Carex fissa*	--	Rare and Vulnerable
Note: * Per Fish and Wildlife Service, the Arkansas River Shiner has not been observed in Creek County since the 1990s.			

3. STEPS 1 AND 2: SCREENING LEVEL ECOLOGICAL LEVEL RISK ASSESSMENT

The first two steps of the eight-step ERA process (Figure 1-1) constitute the SLERA. The SLERA includes screening-level problem formulation, ecological effects evaluation, exposure estimate, and risk calculation. This section presents the SLERA for the site and is organized into the following subsections:

- Screening-level problem formulation
- Assessment and measurement endpoints
- Identification of chemicals of potential concern
- Summary of the SLERA results.

3.1 SCREENING LEVEL PROBLEM FORMULATION

The screening-level problem formulation includes development of a CSM (as described in Section 2.0) and assessment and measurement endpoints. Assessment and measurement endpoints are identified for each representative receptor species evaluated in the Wilcox Process Area, Lorraine Process Area, East Tank Farm, North Tank Farm, and Loading Dock Area. Measurement endpoints are measurable ecological characteristics that are related to the assessment endpoints (EPA 1997). The measurement endpoints are used to assess the potential for effects on the assessment endpoints through their comparison to screening level concentrations or toxicity values. The measurement endpoints for the site are provided in Table 3-1.

3.2 ASSESSMENT AND MEASUREMENT ENDPOINTS

EPA guidance stresses the importance of ecologically significant endpoints. As discussed by EPA, "Assessment endpoints are explicit expressions of the actual environmental value that is to be protected, operationally defined by an ecological entity and its attributes" (EPA 1998). Failure to select appropriate assessment and measurement endpoints can result in the inability to answer the risk questions central to a SLERA. Several criteria are applicable for endpoint selection (Suter 1993; EPA 1998):

1. ***Unambiguous Definition***—Assessment endpoints should indicate a subject and a characteristic of the subject (e.g., fish reproduction).

2. ***Accessibility to Prediction and Measurement***—Assessment endpoints should be reliably predictable from measurements.

3. ***Susceptibility to the Hazardous Agent/Stressor***—Susceptibility of an organism (plant or animal) results from the combination of potential for exposure and the sensitivity to the concentrations of contaminants or other stressors of concern.

4. ***Biological Relevance***—Biological relevance of impacts to an individual organism is determined by the importance of the impact to higher levels of biological organization (e.g., populations or communities).

5. ***Social Relevance and Policy Goals***—Assessment endpoints should be of value to decision-makers and the public. The assessment endpoints should represent effects that would warrant consideration of site remediation or alteration of project plans. Assessment endpoint selection should also include endpoints that may be mandated legally (e.g., protected species).

The ecological assessment endpoints applicable to the site are discussed below:

- Protection of organisms exposed directly or indirectly to surface soil to ensure that COPCs in surface soil do not have unacceptable adverse effects on organism survival, growth, and reproduction, which may result in adverse effects to the community structure (e.g., diversity or biomass).

- Protection of organisms exposed directly or indirectly to sediment to ensure that COPCs in sediment do not have unacceptable adverse effects on organism survival, growth, and reproduction, which may result in adverse effects to the community structure (e.g., diversity or biomass).

- Protection of organisms exposed directly or indirectly to surface water to ensure that COPCs in surface water do not have unacceptable adverse effects on organism survival, growth, and reproduction, which may result in adverse effects to the community structure (e.g., diversity or biomass).

These assessment endpoints are general and are refined and revised for sample types warranting evaluation in the refined assessment conducted in Step 3.

The measurement endpoints are measurable ecological characteristics that are related to the assessment endpoints (EPA 1998). Because it is difficult to "measure" assessment endpoints, measurement endpoints were chosen that permit inference regarding the assessment endpoints described above. Measurement endpoints for the Step 1 and 2 SLERA selected for this risk assessment are the following:

1. ***Surface Soil Data***—The measurement of maximum COPC concentrations in surface soil provides the means, when compared to conservative (based on chronic or no effects levels), ecotoxicological-based screening concentrations, for drawing inferences regarding the assessment endpoint for surface soil.

2. ***Sediment Data***—The measurement of maximum COPC concentrations in sediment provides the means, when compared to conservative (based on chronic or no effects levels), ecotoxicological-based screening concentrations, for drawing inferences regarding the assessment endpoint for sediment.

3. ***Surface Water Data***—The measurement of maximum COPC concentrations in surface water provides the means, when compared to conservative (based on chronic or no effects levels), ecotoxicological-based screening concentrations, for drawing inferences regarding the assessment endpoint for surface water.

3.3 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

COPCs are selected by comparing the maximum chemical concentrations found in site media to ecological risk-based screening values. Maximum concentrations were compared to the lowest screening value obtained from literature-based values found at the following links:

- Surface Soil—the lowest value obtained from the Eco-SSLs of available receptors from:

    1. EPA Eco-SSLs accessed at http://www.epa.gov/ecotox/ecossl or

    2. Region 4 Ecological Screening Values (March 2018) (EPA 2018b), accessed at https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

- Sediment and Surface Water—freshwater values (where available) obtained from:

    1. Oklahoma Water Resources Board Aquatic Life Criteria (OWRB 2017), accessed at http://www.owrb.ok.gov/quality/standards/standards.php

    2. EPA National Recommended Aquatic Life Criteria, accessed at https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

    3. Region 4 Ecological Screening Values (March 2018) (EPA 2018b), accessed at https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

The selected ecological screening values are presented in Table 3-2.

3.4 SLERA RESULTS

Maximum chemical concentrations of detected analytes were compared to media-specific screening levels as shown in Tables 3-3 through 3-6. The results of this comparison are used to identify COPCs. If the screening level is greater than the maximum concentration, the potential for adverse effects is considered unlikely. Because of the conservative nature of the SLERA, only chemicals with maximum concentrations less than the screening level can be removed from further evaluation. If the maximum concentration is equal to or greater than the screening leve1, or if a media-specific screening value is not available, the chemical is retained as a COPC and evaluated further. Inclusion of these chemicals as COPCs does not necessarily indicate that they

pose risks; it indicates that the chemicals cannot be definitively eliminated from further consideration.

Screening values for individual PAH compounds are identified for sediment and surface water, however the primary mode of toxicity for PAHs is non-specific, non-polar, and narcosis (EPA 2007e). The refined assessment for sediment and surface water will be performed using the Total PAH values, which is appropriate given the toxicological properties of PAH compounds.

Essential nutrients, although detected in media, are not included in the list of COPCs. Essential nutrients include calcium, iron, magnesium, sodium, and potassium. These chemicals are necessary for metabolic processes in organisms and, thus, are considered essential nutrients for wildlife. At naturally occurring concentrations, receptors are able to regulate uptake and metabolism of these elements. However, as with all chemicals, it is possible that nutrients may produce toxic effects at very highly elevated concentrations. These five chemicals generally do not have screening level concentrations or toxicity reference values (TRVs) (except iron). They have been eliminated from further evaluation in this SLERA. The uncertainty associated with the toxicity of essential nutrients is discussed in Section 8.

Aluminum naturally occurs and is a large component of most soil types, typically contributing 1 to 30 percent. However, high concentrations of aluminum do not correlate with toxicity as aluminum must be in a freely dissolved ionic form in order to adversely affect ecological receptors. EPA has determined that the most appropriate way to evaluate whether aluminum as a COPC in soil (EPA 2003b) is by measured pH, as bioavailability of aluminum for uptake and toxicity varies with pH. Solubility and bioavailability increase with lower pH (EPA 2003b). The average pH in surface soil at the site is 7.4 (Table 3-7). According to the EPA Eco-SSL document for aluminum (EPA 2003b), aluminum is identified as a COPC only at sites where the soil pH is less than 5.5. Therefore, aluminum in the surface soil is not a COPC for ecological receptors.

This approach can also be applied to sediment because between a pH of 5 and 9, aluminum is insoluble and primarily in the form of the mineral gibbsite (Gensemer and Playle 1999). In order to exhibit toxicity, a metal needs to be freely dissolved to interact with the biotic ligand of the organism, typically gill membranes in aquatic species (Gensemer and Playle 1999). When aluminum is present as a mineral such as gibbsite, and not an ion, it is unable to pass through the gill membrane and consequently cannot enter the organism's cells and potentially cause toxicity. The average pH of the sediment at the site is 6.9 (Table 3-8); consequently, aluminum in the sediment is not a COPC for ecological receptors. Total aluminum was found as a COPC in surface water, but dissolved aluminum concentrations are below the screening criteria, as noted in Section 3.4.3. Dissolved aluminum surface water concentrations were used in the evaluation of aquatic organisms; total aluminum surface water concentrations were used in the food web models.

Dissolved phase contaminants in shallow groundwater could be transported to surface water as noted in Section 2.2. The maximum concentrations detected in groundwater were compared to the surface water criteria described in Section 3.3. Use of the maximum detected concentrations

is consistent with use of conservative assumptions in the SLERA. The results of the comparison are listed in Table 3-9. A number of chemicals in groundwater were identified as exceeding surface water ecological screening values including 11 metals (aluminum, arsenic, barium, beryllium, chromium, hexavalent chromium, cobalt, copper, lead, manganese, and vanadium), cyanide, five PAHs (2-methylnapthalene, anthracene, benzo(g,h,i)perylene, naphthalene, and phenanthrene), one semivolatile (phenol), and nine VOCs (acetone, benzene, cyclohexane, ethylbenzene, isopropylbenzene, methylcyclohexane, toluene, m,p-xylenes, and o-xylenes). It is important to note that upon groundwater day-lighting to surface water the geochemistry changes significantly. For example, hexavalent chromium is likely to be oxidized to the less toxic trivalent form, and volatile chemicals such as naphthalene volatilize quickly once exposed to the atmosphere. In surface water anthracene was the only PAH or semivolatile measured above screening criteria; no VOCs exceeded the screening criteria in surface water (Tables 3-5 and 3-6). Further, concentrations of metals were smaller, and many fewer metals exceeded screening criteria in surface water. Consequently, surface water COPCs are evaluated based upon the concentrations present in the surface water samples collected from Sand Creek, the East Tributary, and the West Tributary.

The results of the SLERA represent maximum estimates of risk and are not necessarily representative of population-wide risks. Therefore, Step 3 of the ERA (the BRAPF) includes a refinement of risk estimates using more site-specific assumptions and information for the exposure areas. Chemicals that lack screening values could not be fully evaluated and therefore potential risks remain uncertain. Uncertainties associated with the SLERA are discussed in Section 8. The following sections summarize COPCs for each area.

3.4.1 Wilcox and Lorraine Process Areas SLERA Results

Process Area Surface Soil COPCs, see Table 3-3:

The following chemicals in surface soil exceeded the soil screening value and were identified as COPCs in the Wilcox and Lorraine Process Areas.

Metals

Antimony	Cobalt	Nickel
Arsenic	Copper	Selenium
Cadmium	Lead	Thallium
Chromium	Manganese	Vanadium
Chromium, hexavalent	Mercury	Zinc

Inorganics

Cyanide

PAHs

Total high molecular weight (HMW) PAHs
Total low molecular weight (LMW) PAHs

Pesticides

4,4'-DDD	Gamma-chlordane
4,4'-DDT	

Semivolatile Organic Compounds (SVOCs)

1,1-biphenyl	Carbazole
4-methylphenol	Dibenzofuran
Bis(2-ethylhexyl)phthalate	Di-n-butyl phthalate

VOCs

Carbon disulfide	Isopropylbenzene

The following chemicals were retained as COPCs in the Wilcox and Lorraine Process Areas due to lack of soil screening values.

SVOCs

Acetophenone

VOCs

1,4-dioxane	Cyclohexane	Toluene
Xylenes (m&p)	Xylenes (o)	

3.4.2 North Tank Farm, Loading Dock Area, and East Tank Farm SLERA Results

North Tank Farm, Loading Dock Area, and East Tank Farm Surface Soil COPCs, see Table 3-4:

The following chemicals in surface soil exceeded the soil screening value and were identified as COPCs in the North Tank Farm, Loading Dock Area, and East Tank Farm.

Metals

Antimony	Cobalt	Selenium
Arsenic	Copper	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Vanadium
Cadmium	Mercury	Zinc
Chromium	Nickel	

Inorganics

Cyanide

PAHs

Total HMW PAHs

Pesticides
Alpha-chlordane

SVOCs

Bis(2-ethylhexyl)phthalate	Dimethyl phthalate	
Carbazole	Di-n-butyl phthalate	
Dibenzofuran		

VOCs

Benzene	Toluene	Total xylenes
Ethylbenzene	m&p-xylenes	
Isopropylbenzene	o-xylenes	

The following chemicals were retained as COPCs in the North Tank Farm, Loading Dock Area, and East Tank Farm due to lack of soil screening values.

SVOCs
Acetophenone

VOCs
Cyclohexane

3.4.3 Stream and Pond SLERA Results

Sediment Pond COPCs, see Table 3-5**:**

The following chemicals exceeded the sediment screening value and were identified as COPCs in the ponds.

Metals

Barium	Lead	Manganese

PAHs
Total PAHs

SVOCs
4-methylphenol

VOCs

Acetone	Toluene

The following chemicals were retained as COPCs in the ponds due to lack of sediment screening values.

Metals

Beryllium	Hexavalent chromium	Vanadium

Inorganics

Cyanide

Surface Water Pond COPCs, see Table 3-5**:**

The following chemicals exceeded the surface water screening value and were identified as COPCs in the ponds.

Metals

Aluminum (total)	Barium (total)	Cadmium (total, dissolved)
Copper (total)	Lead (total, dissolved)	Manganese
Vanadium (total)		

PAHs

Total PAHs

Sediment Stream COPCs, see Table 3-6**:**

The following chemicals exceeded the sediment screening value and were identified as COPCs in the streams.

Metals

Barium	Lead	Manganese
Zinc		

PAHs

Total PAHs

SVOCs

4-methylphenol	Carbazole

VOCs

Cyclohexane	Isopropylbenzene	m&p-xylenes
o-xylenes	Total xylenes	

The following chemicals were retained as COPCs in the streams due to lack of sediment screening values.

Metals

Hexavalent chromium	Vanadium

Inorganics
Cyanide

SVOCs
Acetophenone

VOCs
Methylcyclohexane Trichlorofluoromethane

Surface Water Stream COPCs, see Table 3-6**:**

The following chemicals exceeded the surface water screening value and were identified as COPCs in the streams.

Metals
Aluminum (total) Barium (total) Lead (total, dissolved)
Manganese
(total, dissolved)

Inorganics
Cyanide

PAHs
Total PAHs

3.4.4 Cyanide

The reported cyanide results in this assessment are for total cyanide, which includes both toxic and nontoxic forms of cyanide. The primary toxic form of cyanide is "free cyanide" (CN-), hydrogen cyanide (HCN), and metal cyanides. The screening values used for cyanide are based on CN-. The TRVs used for cyanide in this SLERA are based on available (i.e., toxic) cyanide. The mammalian TRVs are based on potassium cyanide in rats (Sample et al 1996), and the avian TRVs are based on a sodium cyanide study (EPA 1999b). There is no evidence of biomagnification of cyanides in the food chain. Accumulation of cyanide in food webs is not expected, considering the rapid detoxification of cyanide by most species and the lethal effects of large doses of cyanide (ATSDR 2006). Therefore, cyanide has not been carried through the risk assessment. Uncertainties regarding the cyanide screening values are further discussed in Section 7.

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4. SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT REFINEMENT

The third step in the 8-step ERA process is required only for compounds for which the SLERA (Steps 1 and 2) indicates a need for further ecological risk evaluation. Consistent with ERA guidance (EPA 1997), conservative assumptions were used in the SLERA to provide an upper bound estimate of risk to ecological resources. Such an approach meets with the objectives of the SLERA, which are to screen out chemicals that do not have the potential to adversely affect ecological resources and to maintain chemicals that have potential to cause risks.

These conservative assumptions are expected to overestimate actual levels of risk to most ecological receptors. Consequently, some chemicals that may not pose risk may be retained as COPCs at the outset of Step 3. The objective of the BRAPF is to determine the scope and goals of the baseline ERA by considering the results of the SLERA with additional site-specific information and alternative, more realistic assumptions in the estimates of risk. The results of this evaluation build upon the results of the SLERA and are intended to help in making scientific management decisions about the need for further investigation.

4.1 REFINED ASSESSMENT AND MEASUREMENT ENDPOINTS

The following refined assessment endpoints were defined (Table 3-1) to reflect the potential impacts of the complete and significant exposure pathways discussed above:

- Protection of terrestrial plant communities to ensure that COPCs in surface soils do not have unacceptable adverse effects on survival, growth, and reproduction of key plant species, which may result in adverse effects to the community structure.

- Protection of invertebrate communities to ensure that COPCs in surface soils do not have unacceptable adverse effects on survival, growth, and reproduction of key invertebrate species, which may result in adverse effects to the community structure (i.e., diversity or biomass).

- Protection of terrestrial wildlife to ensure that COPCs that have bioaccumulated in prey tissue do not have unacceptable adverse effects on survival, growth, and reproduction of representative receptor species.

- Protection of piscivorous wildlife to ensure that COPCs that have bioaccumulated in prey tissue do not have unacceptable adverse effects on survival, growth, and reproduction of representative receptor species.

- Protection of aquatic organism communities (plants and animals) to ensure that COPCs in surface water and sediment do not have unacceptable adverse effects on survival, growth, and reproduction of key aquatic species, which may result in adverse effects to the community structure (e.g., diversity or biomass).

- Protection of reptiles and amphibians to ensure that COPCs in soils do not have unacceptable adverse effects on survival, growth, and reproduction of key species.

Because assessment endpoints are often defined in terms of ecological characteristics that are difficult to measure (e.g., the health of a population or community), measurement endpoints are selected to provide a quantifiable means of characterizing risks. Measurement endpoints are quantifiable ecological characteristics that are related to each assessment endpoint (EPA 1989). The following refined measurement endpoints were defined to draw inferences regarding the refined assessment endpoints.

1. ***Protection of Terrestrial Plant Communities—***The measurement of maximum COPC concentrations in surface soil and the calculation of 95UCLM COPC concentrations in surface soil provide the means, when compared to relevant receptor-specific benchmarks, for drawing inferences regarding the first assessment endpoint above.

2. ***Protection of Invertebrate Communities—***The measurement of maximum COPC concentrations in soil and the calculation of 95UCLM COPC concentrations in soil provide the means, when compared to relevant receptor-specific benchmarks, for drawing inferences regarding the second assessment endpoint above.

3. ***Protection of Terrestrial Wildlife—***The measurement of maximum COPC concentrations in soil and the calculation of 95UCLM COPC concentrations in soil provide the means to model wildlife doses, which can be compared to relevant receptor-specific benchmarks, to draw inferences regarding the third assessment endpoint above.

4. ***Protection of Piscivorous Wildlife—***The measurement of maximum COPC concentrations in surface water and the calculation of 95UCLM COPC concentrations in surface water provide the means to model wildlife doses, which can be compared to relevant (based on acute or low effects levels) receptor-specific benchmarks, to draw inferences regarding the fourth assessment endpoint above.

5. ***Protection of Benthic Invertebrate Communities—***The measurement of maximum COPC concentrations in sediment and the calculation of 95UCLM COPC concentrations in sediment provide the means, when compared to relevant (based on acute or low effects levels) receptor-specific benchmarks, for drawing inferences regarding the fifth assessment endpoint above.

6. ***Protection of Aquatic Organism Communities***—The measurement of maximum COPC concentrations in surface water and the calculation of 95UCLM COPC concentrations in surface water provide the means, when compared to relevant (based on acute or chronic levels) receptor-specific benchmarks, for drawing inferences regarding the fifth assessment endpoint above.

7. ***Protection of Reptiles and Amphibians—***The assessment of risks to amphibians and reptiles is limited by the lack of sufficient literature-based exposure and toxicity

information. Also, there are currently no assessment methods for evaluating these receptors.

Plants and Invertebrates

The measurement endpoints for plants and soil invertebrates include comparison of exposure point concentrations (EPCs) to TRVs protective of exposures to soil. Potential risks to plants and soil invertebrates were evaluated by comparing EPCs in soil to TRVs for these receptors. TRVs represent the threshold above which effects are expected and below which no effect is expected. Conservative benchmarks have been selected to ensure that all chemicals that may pose a risk are accurately identified. Comparisons were initially made using maximum EPCs as a precautionary initial screen. Comparisons were then refined using 95UCLM concentrations as EPCs. As defined in EPA guidance (EPA 1997), the ratio of a chemical's concentration to its TRV is called a Hazard Quotient (HQ). HQs greater than or equal to 1.0 indicate a potential for unacceptable risk, while HQs less than 1.0 indicate no potential for unacceptable risk. Results of comparisons will be interpreted in light of the anticipated environmental chemistry of site media and spatial relationships that may affect comparison results and relevance.

Wildlife

For wildlife, measurement endpoints are based on the results of food web models that predict the dose of chemicals ingested by wildlife. These doses will be compared to TRVs for wildlife. The first measurement endpoint evaluated will be a comparison of doses based on maximum EPCs to no observed adverse effect level (NOAEL) TRVs. Refinement of the models will be conducted using 95UCLM EPCs. As discussed above, HQs greater than or equal to 1.0 indicate a potential for unacceptable risk, while HQs less than 1.0 indicate no potential for unacceptable risk. Results of comparisons will be interpreted in light of factors that include the anticipated environmental chemistry of site media and spatial relationships that may affect comparison results and relevance. A more detailed presentation of measurement endpoints is provided in Table 3-1.

Benthic Invertebrates

The measurement endpoints for benthic invertebrates include comparison of EPCs to benchmarks called TRVs protective of exposures to sediment. Potential risks to aquatic benthic organisms were evaluated by comparing EPCs in sediment to TRVs for these media. TRVs represent the threshold above which effects are expected and below which either no effect or a low effect is expected. Conservative benchmarks have been selected to ensure that all chemicals that may pose a risk are accurately identified. Comparisons were initially made using maximum EPCs as an initial screen. Comparisons were then refined using 95 UCLM and point-by-point concentrations as EPCs. HQs greater than or equal to 1.0 indicate a potential for unacceptable risk, while HQs less than 1.0 indicate no potential for unacceptable risk. Results of comparisons will be interpreted in light of the anticipated environmental chemistry of site media and spatial relationships that may affect comparison results and relevance.

The simultaneously extracted metals (SEM), acid volatile sulfide (AVS), and total organic carbon (TOC) data were also evaluated in sediment to determine if divalent metals in sediments are bioavailable. Bioavailability of divalent metals in sediments can be predicted by measuring the relationship between AVS and SEM, where total SEM is the sum of cadmium, copper, lead, nickel, and zinc. The sulfides naturally occurring in sediment react with the metals forming an insoluble metal sulfide that is not bioavailable for uptake by ecological receptors. An excess of AVS (will ensure that the bioavailability of metals (and the probability for toxicity) is low; an excess of SEM may indicate the potential for toxicity (Interstate Technology & Regulatory Council [ITRC] 2011). The values are compared by subtracting the AVS concentration from the sum of the SEM concentrations (∑SEM–AVS). If the difference is less than 0, then toxicity is not anticipated. If the difference is greater than zero, then metals may be bioavailable. If total organic carbon data is available, the sum of SEM – AVS difference was divided by fraction of organic carbon in sediment ([∑SEM-AVS]/f_{oc}). Per EPA guidance (2005i), if the result is <130 micromoles per gram of organic carbon (μmol/g_{oc}), then toxicity to benthic invertebrates is not anticipated. If the result is >3,000 μmol/g_{oc}, then toxicity is likely. If the result is between 130 and 3,000 μmol/g_{oc}, then toxicity is uncertain (ITRC 2011).

Aquatic Organisms

The measurement endpoints for aquatic organisms (e.g., fish, invertebrates, and plants) include comparison of EPCs to water quality criteria protective of exposures to surface water. Water quality criteria represent the threshold above which effects are expected and below which either chronic (long-term exposure) or acute (short-term exposure) effects are expected. Conservative benchmarks have been selected to ensure that all chemicals that may pose a risk are accurately identified. Comparisons were initially made using maximum EPCs as an initial screen. Comparisons were then refined using 95UCLM and point-by-point concentrations as EPCs. As discussed above, HQs are used to assess risk. Results of comparisons will be interpreted in light of the anticipated environmental chemistry of site media and spatial relationships that may affect comparison results and relevance.

Amphibians and Reptiles

Exposure estimates are not developed for amphibians or reptiles, because a quantitative evaluation for this receptor group cannot be performed. Literature and database resources were examined for exposure and toxicity information that could be used to quantitatively evaluate risks to amphibians and reptiles. Despite searches of the EPA ECOTOX database, Canadian-based Reptile and Amphibian Toxicology Literature database, and other various literature sources, inadequate data are available for a quantitative evaluation. Therefore, amphibians and reptiles will be evaluated qualitatively based on the results of risk to other receptors. The potential for risks to amphibians and reptiles will be maintained as an uncertainty throughout this SLERA (see Section 8: Uncertainties).

4.2 REFINED EXPOSURE ASSESSMENT

Many of the measurement endpoints identified rely on exposure estimation using chemical analytical data. For lower trophic level receptors (i.e., invertebrates and plants) chemical concentrations are used as the exposure estimate, and the calculated 95UCLM concentrations are identified as EPCs for comparison to benchmarks. In other cases, chemical concentrations are the EPC inputs for food web models that estimate exposures as ingested doses. The exposure assessment identifies the models and input parameters that were used in benchmark comparisons and food web dose modeling. These parameters include identification of EPCs, food web model assumptions, and literature-based uptake factors. These are discussed on a receptor-by-receptor basis.

Exposure Point Concentrations

EPCs are the COPC concentrations that a receptor is assumed to be exposed to within an exposure area. Two separate EPCs were used in the SLERA. The initial evaluation for each receptor consists of a screening level comparison of the maximum case scenario exposure estimate to no-effects benchmarks. Therefore, the maximum concentrations detected in onsite media were used as the EPC in exposure estimation. The maximum EPC is a realistic estimate of hot-spot exposures to organisms that may spend their entire lives in a small area. However, use of the maximum EPCs is conservative and is likely to overestimate risks because it assumes that individual organisms spend 100 percent of their time inhabiting and feeding from the most contaminated sample location at the site.

Additional evaluations were based on 95UCLM concentrations found in onsite soil, sediment, and surface water. The 95UCLM is a more realistic and yet still conservative value for consideration of the site-wide populations and exposures for ecological receptors, because it assumes an upper-bound estimate of the average exposure across the site. The 95UCLM concentration of a chemical within a given sample data grouping was calculated with the EPA statistical software package ProUCL Version 5.1 following EPA guidance (EPA 2002, 2007a). ProUCL was used for calculating the 95UCLMs in this SLERA, as this program allows the user to calculate distribution-specific UCLMs, as well as UCLMs for data that do not exhibit a specific distribution. If the calculated 95UCLM exceeded the maximum detected concentration, then the maximum concentration was used as the EPC. Where the 95UCLM could not be calculated because of low-detection frequencies, the maximum was used in its place. This creates uncertainties that are discussed further in Section 8; however, it is consistent with the methods utilized in ProUCL Version 5.1.

Evaluation for Lower Trophic Level Wildlife

The measurement endpoints for terrestrial plants, soil invertebrates, benthic invertebrates, and aquatic organisms include comparison of EPCs to TRVs protective of exposures to environmental media. The use of EPCs for these organisms is discussed further below.

Terrestrial Plants—COPC concentrations measured in surface soil were used to evaluate the potential for adverse effects to terrestrial plants. Consistent with EPA guidance (EPA 1997), the maximum detected concentration was used as the initial EPC in comparisons against benchmarks protective of plants. A conservative estimate of the 95UCLM concentration was evaluated as an EPC in comparisons to indicate the potential for population-wide impacts.

Soil Invertebrates—COPC concentrations measured in the soil were used to evaluate the potential for adverse effects to soil invertebrates. Consistent with EPA guidance (EPA 1997), the maximum detected concentration was used as the initial EPC in comparisons against benchmarks protective of soil invertebrates. A conservative estimate of the 95UCLM concentration was evaluated as an EPC in comparisons to indicate the potential for population-wide impacts.

Benthic Organisms—COPC concentrations detected in the sediment samples were used to evaluate the potential for adverse effects to benthic organisms. Data were compared to literature-based toxicity values for benthic organisms. The maximum detected concentrations of COPCs in site sediments were used to evaluate sediment contamination according to EPA guidance (EPA 1997). Although use of the maximum concentration is conservative, it is relevant in the evaluation of potential adverse effects to benthic organisms. If a chemical was not detected at concentrations exceeding the available toxicity value, it was concluded that the chemical is not likely to adversely affect benthic organisms in that area. The 95UCLM sediment concentration was also evaluated as an indicator of site-wide risks.

Aquatic Organisms—COPC concentrations measured in surface water samples were used to evaluate the potential for adverse effects to aquatic life. Data were compared to literature-based toxicity values for aquatic life. Both the maximum and 95UCLM concentrations of COPCs were used to evaluate the potential for adverse effects to aquatic life from the presence of COPCs in surface water.

Exposure Modeling for Higher Trophic Level Wildlife

Food web modeling was used to derive the dose-based exposure estimates for wildlife. This section presents the methods used to quantify the potential exposure of wildlife to chemicals via the ingestion of food, surface water, and surface soil. The methods are based on equations presented in EPA (1993) and Sample et al. (1996). The equations and exposure parameters discussed below are consistent with EPA (1997) guidance and standard risk assessment practice.

Chemicals in the exposure media for each receptor were evaluated in the exposure models. Tables 4-1 through 4-5 provide uptake factors for prey used in the exposure models. Table 4-6 provides a summary of exposure parameters for the avian and mammalian representative receptor species identified for evaluation, and food web models are presented in Appendix A.

It should be noted that, in general, conservative assumptions were used in the food web models. The objective of the models is to provide an upper bound risk estimate. Accordingly, in almost

all cases, actual risks are likely to be overestimated by the models. Uncertainties associated with conservative assumptions and other exposure estimation factors are discussed in Section 8.

Two separate EPCs were used in food web dose modeling. The initial measurement endpoint for each bird and mammal receptor consists of a screening level comparison of the maximum case scenario exposure estimate to NOAEL TRVs. Therefore, the maximum concentration detected in onsite media was used as the EPC in exposure estimation for this endpoint. Use of the maximum is highly conservative and is likely to overestimate risks because it assumes that that wildlife spend 100 percent of their time inhabiting and feeding from the most contaminated sample location at the site.

Therefore, food web modeling was also conducted based on the 95UCLM concentration in the exposure media. The 95UCLM is a more realistic value for consideration of the site-wide population, because it assumes an average exposure across the site. As discussed above, the 95UCLM concentration of a chemical within a given sample data grouping was calculated as the 95UCLM derived by the EPA statistical software package ProUCL Version 5.1. If the 95UCLM could not be calculated because of low detection frequencies, the maximum concentration was used instead.

Ingestion of Chemicals from Abiotic Media

Wildlife may ingest soil or sediment while foraging or grooming. Therefore, food web models account for incidental ingestion of soil or sediment.

The following equation was used to calculate the dose of chemical wildlife would obtain from the ingestion of soil or sediment ($Dose_{soil}$, milligram per kilogram [mg/kg]):

$$Dose_{soil} = SI * C_{soil}$$

Where:

$Dose_{soil}$	=	Amount of COPC ingested per day from soil or sediment(mg/kg-day)
SI	=	Soil and sediment ingestion rate (kilograms soil per kilogram body weight per day [kg/kg bw-d])
C_{soil}	=	COPC concentration in surface soil or sediment (mg/kg).

Percent soil or sediment ingestion values obtained from the scientific literature for the wildlife species of concern were multiplied by the food ingestion rates (FI) to estimate soil or sediment ingestion rates. A summary of the percent soil or sediment ingestion rates and FI obtained from the scientific literature is presented in Table 4-6.

Exposures to surface water were calculated in a manner similar to those in soil by multiplying the daily drinking water ingestion rate by the concentrations of COPCs in surface water. The following equation was used to calculate the upper-bound dose of COPC that terrestrial wildlife could obtain from the ingestion of surface water:

$$Dose_{sw} = WI * C_{sw}$$

Where:

$Dose_{sw}$ = amount of COPC ingested per day from surface water (mg/kg bw-d)
WI = surface water ingestion rate (liters per kilogram of body weight per day)
C_{sw} = COPC concentration in surface water (milligram per liter [mg/L]).

Ingestion of Chemicals from Food

The following equation was used to calculate the dose of COPCs that a terrestrial wildlife species could obtain from the ingestion of food (Dose $_{food/prey}$, mg/kg bw-d):

$$Dose_{food/prey} = FI * C_{food/prey}$$

Where:

FI = food ingestion rate (kg/kg bw-d)
$C_{food/prey}$ = estimated concentration of COPC in food (mg/kg).

A summary of the FI used in the SLERA for each of the wildlife species selected for evaluation is presented in Table 4-6. The following section discusses the equations used to estimate COPC concentrations within each food group ($C_{plant/invert/prey}$).

Uptake Factors

Food item concentrations were developed using bioaccumulation factors (BAFs) or bioconcentration factors (BCFs). A hierarchy was used to select BAFs and BCFs. In general, values were selected from defensible, compilation- and consensus-based sources or sources which include validation models (i.e., EPA 2005a–h, Sample et al. 1998a, etc.) instead of values from single studies. First preference was given to regression equations derived from paired field- or laboratory-based measurements. Second preference was given to ratio-derived BAFs developed based on paired data of tissue concentrations compared to media concentrations unless validation studies showed these to be preferable to regressions. Examples of regression and ratio BAF development can be found in Sample et al. (1998a). Third preference was given to modeled equilibrium partitioning-derived BAFs based on physical or chemical characteristics. If no values could be identified, a BAF or BCF of 1 was selected.

EPCs in Plants—Plant tissue concentrations were derived from literature-based uptake factors (Table 4-1). Maximum case scenario dry weight plant tissue concentration was calculated by multiplying the dry weight soil concentration (for terrestrial herbivorous receptors) or the dry weight sediment concentration (for aquatic herbivorous receptors) times the uptake factor or, where a regression was used, by entering the dry weight soil concentration into the equation. 95UCLM case scenario tissue concentrations were calculated using the 95UCLM dry weight

soil/sediment concentration. Where conversion to wet weight values was required, terrestrial plants were considered to contain 75 percent moisture as a default (USACHPPM 2004).

EPCs in Soil Invertebrates—Soil invertebrate concentrations were derived from literature-based uptake factors for uptake in earthworms (Table 4-2). Maximum case scenario dry weight worm tissue concentration was calculated by multiplying the dry weight soil concentration times the uptake factor or, where a regression was used, by entering the dry weight soil concentration into the equation. 95UCLM case scenario tissue concentrations were calculated using the 95UCLM dry weight soil concentration. Where conversion to wet weight values was required, soil invertebrates were considered to contain 75 percent moisture as a default (USACHPPM 2004).

EPCs in Small Mammals—Small mammal concentrations were derived from literature-based uptake factors for uptake in small mammals (Table 4-3). Maximum case scenario dry weight mammal tissue concentration was calculated by multiplying the dry weight soil concentration times the uptake factor or, where a regression was used, by entering the dry weight soil concentration into the equation. 95UCLM case scenario tissue concentrations were calculated using the 95UCLM dry weight soil concentration.

EPCs in Fish—Fish were selected as representatives of the potential for COPCs to accumulate from surface water into aquatic food items. In the SLERA, fish were used as model prey items to evaluate the potential for adverse effects to piscivorous wildlife, because they are important dietary components for these species.

In the SLERA, literature-based water-to-fish uptake factors or bioaccumulation equations were used to estimate concentrations of COPCs in fish tissue using the following equation:

$$C_{fish} = C_{water} * U_{al}$$

Where:

C_{water} = concentration of COPC in water (mg/L)
UF = uptake factor for chemicals in fish ([mg/kg] / [mg/L]).

The maximum concentrations of surface water detected at each site were used as the C_{water} value in the equation. UFs and log K_{ow}s for organic chemicals, and their sources are summarized in Table 4-4. First preference was given to measured uptake factors like the ones available in EPA water quality criteria documents which are available for inorganic COPCs. For COPCs that have little or no uptake data, the Risk Assessment Information System (RAIS) was consulted for available uptake values. For COPCs that did not have data in RAIS, EPI Suite was used to find uptake factor estimates. EPI Suite uptake factor estimation is only available for organic COPCs. In the absence of a literature-based bioaccumulation model or uptake factor for a COPC, an accumulation factor of one was used to estimate chemical concentrations in fish. Use of this default accumulation factor is expected to provide a conservative estimate of accumulation for

most chemicals and is expected to overestimate accumulation for non-bioaccumulative compounds.

EPCs in Benthos—Benthic invertebrates were selected as representatives of the potential for chemicals to accumulate from sediment into food items. In the SLERA, benthic invertebrates were used as model prey items to evaluate the potential for adverse effects to aquatic insectivorous wildlife, because they are important dietary components for these species.

In the SLERA, Biota-Sediment Accumulation Factors (BSAFs) were utilized to estimate benthos concentrations using the following equation:

$$\mathbf{BSAF} = \frac{\text{benthos concentration } (\frac{\text{mg}}{\text{kg}} \text{ wet weight})}{\text{lipid fraction of tissue } (\frac{\text{g lipid}}{\text{g tissue}} \text{ wet weight})} \Bigg/ \frac{\text{sediment concentration } (\frac{\text{mg}}{\text{kg}} \text{ dry weight})}{\text{fraction of organic carbon } (\frac{\text{g carbon carbon}}{\text{g sediment}} \text{ dry weight})}$$

Where:

- Lipid fraction was equal to the default of 3 percent on a wet weight basis
- Fraction of organic carbon was equal to the default of 1 percent on a dry weight basis
- Freshwater BSAFs from the EPA (2009) dataset and Bechtel Jacobs (1998b) were utilized as available. Where no BSAF was available, a default of 4 was utilized.

The equation above was used with the sediment concentration to estimate the benthos tissue concentration. BSAFs and sources are presented in Table 4-5.

Total COPC Ingestion

The total dietary exposure doses ($Dose_{total}$, mg/kg bw-d) to wildlife from COPCs were determined using the following equation.

$$Dose_{total} = Dose_{food} + Dose_{soil} + Dose_{water}$$

where:

$Dose_{food}$ = amount of COPC ingested per day from food (prey) (mg/kg bw-d)
$Dose_{soil}$ = amount of COPC ingested per day from soil or sediment (mg/kg bw-d)
$Dose_{water}$ = amount of COPC ingested per day from water (mg/kg bw-d).

The total dietary intakes are compared to dietary toxicity values to determine if adverse effects are likely to occur to wildlife from the ingestion of COPCs in food, soil, sediment, and surface water.

4.3 REFINED TOXICITY ASSESSMENT

This section derives toxicity values to evaluate exposure estimates for each representative receptor. The TRVs represent concentrations or doses of the chemicals that are protective of the ecological receptors being evaluated. TRVs are compared to EPCs or estimated doses to evaluate each COPC's potential for adverse effects on the receptor in question. The following sections summarize TRVs for each indicator species or community identified for evaluation.

4.3.1 Overview of Bioavailability and Toxicity

The toxicity of chemicals is related to their bioavailability. Organic compounds may form complexes or compounds that bind them to soil and make them chemically inaccessible to ecological receptors. Alternatively, these elements and compounds may be present in forms that are easily dissolved and absorbed, or in forms that tend to bind to biological tissues. It is these forms of easily absorbed chemicals that are most toxic. Most TRVs are based on forms of chemicals that are readily bioavailable.

Metals

For metals, bioavailability is governed largely by formation of metallic compounds, binding to the soil matrix, and speciation. The compounds and bonds formed by metals are determined by reduction and oxidation (redox) reactions, by the dominant pH in soil and sediment, and by the presence of organic carbon. Toxicological benchmarks such as those provided in EPA Eco-SSLs are developed based on moderately bioavailable forms of metals; these benchmarks may overestimate toxicity for less bioavailable forms, or underestimate toxicity for more bioavailable forms. Acidity increases the bioavailability of many cationic metals, such as barium, chromium, copper, lead, vanadium, and zinc, which may become more soluble at a pH below 5. Some metals may also form complexes with iron oxides and hydroxides; this makes these metals less bioavailable and less mobile. The effect of acidity on other metals is complex. Arsenic, for example, may form compounds that are less bioavailable under acidic conditions; however, it may also become more bioavailable if arsenic bound to iron hydroxide compounds is released (Bodek et al. 1988).

Redox conditions and pH also determine the speciation of metals. Some metals may exist in different valence states or chemical forms that demonstrate different toxicity and bioavailability. For example, arsenic can be found in nature as As III or As V, with higher toxicity and mobility typically exhibited by As III (EPA 2005a).

Organic Compounds

For organic compounds, the primary factors determining persistence, mobility, and fate are: (1) degradation, (2) volatilization, and (3) binding to soil. PAHs may degrade over time, resulting in lower concentrations.

Another factor affecting SVOCs (particularly low molecular weight [LMW] PAHs) and VOCs is volatilization. Concentrations of these chemicals may decrease in soil over time due to transfer to and dispersion in the air. Volatilization may be an important factor in eliminating them from soil. Expected contributions of these chemicals to air pathways are insignificant.

Perhaps the most important factor affecting fate of organic compounds in soil is their affinity for binding to fine grained soils and organic matter. Many organic compounds, including PAHs, are hydrophobic and will bind tightly to these soil particles. This decreases the mobility of these compounds, preventing them from dissolving in the water column. However, while the hydrophobicity of these organic compounds may decrease solubility, it may also increase their uptake into the tissues of biota and the potential for bioaccumulation. Hydrophobic compounds may bioaccumulate and biomagnify in fats and lipids within fish, invertebrates, or wildlife (EPA 2000). Soils at the site tend to consist of fine sands with a low percentage of organic matter; therefore, binding to soil is not expected to be a significant factor affecting bioavailability of organics.

4.3.2 Plant TRVs

To assess the potential for chemicals to adversely affect terrestrial plants, soil concentrations were compared to soil TRVs protective of plants (Table 4-7) (EPA 2005 a–h; EPA 2006; EPA 2007 b–g). TRVs from studies by Efroymson et al. (1997a) were established at a level associated with a 20 percent reduction in growth or other measured toxicological endpoints. This level is consistent with other screening level benchmarks for a SLERA and the current regulatory approach. Because few toxicity values have been developed for organic chemicals, surrogate organic chemical TRVs were used for the evaluation of potential adverse effects to plants, as applicable; surrogates are identified in Table 4-7.

4.3.3 Soil Invertebrate TRVs

To assess the potential for inorganic and organic chemicals to adversely affect soil invertebrates, soil concentrations were compared to TRVs protective of soil invertebrates (Table 4-7) (Efroymson et al. 1997b; EPA 2005 a–h; EPA 2007 b–g). TRVs protective of worms were used to assess the potential for inorganic and organic chemicals to adversely affect worms (Efroymson et al. 1997b). TRVs from studies by Efroymson et al. (1997b) were established at a level associated with a 20 percent mortality or other measured toxicological endpoint for earthworms. This level is consistent with other screening level benchmarks for SLERA and the current regulatory approach. Because few toxicity values have been developed for organic chemicals, surrogate organic chemical TRVs were used for the evaluation of potential adverse effects to soil invertebrates, as applicable (Table 4-7).

4.3.4 Wildlife TRVs

COPCs identified as having the potential to adversely affect wildlife species were evaluated using dose-based toxicological benchmarks. Two types of benchmarks were used, each corresponding to a different level of ecological impacts for mammals (Table 4-8) and birds (Table 4-9). First, modeled doses were compared to dose-based NOAELs. NOAELs are doses that have been shown to cause no adverse impacts in test species. The NOAELs used in this SLERA were derived from studies by Hill (1979), EPA Eco-SSLs (EPA 2005a–h, 2006, 2007b–g, 2008), and by Oak Ridge National Laboratory (Sample et al. 1996). The Oak Ridge National Laboratory NOAELs were generally derived based upon measurements of survival, growth, or reproduction in the laboratory. Values from EPA Eco-SSLs were derived through statistical analyses of results from multiple toxicological studies with multiple endpoints. Because NOAELs are conservative and highly protective, they were used as TRVs in this SLERA.

The second set of benchmarks utilized was Lowest Observed Adverse Effects Levels (LOAELs). These are the lowest concentrations at which adverse effects are observed on individual test organisms. The severity of effects considered "low level" varies based on the study from which LOAELs are derived; in general, they correspond to minor changes in growth or reproduction. LOAELs are useful because there is considerable uncertainty associated with NOAELs. Because NOAELs are associated with no effects in a test study, it is uncertain whether they are close to or far below the threshold value at which effects would first be observed. LOAELs thus serve to bound the range of NOAELs, and the threshold of toxic effects is considered to lie between the NOAEL and the LOAEL. Therefore, LOAELs were also utilized as TRVs. In some cases, LOAELs were available from studies EPA Eco-SSL sources or by Oak Ridge National Laboratory (Sample et al. 1996). The corresponding LOAEL was used from the EPA Eco-SSL document when available. When there was no corresponding LOAEL value, the geometric mean of the LOAELs for growth and reproduction was calculated; this approach is similar to that used for derivation of many Eco-SSL NOAELs.

In general, chemical exposures and toxicity were evaluated on a chemical-by-chemical basis. However, combined effects were evaluated for PAHs. EPA studies show that the PAHs can be grouped into HMW and LMW groups and concentrations summed for comparison to benchmarks (EPA 2007f). Toxicity evaluation using summed PAH concentrations is performed for invertebrates, birds, and mammals throughout the SLERA.

TRVs could not be found for certain COPCs due to a lack of available information in the scientific literature. The uncertainty associated with the lack of TRVs is discussed in Section 8.

4.3.5 Benthic Invertebrate TRVs

Several sources of toxicity data were used to identify the potential for chemicals in sediment to cause adverse effects to benthic communities (Table 4-10). Wherever possible, Threshold Effects Levels (TELs) and Probable Effects Levels (PELs) from Long et al. (1995) and

MacDonald et al. (1996) were utilized as TRVs to determine whether chemicals in sediments are likely to impact benthic organisms. In the absence of the above TRVs, the following values were used: Assessment and Remediation of Contaminated Sediments *Hyalella* TELs Dutch Target and Intervention Values for Sediment (Verbuggen et al 2001) and Lowest Effects Levels from Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (Persuad 1993).

4.3.6 Aquatic TRVs

OWRB Aquatic Life Criteria (2017) and freshwater chronic and acute National Ambient Water Quality Criteria (NAWQC) (EPA 2018c) were used as TRVs to evaluate the potential for adverse effects to aquatic life from COPCs in surface water (Table 4-11). When the NAWQC values were not available, the Tier II value from Suter and Tsao (1996) or values from National Oceanic and Atmospheric Administration (NOAA) Quick Reference Screening Tables (Buchman 2008) were used to assess potential impacts to aquatic species from COPCs in surface water.

4.4 REFINED RISK CALCULATION

Refined estimates of exposure (EPCs) are compared to receptor-specific TRVs. As defined in EPA guidance (EPA 1997), the ratio of a chemical's concentration to its TRV is called an HQ. HQs greater than or equal to 1.0 indicate a potential for unacceptable risk, while HQs less than 1.0 indicate no potential for unacceptable risk. Results of comparisons will be interpreted in light of factors that include the anticipated environmental chemistry of site media and spatial relationships that may affect comparison results and relevance.

4.4.1 Refined Risk Characterization

The purpose of the risk characterization is to draw conclusions regarding the potential for risks to each assessment endpoint/representative receptor. This is done using a qualitative weight of evidence approach in which results for each measurement endpoint are considered as lines of evidence. In general, lines of evidence that provide results based on site-specific data applicable at the population level are given the greatest weight. Per EPA guidance (EPA1997), the focus of the SLERA is to protect the ecological values at the site-wide population or community level except where threatened or endangered species are concerned.

4.4.2 Comparison to TRVs

Receptor-specific COPCs for the Site were identified through the comparison of receptor-specific exposure estimates to TRVs. As presented in Section 2.5, TRVs were selected from the literature. Consistent with ERA guidance (EPA 1997), the models used to quantify the potential exposure to higher trophic level organisms were designed to estimate an upper bound potential for adverse effects to the selected representative receptor species. Therefore, exceedance of a TRV indicates the potential for adverse effects, but does not indicate that an adverse effect is occurring from the chemical (Tannenbaum et al. 2003).

The refinement of the risk calculation compares exposure estimates of the COPCs identified in the first phase to TRVs for each representative receptor species. For plant and soil invertebrates, the maximum detected chemical concentrations in soil are used as exposure estimates respectively.

LOAELs are a valuable indicator of risk because they provide an upper bound to NOAELs. Exceeding a NOAEL based TRV does not necessarily indicate a risk, because NOAELs, by definition, correspond to no effects and may not be the highest concentration at which no effects occur. LOAELs provide a clear indication of potential effects and a potential for risk; therefore, comparisons to LOAEL based TRVs provide an important tool. Comparisons focus on 95UCLM case scenario exposure estimates because they are the most relevant estimates for mobile wildlife populations.

It is important to note that the quality of the TRV can influence the HQ. With metals, for instance, one must consider the bioavailable form of the metal from which the TRV is generated and the bioavailable/toxic form of the metal that is most likely present onsite. Additionally, other literature TRVs are available and may generate different HQs. Uncertainties associated with the selection and use of TRVs are discussed in Section 8.

TRVs are not available for all COPCs and, therefore, there is uncertainty associated with the lack of toxicity information for some COPCs. Chemicals that lacked TRVs or had exposure estimates that equaled or exceeded TRVs were considered a COPC (with the exception of essential nutrients). Those chemicals that had exposure estimates below TRVs (HQs less than 1.0) were removed from further consideration.

4.4.3 Background Data

Background data specific to the site is used to compare to site data as part of a weight of evidence approach to inform risk management. The samples utilized as background data are identified in Table 1-1 and on Figure 3-1.

The background surface soil samples were analyzed for metals, total cyanide, PAHs, and SVOCs. The surface soil samples were collected in November 2017. Background sediment samples were analyzed for VOCs, SVOCs, PAHs, total metals, and total cyanide. Background surface water samples were analyzed for VOCs, SVOCs, PAHs, total metals, dissolved metals, and total cyanide. Background surface water and sediment samples were collected in October 2017.

Upper prediction limits (UPLs) were calculated for background data using ProUCL (Version 5.1) and compared to the maximum and 95UCLMs. Comparisons to background are discussed as a factor relevant to potential site-related risks for each receptor. UPLs are summarized in Appendix B.

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5. RISK CHARACTERIZATION RESULTS FOR TERRESTRIAL RECEPTORS

5.1 WILCOX AND LORRAINE PROCESS AREAS

Exposure point concentrations for COPCs at the Wilcox and Lorraine Process Areas are presented in Table 5-1.

5.1.1 Terrestrial Plants

The CSM identifies protection of terrestrial plant communities from impacts of COPCs in soil as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to terrestrial plants (Table 5-2):

- Comparison of the COPC concentrations to benchmarks protective of plants including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.
- Comparison of the COPC concentrations to background UPLs including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Soil Concentrations to Plant TRVs

The first measurement endpoint evaluated was the screening-level comparison of maximum chemical concentrations in soil to literature-based TRVs protective of plants. When maximum EPCs were compared to plant TRVs, the following COPCs had HQs greater than 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals

Cadmium (3)	Lead (173)	Vanadium (40)
Chromium (30)	Manganese (6)	Zinc (86)
Cobalt (2)	Mercury (7)	
Copper (107)	Selenium (3)	

PAHS

LMW PAHs (9)	HMW PAHs (13)

The following COPCs could not be evaluated due to a lack of plant TRVs:

Pesticides
4,4'-DDD

SVOCs

4-methylphenol	Carbazole
Acetophenone	Dibenzofuran

VOCs

1,4-Dioxane	Cyclohexane
Carbon disulfide	Isopropylbenzene

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM Soil Concentrations to Plant TRVs

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs to plant TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM case scenario reflects exposures across the site, which are the focus of the SLERA.

When 95UCLM EPCs were compared to TRVs, the following COPCs had HQs greater than 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals

Chromium (9)	Vanadium (7)
Copper (3)	Zinc (3)
Lead (3)	

The following COPCs could not be evaluated due to a lack of plant TRVs:

Pesticides
4,4'-DDD

SVOCs

4-methylphenol	Carbazole
Acetophenone	Dibenzofuran

VOCs

1,4-Dioxane	Cyclohexane
Carbon disulfide	Isopropylbenzene

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Risk Characterization for Terrestrial Plants

A comparison of the maximum surface soil concentrations to TRVs protective of terrestrial plants indicates that 10 metals (cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, vanadium, and zinc), HMW PAHs, and LMW PAHs have HQs greater than 1. A comparison of the 95UCLM surface soil concentrations to plant TRVs indicates that five metals have HQs greater than 1: chromium, copper, lead, vanadium, and zinc. The results of the risk characterization for plants are discussed in the following subsections.

Cadmium

Cadmium was detected in 114 of 203 surface soil samples. The maximum concentration of 80 mg/kg is approximately 2.5 times the TRV, but the 95UCLM result is below the TRV. Cadmium is not expected to pose risks to terrestrial plants.

Chromium

Chromium was detected in all 203 surface soil samples. The maximum concentration is approximately 30 times the TRV, and the 95UCLM concentration is approximately 9 times the TRV. Chromium concentrations in soil could pose a risk to terrestrial plants.

Cobalt

Cobalt was detected in 188 of 203 surface soil samples. The maximum concentration of 22.5 mg/kg is slightly greater than the TRV of 13 mg/kg. The 95UCLM result is less than the TRV and below the background UPL of 11.1 mg/kg. Cobalt is not expected to pose risks to terrestrial plants.

Copper

Copper was detected in 201 of 203 surface soil samples. The maximum concentration is greater than 100 times the TRV, and the 95UCLM concentration is approximately 3 times the TRV. The majority of the concentrations exceed the background UPL of 3.24 mg/kg. Copper concentrations in soil could pose a risk to terrestrial plants.

Lead

Lead was detected in all 203 surface soil samples collected. The maximum concentration is greater than 100 times the TRV. The 95UCLM result is three times greater than the TRV. The majority of the concentrations exceed the background UPL of 9.19 mg/kg. Lead concentrations in soil could pose a potential risk to terrestrial plants.

Manganese

Manganese was detected in all 203 surface soil samples collected. The maximum concentration is 6.5 times greater than the TRV of 220 mg/kg. However, the 95UCLM concentration of 263 mg/kg is below the background UPL of 505 mg/kg. Manganese concentrations in soil are not expected to pose risk to terrestrial plants.

Mercury

Mercury was detected in 118 of 203 surface soil samples collected. The maximum concentration exceeds the plant TRV with an HQ of 6. However, the 95UCLM concentration is below the TRV. Mercury is not expected to pose risks to terrestrial plants.

Selenium

Selenium was detected in 37 of 203 surface soil samples. The maximum soil concentration is approximately three times the TRV of 0.52 mg/kg. The 95UCLM concentration of 0.39 mg/kg is below the TRV. Selenium is not expected to pose risks to terrestrial plants.

Vanadium

Vanadium was detected in all 203 surface soil samples. The maximum soil concentration is approximately 40 times greater than the TRV of 2 mg/kg. The 95UCLM concentration of 12.5 mg/kg is approximately 7 times greater than the TRV and is greater than the background UPL. Vanadium concentrations in soil could pose a potential risk to terrestrial plants.

Zinc

Zinc was detected in all 203 surface soil samples. The maximum result is approximately 86 times the TRV, and the 95UCLM result is 3 times the TRV. Zinc concentrations in soil could pose a potential risk to terrestrial plants.

LMW PAHs

The maximum total LMW PAH concentration of 188 mg/kg is approximately 9 times greater than the TRV (20 mg/kg). However, the 95UCLM result of 7.09 mg/kg is below the TRV. LMW PAHs are not expected to pose risk to terrestrial plants.

HMW PAHs

The maximum total HMW PAH concentration of 263 mg/kg is approximately 13 times greater than the TRV of 20 mg/kg. However, the 95UCLM result is below the TRV. HMW PAHs are not expected to pose risk to terrestrial plants.

5.1.2 Soil Invertebrates

The CSM identifies protection of the soil invertebrate community from impacts of COPCs in soil as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to soil invertebrates (Table 5-3):

- Comparison of the chemical concentrations to benchmarks protective of soil invertebrates including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

- Comparison of the chemical concentrations to background values including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Soil Concentrations to TRVs Protective of Soil invertebrates

The first measurement endpoint evaluated was the screening-level comparison of maximum chemical concentrations in soil to literature-based TRVs protective of soil invertebrates. When maximum EPCs were compared to soil invertebrate TRVs, the following COPCs exceeded a HQ of 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals

Chromium (74)	Lead (12)	Zinc (115)
Hexavalent chromium (4)	Manganese (3)	
Copper (94)	Mercury (20)	

PAHs

LMW PAHs (6)	HMW PAHs (14)

Pesticides

Gamma-Chlordane (2)

SVOCs
Carbazole (250)

VOCs

Isopropylbenzene (42)	Xylenes, m&p (24)
Toluene (4)	Xylenes, o (5)

The following COPCs could not be evaluated due to a lack of soil invertebrate TRVs:

Metals

Cobalt	Thallium	Vanadium

Pesticides

4,4'-DDD	4,4'-DDT

SVOCs

4-methylphenol	Acetophenone	Dibenzofuran

VOCs

1,4-dioxane	Cyclohexane

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM Soil Concentrations to TRVs Protective of Soil invertebrates

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs to soil invertebrate TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM reflects exposures across the site, which are the focus of the SLERA.

When 95UCLM EPCs were compared to soil invertebrate TRVs, the following COPCs had HQs that exceeded 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals

Chromium (22)	Copper (3)	Zinc (4)
Hexavalent chromium (3)	Mercury (2)	

VOCs

Isopropylbenzene (4)	Xylenes, m&p (3)

The following COPCs could not be evaluated due to a lack of soil invertebrate TRVs:

Metals		
Cobalt	Thallium	Vanadium
SVOCs		
4-methylphenol	Acetophenone	Dibenzofuran
VOCs		
1,4-dioxane	Cyclohexane	

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Risk Characterization for Soil invertebrates

A comparison of the maximum COPC concentrations to TRVs protective of soil invertebrates indicates that seven metals (chromium, hexavalent chromium, copper, lead, manganese, mercury, and zinc), LMW PAHs, HMW PAHs, carbazole, isopropylbenzene, toluene, xylenes (m&p), and xylenes (o) have HQs that exceed 1.0. A comparison of the 95UCLM surface soil concentrations to soil invertebrate TRVs indicates that five metals (chromium, hexavalent chromium, copper, mercury, and zinc), isopropylbenzene, and xylenes (m&p) have HQs greater than 1. The results of the risk characterization for soil invertebrates are discussed in the following subsections.

Chromium

Chromium was detected in all 203 surface soil samples. The maximum concentration of 29.7 mg/kg is approximately 74 times the TRV, and the 95UCLM concentration of 8.9 mg/kg is 22 times the TRV. Chromium concentrations in soil could pose a potential risk to soil invertebrates.

Chromium VI

Chromium VI was detected in 8 of 11 surface soil samples collected. The maximum concentration of 1.3 mg/kg is approximately 4 times the TRV. The 95UCLM result is approximately 3 times the TRV. Background soil concentrations were not available for comparison. Due to the low magnitude of the exceedance, there is a low potential for risk from hexavalent chromium.

Copper

Copper was detected in 201 of 203 surface soil samples. The maximum concentration is approximately 94 times the TRV. The 95UCLM concentration of 266 mg/kg is approximately 3 times the TRV. Copper concentrations in soil could pose a potential risk to soil invertebrates.

Lead

Lead was detected in all 203 surface soil samples. The maximum concentration of 20,800 mg/kg is approximately 12 times greater than the TRV of 1,700 mg/kg, but the 95UCLM concentration of 346 mg/kg is below the TRV. Because the 95UCLM is less than the TRV, lead in soil is not expected to pose a risk to soil invertebrates.

Manganese

Manganese was detected in all 203 surface soil samples. The maximum concentration of 1,430 mg/kg is approximately 3 times the TRV of 450 mg/kg. The 95UCLM concentration is less than the background UPL and is less than the TRV. Manganese is not expected to pose a risk to soil invertebrates.

Mercury

Mercury was detected in 118 of 203 surface soil samples. The maximum concentration of 2 mg/kg is approximately 20 times the soil invertebrate TRV, and the 95UCLM concentration is approximately 2 times the TRV. The 95UCLM concentration is greater than the background UPL of 0.038 mg/kg. Mercury concentrations in soil could pose a potential risk to soil invertebrates.

Zinc

Zinc was detected in all 203 surface soil samples. The maximum concentration of 13,800 mg/kg is more than 100 times the soil invertebrate TRV, and the 95UCLM concentration is approximately 4 times the TRV. Zinc concentrations in soil could pose a potential risk to soil invertebrates.

LMW PAHs

The maximum total LMW PAH concentration of 188 mg/kg is approximately 6 times greater than the TRV (29 mg/kg). However, the 95UCLM result of 7.09 mg/kg is below the TRV; therefore, LMW PAHs in soil are not expected to pose risk to soil invertebrates.

HMW PAHs

The maximum total HMW PAH concentration of 263 mg/kg is approximately 14 times greater than the TRV of 18 mg/kg. However, the 95UCLM result is below the TRV. Therefore, HMW PAHs in soil are not expected to pose risk to soil invertebrates.

Gamma-chlordane

Gamma-chlordane was detected in 32 of 35 surface soil samples. The maximum concentration of 0.05 mg/kg is approximately 2 times the TRV of 0.02 mg/kg. The 95UCLM concentration is

below the TRV. Therefore, the gamma-chlordane in soil is not expected to pose risk to soil invertebrates.

Carbazole

Carbazole was detected in 20 of 203 surface soil samples. The maximum concentration of 40 mg/kg is 250 times greater than the TRV. However, the 95UCLM result is below the TRV. Therefore, carbazole in soil is not expected to pose risk to soil invertebrates.

Isopropylbenzene

Isopropylbenzene was detected in 7 of 69 soil samples. The maximum concentration of 1.7 mg/kg is approximately 42 times the TRV of 0.04 mg/kg. The 95UCLM concentration is 3.5 times the TRV. Isopropylbenzene concentrations in soil could pose a potential risk to soil invertebrates.

Toluene

Toluene was detected in 12 of 69 surface soil samples. The maximum concentration of 0.64 mg/kg is 4 times the TRV of 0.15 mg/kg. However, the 95UCLM result is below the TRV. Therefore, toluene in soil is not expected to pose risk to soil invertebrates.

Xylenes (m&p)

Xylenes (m&p) were detected in 12 of 69 surface soil samples. The maximum concentration of 2.4 mg/kg is 24 times the TRV of 0.1 mg/kg. The 95UCLM result is approximately 3 times the TRV. Xylenes (m&p) concentrations in soil could pose a potential risk to soil invertebrates.

Xylenes (o)

Xylenes (o) were detected in 10 of 69 surface soil samples. The maximum concentration of 0.54 mg/kg is 5 times the TRV of 0.1 mg/kg. However, the 95UCLM result is below the TRV. Therefore, xylenes (o) in soil are not expected to pose risk to soil invertebrates.

5.1.3 Mammalian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of mammals from impacts of COPCs in soil and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to mammals:

- Screening level comparison of maximum doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals

- Comparison of 95UCLM doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Mammals

The HQ for each COPC is calculated based on the comparison of the dose from maximum concentrations in surface soil to the TRVs.

Dose modeling and comparisons based on maximum EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 5-4:**

Terrestrial Herbivorous Mammals (white-footed mouse)	Terrestrial Herbivorous Mammals (cattle)	Terrestrial Insectivorous Mammals	Predatory Mammals
NOAEL-based HQs Lead (4) HMW PAHs (2) LOAEL-based HQs Lead (2)	NOAEL-based HQs Lead (3) LOAEL-based HQs None	NOAEL-based HQs Antimony (5) Cadmium (56) Copper (28) Lead (170) Nickel (2) Selenium (2) Thallium (11) Vanadium (3) Zinc (8) HMW PAHs (28) LOAEL-based HQs Cadmium (6) Copper (17) Lead (89) Zinc (2) HMW PAHs (6)	NOAEL-based HQs Lead (4) LOAEL-based HQs Lead (2)

The following COPCs could not be evaluated due to a lack of TRVs:

SVOCs

1,1-biphenyl	Carbazole	4-methylphenol
Acetophenone	Dibenzofuran	

VOCs

1,4-dioxane	Isopropylbenzene	Chloromethane
cyclohexane		

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Mammals

The second measurement endpoint evaluated the comparison of ingested doses for mammals based on 95UCLM EPCs to NOAEL and LOAEL-based TRVs. The HQ for each chemical is calculated based on the comparison of the dose from 95UCLM concentrations in soil to the TRVs.

Dose modeling and comparisons based on 95UCLM EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 5-5:**

Terrestrial Herbivorous Mammals (white-footed mouse)	**Terrestrial Herbivorous Mammals (cattle)**	**Terrestrial Insectivorous Mammals**	**Predatory Mammals**
NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs Antimony (2) Lead (4) Nickel (2) HMW PAHs (2) LOAEL-based HQs Lead (2)	NOAEL-based HQs None LOAEL-based HQs None

Risk Characterization for Mammalian Wildlife

Maximum doses for terrestrial mammals exceed NOAEL-based TRVs for antimony, cadmium, copper, lead, nickel, selenium, thallium, vanadium, zinc, and total HMW PAHs. Maximum doses exceed LOAEL-based TRVs for cadmium, copper, lead, zinc, and HMW PAHs. 95UCLM-based doses exceed NOAEL-based TRVs for antimony, lead, nickel, and HMW PAHs. 95UCLM-based doses exceed LOAEL-based TRVs only for lead.

The results of the risk characterization for terrestrial mammals are discussed in the following subsections.

Antimony

Antimony was detected in 8 of 203 surface soil samples. The maximum dose is approximately 5 times the NOAEL-based TRV for terrestrial insectivorous mammals but falls below the LOAEL-based TRV. The 95UCLM scenario dose is approximately 2 times the NOAEL-based TRV but is less than the LOAEL-based TRV. Due to the lack of exceedance of the LOAEL based TRVs and the low frequency of detection, antimony is not expected to pose risks to terrestrial mammals.

Cadmium

Cadmium was detected in 114 of 203 surface soil samples. The 95UCLM soil concentration of 0.72 mg/kg is greater than the background UPL of 0.53 mg/kg. The maximum dose is approximately 56 times the NOAEL based TRV for terrestrial insectivorous mammals. The HQ for the LOAEL based TRV for terrestrial insectivorous mammals is 6. For the 95UCLM case scenario, the HQ for the NOAEL based TRV is equal to 1 and the LOAEL based TRV is less than 1. Given the low HQs for the NOAEL and LOAEL based TRVs under the 95UCLM case scenario, cadmium is not expected to pose risks to terrestrial mammals.

Copper

Copper was detected in 201 of 203 surface soil samples. The 95UCLM soil concentration of 225 mg/kg is greater than the background UPL of 3.24 mg/kg. For terrestrial insectivorous mammals, the maximum dose is approximately 28 times the NOAEL based TRV and 17 times the LOAEL based TRV. For the 95UCLM case scenario, the HQ for the LOAEL based TRV is less than 1. Copper concentrations in soil are not expected to pose a potential risk to terrestrial mammals.

Lead

Lead was detected in all 203 surface soil samples. The 95UCLM soil concentration of 346 mg/kg exceeds the background UPL of 9.19 mg/kg. For terrestrial herbivorous and predatory mammals, the maximum dose HQs are between 2.7 and 4 when compared to the NOAEL based TRV. When compared to the LOAEL based TRV, the HQs are between 1.4 and 2.1. For the 95UCLM case scenario, the HQs for the LOAEL based TRVs are less than 1. Given the low HQ for the LOAEL based TRV under the maximum and 95UCLM case scenarios, lead is not expected to pose risks to terrestrial herbivorous or predatory mammals.

For terrestrial insectivorous mammals, the maximum dose HQ is 170 when compared to the NOAEL based TRV and 89 when compared to the LOAEL based TRV. For the 95UCLM case scenario, the HQ is equal to 4 when compared to the NOAEL based TRV and 2 when compared to the LOAEL based TRV. Lead concentrations in soil could pose a potential risk to terrestrial insectivorous mammals.

Nickel

Nickel was detected in 202 of 203 soil samples. The 95UCLM soil concentration of 7.17 mg/kg exceeds the background UPL of 5.6 mg/kg. For terrestrial insectivorous mammals, the maximum dose HQ is 2 when compared to the NOAEL based TRV, and below 1 when compared to the LOAEL based TRV. Given the low HQ for the LOAEL based TRV, nickel is not expected to pose risks to terrestrial mammals.

Selenium

Selenium was detected in 37 of 203 soil samples. For terrestrial insectivorous mammals, the maximum dose HQ is 2 when compared to the NOAEL based TRV, and less than 1 when compared to the LOAEL based TRV. Given the low HQ for the LOAEL based TRV, selenium is not expected to pose risks to terrestrial mammals.

Thallium

Thallium was detected in 41 of 203 soil samples. For terrestrial insectivorous mammals, the maximum dose HQ is 11 when compared to the NOAEL based TRV and 1 when compared to the LOAEL based TRV. Both NOAEL and LOAEL-based HQs are less than 1 for the 95UCLM case scenario. Thallium is not expected to pose risks to terrestrial mammals.

Vanadium

Vanadium was detected in all 203 soil samples. For terrestrial insectivorous mammals, the maximum dose HQ is 3 when compared to the NOAEL based TRV and 1.5 when compared to the LOAEL based TRV. Both NOAEL and LOAEL-based HQs are less than 1 for the 95UCLM case scenario. Vanadium is not expected to pose risks to terrestrial mammals.

Zinc

Zinc was detected in in all 203 soil samples. For terrestrial insectivorous mammals, the maximum dose HQ is 8 when compared to the NOAEL based TRV and 2 when compared to the LOAEL based TRV. Both NOAEL and LOAEL-based HQs are less than 1 for the 95UCLM case scenario. Zinc is not expected to pose risks to terrestrial mammals.

HMW PAHs

The maximum total HMW PAH concentration detected is 263 mg/kg; the 95UCLM soil concentration is 14 mg/kg. For terrestrial insectivorous mammals, the maximum dose HQ is 28 when compared to the NOAEL based TRV and 6 when compared to the LOAEL based TRV. The HQs are less than 2 for the 95UCLM case scenario. HMW PAHs are not expected to pose a potential risk to terrestrial insectivorous mammals.

For terrestrial herbivorous mammals, the maximum dose HQ is 2 when compared to the NOAEL based TRV and less than 1 when compared to the LOAEL based TRV. The HQs are less than 1 for the 95UCLM case scenario. HMW PAHs are not expected to pose a potential risk to terrestrial herbivorous mammals.

5.1.4 Avian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of birds from impacts of COPCs in soil and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to birds:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Birds

The HQ for each chemical is calculated based on the comparison of the dose from maximum concentrations in soil to the avian TRVs.

Dose modeling and comparisons based on maximum EPCs identified the following COPCs with HQs greater than 1.0; the HQ is included in parentheses next to each chemical:

COPCs for Avian Wildlife, see **Table 5-6:**

Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
NOAEL-based HQs Cadmium (42) Copper (46) Lead (633) Vanadium (50) Zinc (11) HMW PAHs (12) 4,4'-DDD (9) 4,4'-DDT (4) LOAEL-based HQs Cadmium (10) Copper (15) Lead (317) Vanadium (25) Zinc (4)	NOAEL-based HQs Lead (3) Vanadium (2) LOAEL-based HQs Lead (2)	NOAEL-based HQs Copper (40) Lead (263) Vanadium (5) Zinc (7) HMW PAHs (6) LOAEL-based HQs Copper (13) Lead (132) Vanadium (3) Zinc (3)

The following COPCs could not be evaluated due to a lack of avian TRVs:

Metals
Antimony Thallium

SVOCs
1,1-biphenyl Carbazole 4-methylphenol
Acetophenone Dibenzofuran

VOCs
1,4-dioxane Isopropylbenzene Cyclohexane
Carbon disulfide Toluene Xylenes (o)
Xylenes (m&p)

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Birds

The second measurement endpoint evaluated the comparison of ingested doses for birds based on 95UCLM EPCs to NOAEL and LOAEL based TRVs. The HQ for each chemical is calculated based on the comparison of the dose from 95UCLM concentrations in soil to the TRVs.

Dose modeling and comparisons based on 95UCLM EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Avian Wildlife, see **Table 5-7:**

Terrestrial Insectivorous Birds	**Predatory Birds**	**Terrestrial Herbivorous Birds**
NOAEL-based HQs Copper (3) Lead (17) Vanadium (9) Zinc (2) 4,4'-DDD (3) LOAEL-based HQs Lead (9) Vanadium (4)	NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs Copper (2) Lead (5) LOAEL-based HQs Lead (3)

Risk Characterization for Avian Wildlife

Maximum doses for terrestrial birds fall below NOAEL based TRVs for all chemicals except for cadmium, copper, lead, vanadium, zinc, HMW PAHs, 4,4'-DDD, and 4,4'-DDT. When 95UCLM doses are considered, HQs are greater than 1 for copper, lead, vanadium, zinc, and 4,4'-DDD. The COPCs are discussed in the following subsections.

Cadmium

Cadmium was detected in 114 of 203 surface soil samples. The 95UCLM soil concentration of 0.72 mg/kg is greater than the background UPL of 0.53 mg/kg. The maximum dose exceeds the NOAEL based TRV with an HQ of 42 and the LOAEL based TRV with an HQ of 10 for terrestrial insectivorous birds. For terrestrial herbivorous birds, the maximum dose exceeds the NOAEL based TRV with an HQ of 2, but the HQ for the LOAEL based TRV is less than 1. For the 95UCLM case scenario, the HQs are less than 1 for all avian receptors. Cadmium is not expected to pose risks to birds.

Copper

Copper was detected in 201 of 203 surface soil samples. The 95UCLM soil concentration of 225 mg/kg is greater than the background UPL of 3.24 mg/kg. The maximum dose exceeds the NOAEL based TRV with an HQ of 46 and the LOAEL based TRV with an HQ of 15 for terrestrial insectivorous birds. For terrestrial herbivorous birds, the maximum dose exceeds the NOAEL based TRV with an HQ of 40 and the LOAEL based TRV with an HQ of 14. The 95UCLM case scenario HQ for the LOAEL based TRV is less than 1 for the terrestrial insectivorous birds and terrestrial herbivorous birds. Because the 95UCLM HQ for the LOAEL based TRV is less than 1, copper is not expected to pose risks to birds.

Lead

Lead was detected in all 203 surface soil samples. The 95UCLM soil concentration of 346 mg/kg exceeds the background UPL of 9.19 mg/kg. The maximum dose exceeds the NOAEL based TRV with an HQ of 633 for terrestrial insectivorous birds, an HQ of 3 for predatory birds, and an HQ of 263 for terrestrial herbivorous birds. The maximum dose exceeds the LOAEL based TRV for terrestrial insectivorous birds with an HQ of 317, an HQ of 2 for predatory birds, and an HQ of 132 for terrestrial herbivorous birds. When the 95UCLM is considered, the NOAEL based HQ is equal to 17 for terrestrial insectivorous birds, less than 1 for predatory birds, and 5 for terrestrial herbivorous birds. The LOAEL-based HQ is equal to 9 for terrestrial insectivorous birds and 3 for terrestrial herbivorous birds. Lead concentrations in soil could pose a potential risk to terrestrial insectivorous birds and terrestrial herbivorous birds.

Vanadium

Vanadium was detected in all 203 soil samples. The 95UCLM soil concentration of 14.2 mg/kg exceeds the background UPL of 11.2 mg/kg. The maximum dose exceeds the NOAEL based

TRV with an HQ of 50 for terrestrial insectivorous birds, an HQ of 2 for predatory birds, and an HQ of 5 for terrestrial herbivorous birds. The maximum dose exceeds the LOAEL based TRV for terrestrial insectivorous birds with an HQ of 25, an HQ of 1 for predatory birds, and an HQ of 2 for terrestrial herbivorous birds. When the 95UCLM is considered, the HQ is equal to 9 for terrestrial insectivorous birds, less than 1 for predatory birds, and less than 1 for terrestrial herbivorous birds. Vanadium concentrations in soil could pose a potential risk to terrestrial insectivorous birds.

Zinc

Zinc was detected in all 203 soil samples. The maximum dose exceeds the NOAEL- based TRV with an HQ of 11 for terrestrial insectivorous birds and 7 for terrestrial herbivorous birds. The LOAEL based HQ is 4 for terrestrial insectivorous birds and 3 for terrestrial herbivorous birds. When the 95UCLM is considered, the LOAEL based TRV HQ is less than 1 for all bird receptors. Zinc is not expected to pose a potential risk to birds.

HMW PAHs

The maximum total HMW PAH concentration detected is 263 mg/kg; the 95UCLM soil concentration is 14 mg/kg. For terrestrial insectivorous birds, the maximum dose HQ is 11 when compared to the NOAEL based TRV and 1 when compared to the LOAEL based TRV. For terrestrial herbivorous birds, the maximum dose HQ is 6 when compared to the NOAEL based TRV and the LOAEL based TRV is less than 1. The HQs are less than 1 for the 95UCLM case scenario; therefore, HMW PAHs are not expected to pose a potential risk to birds.

4,4'-DDD

4,4'-DDD was detected in 30 of 35 soil samples. The maximum dose exceeds the NOAEL based TRV with an HQ of 10 for terrestrial insectivorous birds, but the LOAEL based HQ is less than 1. When the 95UCLM scenario is considered, the dose is 3 times the NOAEL based TRV but is less than the LOAEL based TRV. The HQs are less than 1 for predatory birds and terrestrial herbivorous birds. 4,4'-DDD is not expected to pose a potential risk to birds.

4,4'-DDT

4,4'-DDT was detected in 33 of 35 soil samples. The maximum dose exceeds the NOAEL based TRV with an HQ of 4 for terrestrial insectivorous birds, but the LOAEL based HQ is less than 1. When the 95UCLM is considered, the HQs are less than 1. The NOAEL and LOAEL based HQs are less than 1 for predatory birds and terrestrial herbivorous birds. 4,4'-DDT is not expected to pose a potential risk to birds.

5.2 NORTH TANK FARM, LOADING DOCK AREA, AND EAST TANK FARM

Exposure point concentrations for COPCs for the North Tank Farm, East Tank Farm, and Loading Dock Area are presented in Table 5-8.

5.2.1 Terrestrial Plants

The CSM identifies protection of terrestrial plant survival, growth, and reproduction from impacts of COPCs in soil as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to terrestrial plants (Table 5-9):

- Comparison of the chemical concentrations to benchmarks protective of plants including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.
- Comparison of the chemical concentrations to background values including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Soil Concentrations to TRVs Protective of Plants

The first measurement endpoint evaluated was the screening-level comparison of maximum chemical concentrations in soil to literature-based TRVs protective of plants. When maximum EPCs of COPCs were compared to TRVs, the following COPCs have HQs that exceed 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals

Chromium (95)	Manganese (34)	Vanadium (26)
Cobalt (5)	Nickel (2)	Zinc (7)
Copper (2)	Selenium (17)	
Lead (23)	Thallium (4)	

PAHs

HMW PAHs (2)

The following COPCs could not be evaluated due to a lack of plant TRVs:

SVOCs		
Acetophenone	Carbazole	Dibenzofuran
VOCs		
Benzene	Cyclohexane	Ethylbenzene

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM Soil Concentrations to TRVs Protective of Plants

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs to plant TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM case scenario reflects exposures across the Site, which are the focus of the SLERA.

When 95UCLM EPCs were compared to TRVs, the following COPCs had HQs exceeding 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals		
Chromium (8)	Manganese (2)	Thallium (4)
Vanadium (6)		

Risk Characterization for Terrestrial Plants

When maximum concentrations are compared to TRVs protective of terrestrial plants, chromium, cobalt, copper, lead, manganese, nickel, selenium, thallium, vanadium, zinc, and HMW PAHs are in exceedance. When 95UCLMs are compared to plant TRVs only four metals have an HQ that exceeds 1.0: chromium, manganese, thallium, and vanadium. The COPCs are discussed in the following section.

Chromium

Chromium was detected in 382 of 383 surface soil samples. The HQ for the maximum EPC is 95, and the 95UCLM HQ is 8. The 95UCLM concentration of 7.63 mg/kg exceeds the background UPL of 7.1 mg/kg. Chromium concentrations in soil could pose a risk to terrestrial plants.

Cobalt

Cobalt was detected in 353 of 377 surface soil samples. The 95UCLM concentration of 4.9 mg/kg is less than the background UPL of 11.1 mg/kg. The HQ for the maximum EPC is 4, but the HQ for the 95UCLM is below 1. Given the low magnitude of the exceedance and the 95UCLM being below the background UPL, cobalt is not expected to pose risks to plants.

Copper

Copper was detected in 381 of 383 surface soil samples. The 95UCLM concentration of 12.3 mg/kg is greater than the background UPL of 3.2 mg/kg. The HQ for the maximum EPC is 1.5, but the HQ for the 95UCLM is below 1. Given the low magnitude of the exceedance, copper is not expected to pose risks to plants.

Lead

Lead was detected in 376 of 377 surface soil samples. The HQ for the maximum EPC is 23, but the HQ for the 95UCLM EPC is less than 1. Due to the 95UCLM HQ being less than 1, lead concentrations in soil are not expected to pose risk to plants.

Manganese

Manganese was detected in all 383 surface soil samples. The HQ for the maximum EPC is 34, and the HQ for the 95UCLM is 2. Manganese concentrations in soil could pose a risk to terrestrial plants.

Nickel

Nickel was detected in 357 of 383 surface soil samples. The HQ for the maximum EPC is 2, but the HQ for the 95UCLM is less than 1. Given the low magnitude of exceedance, nickel is not expected to pose risks to plants.

Selenium

Selenium was detected in 81 of 383 surface soil samples. The HQ for the maximum EPC is 17, but the HQ for the 95UCLM EPC is less than 1. Due to the 95UCLM HQ being less than 1, selenium concentrations in soil are not expected to pose risk to plants.

Thallium

Thallium was detected in 4 of 383 surface soil samples. The HQ for the maximum EPC is 4. Due to the low frequency of detection and low magnitude of the exceedance, thallium concentrations in soil are not expected to pose risk to plants.

Vanadium

Vanadium was detected in all 377 surface soil samples. The HQ for the maximum EPC is 26, and the HQ for the 95UCLM is 6. Vanadium concentrations in soil could pose a risk to terrestrial plants.

Zinc

Zinc was detected in 382 of 383 surface soil samples. The HQ for the maximum EPC is 7, but the 95UCLM EPC HQ is less than 1. Because the 95UCLM is less than the TRV, zinc is not expected to pose risks to plants.

HMW PAHs

HMW PAHs were detected in 304 of 304 surface soil samples. The HQ for the maximum EPC is 2, but the HQ for the 95UCLM is less than 1. Given the low magnitude of exceedance, HMW PAHs in soil are not expected to pose risks to plants.

5.2.2 Soil Invertebrates

The CSM identifies protection of soil invertebrate survival, growth, and reproduction from impacts of COPCs in soil as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to soil invertebrates (Table 5-10):

- Comparison of the chemical concentrations to benchmarks protective of soil invertebrates including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.
- Comparison of the chemical concentrations to background values including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Soil Concentrations to TRVs Protective of Soil invertebrates

The first measurement endpoint evaluated was the screening-level comparison of maximum chemical concentrations in soil to literature-based TRVs protective of soil invertebrates. When maximum EPCs were compared to TRVs, the following COPCs had HQs that exceeded 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals

Barium (2)	Chromium (238)	Lead (2)
Manganese (16)	Mercury (3)	Selenium (2)
Zinc (9)		

PAHs

HMW PAHs (2)

Pesticides

Alpha-Chlordane (3)

SVOCs

Carbazole (3)	Di-n-butyl phthalate (6)

VOCs

Benzene (23)	Ethylbenzene (25)	Isopropylbenzene (80)
Toluene (2)	Xylenes (m&p) (6)	Xylenes (o) (3)

The following COPCs could not be evaluated due to a lack of soil invertebrate TRVs:

Metals

Cobalt	Vanadium

SVOCs

Acetophenone	Dibenzofuran

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM Soil Concentrations to TRVs Protective of Soil invertebrates

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs to soil invertebrate TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM case scenario reflects exposures across the site, which are the focus of the SLERA.

When 95UCLM EPCs of COPCs were compared to TRVs, the following COPCs have HQs that exceed 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals
Chromium (19)

VOCs

Benzene (23)	Ethylbenzene (2)	Isopropylbenzene (80)

Risk Characterization for Soil invertebrates

When maximum concentrations are compared to TRVs protective of soil invertebrates, barium, chromium, lead, manganese, mercury, zinc, HMW PAHs, alpha-chlordane, carbazole, di-n-butyl phthalate, benzene, ethylbenzene, isopropylbenzene, toluene, and xylenes have HQs that exceed 1.0. When 95UCLM EPCs are compared to soil invertebrate TRVs, the following COPCs have HQs that exceed 1.0: chromium, benzene, ethylbenzene, and isopropylbenzene. The COPCs are discussed below in further detail.

Barium

Barium was detected in 376 of 377 soil samples. The HQ for the maximum EPC is 2, but the HQ for the 95UCLM result is below 1. Given the low magnitude of exceedance, barium is not expected to pose risks to soil invertebrates.

Chromium

Chromium was detected in 382 of 383 soil samples. The HQ for the maximum EPC is 238, and the HQ for the 95UCLM result is 19. Chromium concentrations in soil could pose a risk to soil invertebrates.

Lead

Lead was detected in 376 of 377 soil samples. The HQ for the maximum EPC is 2, but the HQ for the 95UCLM result is below 1. Given the low magnitude of exceedance, lead is not expected to pose risks to soil invertebrates.

Manganese

Manganese was detected in all 383 soil samples. The HQ for the maximum EPC is 16, and the HQ for the 95UCLM result is 1. Given the low magnitude of the 95UCLM HQ, manganese is not expected to pose risk to soil invertebrates.

Mercury

Mercury was detected in 165 of 383 soil samples. The HQ for the maximum EPC is 3, but the HQ for the 95UCLM result is below 1. Given the low magnitude of exceedance, mercury is not expected to pose risks to soil invertebrates.

Zinc

Zinc was detected in 382 of 383 soil samples. The HQ for the maximum EPC is 9, but the HQ for the 95UCLM result is below 1. Given the low magnitude of the 95UCLM HQ, zinc is not expected to pose risks to soil invertebrates.

HMW PAHs

HMW PAHs were detected in 304 surface soil samples. The HQ for the maximum EPC is 2, but the HQ for the 95UCLM is less than 1. Given the low magnitude of exceedance, HMW PAHs in soil are not expected to pose risks to soil invertebrates.

Alpha-chlordane

Alpha-chlordane was detected in 11 of 147 surface soil samples. The HQ for the maximum EPC is 3, but the HQ for the 95UCLM is less than 1. Given the low magnitude of the exceedance and the low frequency of detection, alpha-chlordane is not expected to pose risks to soil invertebrates.

Carbazole

Carbazole was detected in 15 of 357 surface soil samples. The HQ for the maximum EPC is 3, but the HQ for the 95UCLM is less than 1. Given the low frequency of detection and low magnitude of exceedance, carbazole is not expected to pose risks to soil invertebrates.

Di-n-butyl phthalate

Di-n-butyl phthalate was detected in 9 of 357 surface soil samples. The HQ for the maximum EPC is 6. Given the low frequency of detection, Di-n-butyl phthalate is not expected to pose risks to soil invertebrates.

Benzene

Benzene was detected in 1 of 188 surface soil samples. The detected result of 2.8 mg/kg is approximately 23 times the TRV and is in the Loading Dock Area (LDA-SB-110). Given the low frequency of detection, benzene is not expected to pose risks to soil invertebrates.

Ethylbenzene

Ethylbenzene was detected in 9 of 188 surface soil samples. The maximum concentration of 6.7 mg/kg is approximately 25 times the TRV. Given the low frequency of detection, ethylbenzene is not expected to pose risks to soil invertebrates.

Isopropylbenzene

Isopropylbenzene was detected in 3 out of 188 surface soil samples. The maximum concentration of 3.2 mg/kg is approximately 80 times the TRV. The detected results are in the Loading Dock Area. Isopropylbenzene concentrations in the Loading Dock Area could cause potential risks to soil invertebrates.

Toluene

Toluene was detected in 104 out of 188 surface soil samples. The maximum concentration is approximately 2 times the TRV. Given the low magnitude of the exceedance, toluene is not expected to pose risks to soil invertebrates.

Xylenes (m&p)

Xylenes (m&p) were detected in 38 out of 188 surface soil samples. The maximum concentration is approximately 6 times the TRV. Given the low frequency of detection, xylenes are not expected to pose risks to soil invertebrates.

Xylenes (o)

Xylenes (o) were detected in 12 out of 188 surface soil samples. The maximum concentration is approximately 3 times the TRV. Given the low frequency of detection, xylenes are not expected to pose risks to soil invertebrates.

5.2.3 Mammalian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of mammals from impacts of COPCs in soil and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to mammals:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals
- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Mammals

The HQ for each COPC is calculated based on the comparison of the dose from maximum concentrations in surface soil to the TRVs.

Dose modeling and comparisons based on maximum EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 5-11:**

Terrestrial Herbivorous Mammals (white-footed mouse)	Terrestrial Herbivorous Mammals (cattle)	Terrestrial Insectivorous Mammals	Predatory Mammals
NOAEL-based HQs Manganese (1.5) Selenium (2) LOAEL-based HQs None	NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs Antimony (20) Beryllium (2) Cadmium (7) Lead (27) Manganese (3) Nickel (2) Selenium (6) Silver (2) Thallium (90) Vanadium (2) Zinc (2) HMW PAHs (5) LOAEL-based HQs Antimony (2) Lead (14) Selenium (4) Thallium (9)	NOAEL-based HQs Thallium (2) LOAEL-based HQs None

The following COPCs could not be evaluated due to a lack of TRVs:

SVOCs

Acetophenone	Carbazole	Dibenzofuran
Dimethyl phthalate		

VOCs

Cyclohexane	Isopropylbenzene

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Mammals

The second measurement endpoint evaluated the comparison of ingested doses for mammals based on 95UCLM EPCs to NOAEL and LOAEL-based TRVs. The HQ for each chemical is calculated based on the comparison of the dose from 95UCLM concentrations in soil to the TRVs.

Dose modeling and comparisons based on 95UCLM EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each COPC:

COPCs for Mammalian Wildlife, see **Table 5-12:**

Terrestrial Herbivorous Mammals (white-footed mouse)	Terrestrial Herbivorous Mammals (cattle)	Terrestrial Insectivorous Mammals	Predatory Mammals
NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs None LOAEL-based HQs None	NOAEL-based HQs Nickel (2) Thallium (90) LOAEL-based HQs Thallium (9)	NOAEL-based HQs Thallium (2) LOAEL-based HQs None

Risk Characterization for Mammalian Wildlife

Maximum doses for terrestrial mammals are below NOAEL based TRVs for all COPCs except for antimony, beryllium, cadmium, lead, manganese, nickel, selenium, silver, thallium, vanadium, zinc, and HMW PAHs. Antimony, lead, selenium, thallium, and HMW PAHs exceed the LOAEL-based TRV. For the 95UCLM scenario, only lead and nickel slightly exceed the NOAEL-based TRV for insectivorous mammals. No COPCs have HQs greater than 1.0 for the LOAEL-based scenario. The COPCs for terrestrial mammals are discussed in the following subsections.

<u>Antimony</u>

Antimony was detected in 25 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 20 for terrestrial insectivorous mammals, but the HQ is 2 when compared to the LOAEL. The LOAEL based HQ for the 95UCLM scenario is less than 1. The maximum case scenario HQs are less than 1 for the terrestrial herbivorous mammals and

predatory mammals. Due to the low frequency of detection, antimony is not likely to pose a risk to terrestrial mammals.

Beryllium

Beryllium was detected in 168 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous mammals, but the HQ is less than 1 when compared to the LOAEL. The HQs for the 95UCLM scenarios are less than 1. The maximum case scenario HQs are less than 1 for the terrestrial herbivorous mammals and predatory mammals. Given the low magnitude of the exceedance, beryllium is not likely to pose a risk to terrestrial mammals.

Cadmium

Cadmium was detected in 80 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 7 for terrestrial insectivorous mammals but falls below the LOAEL based TRV. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. Due to the lack of exceedance of the LOAEL based TRV, cadmium is not expected to pose risks to terrestrial mammals.

Lead

Lead was detected in 376 of 377 surface soil samples. The maximum case scenario HQ based on the NOAEL is 27 for terrestrial insectivorous mammals, and the HQ is 14 when compared to the LOAEL. The LOAEL based HQ for the 95UCLM scenario is less than 1. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. Given the low magnitude of the of the 95UCLM HQs, lead is not expected to pose risks to terrestrial mammals.

Manganese

Manganese was detected in all 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 4 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The 95UCLM HQs are less than 1. The maximum case scenario HQ based on the NOAEL is 1 for terrestrial herbivorous mammals (white-footed mouse), but the LOAEL based HQ is less than 1. The maximum case scenario HQs are below 1 for the predatory mammals. Due to the low magnitude of exceedance, manganese is not expected to pose risks to terrestrial mammals.

Nickel

Nickel was detected in 357 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The maximum case scenario HQs are below 1 for the terrestrial

herbivorous mammals and predatory mammals. Due to the low magnitude of exceedance, nickel is not expected to pose risks to terrestrial mammals.

Selenium

Selenium was detected in 81 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 6 for terrestrial insectivorous mammals, and the LOAEL-based HQ is equal to 4. The 95UCLM HQs are less than 1. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial herbivorous mammals (white-footed mouse), but the LOAEL based HQ is less than 1. The maximum case scenario HQs are below 1 for the predatory mammals. Selenium is not expected to pose risks to terrestrial mammals.

Silver

Silver was detected in 32 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. Due to the low magnitude of exceedance and low frequency of detection, silver is not expected to pose risks to terrestrial mammals.

Thallium

Thallium was detected in 4 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 89 for terrestrial insectivorous mammals, and the LOAEL-based HQ is equal to 9. For predatory mammals, the maximum case scenario HQ based on the NOAEL is 2, but the LOAEL-based HQ is less than 1. The maximum case scenario HQs are below 1 for terrestrial herbivorous mammals. The high HQs are based upon a single concentration, and thallium was only detected in 1 percent of the samples. Given the low frequency of detection, thallium is not expected to pose risks to terrestrial mammals.

Vanadium

Vanadium was detected in all 377 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. Vanadium is not expected to pose risks to terrestrial mammals.

Zinc

Zinc was detected in 382 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. Due to the low magnitude of exceedance, zinc is not expected to pose risks to terrestrial mammals.

HMW PAHs

The maximum case scenario HQ based on the NOAEL is 5 for terrestrial insectivorous mammals, and the HQ is less than 1 when compared to the LOAEL. The maximum case scenario HQs are below 1 for the terrestrial herbivorous mammals and predatory mammals. The HQs for the 95UCLM HQs are less than 1. HMW PAHs in soil are not expected to pose risk to terrestrial mammals.

5.2.4 Avian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of birds from impacts of COPCs in soil and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to birds:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Birds

The HQ for each chemical is calculated based on the comparison of the dose from maximum concentrations in soil to the avian TRVs.

Dose modeling and comparisons based on maximum EPCs identified the following COPCs with HQs greater than 1.0; the HQ is included in parentheses next to each chemical:

COPCs for Avian Wildlife, see **Table 5-13:**

Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
NOAEL-based HQs Barium (2) Cadmium (5) Chromium (2) Copper (2) Lead (104) Selenium (4) Silver (8) Vanadium (33) Zinc (3) HMW PAHs (2) Di-n-butyl phthalate (3) LOAEL-Based HQs Lead (52) Selenium (2) Vanadium (16)	NOAEL-based HQs Vanadium (2) LOAEL-Based HQs None	NOAEL-based HQs Barium (2) Lead (36) Manganese (3) Selenium (5) Vanadium (3) LOAEL-Based HQs Lead (18) Selenium (2) Vanadium (2)

The following COPCs could not be evaluated due to a lack of avian NOAEL based TRVs:

Metals

Antimony	Thallium	

SVOCs

Acetophenone	Carbazole	Dibenzofuran
Dimethyl phthalate		

VOCs

Benzene	Cyclohexane	Ethylbenzene
Isopropylbenzene	Toluene	Xylenes (m&p)
Xylenes (o)		

There are no available avian LOAELs for aluminum or bis(2-ethylhexyl)phthalate.

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Birds

The second measurement endpoint evaluated the comparison of ingested doses for birds based on 95UCLM EPCs to NOAEL and LOAEL based TRVs. The HQ for each chemical is calculated based on the comparison of the dose from 95UCLM concentrations in soil to the TRVs.

Dose modeling and comparisons based on 95UCLM EPCs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each COPC:

COPCs for Avian Wildlife, see **Table 5-14:**

Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
NOAEL-Based HQs Lead (5) Vanadium (7) LOAEL-Based HQs Lead (2) Vanadium (4)	NOAEL-Based HQs None LOAEL-Based HQs None	NOAEL-Based HQs None LOAEL-Based HQs None

Risk Characterization for Avian Wildlife

Maximum doses for terrestrial birds fall below NOAEL based TRVs for all chemicals except for barium, cadmium, chromium, copper, lead, manganese, selenium, silver, vanadium, zinc, di-n-butyl phthalate, and HMW PAHs. Comparison of 95UCLM-based doses to TRVs indicates only lead and vanadium have HQs that exceed 1.0 for insectivorous birds. The COPCs are discussed in the following subsections.

Barium

Barium was detected in 376 of 377 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous birds and terrestrial herbivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are below 1 for predatory birds. Due to the low magnitude of the exceedance, barium is not likely to pose a risk to terrestrial bird receptors.

Cadmium

Cadmium was detected in 80 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 5 for terrestrial insectivorous birds, but the HQ based on the LOAEL is 1. The maximum case scenario HQs are below 1 for predatory birds and terrestrial herbivorous birds. The 95UCLMs are less than 1 for all terrestrial birds; therefore, cadmium is not likely to pose a risk to terrestrial bird receptors.

Chromium

Chromium was detected in 382 of 383 surface soil samples. The maximum case scenario HQ

based on the NOAEL is 2 for terrestrial insectivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are below 1 for predatory birds and terrestrial herbivorous birds. Due to the low magnitude of the exceedance, chromium is not likely to pose a risk to terrestrial bird receptors.

Copper

Copper was detected in 381 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are below 1 for predatory birds and terrestrial herbivorous birds. Due to the low magnitude of the exceedance, copper is not likely to pose a risk to terrestrial bird receptors.

Lead

Lead was detected in 376 of 377 surface soil samples. The maximum case scenario HQ based on the NOAEL is 104 for terrestrial insectivorous birds, and 36 for terrestrial herbivorous birds. The maximum case scenario based on the LOAEL is 52 for terrestrial insectivorous birds and 18 for terrestrial herbivorous birds. The 95UCLM scenario LOAEL-based HQ is 2 for terrestrial insectivorous birds and less than 1 for terrestrial herbivorous birds. Lead in soil could pose a risk to terrestrial insectivorous birds.

Manganese

Manganese was detected in all 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 3 for terrestrial herbivorous birds. The maximum case scenario HQ based on the LOAEL is 1 for terrestrial herbivorous birds. The 95UCLM HQs are less than 1 for all terrestrial bird receptors. Due to the low magnitude of the HQ, manganese is not likely to pose a risk to terrestrial bird receptors.

Selenium

Selenium was detected in 81 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is equal to 4 for terrestrial insectivorous birds and 5 for terrestrial herbivorous birds. The maximum case scenario HQ based on the LOAEL is equal to 2 for terrestrial insectivorous and terrestrial herbivorous birds. The maximum case scenario HQs are less than 1 for predatory birds. The 95UCLM HQs are less than 1 for all terrestrial bird receptors. Due to the low magnitude of the HQ, selenium is not likely to pose a risk to terrestrial bird receptors.

Silver

Silver was detected in 32 of 383 surface soil samples. The maximum case scenario HQ based on the NOAEL is 8 for terrestrial insectivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are less than 1 for predatory birds and terrestrial herbivorous birds. Due to the low magnitude of the LOAEL based HQ and the low frequency of detection, silver is not likely to pose a risk to terrestrial bird receptors.

Vanadium

Vanadium was detected in all 377 surface soil samples. The maximum case scenario based on the NOAEL is 33 for terrestrial insectivorous birds, and 3 for terrestrial herbivorous birds. The maximum case scenario HQ based on the LOAEL is 16 for terrestrial insectivorous birds, and 2 for terrestrial herbivorous birds. The 95UCLM scenario LOAEL-based HQ is 4 for terrestrial insectivorous birds and less than 1 for terrestrial herbivorous birds. Vanadium in soil could pose a risk to terrestrial insectivorous birds. Due to the low magnitude of the exceedance, vanadium is not likely to pose a risk to terrestrial herbivorous birds.

Zinc

Zinc was detected in 382 of 383 surface soil samples. The maximum case scenario based on the NOAEL is 3 for terrestrial insectivorous birds. The maximum case scenario HQ based on the LOAEL is 1 for terrestrial insectivorous birds. The 95UCLM LOAEL-based HQ is less than 1. Due to the low magnitude of the HQ, zinc is not likely to pose a risk to terrestrial bird receptors.

Di-n-butyl phthalate

Di-n-butyl phthalate was detected in 9of 357 surface soil samples. The maximum case scenario HQ based on the NOAEL is 3 for terrestrial insectivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are below 1 for predatory birds and terrestrial herbivorous birds. Due to the low frequency of detection and low magnitude of the exceedance, di-n-butyl phthalate is not likely to pose a risk to terrestrial bird receptors.

HMW PAHs

The maximum case scenario HQ based on the NOAEL is 2 for terrestrial insectivorous birds, but the HQ based on the LOAEL is less than 1. The maximum case scenario HQs are below 1 for predatory birds and terrestrial herbivorous birds. Due to the low magnitude of the HQ, HMW PAHs are not likely to pose a risk to terrestrial bird receptors.

5.3 SUMMARY OF TERRESTRIAL RISKS

5.3.1 Wilcox and Lorraine Process Area Summary

COPCs have been identified in surface soil that may pose risk to terrestrial receptors. Some of the detected chemicals are lacking a TRV and thus cannot be evaluated. The uncertainty associated with a lack of TRV is discussed in Section 8. The risk characterization results for each receptor are summarized below.

An important consideration in evaluating risk is habitat quality. A description of the Wilcox Process Area and Lorraine Process Area is presented in Section 2.2. As discussed above, most of the area is covered with trees and native grasses. Unoccupied residences are present in Wilcox Process Area and Lorraine Process Area. Additionally, there are areas of stressed vegetation and barren soil, and visible tar waste.

Terrestrial Plants Summary

A comparison of the maximum surface soil concentrations to TRVs protective of terrestrial plants indicates that 10 metals (cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, vanadium, and zinc), HMW PAHs, and LMW PAHs have HQs greater than 1. A comparison of the 95UCLM to plant TRVs indicates that chromium, copper, lead, vanadium, and zinc have HQs greater than 1. Chromium, copper, lead, vanadium, and zinc concentrations in soil could pose risks to terrestrial plants.

Soil Invertebrates Summary

A comparison of the maximum COPC concentrations to TRVs protective of soil invertebrates indicates that seven metals (chromium, hexavalent chromium, copper, lead, manganese, mercury, and zinc), LMW PAHs, HMW PAHs, carbazole, isopropylbenzene, toluene, xylenes (m&p), and xylenes (o) have HQs that exceed 1.0. A comparison of the 95UCLM COPC concentrations to soil invertebrate TRVs indicates that five metals (chromium, hexavalent chromium, copper, mercury, and zinc), isopropylbenzene, and xylenes (m&p) have HQs greater than 1. Chromium, hexavalent chromium, copper, mercury, zinc, isopropylbenzene, and xylenes (m&p) were found to pose potential risks to soil invertebrates. Lead, manganese, gamma-chlordane, LMW PAHs, HMW PAHs, carbazole, toluene, and xylenes (o)were not considered potential risks to soil invertebrates due to low detection frequency and/or low magnitude of exceedance.

Mammalian Wildlife Summary

Maximum doses for terrestrial mammals exceed NOAEL-based TRVs for antimony, cadmium, copper, lead, nickel, selenium, thallium, vanadium, zinc, and total HMW PAHs. Maximum doses exceed LOAEL-based TRVs for cadmium, copper, lead, zinc, and HMW PAHs. 95UCLM-based doses exceed NOAEL-based TRVs for antimony, lead, nickel, and HMW PAHs. Lead was found to pose potential risk to terrestrial mammals. Antimony, cadmium, copper, nickel, selenium, thallium, vanadium, HMW PAHs, and zinc were not considered potential risks to terrestrial mammals due to the low magnitude of exceedance.

Avian Wildlife Summary

Maximum doses for terrestrial birds fall below NOAEL based TRVs for all chemicals except for cadmium, copper, lead, vanadium, zinc, HMW PAHs, 4,4’-DDD, and 4,4’-DDT. 95UCLM doses exceed NOAEL-based TRVs for copper, lead, vanadium, zinc, and 4,4’-DDD. Lead and vanadium were found to pose potential risk to terrestrial birds. Cadmium, copper, HMW PAHs, zinc 4,4’-DDD, and 4,4’-DDT were not considered potential risks due to the low magnitude of exceedance.

5.3.2 North Tank Farm, Loading Dock Area, and East Tank Farm Summary

COPCs have been identified in surface soil that may pose risk to terrestrial receptors. Some of the detected chemicals are lacking a TRV and thus cannot be evaluated. The uncertainty associated with a lack of TRV is discussed in Section 8. The risk characterization results for each receptor are summarized below.

A description of the North Tank Farm, Loading Dock Area, and East Tank Farm is presented in Section 2.2. As discussed above, three occupied residences, small ponds, and a herd of cattle are present on the East Tank Farm. One occupied residence is located on the North Tank Farm. Approximately 30 percent of the Loading Dock Area, 60 percent of the North Tank Farm, and 30 percent of the East Tank Farm are covered with trees. There are also multiple areas of stressed vegetation, barren areas, and visible black, tarry waste.

Terrestrial Plants Summary

When maximum concentrations are compared to TRVs protective of terrestrial plants, chromium, cobalt, copper, lead, manganese, nickel, selenium, thallium, vanadium, zinc, and HMW PAHs are in exceedance. When 95UCLM concentrations are compared to terrestrial plant TRVs, chromium, manganese, thallium, and vanadium are in exceedance.

Chromium, manganese, and vanadium in soil were found to pose potential risks to terrestrial plants. Cobalt, copper, lead, nickel, selenium, thallium, zinc, and HMW PAHs were not considered potential risks to plants due to low detection frequency and/or low magnitude of exceedance.

Soil Invertebrates Summary

When maximum concentrations are compared to TRVs protective of soil invertebrates, barium, chromium, lead, manganese, mercury, zinc, HMW PAHs, alpha-chlordane, carbazole, di-n-butyl phthalate, benzene, ethylbenzene, isopropylbenzene, toluene, and xylenes are in exceedance. When 95UCLM concentrations are compared to soil invertebrate TRVs, chromium, benzene, ethylbenzene, and isopropylbenzene are in exceedance. Chromium and isopropylbenzene were found to pose potential risks to soil invertebrates. Barium, lead, manganese, mercury, zinc, HMW PAHs, carbazole, di-n-butyl phthalate, benzene, ethylbenzene, xylenes, and toluene were not considered potential risks to soil invertebrates due to low detection frequency and/or low magnitude of exceedance.

Mammalian Wildlife Summary

When maximum doses are compared to NOAEL based TRVs protective of terrestrial mammals, antimony, beryllium, cadmium, lead, manganese, nickel, selenium, silver, thallium, vanadium, zinc, and HMW PAHs are in exceedance for at least one receptor. When 95UCLM doses are compared to NOAEL based TRVs, lead and nickel are in exceedance for terrestrial insectivorous mammals. The COPCs were not considered potential risks to terrestrial mammals due to the low

magnitude of exceedance. COPCs present in soil are not considered potential risks to the cattle on the East Tank Farm.

Avian Wildlife Summary

Maximum doses for terrestrial birds fall below NOAEL based TRVs for all chemicals except for barium, cadmium, chromium, copper, lead, manganese, selenium, silver, vanadium, zinc, di-n-butyl phthalate, and HMW PAHs. When 95UCLM doses are compared to NOAEL based TRVs, lead, vanadium, and di-n-butyl phthalate are in exceedance for one or more receptors. Lead and vanadium were found to pose potential risk to terrestrial insectivorous birds. Barium, cadmium, chromium, copper, selenium, silver, manganese, zinc, di-n-butyl phthalate, and HMW PAHs were not considered potential risks due to the low magnitude of exceedance.

6. RISK CHARACTERIZATION RESULTS FOR AQUATIC RECEPTORS

6.1 PONDS

Exposure point concentrations for COPCs in ponds are presented in Table 6-1.

6.1.1 Benthic Invertebrates

The CSM identifies protection of benthic invertebrate survival, growth, and reproduction from impacts of COPCs in sediment as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to benthic invertebrates (Table 6-2):

- Comparison of the chemical concentrations in sediment to benchmarks protective of benthic invertebrates including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs
  - Assessment of SEM and AVS to characterize bioavailability of divalent metals in sediment.
- Comparison of the chemical concentrations in sediment to background values including
  - Comparison using maximum EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). The 95UCLM concentrations will be used to provide an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Sediment Concentrations to TRVs Protective of Benthic Organisms

The first measurement endpoint included a comparison of maximum COPC concentrations in sediment to literature-based TRVs protective of benthic invertebrates. When maximum EPCs of COPCs were compared to TRVs, the following COPCs had HQs exceeding 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals
Lead (6)

PAHs
Total PAHs (2)

SVOCs
4-methylphenol (3)

Measurement Endpoint 2: Comparison of 95UCLM EPCs to Benthic Invertebrate TRVs

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs in sediment to benthic invertebrate TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM case scenario reflects exposures across the site, which are the focus of the SLERA.

When 95UCLM EPCs of COPCs were compared to TRVs, the following COPCs have HQs exceeding 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals
Lead (3)

Measurement Endpoint 3: Simultaneously Extracted Metals/Acid Volatile Sulfide (SEM/AVS)

The third measurement endpoint evaluated the SEM, AVS, and total organic carbon (TOC) data in sediment. The differences are summarized in Table 6-3.

The sum of SEM – AVS difference is divided by fraction of organic carbon in sediment ($[\sum SEM\text{-}AVS]/f_{OC}$). Per EPA guidance (2005i), if the result is <130 micromoles per gram of organic carbon ($\mu mol/g_{oc}$), then toxicity to benthic invertebrates is not anticipated. If the result is >3,000 $\mu mol/g_{oc}$, then toxicity is likely. If the result is between 130 and 3,000 $\mu mol/g_{oc}$, then toxicity is uncertain (ITRC 2011). Sediment samples were analyzed for TOC. Calculations are summarized in Table 6-3.

The $\sum$SEM-AVS differences are less than 0 for the onsite ponds, except for Pond 1. This indicates that metals in Pond 1 may be bioavailable. When the TOC results are taken into account, the ($[\sum SEM\text{-}AVS]/f_{OC}$) values were <130 $\mu mol/g_{oc}$, indicating toxicity to benthic invertebrates is not anticipated, with the exception of one sample from Pond 1. The ($[\sum SEM\text{-}AVS]/f_{OC}$) value for sample location P1-SD04-0.5 is 134.25 $\mu mol/g_{oc}$, which indicates the toxicity is uncertain at this location.

Risk Characterization for Benthic Invertebrates

When maximum concentrations in sediment are compared to TRVs protective of benthic invertebrates, lead, 4-methylphenol, and total PAHs are in exceedance. When 95 UCLM sediment concentrations are compared to TRVs, lead and 4-methylphenol are in exceedance. The maximum concentration of each of the COPCs exceeds background. Discussion of the results for benthic invertebrates is provided in the following subsections.

Lead

Lead was detected in all 22 sediment samples. The HQ for the maximum concentration is equal to 6, and the 95UCLM HQ is 3. The SEM/AVS results indicate that lead is not bioavailable to ecological receptors. Given the SEM/AVS results, lead is not expected to pose risk to benthic invertebrates.

Total PAHs

PAH was detected in 20 of 22 sediment samples. The HQ for the maximum concentration is 2, and the 95UCLM HQ is less than 1. Due to the low magnitude of exceedance, PAHs in the sediment are not expected to pose risks to benthic invertebrates.

4-Methylphenol

4-Methylphenol was detected in 3 of 22 sediment samples. The HQ for the maximum exceedance is 3. Due to low magnitude of exceedance and the low frequency of detection, 4-methylphenol in the sediment is not expected to pose risk to benthic invertebrates.

6.1.2 Aquatic Organisms

The CSM identifies protection of aquatic organism survival, growth, and reproduction from impacts of COPCs in surface water as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to aquatic organisms (Table 6-4):

- Comparison of the chemical concentrations in surface water to benchmarks protective of aquatic organisms including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

- Comparison of the chemical concentrations in surface water to background values including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). Dissolved metal concentrations are used to calculate HQs for aquatic organisms in the water column; the HQs for total metal concentrations are presented for informational purposes. The 95UCLM concentrations will be used to provide an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Surface Water Concentrations to TRVs Protective of Aquatic Organisms

The first measurement endpoint included a comparison of maximum COPC concentrations in surface water to literature-based TRVs protective of aquatic organisms. When maximum EPCs of COPCs were compared to TRVs, the following COPCs had HQs exceeding 1.0; the HQ is included in parentheses next to each COPC:

Maximum EPC

Metals
Cadmium, dissolved (42) Lead, dissolved (10) Manganese, dissolved (2)

PAHs
Benzo(a)pyrene (4)

Measurement Endpoint 2: Comparison of 95UCLM Surface Water Concentrations to TRVs Protective of Aquatic Organisms

When 95UCLM EPCs in surface water were compared to TRVs, the following COPCs had HQs that exceeded 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals
Cadmium, dissolved (27) Lead, dissolved (10)

PAHs
Benzo(a)pyrene (4)

Risk Characterization for Aquatic Organisms

When maximum dissolved surface water concentrations are compared to TRVs protective of aquatic organisms, cadmium, lead, manganese, and benzo(a)pyrene are in exceedance. When 95UCLM concentrations are compared to aquatic organism TRVs, cadmium, lead, and benzo(a)pyrene are in exceedance. The COPCs are discussed in the following subsection.

Cadmium

Cadmium was detected in 7 of 22 filtered surface water samples. The detections were present in Ponds 1, 2, and 3. The maximum EPC HQ is 42, and the 95UCLM HQ is 27. Cadmium in the surface water could pose risk to aquatic organisms present in Ponds 1, 2, and 3.

Lead

Lead was detected in 3 of 22 filtered surface water samples. The maximum EPC HQ is 10. The three detections were limited to Pond 1, and the results were greater than the TRV of 2.9 micrograms per liter (µg/L). Lead in the surface water could pose risk to aquatic organisms present in Pond 1.

Manganese

Manganese was detected in 16 of 22 filtered surface water samples. The maximum EPC HQ is 2, but the 95UCLM EPC HQ is less than 1. Given the low magnitude of the exceedance, manganese is not expected to pose risks to aquatic organisms.

Benzo(a)pyrene

Benzo(a)pyrene was detected in 7 of 17 surface water samples. The maximum and 95UCLM EPC HQ is 4. The 7 detections are greater than the chronic surface water TRV of 0.014 µg/L but less than the acute surface water TRV of 0.24 µg/L; detected concentrations are located in Ponds 3, 5, and 7. Pond 7 is located to the east of the site, and Ponds 3 and 5 are located onsite. The benzo(a)pyrene concentrations in Ponds 3 and 5 are similar to the amount detected in Pond 7. The source of the detected benzo(a)pyrene concentrations may not be site-related.

6.1.3 Aquatic Mammalian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of mammals from impacts of COPCs in sediment and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to mammals:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Mammals

The HQ for each COPC is calculated based on the comparison of the dose from the food web model using the maximum sediment concentrations to the NOAEL and LOAEL-based TRVs.

Doses from the food web models based on maximum sediment EPCs compared to the TRVs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 6-5:**

Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
NOAEL-based HQs Aluminum (19) LOAEL-based HQs Aluminum (2)	NOAEL-based HQs Aluminum (461) LOAEL-based HQs Aluminum (46)	NOAEL-based HQs Aluminum (6) LOAEL-based HQs None

The following COPCs could not be evaluated due to lack of TRVs:

SVOCs
4-methylphenol

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Mammals

The second measurement endpoint evaluated the comparison of ingested doses for mammals based on 95UCLM EPCs to NOAEL and LOAEL-based TRVs. The HQ for each chemical is calculated based on the comparison of the dose from 95UCLM concentrations in sediment to the NOAEL and LOAEL-based TRVs.

Doses from the food web models based on 95UCLM sediment EPCs compared to the TRVs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 6-6:**

Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
NOAEL-based HQs Aluminum (9) LOAEL-based HQs None	NOAEL-based HQs Aluminum (243) LOAEL-based HQs Aluminum (24)	NOAEL-based HQs Aluminum (2) LOAEL-based HQs None

Risk Characterization for Aquatic Mammalian Wildlife

When food web modeled doses are compared to NOAEL based TRVs protective of mammals, aluminum was in exceedance for aquatic insectivorous mammals, aquatic herbivorous mammals, and piscivorous mammals. The aluminum results are discussed further below.

Aluminum

Aluminum was detected in all 22 sediment samples and 4 of 22 filtered surface water samples. The maximum and 95UCLM doses exceed NOAEL based TRVs for aquatic herbivorous mammals, aquatic insectivorous mammals, and piscivorous mammals. 95UCLM HQs based on LOAEL TRVs are greater than 1 for aquatic insectivorous mammals and less than 1 for aquatic herbivorous mammals and piscivorous mammals. As noted in Section 3.3, aluminum is not considered a COPC in sediment. Additionally, the dissolved aluminum surface water concentrations are below the screening criteria of 680 µg/L. Therefore, aluminum is not considered a risk to aquatic mammals.

6.1.4 Aquatic Avian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of birds from impacts of COPCs in soil and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to birds:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Birds

The HQ for each COPC is calculated based on the comparison of the dose from the food web model using the maximum sediment concentrations to the NOAEL and LOAEL-based TRVs.

Dose modeling from food webs based on maximum EPCs compared to the TRVs did not identify any COPCs with HQs exceeding 1.0 (Table 6-7).

The following COPCs could not be evaluated due to lack of TRVs:

Metals
Aluminum

SVOCs
4-methylphenol

VOCs
Acetone Toluene

Risk Characterization for Aquatic Avian Wildlife

When maximum food web modeled doses are compared to TRVs protective of birds, no COPCs had HQs greater than 1.0. Therefore, there is no risk to aquatic avian wildlife in the ponds.

6.2 STREAMS

Exposure point concentrations for COPCs in streams are presented in Table 6-8.

6.2.1 Benthic Invertebrates

The CSM identifies protection of benthic invertebrate survival, growth, and reproduction from impacts of COPCs in sediment as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to benthic invertebrates (Table 6-9):

- Comparison of the chemical concentrations in sediment to benchmarks protective of benthic invertebrates including:
  - Comparison using maximum EPCs
  - Comparison using 95UCLM EPCs
  - Assessment of SEM and AVS to characterize bioavailability of divalent metals in sediment.
- Comparison of the chemical concentrations in sediment to background values including
  - Comparison using maximum EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., hotspots). The 95UCLM concentrations will be used to provide an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Sediment Concentrations to TRVs Protective of Benthic Organisms

The first measurement endpoint included a comparison of maximum COPC concentrations in sediment to literature-based TRVs protective of benthic invertebrates. When maximum EPCs of COPCs were compared to TRVs, the following COPCs have HQs that exceeded 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals

Lead (3) Manganese (2)

PAHs
Total PAHs (10)

SVOCs
4-methylphenol (6)

VOCs
m&p-xylenes (6) o-xylenes (8)

The following COPCs could not be evaluated due to a lack of benthic invertebrate TRVs:

SVOCs
Acetophenone Carbazole

VOCs
Cyclohexane Isopropylbenzene Methylcyclohexane
Trichlorofluoromethane

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 2: Comparison of 95UCLM EPCs to Benthic Invertebrate TRVs

The second measurement endpoint evaluated was a comparison of 95UCLM EPCs in sediment to benthic invertebrate TRVs. 95UCLM EPCs are a more realistic indicator of risk because the 95UCLM case scenario reflects exposures across the Site, which are the focus of the SLERA.

When 95UCLM EPCs of COPCs were compared to TRVs, the following COPCs had HQs that exceed 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

PAHs
Total PAHs (4)

SVOCs
4-methylphenol (6)

VOCs
m&p-xylenes (6) o-xylenes (8)

The following COPCs could not be evaluated due to a lack of benthic invertebrate TRVs:

SVOCs
Acetophenone Carbazole

VOCs
Cyclohexane Isopropylbenzene Methylcyclohexane
Trichlorofluoromethane

The uncertainty associated with the lack of TRVs is discussed in Section 8.

Measurement Endpoint 3: Simultaneously Extracted Metals/Acid Volatile Sulfide (SEM/AVS)

The third measurement endpoint evaluated the SEM, AVS, and TOC data in sediment. The differences are summarized in Table 6-10.

The sum of SEM – AVS difference is divided by fraction of organic carbon in sediment ($[\sum$ SEM - AVS$]/f_{oc}$). Per EPA guidance (2005i), if the result is <130 μmol/g_{oc}, then toxicity to benthic invertebrates is not anticipated. If the result is >3,000 μmol/g_{oc}, then toxicity is likely. If the result is between 130 and 3,000 μmol/g_{oc}, then toxicity is uncertain (ITRC 2011). Selected sediment samples were analyzed for TOC. Calculations are summarized in Table 6-10.

The ∑SEM-AVS differences are less than or equal to 0 for the onsite streams and tributaries, except for two locations in the west tributary. This indicates that metals in the west tributary may be bioavailable. Sediment samples were also analyzed for TOC. When the TOC results are taken into account, the ($[\sum$SEM-AVS$]/f_{OC}$) values were <130 μmol/g_{oc} for all sediment samples, indicating toxicity to benthic invertebrates is not anticipated.

Risk Characterization for Benthic Invertebrates

When maximum concentrations in sediment are compared to TRVs protective of benthic invertebrates, lead, manganese, m&p-xylenes, o-xylenes, and total PAHs have HQs greater than 1.0. When 95UCLM sediment concentrations are compared to benthic invertebrate TRVs, total PAHs, 4-methylphenol, and xylenes have HQs greater than 1.0. The maximum concentration of each of the COPCs exceeds background. Further evaluation of each of the COPCs is provided in the following subsections.

Lead

Lead was detected in 18 sediment samples. The HQ for the maximum concentration is equal to 3, and the 95UCLM HQ is 1. The SEM/AVS results indicate that lead is not bioavailable to ecological receptors in the streams and tributaries. Given the low magnitude of the exceedance and the SEM/AVS results, lead is not expected to pose risk to benthic invertebrates.

Manganese

Manganese was detected in 18 sediment samples. The HQ for the maximum concentration is 2, and the 95UCLM HQ is less than 1. Due to the low magnitude of exceedance, manganese is not expected to pose risk to benthic invertebrates.

m & p-Xylenes

m & p-Xylenes were detected in 1 of 18 sediment locations (SC-SD-22). The sediment concentration of 0.77 mg/kg is approximately 6 times the TRV of 0.13 mg/kg. Given the low frequency of detection, m&p-xylenes are not expected to pose risk to benthic invertebrates.

o-Xylenes

o-Xylenes were detected in 1 of 18 sediment locations (SC-SD-22). The sediment concentration of 0.70 mg/kg is approximately 8 times the TRV of 0.089 mg/kg. Given the low frequency of detection, o-xylenes are not expected to pose risk to benthic invertebrates.

Total PAHs

PAHs were detected in 18 sediment samples. The HQ for the maximum concentration is 10, and the 95UCLM HQ is 4. This result is consistent with individual PAH concentrations. PAHs in the sediment could pose risks to benthic invertebrates in the streams and tributaries.

4-methylphenol

4-Methylphenol was detected in 1 of 18 sediment locations (ET-SD-02). The sediment concentration of 0.28 mg/kg is approximately 6 times the TRV of 0.05 mg/kg. Given the low frequency of detection, 4-methylphenol is not expected to pose risk to benthic invertebrates.

6.2.2 Aquatic Organisms

The CSM identifies protection of aquatic organism survival, growth, and reproduction from impacts of COPCs in surface water as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to aquatic organisms (Table 6-11):

- Comparison of the chemical concentrations in surface water to benchmarks protective of aquatic organisms including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

- Comparison of the chemical concentrations in surface water to background values including:

  — Comparison using maximum EPCs
  — Comparison using 95UCLM EPCs.

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific

locations (i.e., hotspots). Dissolved metal concentrations are used to calculate HQs for aquatic organisms in the water column; the HQs for total metal concentrations are presented for informational purposes. The 95UCLM concentrations will be used to provide an indicator of population-wide risks in this refinement of the SLERA.

Measurement Endpoint 1: Comparison of Maximum Surface Water Concentrations to TRVs Protective of Aquatic Organisms

The first measurement endpoint included a comparison of maximum COPC concentrations in surface water to literature-based TRVs protective of aquatic organisms. When maximum EPCs were compared to TRVs, the following COPCs have HQs that exceed 1.0; the HQ is included in parentheses next to each chemical:

Maximum EPC

Metals
Lead, dissolved (2) Manganese, dissolved (11)

PAHs
Benzo(a)anthracene (4)

Measurement Endpoint 2: Comparison of 95UCLM Surface Water Concentrations to TRVs Protective of Aquatic Organisms

When 95UCLM EPCs in surface water were compared to TRVs, the following COPCs had HQs that exceeded 1.0; the HQ is included in parentheses next to each chemical:

95UCLM EPC

Metals
Manganese, dissolved (4)

PAHs
Benzo(a)anthracene (4)

Risk Characterization for Aquatic Organisms

When maximum dissolved surface water concentrations are compared to TRVs protective of aquatic organisms, lead, manganese, and benzo(a)anthracene are in exceedance. Using 95UCLMs, only dissolved manganese and benzo(a)anthracene have HQs that exceed 1.0. The COPCs are discussed in the following subsections.

Lead

Lead was detected in 5 of 31 filtered water samples. The maximum EPC HQ is 2, and the 95UCLM HQ is less than 1. Given the low magnitude of the exceedance, lead is not expected to pose a risk to aquatic organisms.

Manganese

Manganese was detected in 31 of 31 filtered surface water samples. The maximum EPC HQ is 11, and the 95UCLM EPC HQ is 4. The upstream concentration of manganese in the east tributary (691 µg/L) is greater than the TRV of 100 µg/L, indicating that manganese in the east tributary likely originated from an upstream source. Dissolved manganese concentrations in the remaining east tributary locations range from 111 to 362 µg/L, which is less than the upstream concentration. Manganese in surface water could pose risk to aquatic organisms in Sand Creek and West Tributary.

Benzo(a)anthracene

Benzo(a)anthracene was detected in 1 of 28 surface water samples. The detected result is approximately 4 times the TRV of 0.027 µg/L. Given the low frequency of detection, benzo(a)anthracene is not expected to pose a risk to aquatic organisms.

6.2.3 Aquatic Mammalian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of mammals from impacts of COPCs in sediment and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to mammals:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of mammals.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Mammals

The HQ for each COPC is calculated based on the comparison of the dose from the food web model using the maximum sediment concentrations to the NOAEL and LOAEL-based TRVs.

Doses from the food web models based on maximum sediment EPCs compared to the TRVs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 6-12:**

Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
NOAEL-based HQs Aluminum (13) LOAEL-based HQs None	NOAEL-based HQs Aluminum (384) LOAEL-based HQs Aluminum (38)	NOAEL-based HQs Manganese (2) HMW PAHs (2) LOAEL-based HQs None

The following COPCs could not be evaluated due to a lack of TRVs:

SVOCs
4-methylphenol Acetophenone Carbazole

VOCs
Cyclohexane Isopropylbenzene Methylcyclohexane
Trichlorofluoromethane

Measurement Endpoint 2: Comparison of 95UCLM Doses to NOAEL and LOAEL-based TRVs for Mammals

The second measurement endpoint evaluated the comparison of modeled ingested doses for mammals based on 95UCLM EPCs to NOAEL and LOAEL-based TRVs. The HQ for each chemical is calculated based on the comparison of the modeled dose from 95UCLM concentrations in sediment to the TRVs.

Doses from the food web models based on 95UCLM sediment EPCs compared to the TRVs identified the following COPCs with HQs greater than 1.0 for each feeding guild; the HQ is included in parentheses next to each chemical:

COPCs for Mammalian Wildlife, see **Table 6-13:**

Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
NOAEL-based HQs Aluminum (6) LOAEL-based HQs None	NOAEL-based HQs Aluminum (174) LOAEL-based HQs Aluminum (17)	NOAEL-based HQs None LOAEL-based HQs None

Risk Characterization for Aquatic Mammalian Wildlife

When food web modeled doses using maximum sediment concentrations are compared to NOAEL based TRVs protective of mammals, aluminum was in exceedance for aquatic insectivorous mammals and aquatic herbivorous mammals. Manganese was in exceedance for piscivorous mammals. HMW PAHs were in exceedance for piscivorous mammals. When food web modeled doses using 95UCLM sediment concentrations are compared to NOAEL based TRVs, aluminum was in exceedance for aquatic insectivorous mammals and aquatic herbivorous mammals. The results for these COPCs are discussed further below.

Aluminum

Aluminum was detected in 18 sediment samples and 9 of 31 filtered surface water samples. The maximum and 95UCLM doses exceed NOAEL based TRVs for aquatic herbivorous mammals and aquatic insectivorous mammals. As noted in Section 3.3, aluminum is not considered a COPC in sediment. Additionally, the dissolved aluminum surface water concentrations are below the screening criteria of 680 µg/L. Therefore, aluminum is not considered a risk to aquatic mammals.

Manganese

Manganese was detected in 18 sediment samples and 31 filtered surface water samples. The maximum dose is between 1 and 2 times the NOAEL based TRV for piscivorous mammals but falls below the LOAEL based TRV. Due to the lack of exceedance of the LOAEL based TRV, manganese is not expected to pose risks to aquatic mammals.

HMW PAHs

HMW PAHs were detected in all 18 sediment samples. The maximum dose is 2 times the NOAEL based TRV for piscivorous mammals but falls below the LOAEL based TRV. Due to the lack of exceedance of the LOAEL based TRV, HMW PAHs are not expected to pose risks to aquatic mammals.

6.2.4 Aquatic Avian Wildlife

The CSM identifies protection of the survival, growth, and reproduction of birds from impacts of COPCs in sediment and food as an assessment endpoint. The following measurement endpoints were evaluated as indicators of risk to birds:

- Screening level comparison of maximum case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL and LOAEL based benchmarks protective of birds.

Measurement Endpoint 1: Comparison of Maximum Doses to NOAEL and LOAEL-based TRVs for Birds

The HQ for each COPC is calculated based on the comparison of the dose from the food web model using the maximum sediment concentrations to the NOAEL and LOAEL-based TRVs.

Dose modeling from food webs based on maximum EPCs compared to the TRVs identified no COPCs exceeding avian TRVs for each feeding guild; all HQs are below 1. The HQs are presented in Table 6-14.

The following COPCs could not be evaluated due to lack of TRVs:

Metals
Beryllium

PAHs
Total PAHs

SVOCs

4-methylphenol	Acetophenone	Carbazole

VOCs

Cyclohexane	Isopropylbenzene	Methylcyclohexane
Trichlorofluoromethane	Xylenes (m&p)	Xylenes (o)

Risk Characterization for Aquatic Avian Wildlife

No chemicals were found to be in exceedance for aquatic herbivorous birds or piscivorous birds.

6.3 SUMMARY OF AQUATIC RISKS

COPCs have been identified in sediment and surface water that may pose risk to aquatic receptors. Some of the detected COPCs are lacking a TRV and thus cannot be evaluated. The uncertainty associated with a lack of TRV is discussed in Section 8. The risk characterization results for each receptor are summarized below.

6.3.1 Risk Summary for Ponds

Benthic Invertebrate Summary

No COPCs were found that pose potential risks to benthic invertebrates in ponds. When maximum concentrations are compared to TRVs protective of benthic invertebrates, lead, 4-methylphenol, and total PAHs are in exceedance. When 95 UCLM concentrations are compared to TRVs, lead and 4-methylphenol are in exceedance. Based on the SEM/AVS results, lead is not bioavailable to ecological receptors. 4-Methylphenol and total PAHs were not

considered potential risks to benthic invertebrates due to the low frequency of detection and/or low magnitude of exceedance.

Aquatic Organism Summary

When maximum COPC concentrations are compared to TRVs protective of aquatic organisms, cadmium, lead, manganese, and benzo(a)pyrene are in exceedance. When 95UCLM concentrations are compared to aquatic organism TRVs, cadmium and benzo(a)pyrene are in exceedance. Cadmium could pose a potential risk to aquatic organisms in Ponds 1, 2, and 3. Lead could pose a potential risk to aquatic organisms in Pond 1. Benzo(a)pyrene could pose potential risk to aquatic organisms in Ponds 3, 5, and 7. Manganese was not considered a potential risk to aquatic organisms due to the low magnitude of exceedance.

Aquatic Mammals Summary

No COPCs were found to pose potential risks to aquatic mammalian receptors in ponds. When maximum doses are compared to NOAEL based TRVs protective of mammals, aluminum was in exceedance for aquatic insectivorous mammals, aquatic herbivorous mammals, and piscivorous mammals. 95UCLM HQs for LOAEL based TRVs are greater than 1 for aquatic insectivorous mammals and less than 1 for aquatic herbivorous mammals and piscivorous mammals. However, aluminum was not considered a potential risk due to the pH of sediment and the dissolved surface water concentrations being below the screening criteria.

Aquatic Birds Summary

No COPCs were found to pose potential risks to aquatic avian receptors in ponds. When maximum doses are compared to NOAEL based TRVs protective of birds, no COPCs have HQs that exceed 1.0.

6.3.2 Risk Summary for Streams and Tributaries

Benthic Invertebrate Summary

When maximum COPC concentrations are compared to TRVs protective of benthic invertebrates, lead, manganese, m&p-xylenes, o-xylenes, 4-methylphenol, and total PAHs are in exceedance. PAHs were found to pose potential risks to benthic invertebrates. When 95UCLM concentrations are compared to benthic invertebrate TRVs, total PAHs, 4-methylphenol, and xylenes have HQs greater than 1.0. Based on the SEM/AVS results, lead is not bioavailable to ecological receptors. Lead, manganese, m&p-xylenes, o-xylenes, and 4-methylphenol were not considered potential risks to benthic invertebrates due to low detection frequency and/or low magnitude of exceedance.

Aquatic Organism Summary

When maximum dissolved surface water COPC concentrations are compared to TRVs protective of aquatic organisms, lead, manganese, and benzo(a)anthracene are in exceedance. Using 95UCLMs, only dissolved manganese and benzo(a)anthracene have HQs that exceed 1.0. Manganese was found to pose potential risks to aquatic organisms. Lead and benzo(a)anthracene were not considered potential risks to aquatic organisms due to low detection frequency and/or low magnitude of exceedance.

Aquatic Mammals Summary

No COPCs were found to pose potential risks to aquatic mammalian receptors. When maximum doses are compared to NOAEL based TRVs protective of mammals, aluminum, HMW PAHs, and manganese were in exceedance for one or more receptors. When 95UCLM doses are compared to NOAEL based TRVs, aluminum was in exceedance for aquatic insectivorous mammals and aquatic herbivorous mammals. Aluminum was not considered a potential risk due to the pH of sediment and the dissolved surface water concentrations being below the screening criteria. HMW PAHs and manganese were not considered potential risks due to the low magnitude of the exceedance.

Aquatic Birds Summary

No COPCs were found to have HQs greater than 1.0 for aquatic herbivorous birds or piscivorous birds. When maximum doses are compared to NOAEL based TRVs protective of birds, HQs were below 1 for all COPCs.

7. UNCERTAINTY EVALUATION

This SLERA incorporates a number of uncertainties associated with the estimates of ecological risk. As directed in the ERA guidance (EPA 1997), a conservative approach was utilized in the SLERA to ensure that chemicals eliminated from consideration do not pose risks to ecological receptors. Accordingly, the risks are likely to be overestimated. The main areas of uncertainty associated with the SLERA are grouped under the following categories, each of which is discussed in the following subsections:

- Environmental Sampling and Analysis
- Analysis of Chemical Data
- Analysis of Estimated Exposure and Toxicity Data
- Assessment of Risks
- Presence of Threatened and Endangered Species
- Aluminum uncertainty.

Environmental Sampling and Analysis

Of the potential uncertainties associated with environmental sampling, the sample design is likely to have the greatest impact on the evaluation of risks to ecological resources. The sample design was developed based on the available historical information regarding the activities that took place at the site. Focusing the study design to provide analyses for certain chemicals to specific suspected source areas is a valid and accepted means of maintaining a practical and efficient limit on the field effort. However, there is always a possibility that the study design could miss samples where these chemicals are present or miss other types of chemicals in a specific sample.

In an effort to address the uncertainties just discussed, and in accordance with the conservative nature of SLERAs, samples were biased to areas of likely contamination in an effort to characterize the areas that were most impacted from historic activities. For example, the food webs assume that mammals and birds obtain all their food from within one exposure area, clearly a highly conservative assumption. With the exception of fixed or limited mobility receptors (e.g., benthic organisms), ecological receptors are unlikely to utilize only those areas of highest contamination and are more likely to forage over a larger area that includes areas of contamination as well as less contaminated outlying areas.

Analysis of Chemical Data

The maximum concentration of a pair of duplicate or split samples (collected from the same location on the same date) was used to represent the concentration for that location. Selecting the maximum concentration of a chemical detected in duplicate samples for use in the ERAs is a conservative measure and may overestimate risks. The 95UCLM was used as an upper estimate of mean exposures. This exposure scenario is also conservative and may also overestimate risks presented in this report.

Chemicals that are not detected in any onsite samples are considered not to be present at the site because, based on the analytical tools and capabilities at the time of investigation, there is no evidence indicating that these chemicals are present. Risks from these ND chemicals cannot be determined; therefore, the assessment of risk from these ND chemicals remains an uncertainty in this SLERA.

Analysis of Estimated Exposure and Toxicity Data

A major source of uncertainty in the SLERA is associated with the estimation of each receptor's exposure to COPCs. Generally, the models used to estimate exposures from soil and prey were created to represent a worst-case scenario of possible risks to the receptor groups, and thus, many conservative assumptions were incorporated into the models. For example, bioaccumulation of a chemical in a prey organism was estimated from the maximum detected concentration in soil. Also, a BAF of 1.0 was used to estimate chemical concentrations in prey (soil invertebrates) for which literature-based BAFs were not available. This accumulation factor is expected to provide a conservative estimate of accumulation for all chemicals that are not bioaccumulative.

Additionally, for the SLERA, the models assume that receptors are exposed to the maximum detected and 95UCLM concentrations of chemicals over their entire foraging range. This approach is consistent with the objectives of the screening-level assessment, which is to estimate a worst-case scenario under which risks would not be underestimated. It is expected, however, that such a conservative scenario would overestimate risk.

There is uncertainty associated with the lack of formal literature-based TRVs for certain chemicals. There were a number of SVOCs and VOCs detected for which TRVs could not be established or derived for some chemicals because adequate toxicity information could not be found in the scientific literature. Given the absence of methods for estimating risks from exposure to chemicals with no appropriate TRVs, it is not possible to estimate the uncertainty associated with the limitation. It is not possible to indicate if the impacts result in an underestimate or overestimate of potential ecological risks. Presumably, either scenario is possible. Consequently, risks to ecological receptors resulting from exposure to these chemicals without TRVs cannot be quantitatively assessed.

There is also uncertainty associated with toxicological evaluation of essential nutrients including calcium, iron, magnesium, potassium, and sodium. These chemicals are necessary for metabolic processes in organisms and, thus, are considered essential nutrients for wildlife. At naturally occurring concentrations, receptors are able to regulate uptake and metabolism of these elements. However, as with all chemicals, it is possible that nutrients may produce toxic effects at very highly elevated concentrations. These five chemicals do not have screening level concentrations or TRVs, except iron which has screening level concentrations for surface soil. As these metals are essential nutrients, adverse effects on organisms can occur if concentrations are either too low (causing deficiency symptoms) or too high (causing toxic symptoms). However, organisms can adapt to different levels of these metals, although there is little information available regarding concentrations at which adverse effects of either type may be observed. Because screening-level concentrations and TRVs are not available for the essential nutrients, it is not

possible to quantitatively assess the potential for risks to ecological receptors from them. However, because these nutrients are essential to flora and fauna, these essential nutrients are not maintained as COPCs.

Assessment of Risks

There are uncertainties associated with the assessment of risks in the SLERA for the site. One apparent uncertainty results from the extrapolation of assumptions about the potential for adverse effects from individual organisms to populations. The intent of this SLERA, as set forth in the assessment endpoints, is to ultimately evaluate risks to populations. Few methods are available to extrapolate the potential for adverse effects from the individual level to the population level. It is generally assumed that if there is no potential for direct adverse effects to individual organisms then it is also unlikely for there to be the potential for direct adverse effects to populations. Similarly, it is assumed that if there is the potential for adverse effects to individual organisms there is also the potential for adverse effects to populations. However, it is conservative to assume that potential damage at the individual level will impact the populations in the surrounding ecosystem.

This uncertainty is one of several limitations associated with the use of HQs to determine the potential for risk to ecological receptors. While the HQ is a standard tool in ERAs set forth in EPA guidance (EPA 1997), an article in the scientific literature points out a number of limitations to the use of this method (Tannenbaum et al. 2003). The use of the HQ identifies a potential for risk as opposed to an actual risk, because the HQ result is not a probability. Because the HQ identifies whether a dose or concentration exceeds a benchmark, it is not a linear or scalable metric. Also, the HQ cannot be used to quantitatively extrapolate between individual and population level effects. Because HQs are based on NOAELs and on the most sensitive species in a medium, HQs are often exceeded by concentrations normally found in the environment. These limitations should be considered before using HQ-based estimates of the potential for risk to draw conclusions or make decisions based on assessment results.

Another important uncertainty is the limited ability of risk assessment to assess combined and synergistic effects of chemicals. At the site, ecological receptors are exposed to a chemical mixture; however, comparison of individual chemicals to TRVs does not capture the potential for combined effects. Combined and synergistic effects are usually assessed by performing bioassays. As such, risk assessment conclusions have conservatively identified the potential for synergistic effects and recommended in certain cases the consideration in risk management of all detected chemicals.

In addition, the assessment of risks was primarily based on the comparison of estimated doses to toxicity values from the literature. There are many uncertainties associated with these evaluation tools and thus with the assessment of risks based upon them.

Presence of Threatened and Endangered Species

A major uncertainty in the SLERA is the presence/absence of threatened and endangered species at the site. Potential species of concern are described in Section 2.8. The threatened and endangered list was determined from a list of potentially present threatened and endangered species within or adjacent to the site compiled from the ODWC, USFWS, and ONHI listings for Creek County, although no survey has been performed at the site. Therefore, it is not known whether the protected species actually utilize the site.

Aluminum Uncertainty

Aluminum has been identified as a COPC in some or all media (soil, sediment, and surface water) at the site. Additionally, based on the SLERA and BRAPF, aluminum continued to represent potential risk based on conservative exposure and toxicological assumptions. As noted in the aluminum EcoSSL (EPA 2003b), aluminum is the most abundant element in the earth's crust that constitutes from 1 to 30 percent (10,000 to 300,000 mg/kg) of native United States soils. The average aluminum concentration in the western United States is reported to be 58,000 mg/kg (Shacklette and Boerngan 1984). The maximum surface soil aluminum concentration was found in the East Tank Farm (21,500 mg/kg), and the maximum sediment aluminum concentration was in Pond 6 (16,900 mg/kg). As can be seen, aluminum concentrations at the site are within or below typical naturally occurring concentrations.

Further, it is important to note that measurements of total aluminum (fraction reported by laboratories) are not toxicologically appropriate. According to EcoSSL (EPA 2003b) the following issues complicate toxic considerations of the element:

- Total aluminum measurements do not correlate with toxicity to plants and soil invertebrates
- Aluminum toxicity is related to soluble form of the element, which does not occur until the pH of the medium is less than 5.0
- Plant uptake of aluminum is associated with soluble aluminum
- Oral toxicity of aluminum is associated with soluble aluminum.

As a result of the complications associated with assessing potential risk from aluminum, EPA established a non-numeric standard of "pH < 5.5" for the designation of aluminum as a COPC in soil (EPA has added a 0.5 log unit for conservatism). In addition, the average soil pH at the site is 7.4 (Table 3-7), and the average sediment pH is 6.9 (Table 3-8). Consequently, it is unlikely that aluminum presents potential risk to any ecological receptors at the site.

Cyanide Uncertainty

Cyanide was identified as a potential COPC because it exceeded the ecological risk screening value. However, it has not been carried through the risk assessment because the site cyanide data were provided as total cyanide rather than free cyanide. Ecological risk screening values are based on free cyanide, which is the toxic form of cyanide.

There are many complex compounds involving cyanide, and it is important to understand the fate and effects of these various compounds in the environment. Cyanide is a triple bonded carbon-nitrogen molecule and it occurs both naturally and as a result of various industrial activities (although no sources associated with the site have been identified). Cyanide can exist as an anion carrying a negative charge. The many forms of cyanide depend upon the environmental medium, pH, temperature, and availability of other atoms or compounds (ligands) with which the cyanide ion can bond or complex. Sorption to soil is not an important process for cyanide. The important environmental forms of cyanide include:

- Free cyanide (CN^- and hydrogen cyanide [HCN])
- Metal cyanides (e.g. CuCN, $Zn(CN)_2$)
- Iron cyanide complexes including ferrocyanide ($Fe(II)(CN)_6^{3-}$)
- Cyanide nitriles; organic compounds bonded to cyanide such as acetonitrile.

In general, the toxicological effects of cyanide [from least to most toxic] are:

$$\text{Iron cyanide} << \text{metal cyanides and cyanide nitriles} << CN^- < HCN$$

Recognizing the substantial differences in the toxicity of the various forms of cyanide in the environment, risk screening values for the protection of ecological receptors are for “free” cyanide, not total cyanide measurements. The term “free” cyanide is also alternately called “available” or “amenable” cyanide.

The most common cyanide forms in the environment are the iron cyanides which are essentially not toxic, and even if released to the water column and HCN is formed, it will evaporate because it is highly volatile. Because no known operations at the site involved cyanide, and total cyanide measurements vastly overestimate cyanide risks because toxicity is due to free cyanide, this inorganic molecule has not been considered a risk at the site.

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8. CONCLUSIONS

The SLERA concludes that there are COPCs in surface soil, sediment, and surface water that required further evaluation in the BRAPF. The results of the SLERA represent maximum estimates of risk and are not necessarily representative of population-wide risks; therefore, the BRAPF includes a refinement of risk estimates using more site-specific assumptions and information. A refined assessment of risks was performed to provide a more site-specific and realistic risk characterization for the site.

Table 8-1 summarizes the results of the BRAPF. The refinement of risk estimates and weight of evidence evaluation presented in the BRAPF built upon the results of the SLERA to conclude the following:

- **Terrestrial Plants:** Based on the refined assessment as part of the BRAPF, the findings of the SLERA are that COPCs in surface soil may pose risk to terrestrial plants in the Wilcox Process Area and Lorraine Process Area (chromium, copper, lead, vanadium, and zinc) and in the North Tank Farm, Loading Dock Area, and East Tank Farm (chromium, manganese, and vanadium).

- **Soil Invertebrates:** Based on the refined assessment as part of the BRAPF, the findings of the SLERA are that COPCs in surface soil may pose risk to soil invertebrates in the Wilcox Process Area and Lorraine Process Area (chromium, hexavalent chromium, copper, mercury, isopropylbenzene, xylenes (m&p), and zinc) and in the North Tank Farm, Loading Dock Area, and East Tank Farm (chromium and isopropylbenzene).

- **Terrestrial Mammals:** Based on the refined assessment performed as part of the BRAPF, the findings of the SLERA are that lead in surface soil may pose risk to terrestrial mammals in the Wilcox Process Area and Lorraine Process Area.

- **Terrestrial Birds:** Based on the refined assessment performed as part of the BRAPF, the findings of the SLERA are that COPCs in surface soil may pose risk to terrestrial birds in the Wilcox Process Area and Lorraine Process Area (copper, lead, and vanadium) and in the North Tank Farm, Loading Dock Area, and East Tank Farm (lead and vanadium).

- **Aquatic and Benthic Communities:** Based on the refined assessment performed as part of the BRAPF, the findings of the SLERA are that chemicals in surface water may pose risk to aquatic organisms in ponds (cadmium, lead, and benzo(a)pyrene). Chemicals in sediment and surface water may pose risk to aquatic and benthic organisms in streams and tributaries (total PAHs and manganese).

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9. REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. *Toxicological profile for Cyanide.* Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Agriculture and Agri-Food Canada. 2001. *Water Requirements for Pastured Livestock.* Online: http://www.agr.gc.ca/pfra/pub/facts/watereq.pdf.

American Petroleum Institute. *Risk -Based Screening Levels for the Protection of Livestock Exposed to Petroleum Hydrocarbons*, Publication Number 4733, July.

Australian and New Zealand Environment and Conservation Council (ANZECC). 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Volume 1. October.

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. ORNL-5786. Health and Safety Research Division, Oak Ridge National Laboratory.

Bechtel Jacobs Company LLC. 1998a. *Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants*. Bechtel Jacobs Company LLC, Oak Ridge, Tennessee.

Bechtel Jacobs Company LLC. 1998b. *Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation.* Bechtel Jacobs Company LLC, Oak Ridge, Tennessee.

Beyer, W.N., and C. Stafford. 1993. Survey and evaluation of contaminants in earthworms and in soils derived from dredged material at confined disposal facilities in the Great Lakes region. *Environmental Monitoring and Assessment* 24(2):151-165.

Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. *J. Wildl. Manage.* 58:75–382.

Bodek, I., W.J. Lyman, W.F. Reehl, and D.H. Rosenblatt, eds. 1988. *Environmental Inorganic Chemistry: Properties, Processes, and Estimation Methods*. Pergamon, New York.

Buchman, M.F. 2008. *NOAA Screening Quick Reference Tables*. NOAA OR&R Report 08-1. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, Seattle, Washington. 34 pages.

Cornell Lab of Ornithology. 2019. *Green Heron.* https://www.allaboutbirds.org/guide/Green_Heron/overview.

Cottam, C. and Uhler, F.M. 1945. *Birds in Relation to Fishes*. Fish and Wildlife Service Leaflet 272.

Di Toro, D.M., J.A. McGrath, and D.J. Hansen. 2000. *Technical basis for narcotic chemicals and polycyclic aromatic hydrocarbon criteria. I. Water and tissue.* Environmental Toxicology and Chemistry vol. 19. pp. 1951-1970.

EA Engineering, Science, and Technology, Inc., PBC (EA). 2015. *Remedial Investigation/Feasibility Study Work Plan for Wilcox Oil Company Superfund Site, Bristow, Creek County, Oklahoma*. August.

———. 2016a. *Sampling and Analysis Plan for Remedial Investigation/Feasibility Study, Wilcox Oil Company Superfund Site, Bristow, Creek County, Oklahoma*. Revision 01. September.

———. 2016b. *Conceptual Site Model Technical Memorandum, Remedial Investigation/Feasibility Study, Wilcox Oil Company Superfund Site, Bristow, Creek County, Oklahoma. Revision 01*. September.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. 128 pp. ES/ER/TM-85/R3. November.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. 128 pp. ES/ER/TM-85/R3. November.

Field, L.J., D.D. MacDonald, and S.B. Norton. 2002. Predicting amphipod toxicity from sediment chemistry using logistic regression models. *Environmental Toxicology and Chemistry* 21:1993–2005.

Gensemer, R.W and R.C. Playle. 1999. The bioavailability and toxicity of aluminum in Aquatic Environments. *Critical Reviews in Environmental Science and Technology*. 29:315-450.

Government of British Columbia Ministry of Environment. 2015. *British Columbia Water Quality Guidelines*. http://www.env.gov.bc.ca/wat/wq/#reference. Accessed February 2015.

Green, D.A. and J.S. Millar. 1987. Changes in gut dimensions and capacity of *Peromyscus maniculatus* relative to diet quality and energy needs. *Can. J. Zool.* 65:2159–2162.

Jones, D. S., G. W. Suter II, and R. N. Hull. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-associated Biota*: 1997 Revision,ES/ER/TM-95/R3, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Hill, C.H. 1979. The effect of dietary protein levels on mineral toxicity in chicks. *Journal of Nutrition* 109(3):501–507.

Interstate Technology & Regulatory Council (ITRC). 2011. *Incorporating Bioavailability Considerations into the Evaluation of Contaminated Sediment Sites.* February. https://www.itrcweb.org/contseds-bioavailability/index.htm.

Leung, K.M.Y., A. Bjoresaeter, J.S. Gray, W.K. Li, G.C.S. Lui, Y. Wany, and P.K.S. Lam. 2005. Deriving sediment quality guidelines from field-based species sensitivity distributions. *Environmental Science and Technology* 39:5148–5156.

Lockheed Martin SERAS (LMS). 2016. *Trip Report: November 30 through December 16,2015, Wilcox Oil Company Superfund Site. Draft.* Work Assignment No. SERAS-277. Prepared for EPA Environmental Response Team. 15 April.

Long, E.R. and L.G. Morgan. 1990. *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program*. National Oceanic and Atmospheric Administration, National Ocean Service, Seattle, Washington.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management* 19(1):81–97.

Lyons, R.K., Machen, R. and Forbes, T.D.A. 1999. *Understanding forage intake in range animals*. Texas Agriculture Extension Service, Texas A&M University. Pub. L-5152.

MacDonald, D.D., R.S. Carr, F.D. Calder, E.R. Long, and C.G. Ingersoll. 1996. Development and evaluation of sediment quality guidelines for Florida coastal waters. *Ecotoxicology* 5:253–278.

Oklahoma Department of Wildlife Conservation (ODWC). 2016. *Oklahoma Species List: Federally-Listed, Proposed Candidate, and Species under Review.* Accessed on 22 March 2016. http://wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm.

Oklahoma Natural Heritage Inventory (ONHI). 2016a. *Central Biological Repository Information Home Page.* http://www.oknaturalheritage.ou.edu/. Accessed on 22 March 2016.

———. 2016b. *Rare and Vulnerable Plant Species of Oklahoma Home Page*. http://www.oknaturalheritage.ou.edu/carexfis.htm. Accessed on 22 March.

Oklahoma Water Resources Board (OWRB). 2017. *Oklahoma's Water Quality Standard, Title 785, Chapter 45*. September.

Nagy, K. A. 1987. *Field metabolic rate and food requirement scaling in mammals and birds.* Ecol. Monogr. 57: 111-128.

———. 2001. *Food Requirements of wild animals: predictive equations for free-living mammals, reptiles, and birds.* Nutrition Abstracts and Reviews. Series B 71, 21R-31R.

Oak Ridge National Laboratory (ORNL). 2009. Risk Assessment Information System (RAIS). http://rais.ornl.gov/#.

Oswald, C., P. Fonken, D. Atkinson, and M. Palladino. 1993. Lactational water balance and recycling in white-footed mice, red-backed voles, and gerbils. *J. Mammal.* 74:963–970.

Persaud, D., R. Jaagumagi, and A. Hayton. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. ISBN 0-7729-9248-7. Ontario Ministry of the Environment, Ottawa, Ontario. 23p.

Pitts, T.D. 1984. Description of American robin territories in northwest Tennessee. *Migrant* 55:1–6.

Sample, B.E. and G.W. Suter, II. 1994. *Estimating Exposure of Terrestrial Wildlife to Contaminants.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-125.

Sample, B.E., D.M. Opresko, and G.W. Suter. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision.* Risk Assessment Program, Health Sciences Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-86/R3.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998a. *Development and Validation of Bioaccumulation Models for Earthworms.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. 93 pp. ES/ER/TM-220.

———. 1998b. *Development and Validation of Bioaccumulation Models for Small Mammals.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-219.

Shacklette, H.T. and J.G. Boerngen. 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States.* USGS Professional Paper 1270.

Suter, G.W. II. 1993. *Ecological Risk Assessment.* Lewis Publishers, Chelsea, Michigan. 538 pp.

Suter II, G.W and C.L. Tsao. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision.* ES/ER/TM-96/R2. Risk Assessment Program, Health Sciences Research Division, Oak Ridge National Laboratory.

Tannenbaum, L.V., M.S. Johnson, and M. Bazar. 2003. Application of the hazard quotient method in remedial decisions: a comparison of human and ecological risk assessments. *Human and Ecological Risk Assessment* 9(1):387–401.

Travis, C.C. and A.D. Arms. 1988. Bioconcentration of organics in beef, milk, and vegetation. *Environmental Science and Technology* 22:271–274.

Trust, K. A., Fairbrother, A., and Hooper, M. J. 1994. effects of 7,12-dimethylbenz(a)anthracene on immune function and mixed-function oxygenase activity in the European starling. Environmental Toxicology and Chemistry. 13(5): 821.

U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM). 2004. *Development of Terrestrial Exposure and Bioaccumulation Information for the Army Risk Assessment Modeling System (ARAMS), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Contract Number DAAD050-00-P-8365, Aberdeen Proving Ground, Maryland.*

U.S. Department of Agriculture (USDA). 1959. *Soil Survey of Creek County, Oklahoma.* In cooperation with Oklahoma Agriculture Experiment Station, Bulletin 81. May.

———. 2019. Natural Resource Conservation Agency Web Soil Survey; located at http://websoilsurvey.nrcs.usda.gov/. Accessed 23 April 2019.

U.S. Environmental Protection Agency (EPA). 1980. *Ambient Aquatic Life Water Quality Criteria for Antimony*. EPA Office of Research and Development Environmental Research Laboratories. October.

———. 1985a. *Ambient Aquatic Life Water Quality Criteria for Arsenic*. EPA Office of Research and Development Environmental Research Laboratories. January.

———. 1985b. *Ambient Aquatic Life Water Quality Criteria for Lead – 1984*. EPA Office of Research and Development Environmental Research Laboratories. January.

———. 1985c. *Ambient Aquatic Life Water Quality Criteria for Mercury – 1984*. EPA Office of Research and Development Environmental Research Laboratories. January.

———. 1986. *Ambient Aquatic Life Water Quality Criteria for Nickel – 1986*. EPA Office of Research and Development Environmental Research Laboratories. September.

———. 1987a. *Ambient Aquatic Life Water Quality Criteria for Selenium – 1987*. EPA Office of Research and Development Environmental Research Laboratories. September .

———. 1987b. *Ambient Aquatic Life Water Quality Criteria for Zinc –1987*. EPA Office of Research and Development Environmental Research Laboratories. February.

———. 1989. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A). Interim Final.* EPA/540/1-89/002. EPA Office of Emergency and Remedial Response, Washington, D.C.

———. 1993. *Wildlife Exposure Factors Handbook.* 2 Vols. EPA/630/R-93/187a. EPA Office of Research and Development, Washington, D.C.

———. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final.* EPA 540-R-97-006. EPA Environmental Response Team, Edison, New Jersey. June.

———. 1998. *Guidelines for Ecological Risk Assessment.* EPA/630/R-95/002F. EPA Office of Research and Development, Washington, D.C. April.

———. 1999a. *National Recommended Water Quality Criteria – Correction.* EPA 822-Z-99-001. EPA Office of Water, Washington D.C.

———. 1999b. *Screening Level Ecological Risk Assessment Protocol, Toxicity Reference Values.* U.S. EPA Region 6. August.

———. 2000. *Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment.* EPA-823-R-00-001. February.

———. 2001. *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*. Originally published November 1995. Website version last updated 30 November. http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html.

———. 2002. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites.* EPA Office of Emergency and Remedial Response. OSWER 9285.6-10. December.

———. 2003a. *Guidance for Developing Ecological Soil Screening Levels.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-55.

———. 2003b. *Ecological Soil Screening Levels for Aluminum.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-60.

———. 2005a. *Ecological Soil Screening Levels for Antimony.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-61.

———. 2005b. *Ecological Soil Screening Levels for Arsenic.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-62.

———. 2005c. *Ecological Soil Screening Levels for Barium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7- 63.

———. 2005d. *Ecological Soil Screening Levels for Beryllium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7- 64.

———. 2005e. *Ecological Soil Screening Levels for Cadmium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-65.

———. 2005f. *Ecological Soil Screening Levels for Cobalt.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-67.

———. 2005g. *Ecological Soil Screening Levels for Lead.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-70.

———. 2005h. *Ecological Soil Screening Levels for Vanadium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-75.

———. 2005i. *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc).* Office of Research and Development. EPA 600-R-02-011. January 2005.

———. 2006. *Ecological Soil Screening Levels for Silver.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-77.

———. 2007a. *ProUCL, Version 5.1.* EPA/600/R07/038. April 2007.

———. 2007b. *Ecological Soil Screening Levels for Copper.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-68.

———. 2007c. *Ecological Soil Screening Levels for Manganese.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-71.

———. 2007d. *Ecological Soil Screening Levels for Nickel.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-76.

———. 2007e. *Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-78.

———. 2007f. *Ecological Soil Screening Levels for Selenium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-72.

———. 2007g. *Ecological Soil Screening Levels for Zinc.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-73.

———. 2008. *Ecological Soil Screening Levels for Chromium.* EPA Office of Solid Waste and Emergency Response. OSWER Directive 9285.7- 66.

———. 2009. Biota-Sediment Accumulation Factor (BSAF) data set assembled from Superfund site data. http://www.epa.gov/med/Prods_Pubs/bsaf.htm

———. 2013. *Hazard Ranking System Documentation Record*. Wilcox Oil Company, Bristow, Creek County, Oklahoma. May.

———. 2015. *RAC II Statement of Work for Remedial Investigation and Feasibility Study Phase 2, Wilcox Oil Company Superfund Site, Bristow, Creek County, Oklahoma.* July.

———. 2018a. *Source Control Record of Decision Summary, Wilcox Oil Company Superfund Site, Bristow, Creek County, Oklahoma.* September.

———. 2018b. *Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update*. Scientific Support Section, Superfund Division, EPA Region 4. March.

———. 2018c. *National Recommended Water Quality Criteria – Aquatic Life Criteria Table*. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table.

U.S. Fish and Wildlife Service (USFWS). 2016a. ECOS Environmental Conservation Online System http://ecos.fws.gov/tess_public/reports/species-by-current-rangecounty?fips=40037. Accessed 22 March 2016.

———. 2016b. National Wetlands Inventory Online Mapper. http://www.fws.gov/wetlands/Data/Mapper.html. Accessed 24 March.

University of Nebraska. 2013. *Determining How Much Forage a Beef Cow Consumes Each Day*. Institute of Agriculture and Natural Resources. https://beef.unl.edu/cattleproduction/forageconsumed-day

Verbruggen, E.M.J., R. Posthumus, and A.P. van Wezel. 2001. *Ecotoxicological Serious Risk Concentrations for Soil, Sediment, and Groundwater: Updated Proposal for First Series of Compounds*. National Institute of Public Health and the Environment.

Weston Solutions (formerly Roy F. Weston, Inc.) (Weston). 1997. *Expanded Site Inspection Report, Wilcox Oil Company, Bristow, Creek County, Oklahoma, EPA CERCLA ID NO OKD00101917*. Prepared for the U.S. Environmental Protection Agency. March.

Young, H. 1951. Territorial behavior in the eastern robin. *Proceedings of the Linnaean Society* 58–62:1–37.

FIGURES

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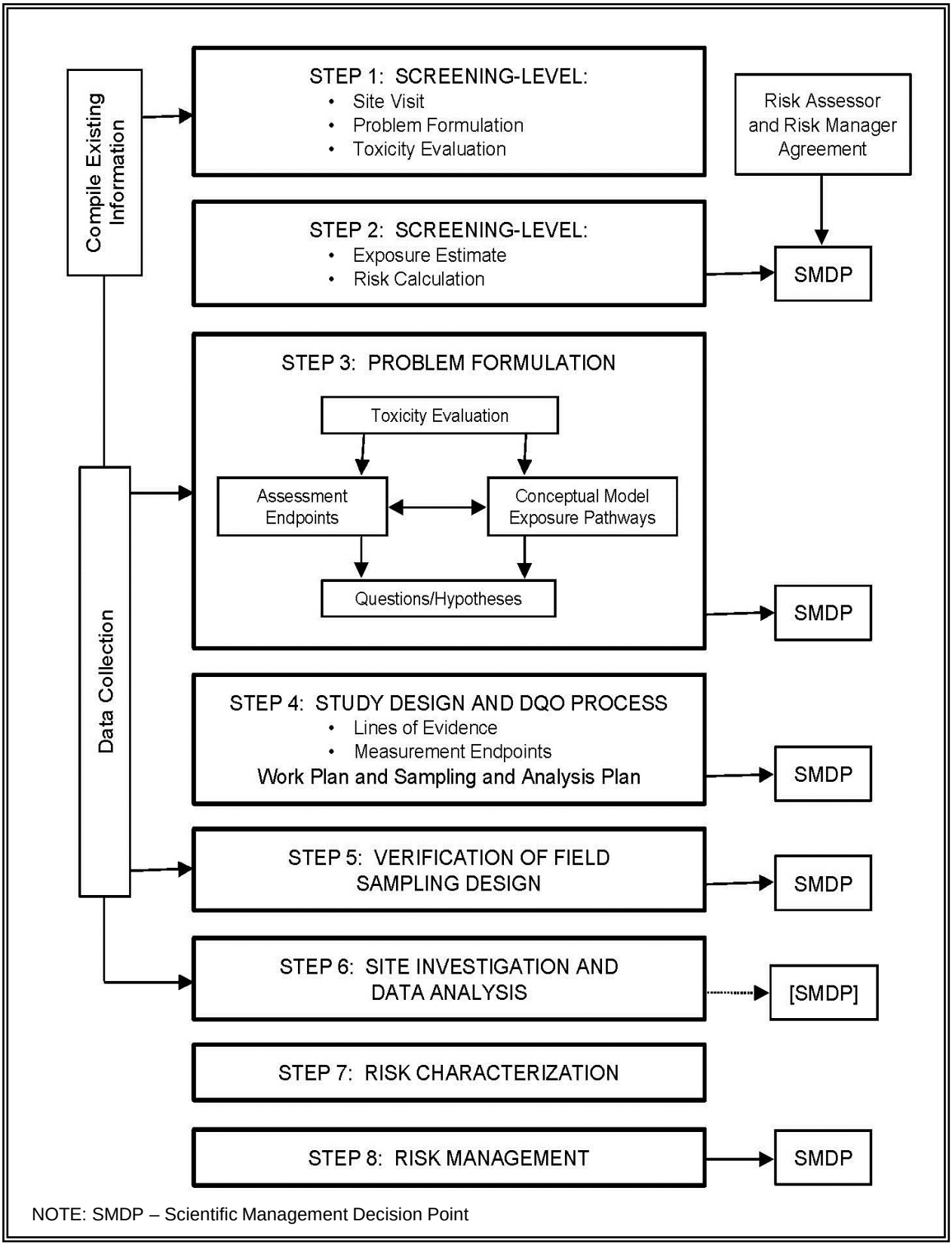

Figure 1-1. Eight-step Ecological Risk Assessment Process for Superfund (from EPA 1997).

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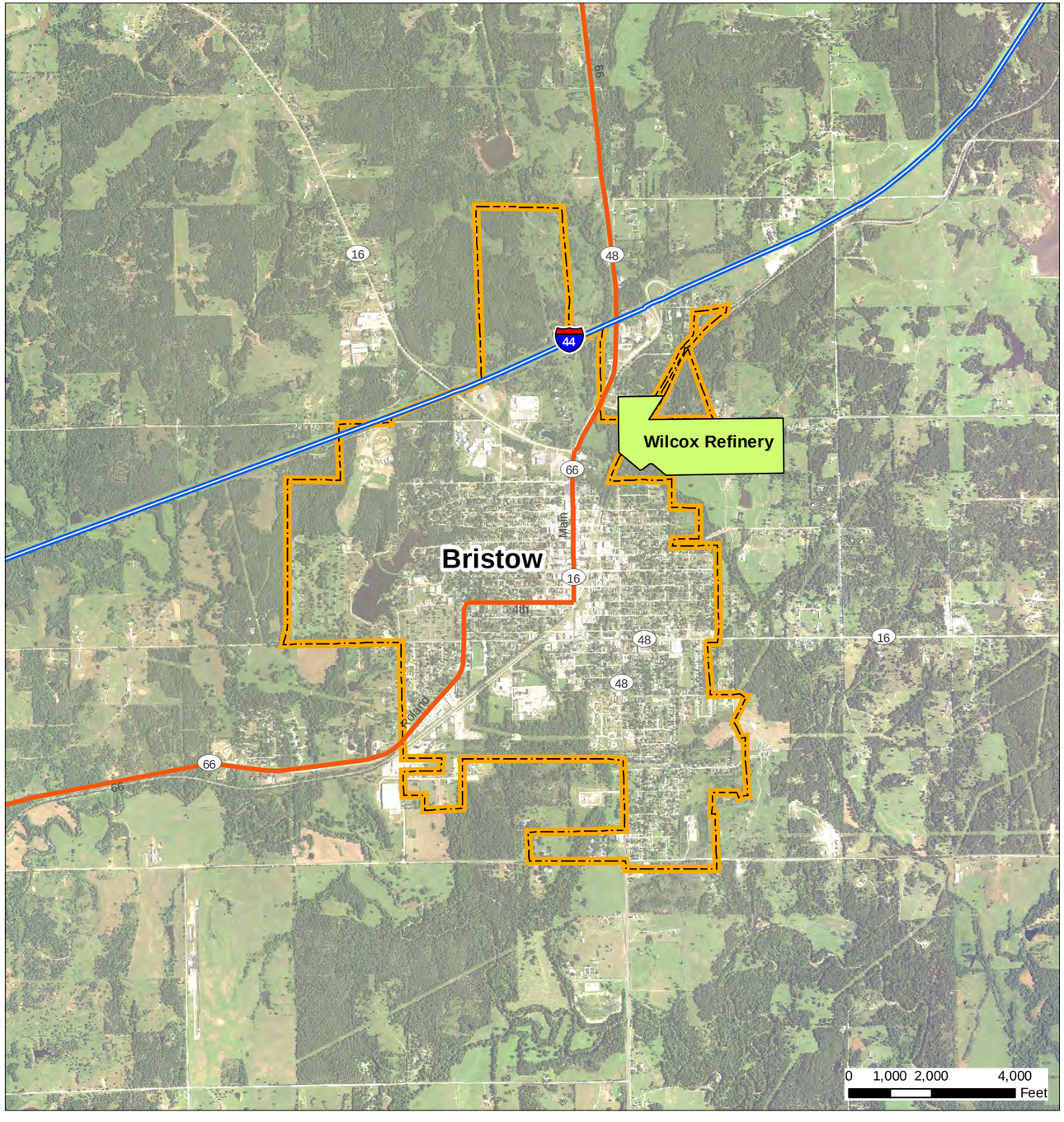
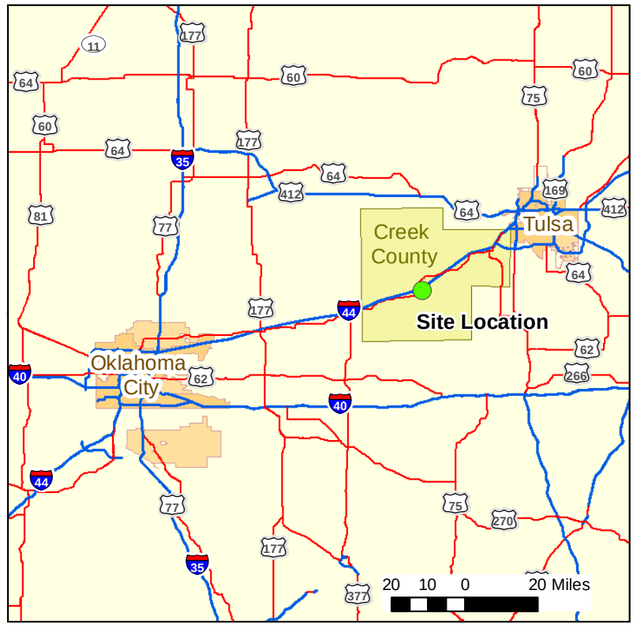


0 1,000 2,000 4,000 Feet



0 100 200 Miles

Legend

- Interstate
- Highway
- Bristow City Boundary

Remedial Investigation
Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

Image Source: National Agriculture Imagery Program 2015

FIGURE 1-2
SITE LOCATION

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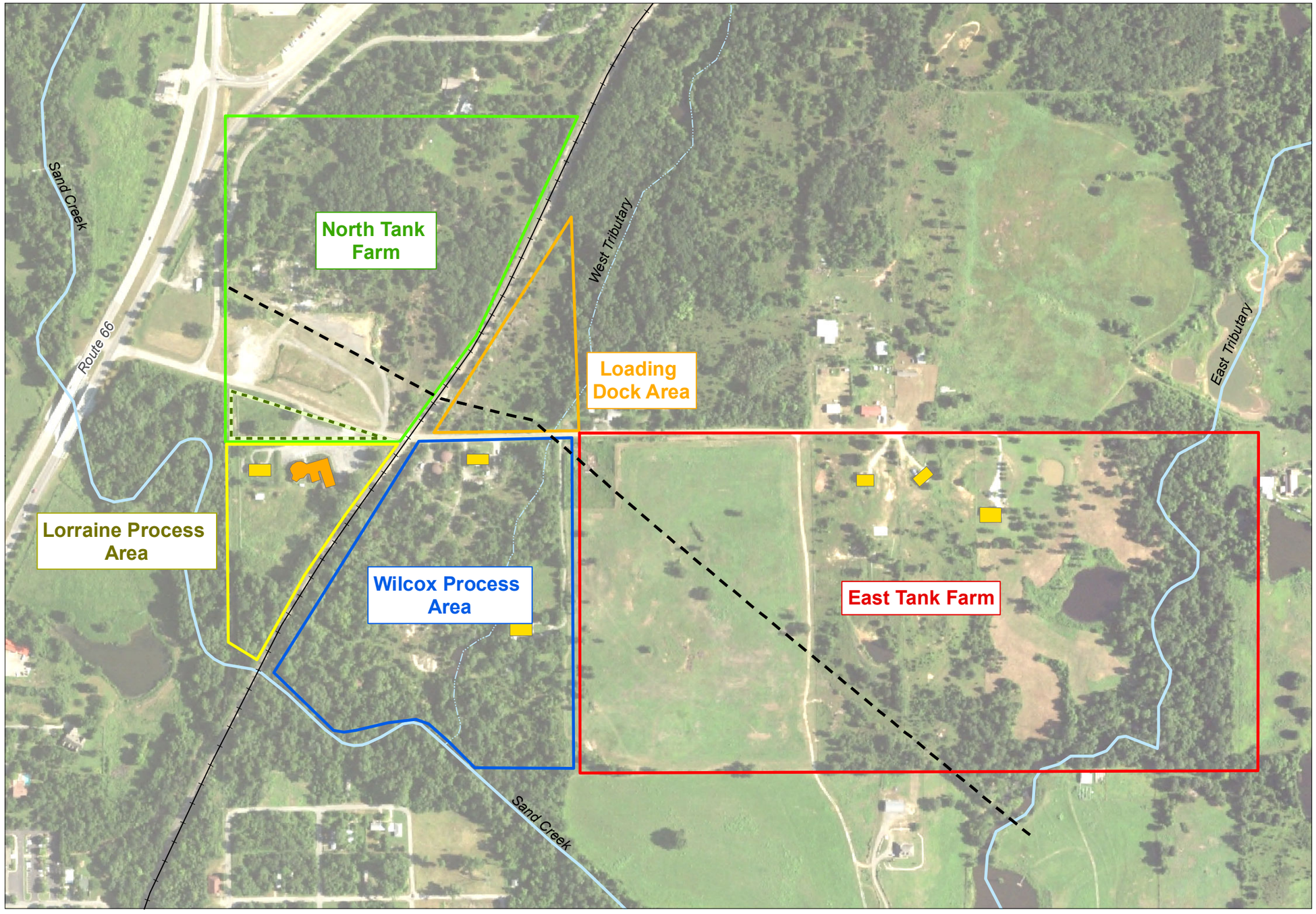


0 200 400 800 Feet

1 inch = 400 feet

Legend

- Stream, Intermittent
- Stream, Perennial
- Pipeline
- Railroad

On-Site Building

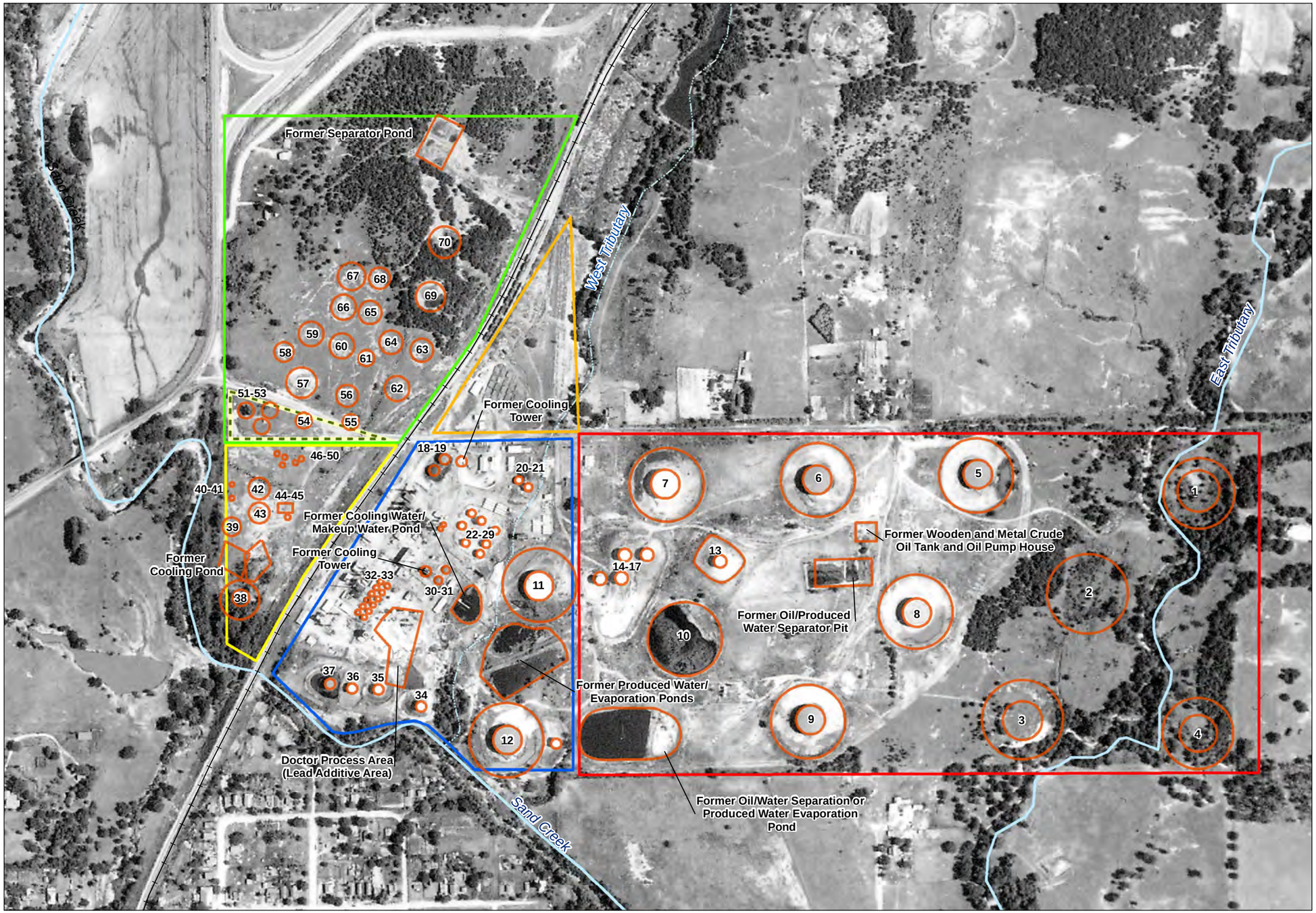
- Church
- Residence
- Area will be designated as part of Lorraine Process Area for this investigation.

Image Source: National Agriculture Imagery Program 2015.

Remedial Investigation
Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

FIGURE 1-3
SITE LAYOUT

P:\gis\Projects\Wilcox\MXDs\SAP\02 SAP revised 062016\3-Historical Site Features.mxd 6/17/2016 EA rmullen



0 200 400 800 Feet

1 inch = 400 feet

Legend

- Historical Feature
- Railroad
- Stream, Intermittent
- Stream, Perennial
- East Tank Farm
- Loading Dock Area
- Lorraine Process Area
- North Tank Farm
- Wilcox Process Area
- Area will be designated as part of Lorraine Process Area for this investigation.

Image Source: 1956 Aerial Photograph.

Remedial Investigation
Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

FIGURE 1-4
HISTORICAL SITE FEATURES

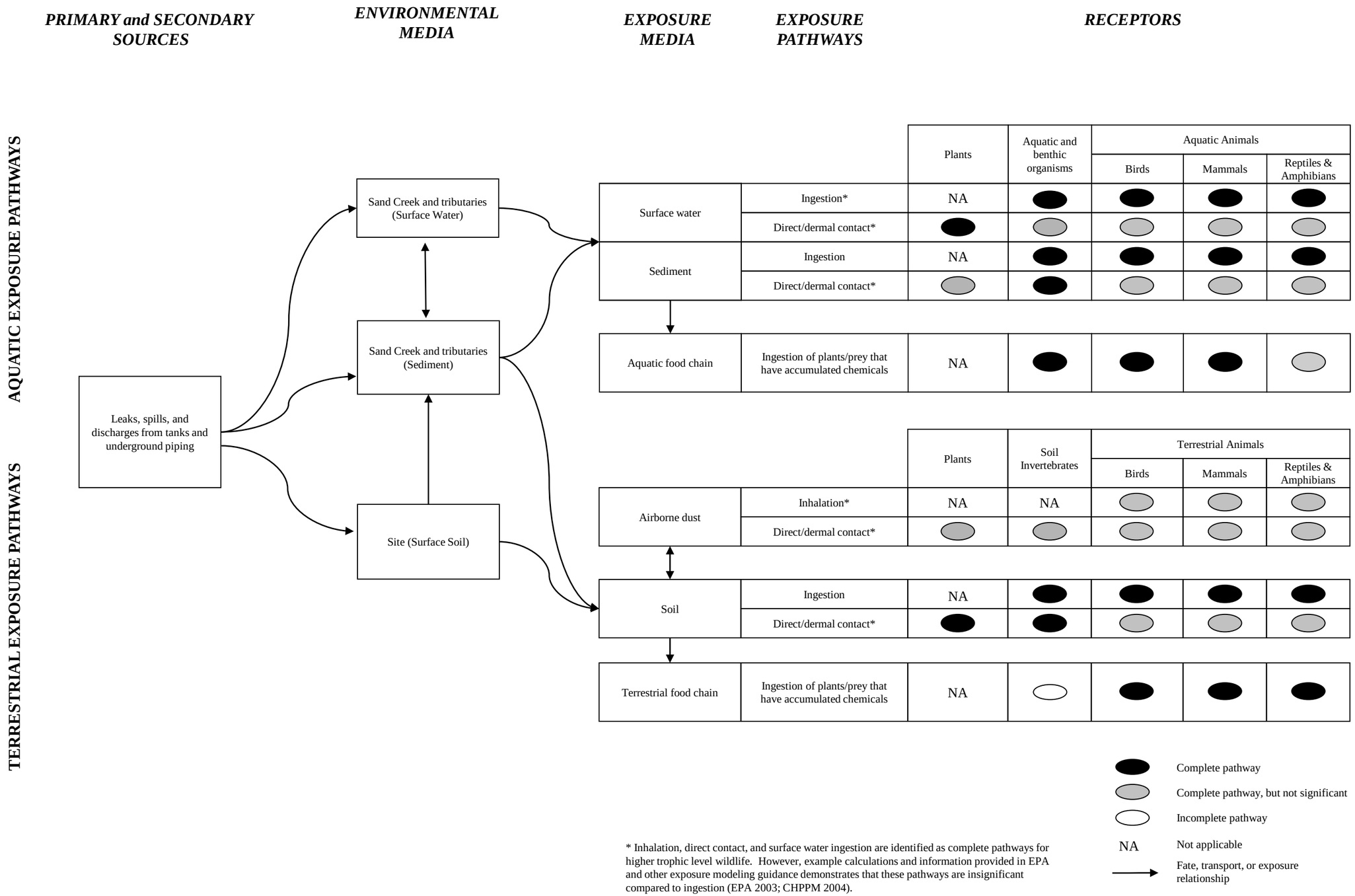
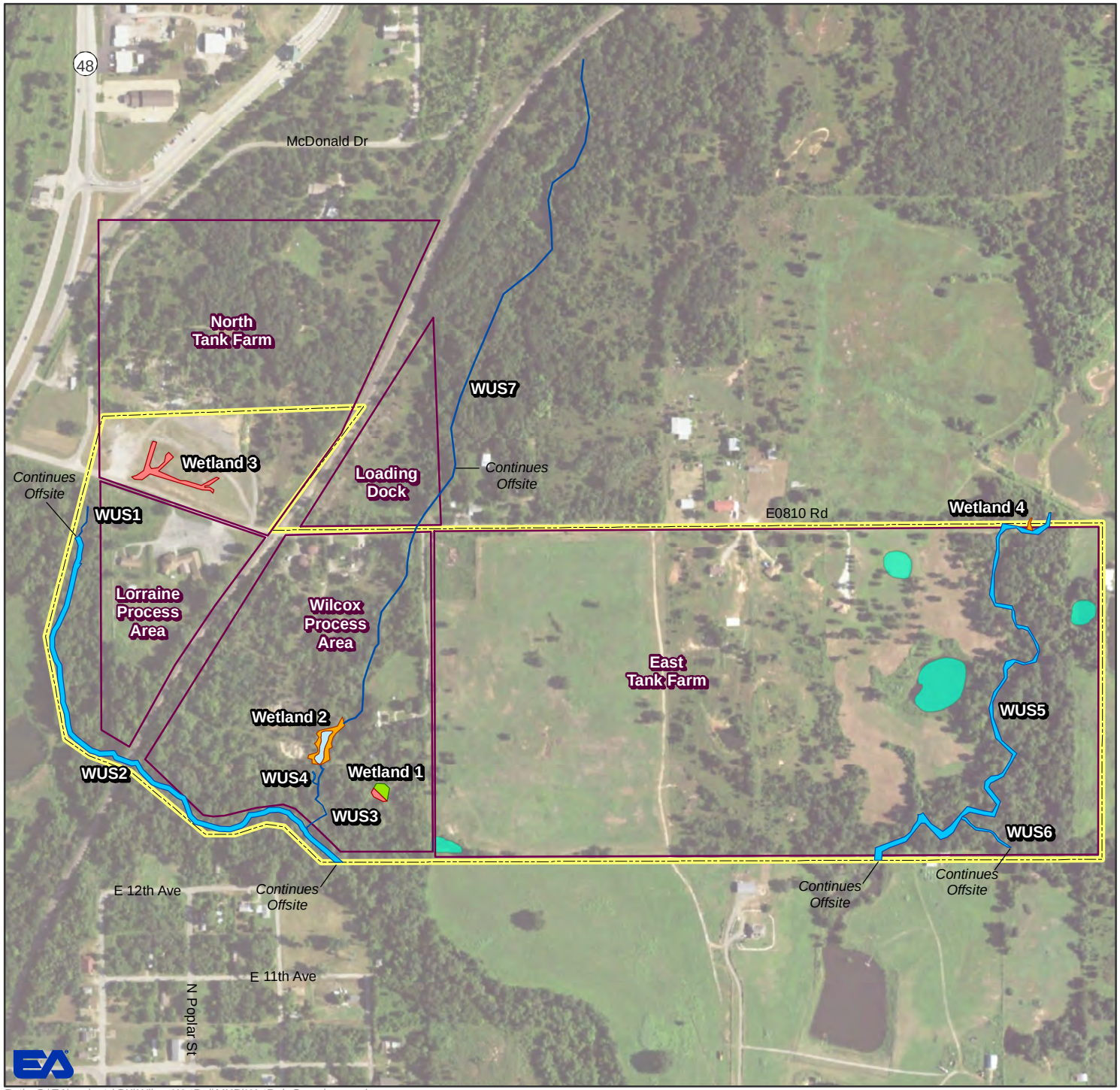


Figure 2-1. Ecological Conceptual Site Model



Legend

- Area of Review
- Farm Pond
- Source Area
- Emergent Wetland
- Forested Wetland
- Open Water
- Scrub-Shrub Wetland
- Waters of the U.S.

N

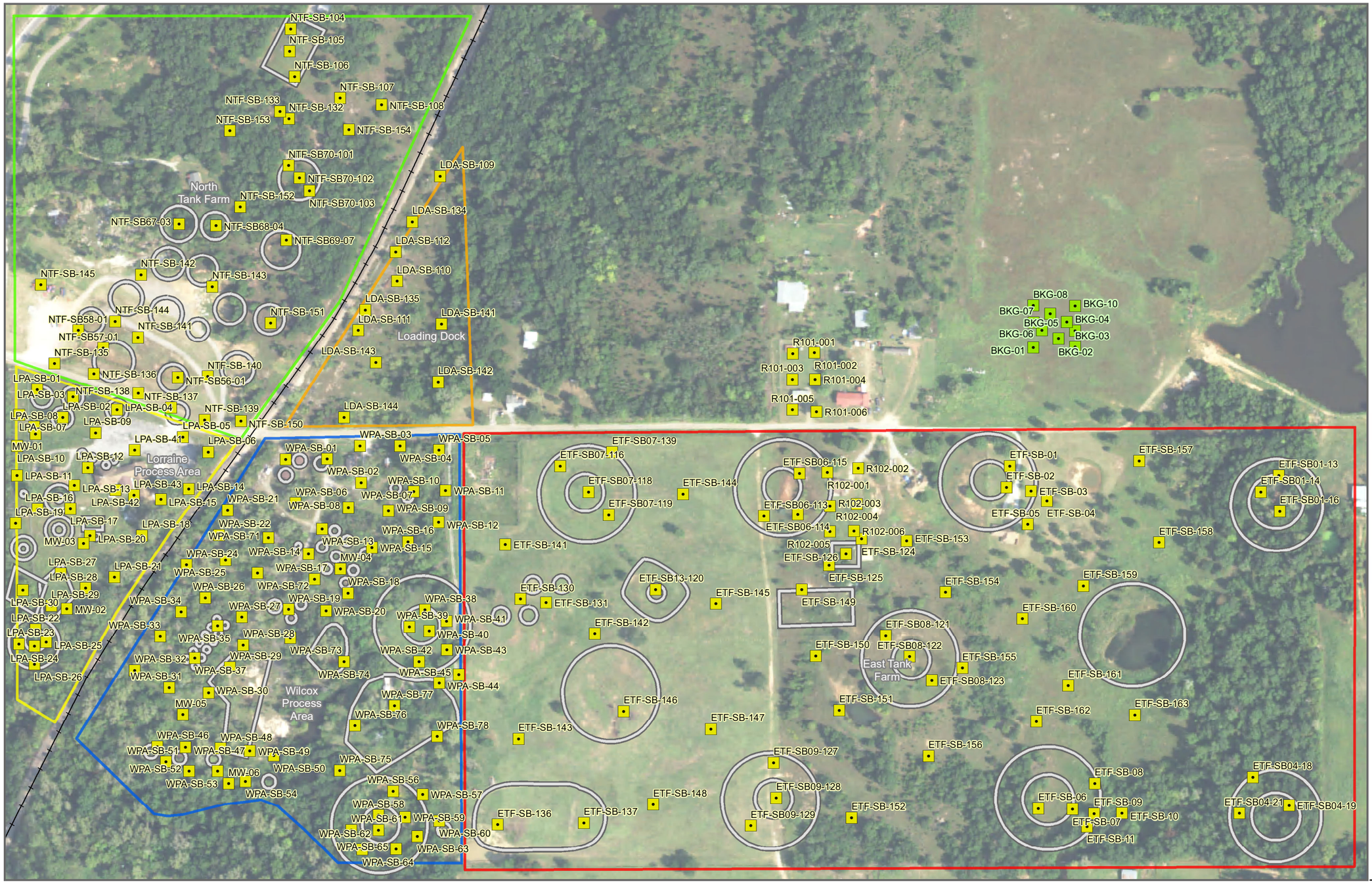
0 500 1,000
Feet

January, 2017
Data Sources: USDA, 2015

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

Figure 2-2.
Wetland Delineation Overview Map

Path: C:\EA\projects\OK\WilcoxWetDel\MXD\WetDel_Overview.mxd



N

0 150 300
Feet

Legend

- Background Soil Sample Location
- Soil Sample Location

Source Area

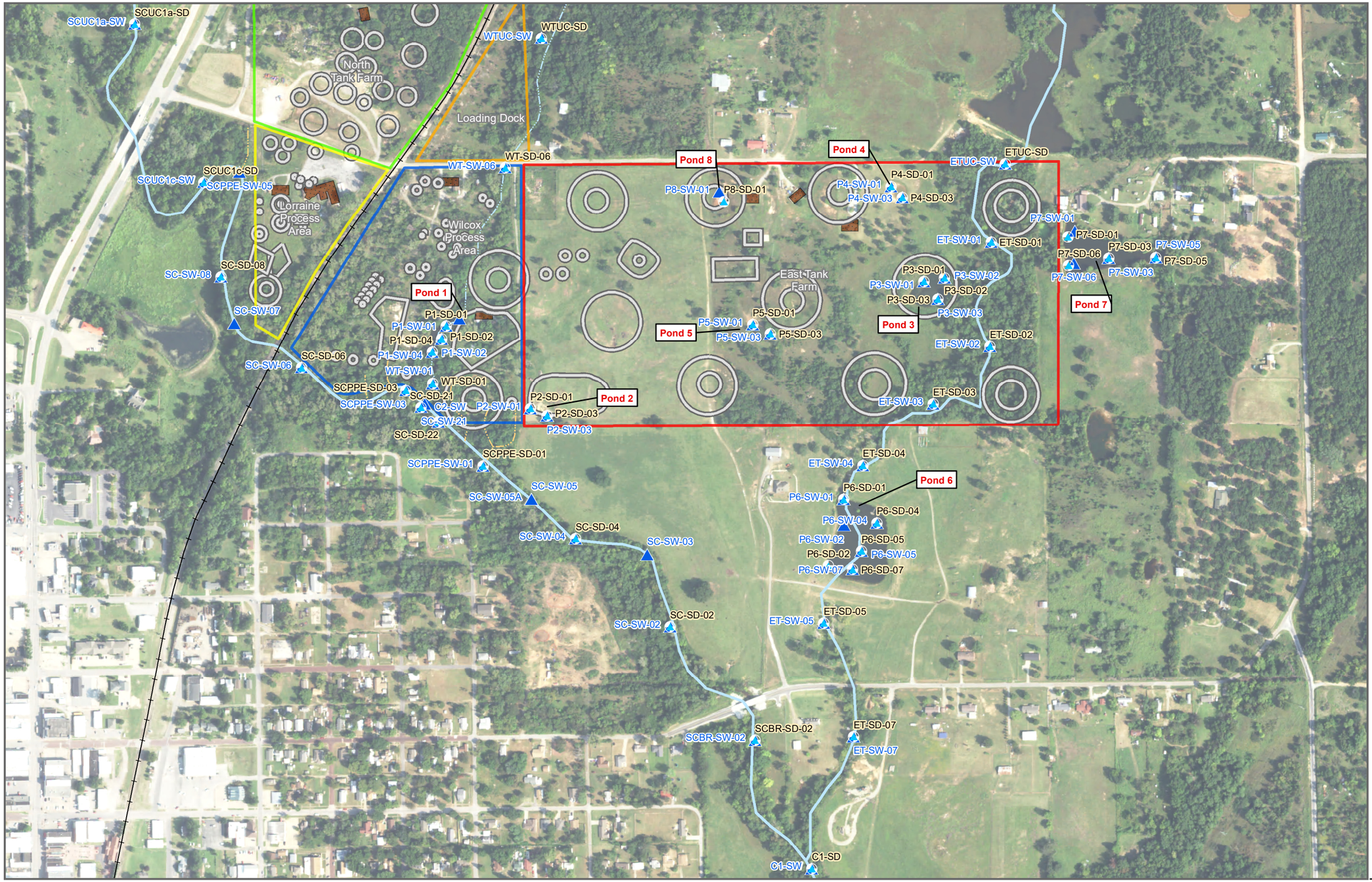
- East Tank Farm
- Loading Dock Area
- Lorraine Process Area
- North Tank Farm
- Wilcox Process Area
- Railroad
- Historical Feature

Image Source: National Agriculture Imagery Program 2015.

Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

Figure 3-1
Soil Sample Location Map

M:\Federal\EPA\RAC II\0128-Wilcox Oil\ R\-FS\GIS\MXDs\RI\Figxx_SampleLocsSoil201911.mxd 11/20/2019 EA jschwertz



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Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

Figure 3-2
Sediment and Surface Water Sample Location Map

TABLES

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Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-01	SURFACE SOIL	ETF-SB-01-0.5_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-01	SURFACE SOIL	ETF-SB-01-2.0_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-13	SURFACE SOIL	ETF-SB01-13-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-13	SURFACE SOIL	ETF-SB01-13-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-13	SURFACE SOIL	ETF-SB01-13-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-13	SURFACE SOIL	ETF-SB01-13-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-14	SURFACE SOIL	ETF-SB01-14-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-14	SURFACE SOIL	ETF-SB01-14-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-16	SURFACE SOIL	ETF-SB01-16-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB01-16	SURFACE SOIL	ETF-SB01-16-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-02	SURFACE SOIL	ETF-SB-02-0.5_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-02	SURFACE SOIL	ETF-SB-02-2.0_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-03	SURFACE SOIL	ETF-SB-03-0.5_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-03	SURFACE SOIL	ETF-SB-03-2.0_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-04	SURFACE SOIL	ETF-SB-04-0.5_11/01/2016	11/1/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-04	SURFACE SOIL	ETF-SB-04-2.0_11/01/2016	11/1/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-18	SURFACE SOIL	ETF-SB04-18-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-18	SURFACE SOIL	ETF-SB04-18-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-19	SURFACE SOIL	ETF-SB04-19-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-19	SURFACE SOIL	ETF-SB04-19-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-19	SURFACE SOIL	ETF-SB04-19-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-21	SURFACE SOIL	ETF-SB04-21-0.5_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB04-21	SURFACE SOIL	ETF-SB04-21-2.0_10/30/2017	10/30/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-05	SURFACE SOIL	ETF-SB-05-0.5_11/01/2016	11/1/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-05	SURFACE SOIL	ETF-SB-05-2.0_11/01/2016	11/1/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-113	SURFACE SOIL	ETF-SB06-113-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-113	SURFACE SOIL	ETF-SB06-113-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-114	SURFACE SOIL	ETF-SB06-114-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-114	SURFACE SOIL	ETF-SB06-114-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-115	SURFACE SOIL	ETF-SB06-115-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB06-115	SURFACE SOIL	ETF-SB06-115-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-116-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-118-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-118-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-119-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-119-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-139-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-07	SURFACE SOIL	ETF-SB07-139-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB07-116	SURFACE SOIL	ETF-SB07-116-1.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-121	SURFACE SOIL	ETF-SB08-121-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-121	SURFACE SOIL	ETF-SB08-121-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-121	SURFACE SOIL	ETF-SB08-121-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-122	SURFACE SOIL	ETF-SB08-122-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-122	SURFACE SOIL	ETF-SB08-122-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-122	SURFACE SOIL	ETF-SB08-122-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-123	SURFACE SOIL	ETF-SB08-123-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-123	SURFACE SOIL	ETF-SB08-123-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB08-123	SURFACE SOIL	ETF-SB08-123-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-09	SURFACE SOIL	ETF-SB09-129-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-09	SURFACE SOIL	ETF-SB-09-2.0_11/03/2016	11/3/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB09-127	SURFACE SOIL	ETF-SB09-127-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB09-128	SURFACE SOIL	ETF-SB09-128-0.5_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB09-128	SURFACE SOIL	ETF-SB09-128-2.0_11/02/2017	11/2/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-10	SURFACE SOIL	ETF-SB-10-0.5_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-10	SURFACE SOIL	ETF-SB-10-2.0_11/02/2016	11/2/2016
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-124	SURFACE SOIL	ETF-SB-124-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-124	SURFACE SOIL	ETF-SB-124-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-125	SURFACE SOIL	ETF-SB-125-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-125	SURFACE SOIL	ETF-SB-125-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-126	SURFACE SOIL	ETF-SB-126-0.5_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-126	SURFACE SOIL	ETF-SB-126-2.0_11/06/2017	11/6/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-130	SURFACE SOIL	ETF-SB-130-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-130	SURFACE SOIL	ETF-SB-130-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-131	SURFACE SOIL	ETF-SB-131-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-131	SURFACE SOIL	ETF-SB-131-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB13-120	SURFACE SOIL	ETF-SB13-120-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB13-120	SURFACE SOIL	ETF-SB13-120-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-136	SURFACE SOIL	ETF-SB-136-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-136	SURFACE SOIL	ETF-SB-136-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-137	SURFACE SOIL	ETF-SB-137-0.5_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-137	SURFACE SOIL	ETF-SB-137-2.0_11/07/2017	11/7/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-141	SURFACE SOIL	ETF-SB-141-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-141	SURFACE SOIL	ETF-SB-141-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-142	SURFACE SOIL	ETF-SB-142-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-142	SURFACE SOIL	ETF-SB-142-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-143	SURFACE SOIL	ETF-SB-143-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-143	SURFACE SOIL	ETF-SB-143-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-144	SURFACE SOIL	ETF-SB-144-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-144	SURFACE SOIL	ETF-SB-144-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-145	SURFACE SOIL	ETF-SB-145-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-145	SURFACE SOIL	ETF-SB-145-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-146	SURFACE SOIL	ETF-SB-146-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-146	SURFACE SOIL	ETF-SB-146-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-147	SURFACE SOIL	ETF-SB-147-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-147	SURFACE SOIL	ETF-SB-147-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-148	SURFACE SOIL	ETF-SB-148-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-148	SURFACE SOIL	ETF-SB-148-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-149	SURFACE SOIL	ETF-SB-149-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-149	SURFACE SOIL	ETF-SB-149-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-150	SURFACE SOIL	ETF-SB-150-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-150	SURFACE SOIL	ETF-SB-150-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-150	SURFACE SOIL	ETF-SB-150-2.0_12/03/2018	12/3/2018

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-151	SURFACE SOIL	ETF-SB-151-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-151	SURFACE SOIL	ETF-SB-151-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-151	SURFACE SOIL	ETF-SB-151-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-151	SURFACE SOIL	ETF-SB-151-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-152	SURFACE SOIL	ETF-SB-152-0.5_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-153	SURFACE SOIL	ETF-SB-153-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-154	SURFACE SOIL	ETF-SB-154-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-154	SURFACE SOIL	ETF-SB-154-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-155	SURFACE SOIL	ETF-SB-155-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-155	SURFACE SOIL	ETF-SB-155-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-156	SURFACE SOIL	ETF-SB-156-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-156	SURFACE SOIL	ETF-SB-156-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-157	SURFACE SOIL	ETF-SB-157-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-158	SURFACE SOIL	ETF-SB-158-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-158	SURFACE SOIL	ETF-SB-158-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-159	SURFACE SOIL	ETF-SB-159-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-159	SURFACE SOIL	ETF-SB-159-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-160	SURFACE SOIL	ETF-SB-160-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-160	SURFACE SOIL	ETF-SB-160-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-161	SURFACE SOIL	ETF-SB-161-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-161	SURFACE SOIL	ETF-SB-161-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-162	SURFACE SOIL	ETF-SB-162-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-162	SURFACE SOIL	ETF-SB-162-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-163	SURFACE SOIL	ETF-SB-163-0.5_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	ETF-SB-163	SURFACE SOIL	ETF-SB-163-2.0_12/03/2018	12/3/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-109	SURFACE SOIL	LDA-SB-109-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-109	SURFACE SOIL	LDA-SB-109-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-109	SURFACE SOIL	LDA-SB-109-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-109	SURFACE SOIL	LDA-SB-109-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-110	SURFACE SOIL	LDA-SB-110-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-110	SURFACE SOIL	LDA-SB-110-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-110	SURFACE SOIL	LDA-SB-110-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-110	SURFACE SOIL	LDA-SB-110-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-111	SURFACE SOIL	LDA-SB-111-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-111	SURFACE SOIL	LDA-SB-111-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-112	SURFACE SOIL	LDA-SB-112-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-112	SURFACE SOIL	LDA-SB-112-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-134	SURFACE SOIL	LDA-SB-134-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-134	SURFACE SOIL	LDA-SB-134-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-135	SURFACE SOIL	LDA-SB-135-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-135	SURFACE SOIL	LDA-SB-135-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-141	SURFACE SOIL	LDA-SB-141-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-141	SURFACE SOIL	LDA-SB-141-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-142	SURFACE SOIL	LDA-SB-142-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-142	SURFACE SOIL	LDA-SB-142-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-143	SURFACE SOIL	LDA-SB-143-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-143	SURFACE SOIL	LDA-SB-143-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-144	SURFACE SOIL	LDA-SB-144-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	LDA-SB-144	SURFACE SOIL	LDA-SB-144-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-104	SURFACE SOIL	NTF-SB-104-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-104	SURFACE SOIL	NTF-SB-104-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-105	SURFACE SOIL	NTF-SB-105-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-105	SURFACE SOIL	NTF-SB-105-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-106	SURFACE SOIL	NTF-SB-106-0.5_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-106	SURFACE SOIL	NTF-SB-106-2.0_10/31/2017	10/31/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-107	SURFACE SOIL	NTF-SB-107-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-107	SURFACE SOIL	NTF-SB-107-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-108	SURFACE SOIL	NTF-SB-108-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-132	SURFACE SOIL	NTF-SB-132-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-132	SURFACE SOIL	NTF-SB-132-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-133	SURFACE SOIL	NTF-SB-133-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-133	SURFACE SOIL	NTF-SB-133-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-133	SURFACE SOIL	NTF-SB-133-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-135	SURFACE SOIL	NTF-SB-135-0.5-2.0_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-135	SURFACE SOIL	NTF-SB-135-0.5-2.0_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-135	SURFACE SOIL	NTF-SB-135-0-0.5_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-136	SURFACE SOIL	NTF-SB-136-0-0.5_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-137	SURFACE SOIL	NTF-SB-137-0.5-2.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-137	SURFACE SOIL	NTF-SB-137-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-138	SURFACE SOIL	NTF-SB-138-0.5-2.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-138	SURFACE SOIL	NTF-SB-138-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-139	SURFACE SOIL	NTF-SB-139-0.5-2.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-139	SURFACE SOIL	NTF-SB-139-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-140	SURFACE SOIL	NTF-SB-140-0.5-1.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-140	SURFACE SOIL	NTF-SB-140-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-141	SURFACE SOIL	NTF-SB-141-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-142	SURFACE SOIL	NTF-SB-142-0.5-2.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-142	SURFACE SOIL	NTF-SB-142-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-143	SURFACE SOIL	NTF-SB-143-0.5-2.0_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-143	SURFACE SOIL	NTF-SB-143-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-144	SURFACE SOIL	NTF-SB-144-0-0.5_03/05/2018	3/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-145	SURFACE SOIL	NTF-SB-145-0.5-2.0_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-145	SURFACE SOIL	NTF-SB-145-0-0.5_03/06/2018	3/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-150	SURFACE SOIL	NTF-SB-150-0.5_11/29/2018	11/29/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-150	SURFACE SOIL	NTF-SB-150-2.0_11/29/2018	11/29/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-151	SURFACE SOIL	NTF-SB-151-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-151	SURFACE SOIL	NTF-SB-151-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-151	SURFACE SOIL	NTF-SB-151-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-151	SURFACE SOIL	NTF-SB-151-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-152	SURFACE SOIL	NTF-SB-152-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-152	SURFACE SOIL	NTF-SB-152-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-152	SURFACE SOIL	NTF-SB-152-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-153	SURFACE SOIL	NTF-SB-153-0.5_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-153	SURFACE SOIL	NTF-SB-153-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-154	SURFACE SOIL	NTF-SB-154-0.5_12/04/2018	12/4/2018

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB-154	SURFACE SOIL	NTF-SB-154-2.0_12/04/2018	12/4/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB56	SURFACE SOIL	NTF-SB56-01-0.5_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB56	SURFACE SOIL	NTF-SB56-01-1.5_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB57	SURFACE SOIL	NTF-SB57-01-0.5_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB57	SURFACE SOIL	NTF-SB57-01-2.0_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB58	SURFACE SOIL	NTF-SB58-01-0.5_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB58	SURFACE SOIL	NTF-SB58-01-2.0_11/08/2017	11/8/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB67-03	SURFACE SOIL	NTF-SB67-03-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB68-0	SURFACE SOIL	NTF-SB68-04-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB68-04	SURFACE SOIL	NTF-SB68-04-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB68-04	SURFACE SOIL	NTF-SB68-04-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB69-07	SURFACE SOIL	NTF-SB69-07-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-101	SURFACE SOIL	NTF-SB70-101-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-101	SURFACE SOIL	NTF-SB70-101-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-102	SURFACE SOIL	NTF-SB70-102-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-102	SURFACE SOIL	NTF-SB70-102-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-103	SURFACE SOIL	NTF-SB70-103-0.5_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	NTF-SB70-103	SURFACE SOIL	NTF-SB70-103-2.0_11/01/2017	11/1/2017
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-001	SURFACE SOIL	R101-001-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-001	SURFACE SOIL	R101-001-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-002	SURFACE SOIL	R101-002-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-002	SURFACE SOIL	R101-002-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-003	SURFACE SOIL	R101-003-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-003	SURFACE SOIL	R101-003-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-004	SURFACE SOIL	R101-004-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-004	SURFACE SOIL	R101-004-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-005	SURFACE SOIL	R101-005-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-005	SURFACE SOIL	R101-005-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-006	SURFACE SOIL	R101-006-2.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R101-006	SURFACE SOIL	R101-006-6.0_12/05/2018	12/5/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-001	SURFACE SOIL	R102-001-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-001	SURFACE SOIL	R102-001-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-001	SURFACE SOIL	R102-001-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-001	SURFACE SOIL	R102-001-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-002	SURFACE SOIL	R102-002-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-002	SURFACE SOIL	R102-002-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-002	SURFACE SOIL	R102-002-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-002	SURFACE SOIL	R102-002-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-003	SURFACE SOIL	R102-003-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-003	SURFACE SOIL	R102-003-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-004	SURFACE SOIL	R102-004-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-004	SURFACE SOIL	R102-004-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-004	SURFACE SOIL	R102-004-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-004	SURFACE SOIL	R102-004-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-005	SURFACE SOIL	R102-005-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-005	SURFACE SOIL	R102-005-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-006	SURFACE SOIL	R102-006-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-006	SURFACE SOIL	R102-006-2.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-006	SURFACE SOIL	R102-006-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	R102-006	SURFACE SOIL	R102-006-6.0_12/06/2018	12/6/2018
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-001	SURFACE SOIL	WO-002-001-00-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-001	SURFACE SOIL	WO-002-001-00-52_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-001	SURFACE SOIL	WO-002-001-06-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-001	SURFACE SOIL	WO-002-001-12-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-002	SURFACE SOIL	WO-002-002-00-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-002	SURFACE SOIL	WO-002-002-06-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-003	SURFACE SOIL	WO-002-003-00-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-003	SURFACE SOIL	WO-002-003-06-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-003	SURFACE SOIL	WO-002-003-12-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-004	SURFACE SOIL	WO-002-004-00-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-004	SURFACE SOIL	WO-002-004-00-52_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-002-004	SURFACE SOIL	WO-002-004-06-51_06/02/2015	6/2/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-06-51_R_05/22/2015	5/22/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-12-51_R_05/22/2015	5/22/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-001	SURFACE SOIL	WO-006-001-24-51_R_05/22/2015	5/22/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-06-51_R_05/22/2015	5/22/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-12-51_R_05/22/2015	5/22/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-002	SURFACE SOIL	WO-006-002-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-003	SURFACE SOIL	WO-006-003-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-003	SURFACE SOIL	WO-006-003-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-003	SURFACE SOIL	WO-006-003-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-003	SURFACE SOIL	WO-006-003-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-003	SURFACE SOIL	WO-006-003-24-52_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-004	SURFACE SOIL	WO-006-004-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-004	SURFACE SOIL	WO-006-004-00-52_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-004	SURFACE SOIL	WO-006-004-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-004	SURFACE SOIL	WO-006-004-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-004	SURFACE SOIL	WO-006-004-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-005	SURFACE SOIL	WO-006-005-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-005	SURFACE SOIL	WO-006-005-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-005	SURFACE SOIL	WO-006-005-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-005	SURFACE SOIL	WO-006-005-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-006	SURFACE SOIL	WO-006-006-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-006	SURFACE SOIL	WO-006-006-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-006	SURFACE SOIL	WO-006-006-12-51_05/19/2015	5/19/2015

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-006	SURFACE SOIL	WO-006-006-12-52_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-006	SURFACE SOIL	WO-006-006-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-007	SURFACE SOIL	WO-006-007-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-007	SURFACE SOIL	WO-006-007-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-007	SURFACE SOIL	WO-006-007-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-007	SURFACE SOIL	WO-006-007-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-008	SURFACE SOIL	WO-006-008-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-008	SURFACE SOIL	WO-006-008-06-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-008	SURFACE SOIL	WO-006-008-12-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-006-008	SURFACE SOIL	WO-006-008-24-51_05/19/2015	5/19/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-00-51S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-06-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-06-51S_06/09/2015	6/9/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-06-52S_06/09/2015	6/9/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-001	SURFACE SOIL	WO-017-001-12-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-00-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-06-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-06-51S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-12-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-002	SURFACE SOIL	WO-017-002-24-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-00-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-00-52_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-06-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-06-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-06-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-06-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-12-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-12-52_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-003	SURFACE SOIL	WO-017-003-24-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-00-51S_06/09/2015	6/9/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-06-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-06-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-12-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-004	SURFACE SOIL	WO-017-004-24-51_05/21/2015	5/21/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-06-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-06-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-12-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-005	SURFACE SOIL	WO-017-005-24-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-006	SURFACE SOIL	WO-017-006-00-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-006	SURFACE SOIL	WO-017-006-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-006	SURFACE SOIL	WO-017-006-06-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-006	SURFACE SOIL	WO-017-006-06-51S_06/10/2015	6/10/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-017-006	SURFACE SOIL	WO-017-006-12-51_05/20/2015	5/20/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-001	SURFACE SOIL	WO-019-001-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-001	SURFACE SOIL	WO-019-001-00-52_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-001	SURFACE SOIL	WO-019-001-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-002	SURFACE SOIL	WO-019-002-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-002	SURFACE SOIL	WO-019-002-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-003	SURFACE SOIL	WO-019-003-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-003	SURFACE SOIL	WO-019-003-00-52_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-003	SURFACE SOIL	WO-019-003-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-004	SURFACE SOIL	WO-019-004-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-004	SURFACE SOIL	WO-019-004-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-005	SURFACE SOIL	WO-019-005-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-005	SURFACE SOIL	WO-019-005-00-52_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-005	SURFACE SOIL	WO-019-005-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-005	SURFACE SOIL	WO-019-005-12-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-005	SURFACE SOIL	WO-019-005-24-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-006	SURFACE SOIL	WO-019-006-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-006	SURFACE SOIL	WO-019-006-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-007	SURFACE SOIL	WO-019-007-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-007	SURFACE SOIL	WO-019-007-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-007	SURFACE SOIL	WO-019-007-12-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-007	SURFACE SOIL	WO-019-007-24-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-008	SURFACE SOIL	WO-019-008-00-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-008	SURFACE SOIL	WO-019-008-06-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-019-008	SURFACE SOIL	WO-019-008-12-51_06/04/2015	6/4/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-06-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-24-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-001	SURFACE SOIL	WO-020-001-24-52_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-06-51S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-06-52S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-002	SURFACE SOIL	WO-020-002-24-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-00-52_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-06-51S_06/12/2015	6/12/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-003	SURFACE SOIL	WO-020-003-24-51_05/18/2015	5/18/2015

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-06-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-004	SURFACE SOIL	WO-020-004-24-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-00-51S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-06-51S_06/08/2015	6/8/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-005	SURFACE SOIL	WO-020-005-24-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-00-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-00-51S_06/11/2015	6/11/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-06-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-06-51S_06/12/2015	6/12/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-12-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-020-006	SURFACE SOIL	WO-020-006-24-51_05/18/2015	5/18/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-001	SURFACE SOIL	WO-021-001-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-001	SURFACE SOIL	WO-021-001-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-001	SURFACE SOIL	WO-021-001-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-001	SURFACE SOIL	WO-021-001-24-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-003	SURFACE SOIL	WO-021-003-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-003	SURFACE SOIL	WO-021-003-00-52_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-003	SURFACE SOIL	WO-021-003-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-003	SURFACE SOIL	WO-021-003-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-003	SURFACE SOIL	WO-021-003-24-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-004	SURFACE SOIL	WO-021-004-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-004	SURFACE SOIL	WO-021-004-00-52_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-004	SURFACE SOIL	WO-021-004-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-004	SURFACE SOIL	WO-021-004-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-004	SURFACE SOIL	WO-021-004-24-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-005	SURFACE SOIL	WO-021-005-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-005	SURFACE SOIL	WO-021-005-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-005	SURFACE SOIL	WO-021-005-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-005	SURFACE SOIL	WO-021-005-24-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-006	SURFACE SOIL	WO-021-006-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-006	SURFACE SOIL	WO-021-006-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-006	SURFACE SOIL	WO-021-006-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-006	SURFACE SOIL	WO-021-006-24-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-007	SURFACE SOIL	WO-021-007-00-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-007	SURFACE SOIL	WO-021-007-06-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-007	SURFACE SOIL	WO-021-007-12-51_06/03/2015	6/3/2015
LOADING DOCK AREA/NORTH TANK FARM/EAST TANK FARM	WO-021-007	SURFACE SOIL	WO-021-007-24-51_06/03/2015	6/3/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-01	SURFACE SOIL	LPA-SB-01-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-01	SURFACE SOIL	LPA-SB-01-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-02	SURFACE SOIL	LPA-SB-02-0.5_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-02	SURFACE SOIL	LPA-SB-02-2.0_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-03	SURFACE SOIL	LPA-SB-03-0.5_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-03	SURFACE SOIL	LPA-SB-03-2.0_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-04	SURFACE SOIL	LPA-SB-04-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-04	SURFACE SOIL	LPA-SB-04-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-05	SURFACE SOIL	LPA-SB-05-0.5_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-05	SURFACE SOIL	LPA-SB-05-2.0_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-06	SURFACE SOIL	LPA-SB-06-0.5_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-06	SURFACE SOIL	LPA-SB-06-2.0_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-07	SURFACE SOIL	LPA-SB-07-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-07	SURFACE SOIL	LPA-SB-07-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-08	SURFACE SOIL	LPA-SB-08-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-08	SURFACE SOIL	LPA-SB-08-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-09	SURFACE SOIL	LPA-SB-09-0.5_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-09	SURFACE SOIL	LPA-SB-09-2.0_04/10/2017	4/10/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-10	SURFACE SOIL	LPA-SB-10-0.5_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-10	SURFACE SOIL	LPA-SB-10-2.0_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-11	SURFACE SOIL	LPA-SB-11-0.5_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-11	SURFACE SOIL	LPA-SB-11-2.0_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-12	SURFACE SOIL	LPA-SB-12-0.5_04/11/2017	4/11/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-12	SURFACE SOIL	LPA-SB-12-2.0_04/11/2017	4/11/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-13	SURFACE SOIL	LPA-SB-13-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-13	SURFACE SOIL	LPA-SB-13-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-14	SURFACE SOIL	LPA-SB-14-0.5_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-14	SURFACE SOIL	LPA-SB-14-2.0_10/24/2016	10/24/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-15	SURFACE SOIL	LPA-SB-15-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-15	SURFACE SOIL	LPA-SB-15-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-16	SURFACE SOIL	LPA-SB-16-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-16	SURFACE SOIL	LPA-SB-16-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-17	SURFACE SOIL	LPA-SB-17-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-17	SURFACE SOIL	LPA-SB-17-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-17	SURFACE SOIL	LPA-SB-17-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-18	SURFACE SOIL	LPA-SB-18-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-18	SURFACE SOIL	LPA-SB-18-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-18	SURFACE SOIL	LPA-SB-18-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-19	SURFACE SOIL	LPA-SB-19-0.5_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-19	SURFACE SOIL	LPA-SB-19-2.0_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-20	SURFACE SOIL	LPA-SB-20-0.5_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-20	SURFACE SOIL	LPA-SB-20-2.0_10/25/2016	10/25/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-21	SURFACE SOIL	LPA-SB-21-0.5_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-21	SURFACE SOIL	LPA-SB-21-2.0_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-22	SURFACE SOIL	LPA-SB-22-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-22	SURFACE SOIL	LPA-SB-22-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-23	SURFACE SOIL	LPA-SB-23-0.5_10/27/2016	10/27/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-23	SURFACE SOIL	LPA-SB-23-2.0_10/27/2016	10/27/2016

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-24	SURFACE SOIL	LPA-SB-24-0.5_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-24	SURFACE SOIL	LPA-SB-24-2.0_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-25	SURFACE SOIL	LPA-SB-25-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-25	SURFACE SOIL	LPA-SB-25-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-26	SURFACE SOIL	LPA-SB-26-0.5_10/27/2016	10/27/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-26	SURFACE SOIL	LPA-SB-26-2.0_10/27/2016	10/27/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-27	SURFACE SOIL	LPA-SB-27-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-27	SURFACE SOIL	LPA-SB-27-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-27	SURFACE SOIL	LPA-SB-27-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-28	SURFACE SOIL	LPA-SB-28-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-28	SURFACE SOIL	LPA-SB-28-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-28	SURFACE SOIL	LPA-SB-28-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-29	SURFACE SOIL	LPA-SB-29-0.5_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-29	SURFACE SOIL	LPA-SB-29-2.0_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-30	SURFACE SOIL	LPA-SB-30-0.5_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-30	SURFACE SOIL	LPA-SB-30-0.5_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-30	SURFACE SOIL	LPA-SB-30-2.0_10/26/2016	10/26/2016
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-41	SURFACE SOIL	LPA-SB-41-0.5_11/29/2018	11/29/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-41	SURFACE SOIL	LPA-SB-41-2.0_11/29/2018	11/29/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-42	SURFACE SOIL	LPA-SB-42-0.5_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-42	SURFACE SOIL	LPA-SB-42-2.0_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-43	SURFACE SOIL	LPA-SB-43-0.5_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	LPA-SB-43	SURFACE SOIL	LPA-SB-43-2.0_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-001	SURFACE SOIL	WO-008-001-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-001	SURFACE SOIL	WO-008-001-06-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-001	SURFACE SOIL	WO-008-001-12-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-001	SURFACE SOIL	WO-008-001-24-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-002	SURFACE SOIL	WO-008-002-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-002	SURFACE SOIL	WO-008-002-00-52_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-002	SURFACE SOIL	WO-008-002-06-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-002	SURFACE SOIL	WO-008-002-12-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-002	SURFACE SOIL	WO-008-002-24-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-003	SURFACE SOIL	WO-008-003-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-003	SURFACE SOIL	WO-008-003-06-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-003	SURFACE SOIL	WO-008-003-12-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-003	SURFACE SOIL	WO-008-003-24-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-004	SURFACE SOIL	WO-008-004-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-004	SURFACE SOIL	WO-008-004-06-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-004	SURFACE SOIL	WO-008-004-12-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-004	SURFACE SOIL	WO-008-004-24-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-008-004	SURFACE SOIL	WO-008-004-24-52_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-001	SURFACE SOIL	WO-011-001-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-001	SURFACE SOIL	WO-011-001-06-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-001	SURFACE SOIL	WO-011-001-12-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-001	SURFACE SOIL	WO-011-001-24-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-002	SURFACE SOIL	WO-011-002-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-002	SURFACE SOIL	WO-011-002-06-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-002	SURFACE SOIL	WO-011-002-12-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-002	SURFACE SOIL	WO-011-002-24-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-002	SURFACE SOIL	WO-011-002-24-52_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-003	SURFACE SOIL	WO-011-003-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-003	SURFACE SOIL	WO-011-003-06-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-003	SURFACE SOIL	WO-011-003-12-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-003	SURFACE SOIL	WO-011-003-24-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-004	SURFACE SOIL	WO-011-004-00-51_06/01/2015	6/1/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-004	SURFACE SOIL	WO-011-004-06-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-004	SURFACE SOIL	WO-011-004-12-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WO-011-004	SURFACE SOIL	WO-011-004-24-51_06/02/2015	6/2/2015
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-01	SURFACE SOIL	WPA-SB-01-0.5_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-01	SURFACE SOIL	WPA-SB-01-2.0_04/17/2017	4/17/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-02	SURFACE SOIL	WPA-SB-02-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-02	SURFACE SOIL	WPA-SB-02-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-02	SURFACE SOIL	WPA-SB-02-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-02	SURFACE SOIL	WPA-SB-02-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-03	SURFACE SOIL	WPA-SB-03-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-03	SURFACE SOIL	WPA-SB-03-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-04	SURFACE SOIL	WPA-SB-04-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-04	SURFACE SOIL	WPA-SB-04-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-05	SURFACE SOIL	WPA-SB-05-0.5_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-05	SURFACE SOIL	WPA-SB-05-2.0_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-06	SURFACE SOIL	WPA-SB-06-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-06	SURFACE SOIL	WPA-SB-06-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-07	SURFACE SOIL	WPA-SB-07-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-07	SURFACE SOIL	WPA-SB-07-2.0_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-08	SURFACE SOIL	WPA-SB-08-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-08	SURFACE SOIL	WPA-SB-08-2.0_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-09	SURFACE SOIL	WPA-SB-09-0.5_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-09	SURFACE SOIL	WPA-SB-09-2.0_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-10	SURFACE SOIL	WPA-SB-10-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-10	SURFACE SOIL	WPA-SB-10-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-11	SURFACE SOIL	WPA-SB-11-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-11	SURFACE SOIL	WPA-SB-11-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-12	SURFACE SOIL	WPA-SB-12-0.5_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-12	SURFACE SOIL	WPA-SB-12-2.0_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-12	SURFACE SOIL	WPA-SB-12-2.0_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-13	SURFACE SOIL	WPA-SB-13-0.5_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-13	SURFACE SOIL	WPA-SB-13-2.0_04/13/2017	4/13/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-14	SURFACE SOIL	WPA-SB-14-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-14	SURFACE SOIL	WPA-SB-14-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-14	SURFACE SOIL	WPA-SB-14-2.0_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-15	SURFACE SOIL	WPA-SB-15-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-15	SURFACE SOIL	WPA-SB-15-2.0_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-16	SURFACE SOIL	WPA-SB-16-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-16	SURFACE SOIL	WPA-SB-16-0.5_04/20/2017	4/20/2017

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-16	SURFACE SOIL	WPA-SB-16-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-16	SURFACE SOIL	WPA-SB-16-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-17	SURFACE SOIL	WPA-SB-17-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-17	SURFACE SOIL	WPA-SB-17-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-18	SURFACE SOIL	WPA-SB-18-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-18	SURFACE SOIL	WPA-SB-18-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-19	SURFACE SOIL	WPA-SB-19-0.5_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-19	SURFACE SOIL	WPA-SB-19-2.0_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-19	SURFACE SOIL	WPA-SB-19-2.0_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-20	SURFACE SOIL	WPA-SB-20-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-20	SURFACE SOIL	WPA-SB-20-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-21	SURFACE SOIL	WPA-SB-21-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-21	SURFACE SOIL	WPA-SB-21-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-22	SURFACE SOIL	WPA-SB-22-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-22	SURFACE SOIL	WPA-SB-22-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-24	SURFACE SOIL	WPA-SB-24-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-24	SURFACE SOIL	WPA-SB-24-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-25	SURFACE SOIL	WPA-SB-25-0.5_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-25	SURFACE SOIL	WPA-SB-25-2.0_04/12/2017	4/12/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-26	SURFACE SOIL	WPA-SB-26-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-26	SURFACE SOIL	WPA-SB-26-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-27	SURFACE SOIL	WPA-SB-27-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-27	SURFACE SOIL	WPA-SB-27-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-28	SURFACE SOIL	WPA-SB-28-0.5_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-28	SURFACE SOIL	WPA-SB-28-2.0_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-30	SURFACE SOIL	WPA-SB-30-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-30	SURFACE SOIL	WPA-SB-30-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-30	SURFACE SOIL	WPA-SB-30-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-31	SURFACE SOIL	WPA-SB-31-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-31	SURFACE SOIL	WPA-SB-31-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-32	SURFACE SOIL	WPA-SB-32-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-32	SURFACE SOIL	WPA-SB-32-0.5_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-32	SURFACE SOIL	WPA-SB-32-2.0_04/19/2017	4/19/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-33	SURFACE SOIL	WPA-SB-33-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-33	SURFACE SOIL	WPA-SB-33-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-34	SURFACE SOIL	WPA-SB-34-0.5_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-34	SURFACE SOIL	WPA-SB-34-2.0_04/18/2017	4/18/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-35	SURFACE SOIL	WPA-SB-35-0.5_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-35	SURFACE SOIL	WPA-SB-35-2.0_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-37	SURFACE SOIL	WPA-SB-37-0.5_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-37	SURFACE SOIL	WPA-SB-37-2.0_04/26/2017	4/26/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-41	SURFACE SOIL	WPA-SB-41-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-41	SURFACE SOIL	WPA-SB-41-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-41	SURFACE SOIL	WPA-SB-41-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-44	SURFACE SOIL	WPA-SB-44-0.5_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-44	SURFACE SOIL	WPA-SB-44-2.0_04/20/2017	4/20/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-45	SURFACE SOIL	WPA-SB-45-0.5_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-45	SURFACE SOIL	WPA-SB-45-2.0_04/24/2017	4/24/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-46	SURFACE SOIL	WPA-SB-46-0.5_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-46	SURFACE SOIL	WPA-SB-46-2.0_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-47	SURFACE SOIL	WPA-SB-47-0.5_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-47	SURFACE SOIL	WPA-SB-47-0.5_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-47	SURFACE SOIL	WPA-SB-47-2.0_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-48	SURFACE SOIL	WPA-SB-48-0.5_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-48	SURFACE SOIL	WPA-SB-48-2.0_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-51	SURFACE SOIL	WPA-SB-51-0.5_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-51	SURFACE SOIL	WPA-SB-51-2.0_04/25/2017	4/25/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-52	SURFACE SOIL	WPA-SB-52-0.5_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-52	SURFACE SOIL	WPA-SB-52-2.0_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-53	SURFACE SOIL	WPA-SB-53-0.5_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-53	SURFACE SOIL	WPA-SB-53-2.0_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-54	SURFACE SOIL	WPA-SB-54-0.5_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-54	SURFACE SOIL	WPA-SB-54-2.0_04/27/2017	4/27/2017
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-71	SURFACE SOIL	WPA-SB-71-0.5_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-71	SURFACE SOIL	WPA-SB-71-2.0_11/30/2018	11/30/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-72	SURFACE SOIL	WPA-SB-72-0.5_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-72	SURFACE SOIL	WPA-SB-72-2.0_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-74	SURFACE SOIL	WPA-SB-74-0.5_12/06/2018	12/6/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-74	SURFACE SOIL	WPA-SB-74-2.0_12/06/2018	12/6/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-75	SURFACE SOIL	WPA-SB-75-0.5_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-75	SURFACE SOIL	WPA-SB-75-2.0_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-76	SURFACE SOIL	WPA-SB-76-0.5_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-76	SURFACE SOIL	WPA-SB-76-2.0_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-77	SURFACE SOIL	WPA-SB-77-0.5_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-77	SURFACE SOIL	WPA-SB-77-2.0_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-78	SURFACE SOIL	WPA-SB-78-0.5_12/05/2018	12/5/2018
WILCOX PROCESS AREA/LORRAINE PROCESS AREA	WPA-SB-78	SURFACE SOIL	WPA-SB-78-2.0_12/05/2018	12/5/2018
PONDS	P1-SD-01	SEDIMENT	P1-SD-01-0.5_10/23/2017	10/23/2017
PONDS	P1-SD-02	SEDIMENT	P1-SD-02-0.5_10/23/2017	10/23/2017
PONDS	P1-SD-04	SEDIMENT	P1-SD-04-0.5_10/23/2017	10/23/2017
PONDS	P1-SW-01	SURFACE WATER	P1-SW-01_10/23/2017	10/23/2017
PONDS	P1-SW-01	SURFACE WATER	P1-SW-01-F_10/23/2017	10/23/2017
PONDS	P1-SW-02	SURFACE WATER	P1-SW-02_10/23/2017	10/23/2017
PONDS	P1-SW-02	SURFACE WATER	P1-SW-02-F_10/23/2017	10/23/2017
PONDS	P1-SW-04	SURFACE WATER	P1-SW-04_10/23/2017	10/23/2017
PONDS	P1-SW-04	SURFACE WATER	P1-SW-04-F_10/23/2017	10/23/2017
PONDS	P2-SD-01	SEDIMENT	P2-SD-01-0.5_10/26/2017	10/26/2017
PONDS	P2-SD-03	SEDIMENT	P2-SD-03-0.5_10/26/2017	10/26/2017
PONDS	P2-SW-01	SURFACE WATER	P2-SW-01_10/26/2017	10/26/2017
PONDS	P2-SW-01	SURFACE WATER	P2-SW-01-F_10/26/2017	10/26/2017
PONDS	P2-SW-03	SURFACE WATER	P2-SW-03_10/26/2017	10/26/2017
PONDS	P2-SW-03	SURFACE WATER	P2-SW-03-F_10/26/2017	10/26/2017
PONDS	P3-SD-01	SEDIMENT	P3-SD-01-0.5_10/26/2017	10/26/2017

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
PONDS	P3-SD-02	SEDIMENT	P3-SD-02-0.5_10/26/2017	10/26/2017
PONDS	P3-SD-03	SEDIMENT	P3-SD-03-0.5_10/26/2017	10/26/2017
PONDS	P3-SW-01	SURFACE WATER	P3-SW-01_10/26/2017	10/26/2017
PONDS	P3-SW-01	SURFACE WATER	P3-SW-01-F_10/26/2017	10/26/2017
PONDS	P3-SW-02	SURFACE WATER	P3-SW-02_10/26/2017	10/26/2017
PONDS	P3-SW-02	SURFACE WATER	P3-SW-02-F_10/26/2017	10/26/2017
PONDS	P3-SW-03	SURFACE WATER	P3-SW-03_10/26/2017	10/26/2017
PONDS	P3-SW-03	SURFACE WATER	P3-SW-03-F_10/26/2017	10/26/2017
PONDS	P4-SD-01	SEDIMENT	P4-SD-01-0.5_10/25/2017	10/25/2017
PONDS	P4-SD-03	SEDIMENT	P4-SD-03-0.5_10/25/2017	10/25/2017
PONDS	P4-SW-01	SURFACE WATER	P4-SW-01_10/25/2017	10/25/2017
PONDS	P4-SW-01	SURFACE WATER	P4-SW-01-F_10/25/2017	10/25/2017
PONDS	P4-SW-03	SURFACE WATER	P4-SW-03_10/25/2017	10/25/2017
PONDS	P4-SW-03	SURFACE WATER	P4-SW-03-F_10/25/2017	10/25/2017
PONDS	P5-SD-01	SEDIMENT	P5-SD-01-0.5_10/24/2017	10/24/2017
PONDS	P5-SD-03	SEDIMENT	P5-SD-03-0.5_10/24/2017	10/24/2017
PONDS	P5-SW-01	SURFACE WATER	P5-SW-01_10/24/2017	10/24/2017
PONDS	P5-SW-01	SURFACE WATER	P5-SW-01-F_10/24/2017	10/24/2017
PONDS	P5-SW-03	SURFACE WATER	P5-SW-03_10/24/2017	10/24/2017
PONDS	P5-SW-03	SURFACE WATER	P5-SW-03-F_10/24/2017	10/24/2017
PONDS	P6-SD-01	SEDIMENT	P6-SD-01-0.5_10/19/2017	10/19/2017
PONDS	P6-SD-02	SEDIMENT	P6-SD-02-0.5_10/19/2017	10/19/2017
PONDS	P6-SD-04	SEDIMENT	P6-SD-04-0.5_10/19/2017	10/19/2017
PONDS	P6-SD-05	SEDIMENT	P6-SD-05-0.5_10/19/2017	10/19/2017
PONDS	P6-SD-07	SEDIMENT	P6-SD-07-0.5_10/19/2017	10/19/2017
PONDS	P6-SW-01	SURFACE WATER	P6-SW-01_10/18/2017	10/18/2017
PONDS	P6-SW-01	SURFACE WATER	P6-SW-01-F_10/18/2017	10/18/2017
PONDS	P6-SW-02	SURFACE WATER	P6-SW-02_10/18/2017	10/18/2017
PONDS	P6-SW-02	SURFACE WATER	P6-SW-02-F_10/18/2017	10/18/2017
PONDS	P6-SW-04	SURFACE WATER	P6-SW-04_10/18/2017	10/18/2017
PONDS	P6-SW-04	SURFACE WATER	P6-SW-04-F_10/18/2017	10/18/2017
PONDS	P6-SW-05	SURFACE WATER	P6-SW-05_10/18/2017	10/18/2017
PONDS	P6-SW-05	SURFACE WATER	P6-SW-05-F_10/18/2017	10/18/2017
PONDS	P6-SW-07	SURFACE WATER	P6-SW-07_10/18/2017	10/18/2017
PONDS	P6-SW-07	SURFACE WATER	P6-SW-07-F_10/18/2017	10/18/2017
PONDS	P7-SD-01	SEDIMENT	P7-SD-01-0.5_10/25/2017	10/25/2017
PONDS	P7-SD-03	SEDIMENT	P7-SD-03-0.5_10/25/2017	10/25/2017
PONDS	P7-SD-05	SEDIMENT	P7-SD-05-0.5_10/25/2017	10/25/2017
PONDS	P7-SD-06	SEDIMENT	P7-SD-06-0.5_10/25/2017	10/25/2017
PONDS	P7-SW-01	SURFACE WATER	P7-SW-01_10/25/2017	10/25/2017
PONDS	P7-SW-01	SURFACE WATER	P7-SW-01-F_10/25/2017	10/25/2017
PONDS	P7-SW-03	SURFACE WATER	P7-SW-03_10/25/2017	10/25/2017
PONDS	P7-SW-03	SURFACE WATER	P7-SW-03-F_10/25/2017	10/25/2017
PONDS	P7-SW-05	SURFACE WATER	P7-SW-05_10/25/2017	10/25/2017
PONDS	P7-SW-05	SURFACE WATER	P7-SW-05-F_10/25/2017	10/25/2017
PONDS	P7-SW-06	SURFACE WATER	P7-SW-06_10/25/2017	10/25/2017
PONDS	P7-SW-06	SURFACE WATER	P7-SW-06-F_10/25/2017	10/25/2017
PONDS	P8-SD-01	SEDIMENT	P8-SD-01-0.5_10/24/2017	10/24/2017
PONDS	P8-SW-01	SURFACE WATER	P8-SW-01_10/24/2017	10/24/2017
PONDS	P8-SW-01	SURFACE WATER	P8-SW-01-F_10/24/2017	10/24/2017
STREAMS	C1-SD	SEDIMENT	C1-SD-0.5_10/16/2017	10/16/2017
STREAMS	C1-SW	SURFACE WATER	C1-SW_10/16/2017	10/16/2017
STREAMS	C1-SW	SURFACE WATER	C1-SW-F_10/16/2017	10/16/2017
STREAMS	C2-SW	SURFACE WATER	C2-SW_11/01/2016	11/1/2016
STREAMS	C2-SW	SURFACE WATER	C2-SW-F_11/01/2016	11/1/2016
STREAMS	ET-SD-01	SEDIMENT	ET-SD-01-0.5_10/19/2017	10/19/2017
STREAMS	ET-SD-02	SEDIMENT	ET-SD-02-0.5_10/19/2017	10/19/2017
STREAMS	ET-SD-03	SEDIMENT	ET-SD-03-0.5_10/19/2017	10/19/2017
STREAMS	ET-SD-04	SEDIMENT	ET-SD-04-0.5_10/19/2017	10/19/2017
STREAMS	ET-SD-05	SEDIMENT	ET-SD-05-0.5_10/18/2017	10/18/2017
STREAMS	ET-SD-07	SEDIMENT	ET-SD-07-0.5_10/18/2017	10/18/2017
STREAMS	ET-SW-01	SURFACE WATER	ET-SW-01_10/19/2017	10/19/2017
STREAMS	ET-SW-01	SURFACE WATER	ET-SW-01-F_10/19/2017	10/19/2017
STREAMS	ET-SW-02	SURFACE WATER	ET-SW-02_10/19/2017	10/19/2017
STREAMS	ET-SW-02	SURFACE WATER	ET-SW-02-F_10/19/2017	10/19/2017
STREAMS	ET-SW-03	SURFACE WATER	ET-SW-03_10/19/2017	10/19/2017
STREAMS	ET-SW-03	SURFACE WATER	ET-SW-03-F_10/19/2017	10/19/2017
STREAMS	ET-SW-04	SURFACE WATER	ET-SW-04_10/19/2017	10/19/2017
STREAMS	ET-SW-04	SURFACE WATER	ET-SW-04-F_10/19/2017	10/19/2017
STREAMS	ET-SW-05	SURFACE WATER	ET-SW-05_10/18/2017	10/18/2017
STREAMS	ET-SW-05	SURFACE WATER	ET-SW-05-F_10/18/2017	10/18/2017
STREAMS	ET-SW-07	SURFACE WATER	ET-SW-07_10/18/2017	10/18/2017
STREAMS	ET-SW-07	SURFACE WATER	ET-SW-07-F_10/18/2017	10/18/2017
STREAMS	SCBR-SD-02	SEDIMENT	SCBR-SD-02-0.5_10/16/2017	10/16/2017
STREAMS	SCBR-SW-02	SURFACE WATER	SCBR-SW-02_10/16/2017	10/16/2017
STREAMS	SCBR-SW-02	SURFACE WATER	SCBR-SW-02-F_10/16/2017	10/16/2017
STREAMS	SCPPE-SD-01	SEDIMENT	SCPPE-SD-01-0.5_10/17/2017	10/17/2017
STREAMS	SCPPE-SD-03	SEDIMENT	SCPPE-SD-03-0.5_10/17/2017	10/17/2017
STREAMS	SCPPE-SW-01	SURFACE WATER	SCPPE-SW-01_10/17/2017	10/17/2017
STREAMS	SCPPE-SW-01	SURFACE WATER	SCPPE-SW-01_11/01/2016	11/1/2016
STREAMS	SCPPE-SW-01	SURFACE WATER	SCPPE-SW-01-F_10/17/2017	10/17/2017
STREAMS	SCPPE-SW-01	SURFACE WATER	SCPPE-SW-01-F_11/01/2016	11/1/2016
STREAMS	SCPPE-SW-03	SURFACE WATER	SCPPE-SW-03_10/17/2017	10/17/2017
STREAMS	SCPPE-SW-03	SURFACE WATER	SCPPE-SW-03_11/02/2016	11/2/2016
STREAMS	SCPPE-SW-03	SURFACE WATER	SCPPE-SW-03-F_10/17/2017	10/17/2017
STREAMS	SCPPE-SW-03	SURFACE WATER	SCPPE-SW-03-F_11/02/2016	11/2/2016
STREAMS	SCPPE-SW-05	SURFACE WATER	SCPPE-SW-05_11/02/2016	11/2/2016
STREAMS	SCPPE-SW-05	SURFACE WATER	SCPPE-SW-05-F_11/02/2016	11/2/2016
STREAMS	SC-SD-02	SEDIMENT	SC-SD-02-0.5_10/16/2017	10/16/2017
STREAMS	SC-SD-04	SEDIMENT	SC-SD-04-0.5_10/17/2017	10/17/2017
STREAMS	SC-SD-06	SEDIMENT	SC-SD-06-0.5_10/17/2017	10/17/2017
STREAMS	SC-SD-08	SEDIMENT	SC-SD-08-0.5_10/17/2017	10/17/2017

Table 1-1
Samples Used in the Screening Level Ecological Risk Assessment for Wilcox Oil Company

Exposure Area	Location	Matrix	Sample Name	Sample Date
STREAMS	SC-SD-21	SEDIMENT	SC-SD-21_12/18/2018	12/18/2018
STREAMS	SC-SD-22	SEDIMENT	SC-SD-22_12/17/2018	12/17/2018
STREAMS	SC-SW-02	SURFACE WATER	SC-SW-02_10/16/2017	10/16/2017
STREAMS	SC-SW-02	SURFACE WATER	SC-SW-02-F_10/16/2017	10/16/2017
STREAMS	SC-SW-03	SURFACE WATER	SC-SW-03_10/31/2016	10/31/2016
STREAMS	SC-SW-03	SURFACE WATER	SC-SW-03-F_10/31/2016	10/31/2016
STREAMS	SC-SW-04	SURFACE WATER	SC-SW-04_10/17/2017	10/17/2017
STREAMS	SC-SW-04	SURFACE WATER	SC-SW-04_10/31/2016	10/31/2016
STREAMS	SC-SW-04	SURFACE WATER	SC-SW-04-F_10/17/2017	10/17/2017
STREAMS	SC-SW-04	SURFACE WATER	SC-SW-04-F_10/31/2016	10/31/2016
STREAMS	SC-SW-05	SURFACE WATER	SC-SW-05_11/01/2016	11/1/2016
STREAMS	SC-SW-05	SURFACE WATER	SC-SW-05-F_11/01/2016	11/1/2016
STREAMS	SC-SW-05A	SURFACE WATER	SC-SW-05A_11/01/2016	11/1/2016
STREAMS	SC-SW-05A	SURFACE WATER	SC-SW-05A-F_11/01/2016	11/1/2016
STREAMS	SC-SW-06	SURFACE WATER	SC-SW-06_10/17/2017	10/17/2017
STREAMS	SC-SW-06	SURFACE WATER	SC-SW-06_11/02/2016	11/2/2016
STREAMS	SC-SW-06	SURFACE WATER	SC-SW-06-F_10/17/2017	10/17/2017
STREAMS	SC-SW-06	SURFACE WATER	SC-SW-06-F_11/02/2016	11/2/2016
STREAMS	SC-SW-07	SURFACE WATER	SC-SW-07_11/02/2016	11/2/2016
STREAMS	SC-SW-07	SURFACE WATER	SC-SW-07-F_11/02/2016	11/2/2016
STREAMS	SC-SW-08	SURFACE WATER	SC-SW-08_10/17/2017	10/17/2017
STREAMS	SC-SW-08	SURFACE WATER	SC-SW-08_11/02/2016	11/2/2016
STREAMS	SC-SW-08	SURFACE WATER	SC-SW-08-F_10/17/2017	10/17/2017
STREAMS	SC-SW-08	SURFACE WATER	SC-SW-08-F_11/02/2016	11/2/2016
STREAMS	SC-SW-21	SURFACE WATER	SC-SW-21_12/18/2018	12/18/2018
STREAMS	SC-SW-22	SURFACE WATER	SC-SW-21-F_12/18/2018	12/18/2018
STREAMS	SC-SW-22	SURFACE WATER	SC-SW-22_12/17/2018	12/17/2018
STREAMS	SC-SW-22	SURFACE WATER	SC-SW-22-F_12/17/2018	12/17/2018
STREAMS	WT-SD-01	SEDIMENT	WT-SD-01-0.5_10/23/2017	10/23/2017
STREAMS	WT-SD-06	SEDIMENT	WT-SD-06-0.5_10/24/2017	10/24/2017
STREAMS	WT-SW-01	SURFACE WATER	WT-SW-01_10/23/2017	10/23/2017
STREAMS	WT-SW-01	SURFACE WATER	WT-SW-01-F_10/23/2017	10/23/2017
STREAMS	WT-SW-03	SURFACE WATER	WT-SW-03_10/23/2017	10/23/2017
STREAMS	WT-SW-03	SURFACE WATER	WT-SW-03-F_10/23/2017	10/23/2017
STREAMS	WT-SW-06	SURFACE WATER	WT-SW-06_10/24/2017	10/24/2017
STREAMS	WT-SW-06	SURFACE WATER	WT-SW-06-F_10/24/2017	10/24/2017
STREAMS	WTUC-SW	SURFACE WATER	WTUC-SW-F_10/24/2017	10/24/2017
BACKGROUND	BKG-01	SURFACE SOIL	BKG-01-0.5	11/2/2017
BACKGROUND	BKG-02	SURFACE SOIL	BKG-02-0.5	11/2/2017
BACKGROUND	BKG-03	SURFACE SOIL	BKG-03-0.5	11/2/2017
BACKGROUND	BKG-04	SURFACE SOIL	BKG-04-0.5	11/2/2017
BACKGROUND	BKG-05	SURFACE SOIL	BKG-05-0.5	11/2/2017
BACKGROUND	BKG-06	SURFACE SOIL	BKG-06-0.5	11/2/2017
BACKGROUND	BKG-07	SURFACE SOIL	BKG-07-0.5	11/2/2017
BACKGROUND	BKG-08	SURFACE SOIL	BKG-08-0.5	11/2/2017
BACKGROUND	BKG-09	SURFACE SOIL	BKG-09-0.5	11/2/2017
BACKGROUND	BKG-10	SURFACE SOIL	BKG-10-0.5	11/2/2017
BACKGROUND	SCUC1a-SD	SEDIMENT	SCUC1a-SD-0.5	10/18/2017
BACKGROUND	SCUC1c-SD	SEDIMENT	SCUC1c-SD-0.5	10/17/2017
BACKGROUND	ETUC-SD	SEDIMENT	ETUC-SD-0.5	10/23/2017
BACKGROUND	WTUC-SD	SEDIMENT	WTUC-SD-0.5	10/24/2017
BACKGROUND	SCUC1a-SW	SURFACE WATER	SCUC1a-SW	10/18/2017
BACKGROUND	SCUC1c-SW	SURFACE WATER	SCUC1c-SW	10/17/2017

Table 3-1
Measurement Endpoints for Ecological Risk Assessment of Wilcox Oil Company

Assessment Endpoint	Measurement Endpoint	On Site-Measurements/Exposure Point Concentrations (EPC)	Evaluation Method	Risk Indicators
Protection of terrestrial plant viability from impacts of COPCs in surface soil	Initial screening	• surface soil concentrations measured at site in past and more recent sampling	• Direct comparison to the EPA Eco-SSLs and Region 4 ecological screening values to define COPCs	• Chemicals defined as COPCs indicate the potential for risk
	Comparison of surface soil concentrations to benchmarks	• surface soil concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: 95UCLM Concentrations	• Direct comparison of maximum surface soil concentrations to plant benchmarks (TRVs) • Direct comparison of 95UCLM surface soil concentrations and individual concentrations against TRVs • Plant benchmarks from 1) USEPA EcoSSLs 2) ORNL benchmarks (Efroymson et al., 1997a)	• Exceedance of benchmarks indicates potential for risks
	Comparison of surface soil concentrations to background surface soil concentrations.	• surface soil concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: Individual Concentrations	• Direct comparison to background concentrations or published background data (Shacklette and Boerngen 1984) if site-specific data is not available	• Exceedance of benchmarks and background indicates a more certain potential for risk
Protection of soil invertebrates exposed to COPCs in surface soil from adverse survival, growth and reproductive effects	Initial screening	• surface soil concentrations measured at site in past and more recent sampling	• Direct comparison to the EPA Eco-SSLs and Region 4 ecological screening values to define COPCs	• Chemicals defined as COPCs indicate the potential for risk
	Comparison of surface soil concentrations to benchmarks	• surface soil concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: 95UCLM Concentrations	• Direct comparison of maximum surface soil concentrations to invertebrate benchmarks • Direct comparison of 95UCLM surface soil concentrations and individual concentrations to invertebrate benchmarks • Invertebrate benchmarks from USEPA EcoSSLs; ORNL benchmarks (Efroymson et al., 1997b)	• Exceedance of benchmarks indicates potential for risks • Exceedance of benchmarks and background indicates a more certain potential for risks
	Comparison of surface soil concentrations to background surface soil concentrations.	• surface soil concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: Individual Concentrations	• Direct comparison to background concentrations or published background data (Shacklette and Boerngen 1984) if site-specific data is not available	• Exceedance of benchmarks and background indicates a more certain potential for risk
Protection of benthic invertebrates and aquatic organisms exposed to COPCs in sediment and surface water from adverse survival, growth and reproductive effects	Initial screening	• Sediment and surface water concentrations measured at site in past and more recent sampling	• Direct comparison to the Oklahoma Water Resources Board Aquatic Life Criteria, EPA National Recommended Aquatic Life Criteria, and Region 4 ecological screening values to define COPCs	• Chemicals defined as COPCs indicate the potential for risk
	Comparison of sediment and surface water concentrations to benchmarks	• Sediment and surface water concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: 95UCLM Concentrations	• Compare maximum, 95UCLM, and individual sediment concentrations against benthic TRVs (consensus based benchmarks from literature-based studies) • Compare maximum, 95UCLM, and individual surface water concentrations against aquatic TRVs (consensus based benchmarks from literature-based studies)	• Exceedance of benchmarks indicates potential for risks
Protection of terrestrial mammals and birds to ensure that ingestion of COPCs in surface soil, surface water, and plants/prey do not have unacceptable impacts on survival, growth, and reproduction	Initial screening	• surface soil and surface water concentrations measured at site in past and more recent sampling	• Direct comparison to the Oklahoma Water Resources Board Aquatic Life Criteria, EPA National Recommended Aquatic Life Criteria, and Region 4 ecological screening values to define COPCs	• Chemicals defined as COPCs indicate the potential for risk
	Comparison of modeled food web doses to benchmarks	• surface soil and surface water concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined SLERA & BRAPF: 95UCLM Concentrations • Plant food item tissue concentrations modeled using literature-based equations - SLERA: Maximum Concentrations - Refined SLERA & BRAPF: 95UCLM Concentrations • Ingested dose based on literature-based exposure factors and uptake equations - SLERA: Maximum Dose - Refined SLERA & BRAPF: 95UCLM Dose	• Calculate maximum case scenario doses using food web models and compare to no-effects benchmarks • Calculate 95UCLM case scenario doses and compare to no- and low-effects benchmarks • Mammal and bird dose-based benchmarks from 1) USEPA EcoSSL 2) ORNL benchmarks (Sample et al., 1998) 3) Additional literature-based sources as relevant	• Exceedance of benchmarks indicates a potential for risks • Exceedance of low-effects benchmarks indicates a more certain potential for risks
	Comparison of surface soil concentrations to background surface soil concentrations.	• surface soil concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: Individual Concentrations	• Direct comparison to background concentrations or published background data (Shacklette and Boerngen 1984) if site-specific data is not available	• Exceedance of both benchmarks and background indicates a more certain potential for risks

Table 3-1
Measurement Endpoints for Ecological Risk Assessment of Wilcox Oil Company

Assessment Endpoint	Measurement Endpoint	On Site-Measurements/Exposure Point Concentrations (EPC)	Evaluation Method	Risk Indicators
Protection of aquatic-feeding mammals and birds, to ensure that ingestion of COPCs in sediment, surface water, and food do not have adverse impacts on survival, growth, and reproduction	Initial screening	• Sediment and surface water concentrations measured at site in past and more recent sampling	• Direct comparison to the Oklahoma Water Resources Board Aquatic Life Criteria, EPA National Recommended Aquatic Life Criteria, and Region 4 ecological screening values to define COPCs	• Chemicals defined as COPCs indicate the potential for risk
	Comparison of modeled food web doses to benchmarks	• Sediment and surface water concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined SLERA & BRAPF: 95UCLM Concentrations • Aquatic food item tissue concentrations modeled using literature-based equations - SLERA: Maximum Concentrations - Refined SLERA & BRAPF: 95UCLM Concentrations • Ingested dose based on literature-based exposure factors and uptake equations - SLERA: Maximum Dose - Refined SLERA & BRAPF: 95UCLM Dose	• Calculate maximum case scenario doses using food web models and compare to no-effects benchmarks • Calculate 95UCLM case scenario doses and compare to no- and low-effects benchmarks • Bird dose-based benchmarks from 1) USEPA EcoSSL 2) ORNL benchmarks (Sample et al., 1998) 3) Additional literature-based sources as relevant	• Exceedance of benchmarks indicates a potential for risks • Exceedance of low-effects benchmarks indicates a more certain potential for risks
	Comparison of sediment and surface water concentrations to background sediment and surface water concentrations.	• Sediment and surface water concentrations measured at site in past and more recent sampling - SLERA: Maximum Concentrations - Refined BRAPF: Individual Concentrations	• Direct comparison to background concentrations	• Exceedance of both benchmarks and background indicates a more certain potential for risks
Protection of reptiles and amphibians to ensure that ingestion of COPCs in surface soil, sediment, surface water, and prey do not have unacceptable impacts on survival, growth, and reproduction	Comparison of modeled food web doses to benchmarks	• EPCs evaluated for other receptors	• Evaluate whether other wildlife receptors are at risk and consider results as surrogate for reptiles.	• Risks from COPCs to other receptors indicate that there may be a risk to reptiles and amphibians from the same COPCs

Table 3-2
Soil, Sediment, and Surface Water Ecological Screening Levels

Chemical	Soil Screening Values (mg/kg)	Soil Screening Value Source	Freshwater Sediment Screening Value (mg/kg)	Freshwater Sediment Screening Value Source	Surface Water Screening Value (µg/L)	Surface Water Screening Value Source
Metals						
Aluminum	5.00E+01	Eco SSL	2.50E+04	Region IV	6.80E+02	EPA National Recommended Aquatic Life Criteria 2018 Aluminum Criteria Calculator
Antimony	2.70E-01	Region IV Screening Level	2.00E+00	Region IV	1.90E+02	Region IV Freshwater
Arsenic	1.80E+01	Region IV Screening Level	9.80E+00	Region IV	1.50E+02	OWRB 2017
Barium	3.30E+02	Region IV Screening Level	2.00E+01	Region IV	2.20E+02	Region IV Freshwater
Beryllium	2.50E+00	Region IV Screening Level	NA	--	1.10E+01	Region IV Freshwater
Cadmium	3.60E-01	Region IV Screening Level	1.00E+00	Region IV	2.30E-01	OWRB 2017
Chromium	2.30E+01	Region IV Screening Level	4.34E+01	Region IV	6.98E+01	OWRB 2017
Chromium, hexavalent	3.40E-01	Region IV Screening Level	NA	--	1.10E+01	OWRB 2017
Cobalt	1.30E+01	Region IV Screening Level	5.00E+01	Region IV	1.90E+01	Region IV Freshwater
Copper	2.80E+01	Region IV Screening Level	3.16E+01	Region IV	1.20E+01	OWRB 2017
Lead	1.10E+01	Region IV Screening Level	3.58E+01	Region IV	2.90E+00	OWRB 2017
Manganese	2.20E+02	Region IV Screening Level	4.60E+02	Region IV	9.30E+01	Region IV Freshwater
Mercury	1.30E-02	Region IV Screening Level	1.80E-01	Region IV	1.30E+00	OWRB 2017
Nickel	3.80E+01	Region IV Screening Level	2.27E+01	Region IV	4.89E+01	OWRB 2017
Selenium	5.20E-01	Region IV Screening Level	7.20E-01	Region IV	5.00E+00	OWRB 2017
Silver	4.20E+00	Region IV Screening Level	1.00E+00	Region IV	2.84E+00	OWRB 2017
Thallium	2.20E-01	Region IV Screening Level	NA	--	6.00E+00	Region IV
Vanadium	7.80E+00	Region IV Screening Level	NA	--	2.70E+01	Region IV Freshwater
Zinc	4.60E+01	Region IV Screening Level	1.21E+02	Region IV	1.10E+02	OWRB 2017
Inorganics						
Cyanide	1.00E-01	Region IV Screening Level	NA	--	1.07E+01	OWRB 2017
PAHs						
1-Methylnaphthalene	NA	defer to LMW PAH	1.41E-01	Region IV	6.10E+00	Region IV Freshwater
2-Methylnaphthalene	NA	defer to LMW PAH	2.00E-02	Region IV	4.70E+00	Region IV Freshwater
Acenaphthene	NA	defer to LMW PAH	6.70E-03	Region IV	1.50E+01	Region IV Freshwater
Acenaphthylene	NA	defer to LMW PAH	5.90E-03	Region IV	1.30E+01	Region IV Freshwater
Anthracene	NA	defer to LMW PAH	5.70E-02	Region IV	2.00E-02	Region IV Freshwater
Benzo(a)Anthracene	NA	defer to HMW PAH	1.08E-01	Region IV	4.70E+00	Region IV Freshwater
Benzo(a)Pyrene	NA	defer to HMW PAH	1.50E-01	Region IV	6.00E-02	Region IV Freshwater
Benzo(b)Fluoranthene	NA	defer to HMW PAH	1.90E-01	Region IV	2.60E+00	Region IV Freshwater
Benzo(g,h,i)Perylene	NA	defer to HMW PAH	1.70E-01	Region IV	1.20E-02	Region IV Freshwater
Benzo(k)Fluoranthene	NA	defer to HMW PAH	2.40E-01	Region IV	6.00E-02	Region IV Freshwater
Chrysene	NA	defer to HMW PAH	1.66E-01	Region IV	4.70E+00	Region IV Freshwater
Dibenzo(a,h)Anthracene	NA	defer to HMW PAH	3.30E-02	Region IV	1.20E-02	Region IV Freshwater
Fluoranthene	NA	defer to LMW PAH	4.23E-01	Region IV	8.00E-01	Region IV Freshwater
Fluorene	NA	defer to LMW PAH	7.70E-02	Region IV	1.90E+01	Region IV Freshwater
Indeno(1,2,3-Cd)Pyrene	NA	defer to HMW PAH	2.00E-01	Region IV	1.20E-02	Region IV Freshwater
Naphthalene	NA	defer to LMW PAH	1.76E-01	Region IV	2.10E+01	Region IV Freshwater
Phenanthrene	NA	defer to LMW PAH	2.04E-01	Region IV	2.30E+00	Region IV Freshwater
Pyrene	NA	defer to HMW PAH	1.95E-01	Region IV	4.60E+00	Region IV Freshwater
Total LMW PAHs	2.90E+01	Region IV Screening Level	6.00E-01	Region IV	NA	--
Total HMW PAHs	1.10E+00	Region IV Screening Level	1.00E+00	Region IV	NA	--
Total PAHs	NA	--	1.61E+00	Region IV	NA	--
Pesticides						
4,4'-DDD	2.10E-02	Region IV Screening Level	3.50E-03	Region IV	1.00E-02	Region IV Freshwater
4,4'-DDE	2.10E-02	Region IV Screening Level	1.40E-03	Region IV	3.00E-01	Region IV Freshwater
4,4'-DDT	2.10E-02	Region IV Screening Level	1.00E-03	Region IV	1.00E-03	Region IV Freshwater
alpha-Chlordane	2.90E-03	Region IV Screening Level	3.20E-03	Region IV	4.00E-03	Region IV Freshwater
gamma-Chlordane	2.00E-02	Region IV Screening Level	3.20E-03	Region IV	4.00E-03	Region IV Freshwater
SVOCs						
1,1-Biphenyl	2.00E-01	Region IV Screening Level	1.98E-01	Region IV	6.50E+00	Region IV Freshwater
1,2,3-Trichlorobenzene	2.00E+01	Region IV Screening Level	1.13E-01	Region IV	3.50E+01	Region IV Freshwater

Table 3-2
Soil, Sediment, and Surface Water Ecological Screening Levels

Chemical	Soil Screening Values (mg/kg)	Soil Screening Value Source	Freshwater Sediment Screening Value (mg/kg)	Freshwater Sediment Screening Value Source	Surface Water Screening Value (µg/L)	Surface Water Screening Value Source
4-chloroaniline	1.00E+00	Region IV Screening Level	9.00E-04	Region IV	8.00E-01	Region IV Freshwater
4-methylphenol	8.00E-02	Region IV Screening Level	9.30E-02	Region IV	5.30E+01	Region IV Freshwater
Acetophenone	NA	--	NA	--	NA	--
Bis(2-ethylhexyl)phthalate	2.00E-02	Avian Eco-SSL	1.80E-01	Region IV	8.00E+00	Region IV Freshwater
Butyl benzyl phthalate	5.90E-01	Soil Invertebrate Eco-SSL	1.00E-01	Region IV	2.30E+01	Region IV Freshwater
Caprolactam	NA	--	NA	--	NA	--
Carbazole	7.00E-02	Region IV Screening Level	6.90E-02	Region IV	4.00E+00	Region IV Freshwater
Dibenzofuran	1.50E-01	Region IV Screening Level	5.10E-01	Region IV	4.00E+00	Region IV Freshwater
Diethyl phthalate	2.50E-01	Region IV Screening Level	6.30E-01	Region IV	2.20E+02	Region IV Freshwater
Dimethyl phthalate	3.50E-01	Region IV Screening Level	6.78E-01	Region IV	1.10E+03	Region IV Freshwater
Di-n-butyl phthalate	1.10E-02	Avian Eco-SSL	1.10E-02	Region IV	1.90E+01	Region IV Freshwater
Pentachlorophenol	2.10E+00	Avian Eco-SSL	1.10E-02	Region IV	1.50E+01	Region IV Freshwater
Phenol	7.90E-01	Region IV	1.75E-01	Region IV	1.60E+02	Region IV
VOCs						
1,4-dioxane	NA	--	NA	--	2.20E+04	Region IV Freshwater
2-Butanone	1.00E+00	Region IV Screening Level	7.60E+00	Region IV	2.20E+04	Region IV Freshwater
Acetone	1.20E+00	Region IV Screening Level	6.50E-02	Region IV	1.70E+03	Region IV Freshwater
Benzene	1.20E-01	Region IV Screening Level	1.00E-02	Region IV	1.60E+02	Region IV Freshwater
Carbon disulfide	5.00E-03	Soil Invertebrate Eco-SSL	7.80E-03	Region IV	1.50E+01	Region IV Freshwater
Cyclohexane	NA	---	2.78E-01	Region IV	1.58E+02	Region IV Freshwater
Ethylbenzene	2.70E-01	Region IV Screening Level	2.90E-01	Region IV	6.10E+01	Region IV Freshwater
Isopropylbenzene (Cumene)	4.00E-02	Region IV Screening Level	3.50E-02	Region IV	4.80E+00	Region IV Freshwater
Methylcyclohexane	NA	--	NA	--	5.20E+01	Region IV Freshwater
Methylene chloride	2.10E-01	Region IV Screening Level	1.80E-02	Region IV	1.50E+03	Region IV Freshwater
Toluene	1.50E-01	Region IV Screening Level	1.00E-02	Region IV	6.20E+01	Region IV Freshwater
Trichlorofluoromethane	1.64E+01	Region IV Screening Level	NA	--	NA	--
Xylenes (m & p)	1.00E-01	Region IV Screening Level for total xylenes	1.30E-01	Region IV Screening Level for total xylenes	2.60E+02	Region IV Freshwater for total xylenes
Xylenes (o)	1.00E-01	Region IV Screening Level for total xylenes	1.30E-01	Region IV Screening Level for total xylenes	2.60E+02	Region IV Freshwater for total xylenes
Xylenes (Total)	1.00E-01	Region IV Screening Level	1.30E-01	Region IV	2.60E+02	Region IV Freshwater

NOTES:
Eco-SSL = Ecological Soil Screening Level.
HMW PAH = High molecular weight polynuclear aromatic hydrocarbon.
LMW PAH = Low molecular weight polynuclear aromatic hydrocarbon.
mg/kg = Milligram per kilogram.
mg/L = Milligram per liter.
µg/L = Microgram per liter.
NA = Screening value not available.
ND = Analyte not detected in media.
ODEQ = Oklahoma Department of Environmental Quality.
OWRB = Oklahoma Water Resources Board.
PAH = Polycyclic aromatic hydrocarbon.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.
Freshwater screening values were adjusted using the average hardness data as applicable.
Aluminum screening value was calculated using a pH 7, Total Orgnaic Carbon of 7 mg/L, and Hardness of 93 mg/L $CaCO_3$.
The surface water screening criteria for pentachlorophenol was determined assuming a pH of 7.8.

Table 3-3
Detection Comparison to Screening Levels
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Analyte	Surface Soil				Selection of Chemicals of Potential Concern
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Screening Criteria (mg/kg)	Terrestrial Habitats
Metals					
Antimony	8/203	1.80E+00	5.41E-01	2.70E-01	YES
Arsenic	203/203	2.09E+01	2.67E+00	1.80E+01	YES
Barium	203/203	2.07E+02	5.03E+01	3.30E+02	NO
Beryllium	110/203	1.30E+00	3.37E-01	2.50E+00	NO
Cadmium	114/203	8.02E+01	7.20E-01	3.60E-01	YES
Chromium	203/203	2.97E+01	8.90E+00	2.30E+01	YES
Chromium, hexavalent	8/11	1.50E+00	1.10E+00	3.40E-01	YES
Cobalt	188/203	2.25E+01	3.20E+00	1.30E+01	YES
Copper	201/203	7.49E+03	2.25E+02	2.80E+01	YES
Lead	203/203	2.08E+04	3.46E+02	1.10E+01	YES
Manganese	203/203	1.43E+03	2.63E+02	2.20E+02	YES
Mercury	118/203	2.00E+00	2.06E-01	1.30E-02	YES
Nickel	202/203	4.07E+01	7.17E+00	3.80E+01	YES
Selenium	37/203	1.60E+00	3.89E-01	5.20E-01	YES
Silver	41/203	2.30E-01	7.25E-02	4.20E+00	NO
Thallium	41/203	4.80E-01	4.50E-02	2.20E-01	YES
Vanadium	203/203	7.92E+01	1.42E+01	7.80E+00	YES
Zinc	203/203	1.38E+04	4.70E+02	4.60E+01	YES
Inorganics					
Cyanide	44/145	7.10E-01	1.06E-01	1.00E-01	YES
PAHs					
2-Methylnaphthalene	141/203	3.00E+01	1.42E+00	NA	defer to LMW PAH
Acenaphthene	36/203	2.50E+00	2.27E-02	NA	defer to LMW PAH
Acenaphthylene	52/203	5.50E-01	3.26E-02	NA	defer to LMW PAH
Anthracene	129/203	2.50E+01	9.51E-01	NA	defer to LMW PAH
Benzo(a)Anthracene	166/203	4.40E+01	1.84E+00	NA	defer to HMW PAH
Benzo(a)Pyrene	165/203	3.10E+01	1.44E+00	NA	defer to HMW PAH
Benzo(b)Fluoranthene	171/203	3.50E+01	9.76E-01	NA	defer to HMW PAH
Benzo(g,h,i)Perylene	172/203	9.10E+00	6.04E-01	NA	defer to HMW PAH
Benzo(k)Fluoranthene	123/201	4.20E+00	2.41E-01	NA	defer to HMW PAH
Chrysene	177/203	1.20E+02	4.65E+00	NA	defer to HMW PAH
Dibenzo(a,h)Anthracene	88/203	5.90E+00	2.98E-01	NA	defer to HMW PAH
Fluoranthene	172/203	6.20E+01	9.02E-01	NA	defer to LMW PAH
Fluorene	57/203	3.30E+01	9.08E-02	NA	defer to LMW PAH
Indeno(1,2,3-Cd)Pyrene	161/203	5.70E+00	3.31E-01	NA	defer to HMW PAH
Naphthalene	100/203	8.50E+00	4.24E-01	NA	defer to LMW PAH
Phenanthrene	179/203	1.60E+02	6.41E+00	NA	defer to LMW PAH
Pyrene	181/203	1.20E+02	5.29E+00	NA	defer to HMW PAH

Table 3-3
Detection Comparison to Screening Levels
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Analyte	Surface Soil				Selection of Chemicals of Potential Concern
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Screening Criteria (mg/kg)	Terrestrial Habitats
Total LMW PAHs	183/183	1.88E+02	1.15E+01	2.90E+01	YES
Total HMW PAHs	182/182	2.63E+02	1.40E+01	1.10E+00	YES
Total PAHs	191/191	5.61E+02	4.61E+01	NA	defer to LMW or HMW PAH
Pesticides					
4,4'-DDD	30/35	1.10E-01	3.17E-02	2.10E-02	YES
4,4'-DDE	30/35	1.70E-02	6.13E-03	2.10E-02	NO
4,4'-DDT	33/35	4.00E-02	1.63E-02	2.10E-02	YES
alpha-Chlordane	3/35	5.50E-04	5.50E-04	2.90E-03	NO
gamma-Chlordane	32/35	5.00E-02	1.33E-02	2.00E-02	YES
SVOCs					
1,1-Biphenyl	45/203	9.70E-01	2.27E-01	2.00E-01	YES
4-chloroaniline	1/195	1.60E-02	1.60E-02	1.00E+00	NO
4-methylphenol	3/201	1.50E-01	1.50E-01	8.00E-02	YES
Acetophenone	4/203	9.00E-02	9.00E-02	NA	YES
Bis(2-ethylhexyl)phthalate	12/203	5.00E-01	5.00E-01	2.00E-02	YES
Butyl benzyl phthalate	1/203	2.30E-02	2.30E-02	5.90E-01	NO
Carbazole	20/203	4.00E+01	1.40E-01	7.00E-02	YES
Dibenzofuran	49/203	1.10E+00	1.33E-02	1.50E-01	YES
Dimethyl phthalate	20/203	2.80E-01	1.54E-01	3.50E-01	NO
Di-n-butyl phthalate	1/203	5.50E-02	5.50E-02	1.10E-02	YES
Pentachlorophenol	5/203	2.00E-01	1.03E-02	2.10E+00	NO
Phenol	21/203	2.40E-01	1.48E-01	7.90E-01	NO
VOCs					
1,4-dioxane	2/202	4.50E-03	4.50E-03	NA	YES
2-Butanone	13/69	6.50E-02	9.58E-03	1.00E+00	NO
Acetone	32/69	2.10E-01	1.37E-02	1.20E+00	NO
Carbon disulfide	1/68	6.30E-03	6.30E-03	5.00E-03	YES
Cyclohexane	8/69	1.30E+01	2.44E-03	NA	YES
Isopropylbenzene (Cumene)	7/69	1.70E+00	1.41E-01	4.00E-02	YES
Toluene	12/69	6.40E-01	1.09E-02	1.50E-01	YES
Xylenes (m & p)	12/69	2.40E+00	3.16E-01	1.00E-01	YES
Xylenes (o)	10/69	5.40E-01	6.49E-02	1.00E-01	YES

Table 3-4
Detection Comparison to Screening Levels
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Analyte	Surface Soil				Selection of Chemicals of Potential Concern
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Screening Criteria (mg/kg)	Terrestrial Habitats
Metals					
Antimony	25/383	6.90E+00	3.58E-01	2.70E-01	YES
Arsenic	382/383	2.21E+01	3.08E+00	1.80E+01	YES
Barium	376/377	6.07E+02	5.21E+01	3.30E+02	YES
Beryllium	168/383	4.30E+00	3.51E-01	2.50E+00	YES
Cadmium	80/383	6.20E+00	3.63E-01	3.60E-01	YES
Chromium	382/383	9.50E+01	7.63E+00	2.30E+01	YES
Cobalt	353/377	6.12E+01	4.93E+00	1.30E+01	YES
Copper	381/383	1.08E+02	1.23E+01	2.80E+01	YES
Lead	376/377	2.73E+03	7.89E+01	1.10E+01	YES
Manganese	383/383	7.40E+03	4.03E+02	2.20E+02	YES
Mercury	165/383	2.70E-01	2.96E-02	1.30E-02	YES
Nickel	357/383	6.15E+01	6.60E+00	3.80E+01	YES
Selenium	81/383	8.90E+00	4.71E-01	5.20E-01	YES
Silver	32/383	4.70E+00	1.09E-01	4.20E+00	YES
Thallium	4/383	3.80E+00	3.80E+00	2.20E-01	YES
Vanadium	377/377	5.22E+01	1.17E+01	7.80E+00	YES
Zinc	382/383	1.11E+03	5.40E+01	4.60E+01	YES
Inorganics					
Cyanide	98/154	9.30E-01	1.15E-01	1.00E-01	YES
PAHs					
1-Methylnaphthalene	4/8	1.26E-01	1.26E-01	NA	defer to LMW PAH
2-Methylnaphthalene	172/357	1.80E+01	4.55E-01	NA	defer to LMW PAH
Acenaphthene	43/357	5.30E-01	1.90E-02	NA	defer to LMW PAH
Acenaphthylene	148/357	2.10E-01	1.51E-02	NA	defer to LMW PAH
Anthracene	182/357	6.56E-01	3.10E-02	NA	defer to LMW PAH
Benzo(a)Anthracene	264/357	1.10E+01	2.25E-01	NA	defer to HMW PAH
Benzo(a)Pyrene	267/367	1.20E+01	2.27E-01	NA	defer to HMW PAH
Benzo(b)Fluoranthene	279/357	2.00E+01	3.60E-01	NA	defer to HMW PAH
Benzo(g,h,i)Perylene	244/357	2.20E+00	7.58E-02	NA	defer to HMW PAH
Benzo(k)Fluoranthene	205/355	7.50E+00	1.35E-01	NA	defer to HMW PAH
Chrysene	292/357	1.30E+01	2.93E-01	NA	defer to HMW PAH
Dibenzo(a,h)Anthracene	169/355	4.40E-01	1.95E-02	NA	defer to HMW PAH
Fluoranthene	277/357	1.60E+01	3.06E-01	NA	defer to LMW PAH
Fluorene	62/357	1.10E+01	3.79E-02	NA	defer to LMW PAH
Indeno(1,2,3-Cd)Pyrene	250/355	3.10E+00	8.08E-02	NA	defer to HMW PAH
Naphthalene	138/357	3.70E+00	1.19E-01	NA	defer to LMW PAH
Phenanthrene	286/357	5.80E+00	2.04E-01	NA	defer to LMW PAH
Pyrene	291/357	1.60E+01	4.28E-01	NA	defer to HMW PAH

Table 3-4
Detection Comparison to Screening Levels
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Analyte	Surface Soil				Selection of Chemicals of Potential Concern
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Screening Criteria (mg/kg)	Terrestrial Habitats
Total LMW PAHs	301/301	2.51E+01	9.41E-01	2.90E+01	NO
Total HMW PAHs	304/304	4.50E+01	1.16E+00	1.10E+00	YES
Total PAHs	323/323	1.01E+02	2.82E+00	NA	defer to LMW or HMW PAH
Pesticides					
4,4'-DDD	63/147	8.50E-03	7.69E-04	2.10E-02	NO
4,4'-DDE	72/147	5.20E-03	7.48E-04	2.10E-02	NO
4,4'-DDT	62/147	1.00E-02	1.07E-03	2.10E-02	NO
alpha-Chlordane	11/147	9.50E-03	6.36E-05	2.90E-03	YES
gamma-Chlordane	67/147	1.60E-02	1.42E-03	2.00E-02	NO
SVOCs					
1,1-Biphenyl	4/357	9.70E-02	9.70E-02	2.00E-01	NO
Acetophenone	1/357	6.10E-02	6.10E-02	NA	YES
Bis(2-ethylhexyl)phthalate	92/355	9.80E-01	9.80E-01	2.00E-02	YES
Carbazole	15/357	4.38E-01	6.37E-02	7.00E-02	YES
Dibenzofuran	8/357	1.80E-01	3.99E-02	1.50E-01	YES
Dimethyl phthalate	101/357	4.80E-01	1.44E-01	3.50E-01	YES
Di-n-butyl phthalate	9/357	1.40E+00	6.42E-02	1.10E-02	YES
Pentachlorophenol	20/357	9.90E-03	2.25E-03	2.10E+00	NO
Phenol	89/357	3.00E-01	1.41E-01	7.90E-01	NO
VOCs					
2-Butanone	48/188	6.60E-02	6.89E-03	1.00E+00	NO
Acetone	111/188	2.50E-01	2.84E-02	1.20E+00	NO
Benzene	1/188	2.80E+00	2.80E+00	1.20E-01	YES
Cyclohexane	5/188	4.10E+01	7.00E-01	NA	YES
Ethylbenzene	9/188	6.70E+00	4.15E-01	2.70E-01	YES
Isopropylbenzene (Cumene)	3/188	3.20E+00	3.20E+00	4.00E-02	YES
Methylene chloride	15/188	5.10E-03	1.66E-03	2.10E-01	NO
Toluene	104/188	3.20E-01	3.79E-03	1.50E-01	YES
Xylenes (m & p)	38/188	5.90E-01	1.74E-02	1.00E-01	YES
Xylenes (o)	12/188	2.80E-01	8.77E-03	1.00E-01	YES

Table 3-5
Detection Comparison to Screening Levels
for Aquatic Receptors in Ponds

Analyte	Sediment (Ponds)			Surface Water (Ponds)			Surface Water (Dissolved)			Selection of Chemicals of Potential Concern	
	Frequency	Maximum (mg/kg)	Screening Criteria (mg/kg)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Aquatic Habitats	
Metals											
Aluminum	22/22	1.69E+04	2.50E+04	9/22	1.91E+04	6.80E+02	4/22	4.66E+02	6.80E+02	YES	Surface water
Arsenic	22/22	4.60E+00	9.80E+00	2/22	3.40E+00	1.50E+02	0/22	0.00E+00	1.50E+02	NO	--
Barium	22/22	1.12E+02	2.00E+01	20/22	2.36E+02	2.20E+02	19/22	5.27E+01	2.20E+02	YES	Sediment, surface water
Beryllium	3/22	5.60E-01	NA	0/22	0.00E+00	1.10E+01	0/22	0.00E+00	1.10E+01	YES	Sediment
Cadmium	0/22	0.00E+00	1.00E+00	4/22	2.50E+01	2.30E-01	7/22	9.60E+00	2.30E-01	YES	Surface water
Chromium	22/22	1.33E+01	4.34E+01	4/22	1.80E+01	6.98E+01	0/22	0.00E+00	6.98E+01	NO	--
Chromium, hexavalent	1/1	4.80E+00	NA	0/1	0.00E+00	1.10E+01	0/22	0.00E+00	1.10E+01	YES	Sediment
Cobalt	22/22	9.00E+00	5.00E+01	0/22	0.00E+00	1.90E+01	0/22	0.00E+00	1.90E+01	NO	--
Copper	22/22	1.25E+01	3.16E+01	2/22	2.69E+01	1.20E+01	0/22	0.00E+00	1.20E+01	YES	Surface water
Lead	22/22	2.24E+02	3.58E+01	8/22	1.81E+02	2.90E+00	3/22	3.01E+01	2.90E+00	YES	Sediment, surface water
Manganese	22/22	5.00E+02	4.60E+02	22/22	4.13E+02	9.30E+01	16/22	1.67E+02	9.30E+01	YES	Sediment, surface water
Mercury	17/22	4.90E-02	1.80E-01	0/22	0.00E+00	1.30E+00	0/22	0.00E+00	1.30E+00	NO	--
Nickel	22/22	1.44E+01	2.27E+01	0/22	0.00E+00	4.89E+01	0/22	0.00E+00	4.89E+01	NO	--
Vanadium	22/22	2.34E+01	NA	2/22	2.91E+01	2.70E+01	0/22	0.00E+00	2.70E+01	YES	Surface water
Zinc	22/22	8.17E+01	1.21E+02	4/22	3.69E+01	1.10E+02	3/22	2.45E+01	1.10E+02	NO	--
Inorganics											
Cyanide	9/22	2.00E-01	NA	9/22	0.00E+00	1.07E+01	0/0	--	1.07E+01	YES	Sediment
PAHs											
2-Methylnaphthalene	7/22	5.90E-02	2.00E-02	0/17	0.00E+00	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Acenaphthene	1/22	3.40E-03	6.70E-03	0/17	0.00E+00	1.50E+01	0/0	--	1.50E+01	NO	defer to Total PAHs
Acenaphthylene	8/22	7.30E-03	5.90E-03	0/17	0.00E+00	1.30E+01	0/0	--	1.30E+01	YES	defer to Total PAHs
Anthracene	10/22	4.90E-02	5.70E-02	0/17	0.00E+00	2.00E-02	0/0	--	2.00E-02	NO	defer to Total PAHs
Benzo(a)Anthracene	18/22	3.50E-01	1.08E-01	0/17	0.00E+00	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Benzo(a)Pyrene	17/22	2.00E-01	1.50E-01	7/17	6.00E-02	6.00E-02	0/0	--	6.00E-02	YES	defer to Total PAHs
Benzo(b)Fluoranthene	20/22	2.10E-01	1.90E-01	0/17	0.00E+00	2.60E+00	0/0	--	2.60E+00	YES	defer to Total PAHs
Benzo(g,h,i)Perylene	18/22	2.20E-01	1.70E-01	0/17	0.00E+00	1.20E-02	0/0	--	1.20E-02	YES	defer to Total PAHs
Benzo(k)Fluoranthene	9/22	2.50E-02	2.40E-01	0/17	0.00E+00	6.00E-02	0/0	--	6.00E-02	NO	defer to Total PAHs
Chrysene	20/22	7.50E-01	1.66E-01	0/17	0.00E+00	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Dibenzo(a,h)Anthracene	9/22	5.80E-02	3.30E-02	0/17	0.00E+00	1.20E-02	0/0	--	1.20E-02	YES	defer to Total PAHs
Fluoranthene	19/22	1.60E-01	4.23E-01	2/17	3.70E-02	8.00E-01	0/0	--	8.00E-01	NO	defer to Total PAHs
Fluorene	4/22	1.50E-02	7.70E-02	0/17	0.00E+00	1.90E+01	0/0	--	1.90E+01	NO	defer to Total PAHs
Indeno(1,2,3-Cd)Pyrene	16/22	1.00E-01	2.00E-01	0/17	0.00E+00	1.20E-02	0/0	--	1.20E-02	NO	defer to Total PAHs
Naphthalene	4/22	1.80E-02	1.76E-01	0/17	0.00E+00	2.10E+01	0/0	--	2.10E+01	NO	defer to Total PAHs
Phenanthrene	13/22	7.10E-01	2.04E-01	0/17	0.00E+00	2.30E+00	0/0	--	2.30E+00	YES	defer to Total PAHs
Pyrene	19/22	7.30E-01	1.95E-01	0/17	0.00E+00	4.60E+00	0/0	--	4.60E+00	YES	defer to Total PAHs
Total LMW PAHs	13/13	8.60E-01	6.00E-01	0/17	0.00E+00	NA	0/0	--	NA	YES	defer to Total PAHs
Total HMW PAHs	20/20	1.64E+00	1.00E+00	2/2	3.70E-02	NA	0/0	--	NA	YES	defer to Total PAHs
Total PAHs	20/20	3.66E+00	1.61E+00	9/9	6.00E-02	NA	0/0	--	NA	YES	Sediment

Table 3-5
Detection Comparison to Screening Levels
for Aquatic Receptors in Ponds

Analyte	Sediment (Ponds)			Surface Water (Ponds)			Surface Water (Dissolved)			Selection of Chemicals of Potential Concern	
	Frequency	Maximum (mg/kg)	Screening Criteria (mg/kg)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Aquatic Habitats	
SVOCs											
1,2,3-Trichlorobenzene	1/16	1.50E-02	1.13E-01	0/22	0.00E+00	3.50E+01	0/0	--	3.50E+01	NO	--
4-chloroaniline	3/22	0.00E+00	9.00E-04	0/22	0.00E+00	8.00E-01	0/0	--	8.00E-01	NO	--
4-methylphenol	3/22	1.40E-01	9.30E-02	0/22	0.00E+00	5.30E+01	0/0	--	5.30E+01	YES	Sediment
VOCs											
2-Butanone	16/21	2.40E-01	7.60E+00	0/16	0.00E+00	2.20E+04	0/0	--	2.20E+04	NO	--
Acetone	18/22	8.60E-01	6.50E-02	11/16	9.30E+00	1.70E+03	0/0	--	1.70E+03	YES	Sediment
Carbon disulfide	3/19	4.10E-03	7.80E-03	1/16	1.00E+00	1.50E+01	0/0	--	1.50E+01	NO	--
Ethylbenzene	1/16	2.90E-04	2.90E-01	0/16	0.00E+00	6.10E+01	0/0	--	6.10E+01	NO	--
Methylene chloride	8/19	1.30E-03	1.80E-02	0/16	0.00E+00	1.50E+03	0/0	--	1.50E+03	NO	--
Toluene	15/20	1.00E-02	1.00E-02	0/16	0.00E+00	6.20E+01	0/0	--	6.20E+01	YES	Sediment

Table 3-6
Detection Comparison to Screening Levels
for Aquatic Receptors in Streams

Analyte	Sediment (Streams)			Surface Water (Streams)			Surface Water (Dissolved)			Selection of Chemicals of Potential Concern	
	Frequency	Maximum (mg/kg)	Screening Criteria (mg/kg)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Aquatic Habitats	
Metals											
Aluminum	18/18	1.41E+04	2.50E+04	13/30	9.48E+02	6.80E+02	9/31	2.15E+02	6.80E+02	YES	Surface Water
Antimony	0/18	0.00E+00	2.00E+00	0/30	0.00E+00	1.90E+02	1/31	2.10E-01	1.90E+02	NO	--
Arsenic	18/18	7.20E+00	9.80E+00	3/30	5.40E+00	1.50E+02	2/31	9.10E-01	1.50E+02	NO	--
Barium	18/18	1.47E+02	2.00E+01	30/30	2.24E+02	2.20E+02	31/31	2.20E+02	2.20E+02	YES	Sediment, surface water
Beryllium	3/18	2.60E-01	NA	0/30	0.00E+00	1.10E+01	0/31	0.00E+00	1.10E+01	YES	Sediment
Chromium	18/18	1.43E+01	4.34E+01	2/30	1.30E+00	6.98E+01	2/31	4.10E-01	6.98E+01	NO	--
Chromium, hexavalent	4/4	3.80E+00	NA	4/15	3.42E-01	1.10E+01	4/16	3.30E-01	1.10E+01	YES	Sediment
Cobalt	18/18	1.40E+01	5.00E+01	2/30	5.20E-01	1.90E+01	2/31	3.60E-01	1.90E+01	NO	--
Copper	18/18	1.10E+01	3.16E+01	2/30	1.20E+00	1.20E+01	2/31	8.90E-01	1.20E+01	NO	--
Lead	18/18	9.17E+01	3.58E+01	5/30	1.91E+01	2.90E+00	5/31	6.10E+00	2.90E+00	YES	Sediment, surface water
Manganese	18/18	1.02E+03	4.60E+02	30/30	1.08E+03	9.30E+01	31/31	1.10E+03	9.30E+01	YES	Sediment, surface water
Mercury	5/18	2.50E-02	1.80E-01	0/30	0.00E+00	1.30E+00	0/31	0.00E+00	1.30E+00	NO	--
Nickel	18/18	1.89E+01	2.27E+01	2/30	1.90E+00	4.89E+01	2/31	1.30E+00	4.89E+01	NO	--
Selenium	0/18	0.00E+00	7.20E-01	0/30	0.00E+00	5.00E+00	1/31	6.50E-01	5.00E+00	NO	--
Silver	2/18	7.50E-02	1.00E+00	0/30	0.00E+00	2.84E+00	0/31	0.00E+00	2.84E+00	NO	--
Vanadium	18/18	3.08E+01	NA	2/30	2.40E+00	2.70E+01	2/31	6.40E-01	2.70E+01	YES	Sediment
Zinc	18/18	1.34E+02	1.21E+02	6/30	8.59E+01	1.10E+02	6/31	7.94E+01	1.10E+02	YES	Sediment
Inorganics											
Cyanide	6/18	2.70E-01	NA	1/29	2.96E+01	1.07E+01	0/0	--	1.07E+01	YES	Sediment, surface water
PAHs											
1-Methylnaphthalene	0/18	0.00E+00	1.41E-01	1/15	2.00E-01	6.10E+00	0/0	--	6.10E+00	NO	defer to Total PAHs
2-Methylnaphthalene	2/18	1.00E-01	2.00E-02	0/28	0.00E+00	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Acenaphthene	3/18	7.90E-02	6.70E-03	0/28	0.00E+00	1.50E+01	0/0	--	1.50E+01	YES	defer to Total PAHs
Acenaphthylene	6/18	4.40E-03	5.90E-03	0/28	0.00E+00	1.30E+01	0/0	--	1.30E+01	NO	defer to Total PAHs
Anthracene	12/18	4.20E-01	5.70E-02	1/28	2.00E-01	2.00E-02	0/0	--	2.00E-02	YES	defer to Total PAHs
Benzo(a)Anthracene	17/18	1.60E+00	1.08E-01	1/28	1.00E-01	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Benzo(a)Pyrene	15/18	1.20E+00	1.50E-01	0/28	0.00E+00	6.00E-02	0/0	--	6.00E-02	YES	defer to Total PAHs
Benzo(b)Fluoranthene	18/18	1.60E+00	1.90E-01	0/28	0.00E+00	2.60E+00	0/0	--	2.60E+00	YES	defer to Total PAHs
Benzo(g,h,i)Perylene	18/18	7.30E-01	1.70E-01	0/28	0.00E+00	1.20E-02	0/0	--	1.20E-02	YES	defer to Total PAHs
Benzo(k)Fluoranthene	11/18	1.70E+00	2.40E-01	0/28	0.00E+00	6.00E-02	0/0	--	6.00E-02	YES	defer to Total PAHs
Chrysene	18/18	5.10E+00	1.66E-01	1/28	2.00E-01	4.70E+00	0/0	--	4.70E+00	YES	defer to Total PAHs
Dibenzo(a,h)Anthracene	11/18	2.90E-01	3.30E-02	0/28	0.00E+00	1.20E-02	0/0	--	1.20E-02	YES	defer to Total PAHs
Fluoranthene	16/18	6.60E-01	4.23E-01	1/28	2.00E-01	8.00E-01	0/0	--	8.00E-01	YES	defer to Total PAHs
Fluorene	7/18	5.40E-01	7.70E-02	1/28	4.00E-01	1.90E+01	0/0	--	1.90E+01	YES	defer to Total PAHs
Indeno(1,2,3-Cd)Pyrene	17/18	3.50E-01	2.00E-01	0/28	0.00E+00	1.20E-02	0/0	--	1.20E-02	YES	defer to Total PAHs
Naphthalene	3/18	8.90E-03	1.76E-01	0/28	0.00E+00	2.10E+01	0/0	--	2.10E+01	NO	defer to Total PAHs
Phenanthrene	13/18	8.70E+00	2.04E-01	3/28	1.50E+00	2.30E+00	0/0	--	2.30E+00	YES	defer to Total PAHs
Pyrene	17/18	3.30E+00	1.95E-01	1/28	7.00E-01	4.60E+00	0/0	--	4.60E+00	YES	defer to Total PAHs
Total LMW PAHs	13/13	9.75E+00	6.00E-01	1/1	2.10E+00	NA	0/0	--	NA	YES	defer to Total PAHs
Total HMW PAHs	18/18	8.93E+00	1.00E+00	3/3	1.10E+00	NA	0/0	--	NA	YES	defer to Total PAHs
Total PAHs	18/18	1.77E+01	1.61E+00	3/3	3.50E+00	NA	0/0	--	NA	YES	Sediment, surface water

Table 3-6
Detection Comparison to Screening Levels
for Aquatic Receptors in Streams

Analyte	Sediment (Streams)			Surface Water (Streams)			Surface Water (Dissolved)			Selection of Chemicals of Potential Concern	
	Frequency	Maximum (mg/kg)	Screening Criteria (mg/kg)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Frequency	Maximum (µg/L)	Screening Criteria (µg/L)	Aquatic Habitats	
SVOCs											
4-methylphenol	1/18	2.80E-01	9.30E-02	0/28	0.00E+00	5.30E+01	0/0	--	5.30E+01	YES	Sediment
Acetophenone	1/18	3.70E-02	NA	0/28	0.00E+00	NA	0/0	--	NA	YES	Sediment
Carbazole	2/18	2.10E-01	6.90E-02	0/28	0.00E+00	4.00E+00	0/0	--	4.00E+00	YES	Sediment
Dimethyl phthalate	2/18	2.10E-01	6.78E-01	2/28	1.90E+00	1.10E+03	0/0	--	1.10E+03	NO	--
Phenol	2/18	1.30E-01	1.75E-01	2/28	3.00E+00	1.60E+02	0/0	--	1.60E+02	NO	--
VOCs											
1,4-dioxane	0/18	0.00E+00	NA	1/13	1.20E-01	2.20E+04	0/0	--	2.20E+04	NO	--
2-Butanone	5/18	9.30E-03	7.60E+00	0/28	0.00E+00	2.20E+04	0/0	--	2.20E+04	NO	--
Acetone	13/18	3.50E-02	6.50E-02	8/28	7.80E+00	1.70E+03	0/0	--	1.70E+03	NO	--
Carbon disulfide	2/18	3.70E-04	7.80E-03	0/28	0.00E+00	1.50E+01	0/0	--	1.50E+01	NO	--
Cyclohexane	2/18	8.00E-01	2.78E-01	0/28	0.00E+00	1.58E+02	0/0	--	1.58E+02	YES	Sediment
Isopropylbenzene (Cumene)	2/18	6.50E-01	3.50E-02	0/28	0.00E+00	4.80E+00	0/0	--	4.80E+00	YES	Sediment
Methylcyclohexane	2/18	4.40E+00	NA	0/28	0.00E+00	5.20E+01	0/0	--	5.20E+01	YES	Sediment
Methylene chloride	3/18	1.10E-03	1.80E-02	0/28	0.00E+00	1.50E+03	0/0	--	1.50E+03	NO	--
Toluene	2/18	5.90E-03	1.00E-02	0/28	0.00E+00	6.20E+01	0/0	--	6.20E+01	NO	--
Trichlorofluoromethane	1/18	9.50E-04	NA	0/28	0.00E+00	NA	0/0	--	NA	YES	Sediment
Xylenes (m & p)	1/18	7.70E-01	1.30E-01	0/28	0.00E+00	2.60E+02	0/0	--	2.60E+02	YES	Sediment
Xylenes (o)	1/18	7.00E-01	1.30E-01	0/28	0.00E+00	2.60E+02	0/0	--	2.60E+02	YES	Sediment
Xylenes (Total)	1/18	7.70E-01	1.30E-01	0/28	0.00E+00	2.60E+02	0/0	--	2.60E+02	YES	Sediment

Table 3-7
Surface Soil pH Results

Matrix	Sample Name	Exposure Area	Analyte	Result	Sample Date	Location	Sample Depth (Feet)
Surface Soil	LPA-SB-27-0.5	Lorriane Process Area	pH	5.46	10-Apr-17	SB-27	0.5
Surface Soil	LPA-SB-27-2.0	Lorriane Process Area	pH	7.12	10-Apr-17	SB-27	2
Surface Soil	LPA-SB-28-0.5	Lorriane Process Area	pH	4.55	10-Apr-17	SB-28	0.5
Surface Soil	LPA-SB-29-0.5	Lorriane Process Area	pH	6.58	10-Apr-17	SB-29	0.5
Surface Soil	WPA-SB-01-0.5	Wilcox Process Area	pH	7.96	10-Apr-17	SB-01	0.5
Surface Soil	WPA-SB-02-0.5	Wilcox Process Area	pH	7.99	10-Apr-17	SB-02	0.5
Surface Soil	WPA-SB-19-0.5	Wilcox Process Area	pH	7.69	10-Apr-17	SB-19	0.5
Surface Soil	WPA-SB-20-0.5	Wilcox Process Area	pH	8.64	10-Apr-17	SB-20	0.5
Surface Soil	WPA-SB-22-0.5	Wilcox Process Area	pH	7.92	10-Apr-17	SB-22	0.5
Surface Soil	WPA-SB-29-0.5	Wilcox Process Area	pH	8.22	10-Apr-17	SB-29	0.5
Surface Soil	WPA-SB-42-0.5	Wilcox Process Area	pH	7.29	10-Apr-17	SB-42	0.5
Surface Soil	WPA-SB-49-0.5	Wilcox Process Area	pH	8.44	10-Apr-17	SB-49	0.5
Surface Soil	WPA-SB-50-0.5	Wilcox Process Area	pH	9.26	10-Apr-17	SB-50	0.5
Surface Soil	WPA-SB-54-0.5	Wilcox Process Area	pH	6.64	10-Apr-17	SB-54	0.5
		Average	**pH**	**7.4**			

Table 3-8
Sediment pH Results

Matrix	Sample Name	EcoZoneName	Analyte	Result	Sample Date	Location	Sample Depth (Feet)
Sediment	C1-SD-0.5	Streams	pH	6.6	16-Oct-17	C1-SD	0.5
Sediment	ET-SD-01-0.5	Streams	pH	7.7	19-Oct-17	ET-SD-01	0.5
Sediment	ET-SD-02-0.5	Streams	pH	7.5	19-Oct-17	ET-SD-02	0.5
Sediment	ET-SD-03-0.5	Streams	pH	7	19-Oct-17	ET-SD-03	0.5
Sediment	ET-SD-04-0.5	Streams	pH	7.1	19-Oct-17	ET-SD-04	0.5
Sediment	ET-SD-05-0.5	Streams	pH	6.7	18-Oct-17	ET-SD-05	0.5
Sediment	ET-SD-07-0.5	Streams	pH	7	18-Oct-17	ET-SD-07	0.5
Sediment	ETUC-SD-0.5	Streams	pH	7.1	23-Oct-17	ETUC-SD	0.5
Sediment	P1-SD-01-0.5	Ponds	pH	6.9	23-Oct-17	P1-SD-01	0.5
Sediment	P1-SD-02-0.5	Ponds	pH	6.9	23-Oct-17	P1-SD-02	0.5
Sediment	P1-SD-04-0.5	Ponds	pH	7	23-Oct-17	P1-SD-04	0.5
Sediment	P2-SD-01-0.5	Ponds	pH	6.8	26-Oct-17	P2-SD-01	0.5
Sediment	P2-SD-03-0.5	Ponds	pH	7	26-Oct-17	P2-SD-03	0.5
Sediment	P3-SD-01-0.5	Ponds	pH	6.6	26-Oct-17	P3-SD-01	0.5
Sediment	P3-SD-02-0.5	Ponds	pH	6.3	26-Oct-17	P3-SD-02	0.5
Sediment	P3-SD-03-0.5	Ponds	pH	6.3	26-Oct-17	P3-SD-03	0.5
Sediment	P4-SD-01-0.5	Ponds	pH	5.4	25-Oct-17	P4-SD-01	0.5
Sediment	P4-SD-03-0.5	Ponds	pH	5.1	25-Oct-17	P4-SD-03	0.5
Sediment	P5-SD-01-0.5	Ponds	pH	6.7	24-Oct-17	P5-SD-01	0.5
Sediment	P5-SD-03-0.5	Ponds	pH	6.2	24-Oct-17	P5-SD-03	0.5
Sediment	P6-SD-01-0.5	Ponds	pH	6.9	19-Oct-17	P6-SD-01	0.5
Sediment	P6-SD-02-0.5	Ponds	pH	7	19-Oct-17	P6-SD-02	0.5
Sediment	P6-SD-04-0.5	Ponds	pH	6.7	19-Oct-17	P6-SD-04	0.5
Sediment	P6-SD-05-0.5	Ponds	pH	7.3	19-Oct-17	P6-SD-05	0.5
Sediment	P6-SD-07-0.5	Ponds	pH	7.2	19-Oct-17	P6-SD-07	0.5
Sediment	P7-SD-01-0.5	Ponds	pH	6.1	25-Oct-17	P7-SD-01	0.5
Sediment	P7-SD-03-0.5	Ponds	pH	6.2	25-Oct-17	P7-SD-03	0.5
Sediment	P7-SD-05-0.5	Ponds	pH	5.9	25-Oct-17	P7-SD-05	0.5
Sediment	P7-SD-06-0.5	Ponds	pH	6.4	25-Oct-17	P7-SD-06	0.5
Sediment	P8-SD-01-0.5	Ponds	pH	5.8	24-Oct-17	P8-SD-01	0.5
Sediment	SCBR-SD-02-0.5	Streams	pH	7	16-Oct-17	SCBR-SD-02	0.5
Sediment	SCPPE-SD-01-0.5	Streams	pH	7.9	17-Oct-17	SCPPE-SD-01	0.5
Sediment	SCPPE-SD-03-0.5	Streams	pH	7.6	17-Oct-17	SCPPE-SD-03	0.5
Sediment	SC-SD-02-0.5	Streams	pH	7.1	16-Oct-17	SC-SD-02	0.5
Sediment	SC-SD-04-0.5	Streams	pH	7.6	17-Oct-17	SC-SD-04	0.5
Sediment	SC-SD-06-0.5	Streams	pH	7.5	17-Oct-17	SC-SD-06	0.5
Sediment	SC-SD-08-0.5	Streams	pH	7.5	17-Oct-17	SC-SD-08	0.5
Sediment	SCUC1a-SD-0.5	Streams	pH	7.3	18-Oct-17	SCUC1a-SD	0.5
Sediment	SCUC1c-SD-0.5	Streams	pH	7.5	17-Oct-17	SCUC1c-SD	0.5
Sediment	WT-SD-01-0.5	Streams	pH	7.4	23-Oct-17	WT-SD-01	0.5
Sediment	WT-SD-06-0.5	Streams	pH	7.4	24-Oct-17	WT-SD-06	0.5
Sediment	WTUC-SD-0.5	Streams	pH	7.4	24-Oct-17	WTUC-SD	0.5
		Average	**pH**	**6.9**			

Table 3-9
Comparison of Maximum Groundwater Concentrations to Surface Water Ecological Screening Levels

Chemical	Location	Date	Maximum Groundwater concentration detected (µg/L)	Surface Water Criteria (µg/L)	Surface Water Criteria Source
Metals					
Aluminum, dissolved	TF-34-01	12/14/2015	**4.43E+03**	6.80E+02	EPA National Recommended Aquatic Life Criteria 2018 Aluminum Criteria Calculator
Antimony, dissolved	AA-GW-03	12/13/2015	1.33E+01	1.90E+02	Region IV Freshwater
Arsenic, dissolved	AA-GW-03	12/13/2015	**7.07E+02**	1.50E+02	EPA National Recommended Aquatic Life Criteria 2018
Barium, dissolved	AA-GW-03	12/13/2015	**7.52E+02**	2.20E+02	Region IV Freshwater
Beryllium, dissolved	AA-GW-03	12/13/2015	**1.39E+01**	1.10E+01	Region IV Freshwater
Cadmium, dissolved	--	--	ND	2.30E-01	OWRB 2017
Chromium, dissolved	AA-GW-03	12/13/2015	**7.52E+02**	6.98E+01	OWRB 2017
Chromium, hexavalent	PW-03	4/10/2017	**2.57E+01**	1.10E+01	OWRB 2017
Cobalt, dissolved	AA-GW-03	12/13/2015	**6.98E+01**	1.90E+01	Region IV Freshwater
Copper, dissolved	AA-GW-03	12/13/2015	**3.90E+01**	1.20E+01	OWRB 2017
Lead, dissolved	TF-34-01	12/14/2015	**3.86E+03**	2.90E+00	OWRB 2017
Manganese, dissolved	LOR-18	12/14/2015	**1.66E+03**	9.30E+01	Region IV Freshwater
Mercury, dissolved	AA-GW-03	12/13/2015	1.50E-01	1.30E+00	OWRB 2017
Nickel, dissolved	AA-GW-03	12/13/2015	9.19E+02	4.89E+01	OWRB 2017
Selenium, dissolved	AA-GW-03	12/13/2015	5.85E+01	5.00E+00	OWRB 2017
Silver, dissolved	--	--	ND	6.00E-02	Region IV Freshwater
Thallium, dissolved	AA-GW-03	12/13/2015	2.00E+00	6.00E+00	Region IV
Vanadium, dissolved	AA-GW-03	12/13/2015	**4.16E+03**	2.70E+01	Region IV Freshwater
Zinc, dissolved	AA-GW-03	12/13/2015	3.59E+01	1.10E+02	OWRB 2017
Inorganics					
Cyanide	MW-03	12/18/2018	**4.71E+01**	5.20E+00	Region IV Freshwater
PAHs					
1-Methylnaphthalene	--	--	ND	6.10E+00	Region IV Freshwater
2-Methylnaphthalene	MW-01	12/18/2018	**3.30E+01**	4.70E+00	Region IV Freshwater
Acenaphthene	PW-04	4/13/2017	2.60E-01	1.50E+01	Region IV Freshwater
Acenaphthylene	MW-01	12/18/2018	1.80E-01	1.30E+01	Region IV Freshwater
Anthracene	PW-03	12/20/2018	**9.00E-02**	2.00E-02	Region IV Freshwater
Benzo(a)Anthracene	PW-03	12/20/2018	3.00E-02	4.70E+00	Region IV Freshwater
Benzo(a)Pyrene	--	--	ND	6.00E-02	Region IV Freshwater
Benzo(b)Fluoranthene	--	--	ND	2.60E+00	Region IV Freshwater
Benzo(g,h,i)Perylene	PW-03	12/20/2018	**3.00E-02**	1.20E-02	Region IV Freshwater
Benzo(k)Fluoranthene	--	--	ND	6.00E-02	Region IV Freshwater
Chrysene	PW-03	12/20/2018	6.00E-02	4.70E+00	Region IV Freshwater
Dibenzo(a,h)Anthracene	--	--	ND	1.20E-02	Region IV Freshwater
Fluoranthene	PW-03	12/20/2018	5.00E-02	8.00E-01	Region IV Freshwater
Fluorene	GW-10	9/22/2016	7.60E-01	1.90E+01	Region IV Freshwater
Indeno(1,2,3-Cd)Pyrene	--	--	ND	1.20E-02	Region IV Freshwater

Table 3-9
Comparison of Maximum Groundwater Concentrations to Surface Water Ecological Screening Levels

Chemical	Location	Date	Maximum Groundwater concentration detected (µg/L)	Surface Water Criteria (µg/L)	Surface Water Criteria Source
Naphthalene	MW-01	12/18/2018	**5.10E+01**	2.10E+01	Region IV Freshwater
Phenanthrene	MW-04	12/18/2018	**5.80E+00**	2.30E+00	Region IV Freshwater
Pyrene	MW-04	12/18/2018	1.30E+00	4.60E+00	Region IV Freshwater
SVOCs					
1,1-Biphenyl	--	--	ND	6.50E+00	Region IV Freshwater
1,2,3-Trichlorobenzene	--	--	ND	3.50E+01	Region IV Freshwater
4-chloroaniline	--	--	ND	8.00E-01	Region IV Freshwater
4-methylphenol	--	--	ND	5.30E+01	Region IV Freshwater
Acetophenone	--	--	ND	NA	--
Benzaldehyde	--	--	ND	1.43E+02	Region IV
Bis(2-ethylhexyl)phthalate	GW-10	9/22/2016	3.10E+00	8.00E+00	Region IV Freshwater
Butyl benzyl phthalate	--	--	ND	2.30E+01	Region IV Freshwater
Caprolactam	--	--	ND	NA	--
Carbazole	MW-04	12/18/2018	2.40E+00	4.00E+00	Region IV Freshwater
Dibenzofuran	PW-04	4/13/2017	8.70E-01	4.00E+00	Region IV Freshwater
Diethyl phthalate	PW-03	4/2/2017	1.60E+02	2.20E+02	Region IV Freshwater
Dimethyl phthalate	PW-03	12/20/2018	8.40E+00	1.10E+03	Region IV Freshwater
Di-n-butyl phthalate	--	--	ND	1.90E+01	Region IV Freshwater
Hexane	--	--	ND	6.00E-01	Region IV Freshwater
n-Butyl Alcohol	--	--	ND	NA	--
Pentachlorophenol	--	--	ND	1.50E+01	Region IV Freshwater
Phenol	PW-03	4/2/2017	**3.40E+05**	1.60E+02	Region IV
VOCs					
1,4-dioxane	GW-10	9/22/2016	2.70E+00	2.20E+04	Region IV Freshwater
2-Butanone	PW-03	4/12/2017	1.20E+03	2.20E+04	Region IV Freshwater
Acetone	PW-03	4/12/2017	**2.80E+03**	1.70E+03	Region IV Freshwater
Benzene	MW-04	12/18/2018	**2.40E+03**	1.60E+02	Region IV Freshwater
Carbon disulfide	--	--	ND	1.50E+01	Region IV Freshwater
Cyclohexane	MW-04	12/18/2018	**6.50E+02**	1.58E+02	Region IV Freshwater
Ethylbenzene	MW-04	12/18/2018	**1.10E+03**	6.10E+01	Region IV Freshwater
Isopropylbenzene (Cumene)	PW-04	4/13/2017	**1.00E+02**	4.80E+00	Region IV Freshwater
Methyl acetate	PW-03	4/12/2017	2.60E+01	NA	--
Methylcyclohexane	MW-04	12/18/2018	**4.10E+02**	5.20E+01	Region IV Freshwater
Methylene chloride	--	--	ND	1.50E+03	Region IV Freshwater
Tetrachloroethene (PCE)	GW-13-119	12/19/2018	8.00E+00	5.30E+01	Region IV Freshwater
Toluene	MW-04	12/18/2018	**1.10E+03**	6.20E+01	Region IV Freshwater
Trichlorofluoromethane	--	--	ND	NA	--
Xylenes (m & p)	MW-04	12/18/2018	**2.30E+03**	2.60E+02	Region IV Freshwater for total xylenes
Xylenes (o)	MW-04	12/18/2018	**5.00E+02**	2.60E+02	Region IV Freshwater for total xylenes

Table 3-9
Comparison of Maximum Groundwater Concentrations to Surface Water Ecological Screening Levels

Chemical	Location	Date	Maximum Groundwater concentration detected (µg/L)	Surface Water Criteria (µg/L)	Surface Water Criteria Source

NOTES:
NA = Screening Value not available.
ND = Analyte not detected in media.
OWRB = Oklahoma Water Resources Board.
µg/L = Microgram per liter.
Freshwater screening values were adjusted using the average hardness data as applicable.
Aluminum screening value was calculated using a pH 7, Total Organic Carbon of 7 mg/L, and Hardness of 93 mg/L $CaCO_3$.
The surface water screening criteria for pentachlorophenol was determined assuming a pH of 7.8.

Table 4-1
Uptake Models Relating Concentrations in Soil to Concentrations in Plants

Chemical	Food Item (Plant) Uptake			
	Uptake Model[A, B, C]	BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Log K_{ow}	Source
Metals				
Aluminum	Uptake Factor	4.00E-03	--	Baes et al. 1984
Antimony	Uptake Factor	2.00E-01	--	Baes et al. 1984
Arsenic	Log Linear	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	--	Bechtel Jacobs 1998a
Barium	Uptake Factor	1.50E-01	--	Baes et al. 1984
Beryllium	Uptake Factor	1.00E-02	--	Baes et al. 1984
Cadmium	Log Linear	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	--	Bechtel Jacobs 1998a
Chromium	Uptake Factor	7.50E-03	--	Baes et al. 1984
Chromium, hexavalent	Uptake Factor	7.50E-03	--	Baes et al. 1984
Cobalt	Uptake Factor	2.00E-02	--	Baes et al. 1984
Copper	Log Linear	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	--	Bechtel Jacobs 1998a
Lead	Log Linear	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	--	Bechtel Jacobs 1998a
Manganese	Uptake Factor	2.50E-01	--	Baes et al. 1984
Mercury	Log Linear	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	--	Bechtel Jacobs 1998a
Nickel	Log Linear	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	--	Bechtel Jacobs 1998a
Selenium	Log Linear	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	--	Bechtel Jacobs 1998a
Silver	Uptake Factor	4.00E-01	--	Baes et al. 1984
Thallium	Uptake Factor	4.00E-03	--	Baes et al. 1984
Vanadium	Uptake Factor	5.50E-03	--	Baes et al. 1984
Zinc	Log Linear	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	--	Bechtel Jacobs 1998a
PAHs				
1-Methylnaphthalene	Uptake Factor	2.74E-01	3.72E+00	Regression from Travis and Arms 1988
2-Methylnaphthalene	Uptake Factor	2.74E-01	3.72E+00	Regression from Travis and Arms 1988
Acenaphthene	Uptake Factor	1.55E-01	4.15E+00	Regression from Travis and Arms 1988
Acenaphthylene	Uptake Factor	2.04E-01	3.94E+00	Regression from Travis and Arms 1988
Anthracene	Uptake Factor	1.18E-01	4.35E+00	Regression from Travis and Arms 1988
Benzo(a)Anthracene	Uptake Factor	1.70E-02	5.81E+00	Regression from Travis and Arms 1988
Benzo(a)Pyrene	Uptake Factor	1.14E-02	6.11E+00	Regression from Travis and Arms 1988
Benzo(b)Fluoranthene	Uptake Factor	1.14E-02	6.11E+00	Regression from Travis and Arms 1988
Benzo(b,k)Fluoranthene	Uptake Factor	1.14E-02	6.11E+00	Regression from Travis and Arms 1988
Benzo(g,h,i)Perylene	Uptake Factor	5.19E-03	6.70E+00	Regression from Travis and Arms 1988
Benzo(k)Fluoranthene	Uptake Factor	1.14E-02	6.11E+00	Regression from Travis and Arms 1988
Chrysene	Uptake Factor	2.50E-02	5.52E+00	Regression from Travis and Arms 1988
Dibenzo(a,h)Anthracene	Uptake Factor	5.19E-03	6.70E+00	Regression from Travis and Arms 1988
Fluoranthene	Uptake Factor	5.48E-02	4.93E+00	Regression from Travis and Arms 1988
Fluorene	Uptake Factor	1.84E-01	4.02E+00	Regression from Travis and Arms 1988
Indeno(1,2,3-Cd)Pyrene	Uptake Factor	5.19E-03	6.70E+00	Regression from Travis and Arms 1988
Naphthalene	Uptake Factor	5.70E-01	3.17E+00	Regression from Travis and Arms 1988
Phenanthrene	Uptake Factor	1.18E-01	4.35E+00	Regression from Travis and Arms 1988
Pyrene	Uptake Factor	5.48E-02	4.93E+00	Regression from Travis and Arms 1988
Total LMW PAHs	Uptake Factor	1.04E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988
Total HMW PAHs	Uptake Factor	1.04E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988
Total PAHs	Uptake Factor	1.02E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988

Table 4-1
Uptake Models Relating Concentrations in Soil to Concentrations in Plants

Chemical	Food Item (Plant) Uptake			
	Uptake Model[A, B, C]	BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Log K_{ow}	Source
Pesticides				
4,4'-DDD	Uptake Factor	1.57E-02	5.87E+00	Regression from Travis and Arms 1988
4,4'-DDE	Uptake Factor	1.32E-02	6.00E+00	Regression from Travis and Arms 1988
4,4'-DDT	Uptake Factor	4.61E-03	6.79E+00	Regression from Travis and Arms 1988
alpha-Chlordane	Uptake Factor	9.33E-03	6.26E+00	Regression from Travis and Arms 1988
gamma-Chlordane	Uptake Factor	3.48E-03	7.00E+00	Regression from Travis and Arms 1988
SVOCs				
1,1-Biphenyl	Uptake Factor	2.60E-01	3.76E+00	Regression from Travis and Arms 1988
1,2,3-Trichlorobenzene	Uptake Factor	2.07E-01	3.93E+00	Regression from Travis and Arms 1988
4-chloroaniline	Uptake Factor	3.93E+00	1.72E+00	Regression from Travis and Arms 1988
4-methylphenol	Uptake Factor	2.50E+00	2.06E+00	Regression from Travis and Arms 1988
Acetophenone	Uptake Factor	4.20E+00	1.67E+00	Regression from Travis and Arms 1988
Bis(2-ethylhexyl)phthalate	Uptake Factor	5.48E-04	8.39E+00	Regression from Travis and Arms 1988
Butyl benzyl phthalate	Uptake Factor	6.17E-02	4.84E+00	Regression from Travis and Arms 1988
Acetophenone	Uptake Factor	1.61E+01	6.60E-01	Regression from Travis and Arms 1988
Carbazole	Uptake Factor	5.26E-01	3.23E+00	Regression from Travis and Arms 1988
Dibenzofuran	Uptake Factor	2.78E-01	3.71E+00	Regression from Travis and Arms 1988
Dimethyl phthalate	Uptake Factor	4.25E+00	1.66E+00	Regression from Travis and Arms 1988
Di-n-butyl phthalate	Uptake Factor	8.38E-02	4.61E+00	Regression from Travis and Arms 1988
Pentachlorophenol	Uptake Factor	7.05E-02	4.74E+00	Regression from Travis and Arms 1988
Phenol	Uptake Factor	5.19E+00	1.51E+00	Regression from Travis and Arms 1988
VOCs				
1,4-dioxane	Uptake Factor	5.93E+01	-3.20E-01	Regression from Travis and Arms 1988
2-Butanone	Uptake Factor	2.74E+01	2.60E-01	Regression from Travis and Arms 1988
Acetone	Uptake Factor	5.33E+01	-2.40E-01	Regression from Travis and Arms 1988
Benzene	Uptake Factor	2.74E+00	1.99E+00	Regression from Travis and Arms 1988
Carbon disulfide	Uptake Factor	2.93E+00	1.94E+00	Regression from Travis and Arms 1988
Chloromethane (Methyl chloride)	Uptake Factor	9.08E+00	1.09E+00	Regression from Travis and Arms 1988
Cyclohexane	Uptake Factor	5.62E-01	3.18E+00	Regression from Travis and Arms 1988
Ethylbenzene	Uptake Factor	6.87E-01	3.03E+00	Regression from Travis and Arms 1988
Isopropylbenzene (Cumene)	Uptake Factor	3.93E-01	3.45E+00	Regression from Travis and Arms 1988
Methylcyclohexane	Uptake Factor	3.26E-01	3.59E+00	Regression from Travis and Arms 1988
Methylene chloride	Uptake Factor	6.51E+00	1.34E+00	Regression from Travis and Arms 1988
Toluene	Uptake Factor	1.32E+00	2.54E+00	Regression from Travis and Arms 1988
Trichlorofluoromethane	Uptake Factor	2.27E+00	2.13E+00	Regression from Travis and Arms 1988
Xylenes (m & p)	Uptake Factor	6.34E-01	3.09E+00	Regression from Travis and Arms 1988
Xylenes (o)	Uptake Factor	6.34E-01	3.09E+00	Regression from Travis and Arms 1988
Xylenes (Total)	Uptake Factor	5.85E-01	3.15E+00	Regression from Travis and Arms 1988

NOTES:
A - Equation types:
Uptake Factor: [ConcBio] = m x [ConcSoil]
Log linear: [ConcBio] = 10b*[ConcSoil]m
B - Uptake factor for organics derived using the following equations from Travis & Arms 1988 (equation 5, pg 273): Log Upfp = 1.588 - (0.578)(Log Kow)
UpF_p = plant uptake factor
K_{ow} = octanol-water partitioning coefficient
C - Uptake factor for inorganics derived using the following equations from Bechtel Jacobs 1998: ln(plant) = B0 + B1(ln(soil concentration))
B0 = Constituent-specific intercept based on tissue type
B1 = Constituent-specific slope based on tissue type
Data for B0 and B1 are presented in Bechtel Jacobs 1998, Table 7, pg. 22.
Log K_{ow} values from KOWWIN program from EPI suite except for TPH values.
Log Kow for m, p-xylenes = average of m-xylene and p-xylene Log Kow.

Table 4-2
Uptake Models Relating Concentrations in Soil to Concentrations in Soil Invertebrates

Chemical	Food Item (Worm) Uptake		
	Uptake Model[A, B, C]	BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Source
Metals			
Aluminum	Uptake Factor	1.18E-01	90% UF, Sample et al 1998a
Antimony	Uptake Factor	1.00E+00	Default
Arsenic	Log Linear	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	Sample et al. 1998a
Barium	Uptake Factor	1.60E-01	90% UF, Sample et al 1998a
Beryllium	Uptake Factor	1.18E+00	90% UF, Sample et al 1998a
Cadmium	Log Linear	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	Sample et al. 1998a
Chromium	Log Linear	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	Sample et al. 1998a
Chromium, hexavalent	Log Linear	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	Sample et al. 1998a
Cobalt	Uptake Factor	2.91E-01	90% UF, Sample et al 1998a
Copper	Log Linear	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	Sample et al. 1998a
Lead	Log Linear	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	Sample et al. 1998a
Manganese	Log Linear	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	Default
Mercury	Log Linear	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	Sample et al. 1998a
Nickel	Log Linear	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	Sample et al. 1998a
Selenium	Log Linear	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	Sample et al. 1998a
Silver	Uptake Factor	1.53E+01	90% UF, Sample et al 1998a
Thallium	Uptake Factor	1.00E+00	Default
Vanadium	Uptake Factor	8.80E-01	90% UF, Sample et al 1998a
Zinc	Log Linear	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	Sample et al. 1998a
PAHs			
1-Methylnaphthalene	Uptake Factor	2.30E-01	Beyer and Stafford 1993
2-Methylnaphthalene	Uptake Factor	2.00E-01	Beyer and Stafford 1993
Acenaphthene	Uptake Factor	3.00E-01	Beyer and Stafford 1993
Acenaphthylene	Uptake Factor	2.20E-01	Beyer and Stafford 1993
Anthracene	Uptake Factor	3.20E-01	Beyer and Stafford 1993
Benzo(a)Anthracene	Uptake Factor	2.70E-01	Beyer and Stafford 1993
Benzo(a)Pyrene	Uptake Factor	3.40E-01	Beyer and Stafford 1993
Benzo(b)Fluoranthene	Uptake Factor	2.10E-01	Beyer and Stafford 1993
Benzo(b,k)Fluoranthene	Uptake Factor	2.10E-01	Beyer and Stafford 1993
Benzo(g,h,i)Perylene	Uptake Factor	1.50E-01	Beyer and Stafford 1993
Benzo(k)Fluoranthene	Uptake Factor	2.10E-01	Beyer and Stafford 1993
Chrysene	Uptake Factor	4.40E-01	Beyer and Stafford 1993
Dibenzo(a,h)Anthracene	Uptake Factor	4.90E-01	Beyer and Stafford 1993
Fluoranthene	Uptake Factor	3.70E-01	Beyer and Stafford 1993
Fluorene	Uptake Factor	2.00E-01	Beyer and Stafford 1993
Indeno(1,2,3-Cd)Pyrene	Uptake Factor	4.10E-01	Beyer and Stafford 1993
Naphthalene	Uptake Factor	2.10E-01	Beyer and Stafford 1993
Phenanthrene	Uptake Factor	2.80E-01	Beyer and Stafford 1993
Pyrene	Uptake Factor	3.90E-01	Beyer and Stafford 1993
Total LMW PAHs	Uptake Factor	3.00E-01	Beyer and Stafford 1993, value for total PAHs
Total HMW PAHs	Uptake Factor	3.00E-01	Beyer and Stafford 1993, value for total PAHs
Total PAHs	Uptake Factor	3.00E-01	Beyer and Stafford 1993
Pesticides			
4,4'-DDD	Uptake Factor	1.00E+00	Default
4,4'-DDE	Uptake Factor	1.00E+00	Default

Table 4-2
Uptake Models Relating Concentrations in Soil to Concentrations in Soil Invertebrates

Chemical	Food Item (Worm) Uptake		
	Uptake Model[A, B, C]	BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Source
4,4'-DDT	Uptake Factor	1.00E+00	Default
alpha-Chlordane	Uptake Factor	1.00E+00	Default
gamma-Chlordane	Uptake Factor	1.00E+00	Default
SVOCs			
1,1-Biphenyl	Uptake Factor	1.00E+00	Default
1,2,3-Trichlorobenzene	Uptake Factor	1.00E+00	Default
4-chloroaniline	Uptake Factor	1.00E+00	Default
4-methylphenol	Uptake Factor	1.00E+00	Default
6-Methyl Chrysene	Uptake Factor	1.00E+00	Default
Acetophenone	Uptake Factor	1.00E+00	Default
Benzaldehyde	Uptake Factor	1.00E+00	Default
Bis(2-ethylhexyl)phthalate	Uptake Factor	1.00E+00	Default
Butyl benzyl phthalate	Uptake Factor	1.00E+00	Default
Caprolactam	Uptake Factor	1.00E+00	Default
Carbazole	Uptake Factor	1.00E+00	Default
Dalapon	Uptake Factor	1.00E+00	Default
Dibenzofuran	Uptake Factor	1.00E+00	Default
Diethyl phthalate	Uptake Factor	1.00E+00	Default
Dimethyl phthalate	Uptake Factor	1.00E+00	Default
Di-n-butyl phthalate	Uptake Factor	1.00E+00	Default
Hexane	Uptake Factor	1.00E+00	Default
n-Butyl Alcohol	Uptake Factor	1.00E+00	Default
Pentachlorophenol	Uptake Factor	1.00E+00	Default
Phenol	Uptake Factor	1.00E+00	Default
VOCs			
1,4-dioxane	Uptake Factor	1.00E+00	Default
2-Butanone	Uptake Factor	1.00E+00	Default
Acetone	Uptake Factor	1.00E+00	Default
Benzene	Uptake Factor	1.00E+00	Default
Carbon disulfide	Uptake Factor	1.00E+00	Default
Chloromethane (Methyl chloride)	Uptake Factor	1.00E+00	Default
Cyclohexane	Uptake Factor	1.00E+00	Default
Ethylbenzene	Uptake Factor	1.00E+00	Default
Isopropylbenzene (Cumene)	Uptake Factor	1.00E+00	Default
Methylcyclohexane	Uptake Factor	1.00E+00	Default
Methylene chloride	Uptake Factor	1.00E+00	Default
Toluene	Uptake Factor	1.00E+00	Default
Trichlorofluoromethane	Uptake Factor	1.00E+00	Default
Xylenes (m & p)	Uptake Factor	1.00E+00	Default
Xylenes (o)	Uptake Factor	1.00E+00	Default
Xylenes (Total)	Uptake Factor	1.00E+00	Default

NOTES:
A - The default uptake factor for chemicals where no information was available was assumed to be 1.
B - Equation types:
Uptake Factor: [ConcBio] = m x [ConcSoil]
Log linear: [ConcBio] = 10b*[ConcSoil]m
C - Uptake factor derived using the following equations from Sample, et. al 1998a:
ln(earthworm) = B0 + B1(ln(soil concentration))
B0 = Constituent-specific intercept based on tissue type
B1 = Constituent-specific slope based on tissue type
Data for B0 and B1 are presented in Sample, et. Al 1998a, Table 12, pg. 33.

Table 4-3
Uptake Models Relating Doses ingested by Small Mammals to Concentrations in Small Mammals

Chemical	Food Item (Small Mammal) Uptake			
	Uptake Model	UF/BTF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Log K_{ow}	Source
Metals				
Aluminum	Uptake Factor	7.32E-02	--	Sample et al. 1998b
Antimony	Uptake Factor	1.00E+00	--	Default
Arsenic	Log Linear	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	--	Sample et al. 1998b
Barium	Log Linear	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	--	Sample et al. 1998b
Beryllium	Uptake Factor	1.00E+00	--	Default
Cadmium	Log Linear	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	--	Sample et al. 1998b
Chromium	Log Linear	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	--	Sample et al. 1998b
Chromium, hexavalent	Log Linear	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	--	Sample et al. 1998b
Cobalt	Uptake Factor	1.00E-01	--	90%UF from Sample et al. 1998b
Copper	Log Linear	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	--	Sample et al. 1998b
Lead	Log Linear	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	--	Sample et al. 1998b
Manganese	Uptake Factor	5.87E-02	--	90% UF, Sample et al 1998b
Mercury	Uptake Factor	1.92E-01	--	Sample et al. 1998b
Nickel	Log Linear	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	--	Sample et al. 1998b
Selenium	Log Linear	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	--	Sample et al. 1998b
Silver	Uptake Factor	5.01E-01	--	90% UF, Sample et al 1998b
Thallium	Uptake Factor	1.23E-01	--	90%UF from Sample et al. 1998b
Vanadium	Uptake Factor	1.79E-01	--	Sample et al. 1998b
Zinc	Log Linear	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	--	Sample et al. 1998b
PAHs				
1-Methylnaphthalene	Biotransfer Factor	5.27E-04	3.72E+00	Regression from Travis and Arms 1988
2-Methylnaphthalene	Biotransfer Factor	5.27E-04	3.72E+00	Regression from Travis and Arms 1988
Acenaphthene	Biotransfer Factor	1.42E-03	4.15E+00	Regression from Travis and Arms 1988
Acenaphthylene	Biotransfer Factor	8.75E-04	3.94E+00	Regression from Travis and Arms 1988
Anthracene	Biotransfer Factor	2.25E-03	4.35E+00	Regression from Travis and Arms 1988
Benzo(a)Anthracene	Biotransfer Factor	6.49E-02	5.81E+00	Regression from Travis and Arms 1988
Benzo(a)Pyrene	Biotransfer Factor	1.29E-01	6.11E+00	Regression from Travis and Arms 1988
Benzo(b)Fluoranthene	Biotransfer Factor	1.29E-01	6.11E+00	Regression from Travis and Arms 1988
Benzo(b,k)Fluoranthene	Biotransfer Factor	1.29E-01	6.11E+00	Regression from Travis and Arms 1988
Benzo(g,h,i)Perylene	Biotransfer Factor	5.04E-01	6.70E+00	Regression from Travis and Arms 1988
Benzo(k)Fluoranthene	Biotransfer Factor	1.29E-01	6.11E+00	Regression from Travis and Arms 1988
Chrysene	Biotransfer Factor	3.33E-02	5.52E+00	Regression from Travis and Arms 1988
Dibenzo(a,h)Anthracene	Biotransfer Factor	5.04E-01	6.70E+00	Regression from Travis and Arms 1988
Fluoranthene	Biotransfer Factor	8.55E-03	4.93E+00	Regression from Travis and Arms 1988
Fluorene	Biotransfer Factor	1.05E-03	4.02E+00	Regression from Travis and Arms 1988
Indeno(1,2,3-Cd)Pyrene	Biotransfer Factor	5.04E-01	6.70E+00	Regression from Travis and Arms 1988
Naphthalene	Biotransfer Factor	1.49E-04	3.17E+00	Regression from Travis and Arms 1988
Phenanthrene	Biotransfer Factor	2.25E-03	4.35E+00	Regression from Travis and Arms 1988
Pyrene	Biotransfer Factor	8.55E-03	4.93E+00	Regression from Travis and Arms 1988
Total LMW PAHs	Biotransfer Factor	1.26E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988

Table 4-3
Uptake Models Relating Doses ingested by Small Mammals to Concentrations in Small Mammals

Chemical	Food Item (Small Mammal) Uptake			
	Uptake Model	UF/BTF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Log K_{ow}	Source
Total HMW PAHs	Biotransfer Factor	1.26E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988
Total PAHs	Biotransfer Factor	1.20E-01	--	Average of individual PAH biotransfer factors calculated via regression from Travis and Arms 1988
Pesticides				
4,4'-DDD	Biotransfer Factor	7.45E-02	5.87E+00	Regression from Travis and Arms 1988
4,4'-DDE	Biotransfer Factor	1.00E-01	6.00E+00	Regression from Travis and Arms 1988
4,4'-DDT	Biotransfer Factor	6.20E-01	6.79E+00	Regression from Travis and Arms 1988
alpha-Chlordane	Biotransfer Factor	1.83E-01	6.26E+00	Regression from Travis and Arms 1988
gamma-Chlordane	Biotransfer Factor	1.00E+00	7.00E+00	Regression from Travis and Arms 1988
SVOCs				
1,1-Biphenyl	Biotransfer Factor	5.78E-04	3.76E+00	Regression from Travis and Arms 1988
1,2,3-Trichlorobenzene	Biotransfer Factor	8.55E-04	3.93E+00	Regression from Travis and Arms 1988
4-chloroaniline	Biotransfer Factor	5.27E-06	1.72E+00	Regression from Travis and Arms 1988
4-methylphenol	Biotransfer Factor	1.15E-05	2.06E+00	Regression from Travis and Arms 1988
Acetophenone	Biotransfer Factor	4.70E-06	1.67E+00	Regression from Travis and Arms 1988
Bis(2-ethylhexyl)phthalate	Biotransfer Factor	2.47E+01	8.39E+00	Regression from Travis and Arms 1988
Butyl benzyl phthalate	Biotransfer Factor	6.95E-03	4.84E+00	Regression from Travis and Arms 1988
Caprolactam	Biotransfer Factor	4.59E-07	6.60E-01	Regression from Travis and Arms 1988
Carbazole	Biotransfer Factor	1.71E-04	3.23E+00	Regression from Travis and Arms 1988
Dibenzofuran	Biotransfer Factor	5.15E-04	3.71E+00	Regression from Travis and Arms 1988
Dimethyl phthalate	Biotransfer Factor	4.59E-06	1.66E+00	Regression from Travis and Arms 1988
Di-n-butyl phthalate	Biotransfer Factor	4.09E-03	4.61E+00	Regression from Travis and Arms 1988
Pentachlorophenol	Biotransfer Factor	5.52E-03	4.74E+00	Regression from Travis and Arms 1988
Phenol	Biotransfer Factor	3.25E-06	1.51E+00	Regression from Travis and Arms 1988
VOCs				
1,4-dioxane	Biotransfer Factor	4.81E-08	-3.20E-01	Regression from Travis and Arms 1988
2-Butanone	Biotransfer Factor	1.83E-07	2.60E-01	Regression from Travis and Arms 1988
Acetone	Biotransfer Factor	5.78E-08	-2.40E-01	Regression from Travis and Arms 1988
Benzene	Biotransfer Factor	9.89E-06	1.99E+00	Regression from Travis and Arms 1988
Carbon disulfide	Biotransfer Factor	8.75E-06	1.94E+00	Regression from Travis and Arms 1988
Chloromethane (Methyl chloride)	Biotransfer Factor	1.24E-06	1.09E+00	Regression from Travis and Arms 1988
Cyclohexane	Biotransfer Factor	1.52E-04	3.18E+00	Regression from Travis and Arms 1988
Ethylbenzene	Biotransfer Factor	1.08E-04	3.03E+00	Regression from Travis and Arms 1988
Isopropylbenzene (Cumene)	Biotransfer Factor	2.83E-04	3.45E+00	Regression from Travis and Arms 1988
Methylcyclohexane	Biotransfer Factor	3.91E-04	3.59E+00	Regression from Travis and Arms 1988
Methylene chloride	Biotransfer Factor	2.20E-06	1.34E+00	Regression from Travis and Arms 1988
Toluene	Biotransfer Factor	3.48E-05	2.54E+00	Regression from Travis and Arms 1988
Trichlorofluoromethane	Biotransfer Factor	1.36E-05	2.13E+00	Regression from Travis and Arms 1988
Xylenes (m & p)	Biotransfer Factor	1.24E-04	3.09E+00	Regression from Travis and Arms 1988
Xylenes (o)	Biotransfer Factor	1.24E-04	3.09E+00	Regression from Travis and Arms 1988
Xylenes (Total)	Biotransfer Factor	1.42E-04	3.15E+00	Regression from Travis and Arms 1988

NOTES:

Biotransfer factor:

Derived using the following equations from Travis & Arms 1988 (equation 2, pg. 272): Log UpFsm = -7.6 + log Kow

UpF_{sm} = Small mammal uptake factor.

K_{ow} = Octanol-water partitioning coefficient.

Log K_{ow} values for most chemicals are from Syracuse Research Corporation (http://www.syrres.com/esc/est_kowdemo.htm)

Biotransfer factors were divided by 0.25 to account for wet weight to dry weight conversion.

Table 4-4
Uptake Models Relating Concentrations in Surface Water to Concentrations in Fish

Chemical	Food Item (Fish) Uptake			
	Uptake Model[A, B, C]	BCFBAF value (L/kg wet weight)	BAF (mg/kg dry wt. to mg/kg dry wt.)	Source
Metals				
Aluminum	Uptake Factor	2.70E+00	1.08E+01	From Table C-5 - USEPA 1999
Antimony	Uptake Factor	1.00E+00	4.00E+00	Based on bluegill in Table 5 - USEPA 1980
Arsenic	Uptake Factor	4.00E+00	1.60E+01	Based on bluegill in Table 5 - USEPA 1985a
Barium	Uptake Factor	4.00E+00	1.60E+01	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
Beryllium	Uptake Factor	6.20E+01	2.48E+02	From Table C-5 - USEPA 1999
Cadmium	Uptake Factor	5.90E+01	2.36E+02	Based on bluegill in Table 5 geometric mean - USEPA
Chromium	Uptake Factor	2.00E+02	8.00E+02	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
Chromium, hexavalent	Uptake Factor	2.00E+02	8.00E+02	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
Cobalt	Uptake Factor	NA	1.00E+00	Default
Copper	Uptake Factor	4.64E+02	1.86E+03	Based on fathead minnow in Table 5 - USEPA 2003
Lead	Uptake Factor	NA	4.50E+01	Based on bluegill in Table 5 - USEPA 1985b
Manganese	Uptake Factor	4.00E+02	1.60E+03	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
Mercury	Uptake Factor	1.80E+03	7.20E+03	Based on rainbow trout in Table 5 - USEPA 1985c
Nickel	Uptake Factor	2.40E+01	9.60E+01	Based on rainbow trout/fathead minnow in Table 5 geometric mean - USEPA 1986
Selenium	Uptake Factor	2.42E+02	9.70E+02	Based on bluegill in Table 5 geometric mean - USEPA 1987a
Silver	Uptake Factor	8.77E+01	3.51E+02	From Table C-5 - USEPA 1999
Thallium	Uptake Factor	1.00E+04	4.00E+04	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
Vanadium	Uptake Factor	NA	1.00E+00	Default
Zinc	Uptake Factor	6.30E+01	2.52E+02	Based on mummichog in Table 5 geometric mean- USEPA 1987b
PAHs				
1-Methylnaphthalene	Uptake Factor	1.66E+02	6.64E+02	BCF calculated via Regression from BCFBAF Program
2-Methylnaphthalene	Uptake Factor	1.64E+02	6.56E+02	BCF calculated via Regression from BCFBAF Program
Acenaphthene	Uptake Factor	1.79E+02	7.17E+02	BCF calculated via Regression from BCFBAF Program
Acenaphthylene	Uptake Factor	1.85E+02	7.40E+02	BCF calculated via Regression from BCFBAF Program
Anthracene	Uptake Factor	4.01E+02	1.60E+03	BCF calculated via Regression from BCFBAF Program
Benzo(a)Anthracene	Uptake Factor	3.18E+03	1.27E+04	BCF calculated via Regression from BCFBAF Program
Benzo(a)Pyrene	Uptake Factor	5.15E+03	2.06E+04	BCF calculated via Regression from BCFBAF Program
Benzo(b)Fluoranthene	Uptake Factor	3.02E+03	1.21E+04	BCF calculated via Regression from BCFBAF Program
Benzo(b,k)Fluoranthene	Uptake Factor	3.02E+03	1.21E+04	BCF calculated via Regression from BCFBAF Program
Benzo(g,h,i)Perylene	Uptake Factor	1.10E+04	4.40E+04	BCF calculated via Regression from BCFBAF Program
Benzo(k)Fluoranthene	Uptake Factor	4.99E+03	2.00E+04	BCF calculated via Regression from BCFBAF Program
Chrysene	Uptake Factor	3.17E+03	1.27E+04	BCF calculated via Regression from BCFBAF Program
Dibenzo(a,h)Anthracene	Uptake Factor	9.60E+03	3.84E+04	BCF calculated via Regression from BCFBAF Program
Fluoranthene	Uptake Factor	1.18E+03	4.72E+03	BCF calculated via Regression from BCFBAF Program
Fluorene	Uptake Factor	2.66E+02	1.06E+03	BCF calculated via Regression from BCFBAF Program
Indeno(1,2,3-Cd)Pyrene	Uptake Factor	1.22E+04	4.88E+04	BCF calculated via Regression from BCFBAF Program
Naphthalene	Uptake Factor	6.99E+01	2.80E+02	BCF calculated via Regression from BCFBAF Program
Phenanthrene	Uptake Factor	1.86E+03	7.44E+03	BCF calculated via Regression from BCFBAF Program
Pyrene	Uptake Factor	7.71E+02	3.08E+03	BCF calculated via Regression from BCFBAF Program
Total LMW PAHs	Uptake Factor	--	1.43E+04	Average of BCFs of individual PAHs
Total HMW PAHs	Uptake Factor	--	1.43E+04	Average of BCFs of individual PAHs
Total PAHs	Uptake Factor	--	1.34E+04	Average of BCFs of individual PAHs
Pesticides				
4,4'-DDD	Uptake Factor	4.36E+03	1.74E+04	BCF calculated via Regression from BCFBAF Program
4,4'-DDE	Uptake Factor	9.17E+03	3.67E+04	BCF calculated via Regression from BCFBAF Program
4,4'-DDT	Uptake Factor	1.68E+04	6.74E+04	BCF calculated via Regression from BCFBAF Program
alpha-Chlordane	Uptake Factor	5.90E+03	2.36E+04	BCF calculated via Regression from BCFBAF Program
gamma-Chlordane	Uptake Factor	1.33E+04	5.32E+04	BCF calculated via Regression from BCFBAF Program

Table 4-4
Uptake Models Relating Concentrations in Surface Water to Concentrations in Fish

Chemical	Food Item (Fish) Uptake			
	Uptake Model[A, B, C]	BCFBAF value (L/kg wet weight)	BAF (mg/kg dry wt. to mg/kg dry wt.)	Source
SVOCs				
1,1-Biphenyl	Uptake Factor	2.05E+02	8.20E+02	BCF calculated via Regression from BCFBAF Program
1,2,3-Trichlorobenzene	Uptake Factor	2.18E+02	8.72E+02	BCF calculated via Regression from BCFBAF Program
4-chloroaniline	Uptake Factor	7.49E+00	3.00E+01	BCF calculated via Regression from BCFBAF Program
4-methylphenol	Uptake Factor	8.85E+00	3.54E+01	BCF calculated via Regression from BCFBAF Program
Acetophenone	Uptake Factor	1.33E+00	5.32E+00	BCF calculated via Regression from BCFBAF Program
Bis(2-ethylhexyl)phthalate	Uptake Factor	1.71E+03	6.84E+03	BCF calculated via Regression from BCFBAF Program
Butyl benzyl phthalate	Uptake Factor	6.14E+02	2.46E+03	BCF calculated via Regression from BCFBAF Program
Caprolactam	Uptake Factor	3.16E+00	1.26E+01	BCF calculated via Regression from BCFBAF Program
Carbazole	Uptake Factor	1.32E+02	5.28E+02	BCF calculated via Regression from BCFBAF Program
Dibenzofuran	Uptake Factor	2.43E+02	9.72E+02	BCF calculated via Regression from BCFBAF Program
Dimethyl phthalate	Uptake Factor	5.28E+00	2.11E+01	BCF calculated via Regression from BCFBAF Program
Di-n-butyl phthalate	Uptake Factor	4.33E+02	1.73E+03	BCF calculated via Regression from BCFBAF Program
Pentachlorophenol	Uptake Factor	1.11E+03	4.44E+03	BCF calculated via Regression from BCFBAF Program
Phenol	Uptake Factor	4.27E+00	1.71E+01	BCF calculated via Regression from BCFBAF Program
VOCs				
1,4-dioxane	Uptake Factor	3.16E+00	1.26E+01	BCF calculated via Regression from BCFBAF Program
2-Butanone	Uptake Factor	3.16E+00	1.26E+01	BCF calculated via Regression from BCFBAF Program
Acetone	Uptake Factor	3.16E+00	1.26E+01	BCF calculated via Regression from BCFBAF Program
Benzene	Uptake Factor	1.18E+01	4.72E+01	BCF calculated via Regression from BCFBAF Program
Carbon disulfide	Uptake Factor	8.85E+00	3.54E+01	BCF calculated via Regression from BCFBAF Program
Chloromethane (Methyl chloride)	Uptake Factor	3.16E+00	1.26E+01	BCF calculated via Regression from BCFBAF Program
Cyclohexane	Uptake Factor	8.64E+01	3.46E+02	BCF calculated via Regression from BCFBAF Program
Ethylbenzene	Uptake Factor	5.56E+01	2.22E+02	BCF calculated via Regression from BCFBAF Program
Isopropylbenzene (Cumene)	Uptake Factor	1.21E+02	4.84E+02	BCF calculated via Regression from BCFBAF Program
Methylcyclohexane	Uptake Factor	1.12E+02	4.48E+02	BCF calculated via Regression from BCFBAF Program
Methylene chloride	Uptake Factor	3.10E+00	1.24E+01	BCF calculated via Regression from BCFBAF Program
Toluene	Uptake Factor	2.94E+01	1.18E+02	BCF calculated via Regression from BCFBAF Program
Trichlorofluoromethane	Uptake Factor	2.17E+01	8.68E+01	BCF calculated via Regression from BCFBAF Program
Xylenes (m & p)	Uptake Factor	5.78E+01	2.31E+02	BCF calculated via Regression from BCFBAF Program, average of two values
Xylenes (o)	Uptake Factor	5.65E+01	2.26E+02	BCF calculated via Regression from BCFBAF Program
Xylenes (Total)	Uptake Factor	5.65E+01	2.26E+02	BCF calculated via Regression from BCFBAF Program

NOTES:
A - Equation types:
Uptake Factor:
B - Uptake factor for organics derived using the BCFBAF Program from USEPA
http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm
C - Uptake factor for inorganics from the following sources:
ORNL 2009, BCF from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem
ORNL 2009, BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
USEPA 1999, Table C-5
USEPA 1980, Table 5 (bluegill)
USEPA 1985a, Table 5
USEPA 1985b, Table 5
USEPA 1985c, Table 5
Uptake factors from given in wet weight were divided by 0.25 to account for wet weight to dry weight conversion.

Table 4-5
Uptake Models Relating Concentrations in Sediment to Concentrations in Benthos

Chemical	Food Item (Benthos) Uptake		
	UF or BSAF?	UF/BSAF Value	Source
Metals			
Aluminum	Uptake Factor	1.00E+00	Default
Antimony	Uptake Factor	1.00E+00	Default
Arsenic	Uptake Factor	1.27E-01	Median BAF (not normalized for TOC and lipids) from data of non-depurated organisms as advised for use (Bechtel Jacobs 1998)
Barium	Uptake Factor	1.00E+00	Default
Beryllium	Uptake Factor	1.00E+00	Default
Cadmium	Uptake Factor	3.07E+00	90th percentile BAF (not normalized for TOC and lipids) from data of depurated organisms as advised for use (Bechtel Jacobs 1998)
Chromium	Uptake Factor	4.68E-01	90th percentile BAF (not normalized for TOC and lipids) from data for all organisms (Bechtel Jacobs 1998)
Chromium, hexavalent	Uptake Factor	4.68E-01	90th percentile BAF (not normalized for TOC and lipids) from data for all organisms (Bechtel Jacobs 1998)
Cobalt	Uptake Factor	1.00E+00	Default
Copper	Uptake Factor	5.25E+00	90th percentile BAF (not normalized for TOC and lipids) from data for all organisms as advised for use (Bechtel Jacobs 1998)
Lead	Uptake Factor	6.60E-02	Median BAF (not normalized for TOC and lipids) from data of non-depurated organisms as advised for use (Bechtel Jacobs 1998)
Manganese	Uptake Factor	1.00E+00	Default
Mercury	Uptake Factor	2.87E+00	90th percentile BAF (not normalized for TOC and lipids) from data for all organisms (Bechtel Jacobs 1998)
Nickel	Uptake Factor	2.32E+00	90th percentile BAF (not normalized for TOC and lipids) from data for all organisms (Bechtel Jacobs 1998)
Selenium	Uptake Factor	1.00E+00	Default
Silver	Uptake Factor	1.00E+00	Default
Thallium	Uptake Factor	1.00E+00	Default
Vanadium	Uptake Factor	1.00E+00	Default
Zinc	Uptake Factor	4.76E+00	90th percentile BAF (not normalized for TOC and lipids) from data of depurated organisms as advised for use (Bechtel Jacobs 1998)
PAHs			
1-Methylnaphthalene	BSAF	1.40E-01	Average of freshwater BSAF (tissue type unknown) from EPA data set (2009)
2-Methylnaphthalene	BSAF	1.46E-01	Average of whole body freshwater BSAF from EPA data set (2009)
Acenaphthene	BSAF	3.00E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Acenaphthylene	BSAF	1.52E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Anthracene	BSAF	9.92E-03	Average of whole body freshwater BSAF from EPA data set (2009)
Benzo(a)Anthracene	BSAF	1.88E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Benzo(a)Pyrene	BSAF	3.37E-03	Average of whole body freshwater BSAF from EPA data set (2009)
Benzo(b)Fluoranthene	BSAF	3.25E-03	Average of whole body freshwater BSAF from EPA data set (2009)
Benzo(b,k)Fluoranthene	BSAF	3.59E-03	Average of benzo(b)fluoranthene and benzo(k)fluoranthene BSAFs
Benzo(g,h,i)Perylene	BSAF	1.62E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Benzo(k)Fluoranthene	BSAF	3.93E-03	Average of whole body freshwater BSAF from EPA data set (2009)
Chrysene	BSAF	1.38E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Dibenzo(a,h)Anthracene	BSAF	2.15E-03	Average of whole body freshwater BSAF from EPA data set (2009)
Fluoranthene	BSAF	3.40E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Fluorene	BSAF	2.13E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Indeno(1,2,3-Cd)Pyrene	BSAF	1.44E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Naphthalene	BSAF	1.10E-01	Average of whole body freshwater BSAF from EPA data set (2009)
Phenanthrene	BSAF	2.20E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Pyrene	BSAF	6.79E-02	Average of whole body freshwater BSAF from EPA data set (2009)
Total LMW PAHs	BSAF	6.19E-02	Average of BSAFs of Individual LMW PAHs
Total HMW PAHs	BSAF	1.78E-02	Average of BSAFs of Individual HMW PAHs
Total PAHs	BSAF	3.74E-02	Average of available BSAFs for individual PAHs
Pesticides			
4,4'-DDD	BSAF	2.13E+00	Average of whole body freshwater BSAF from EPA data set (2009)
4,4'-DDE	BSAF	2.95E+00	Average of whole body freshwater BSAF from EPA data set (2009)

Table 4-5
Uptake Models Relating Concentrations in Sediment to Concentrations in Benthos

Chemical	Food Item (Benthos) Uptake		
	UF or BSAF?	UF/BSAF Value	Source
4,4'-DDT	BSAF	5.22E+00	Average of whole body freshwater BSAF from EPA data set (2009)
alpha-Chlordane	BSAF	1.10E+00	Average of whole body freshwater BSAF from EPA data set (2009)
gamma-Chlordane	BSAF	1.08E+00	Average of whole body freshwater BSAF from EPA data set (2009)
SVOCs			
1,1-Biphenyl	BSAF	4.00E+00	Default
1,2,3-Trichlorobenzene	BSAF	4.00E+00	Default
4-chloroaniline	BSAF	4.00E+00	Default
4-methylphenol	BSAF	4.00E+00	Default
Acetophenone	BSAF	4.00E+00	Default
Bis(2-ethylhexyl)phthalate	BSAF	1.54E+00	Average of composite freshwater BSAF from EPA data set (2009)
Butyl benzyl phthalate	BSAF	4.00E+00	Default
Caprolactam	BSAF	4.00E+00	Default
Carbazole	BSAF	4.00E+00	Default
Dibenzofuran	BSAF	4.00E+00	Default
Dimethyl phthalate	BSAF	4.00E+00	Default
Di-n-butyl phthalate	BSAF	4.00E+00	Default
Pentachlorophenol	BSAF	4.00E+00	Default
Phenol	BSAF	4.00E+00	Default
VOCs			
1,4-dioxane	BSAF	4.00E+00	Default
2-Butanone	BSAF	4.00E+00	Default
Acetone	BSAF	4.00E+00	Default
Benzene	BSAF	4.00E+00	Default
Carbon disulfide	BSAF	4.00E+00	Default
Chloromethane (Methyl chloride)	BSAF	4.00E+00	Default
Cyclohexane	BSAF	4.00E+00	Default
Ethylbenzene	BSAF	4.00E+00	Default
Isopropylbenzene (Cumene)	BSAF	4.00E+00	Default
Methylcyclohexane	BSAF	4.00E+00	Default
Methylene chloride	BSAF	4.00E+00	Default
Toluene	BSAF	4.00E+00	Default
Trichlorofluoromethane	BSAF	4.00E+00	Default
Xylenes (m & p)	BSAF	4.00E+00	Default
Xylenes (o)	BSAF	4.00E+00	Default
Xylenes (Total)	BSAF	4.00E+00	Default

NOTES:
NA = Not available.
The default lipid composition for benthic invertebrates is 3% wet weight.
The default fraction of organic carbon is 1%.
BSAF = [benthic invertebrate tissue chemical concentration (mg/kg wet weight)/lipid fraction of the organism (g lipid/g wet weight)]/
Benthic tissue concentration (mg/kg dry weight)=[(BSAF x 0.03 x sediment concentration)/0.01] / 0.25

Table 4-6
Wildlife Exposure Factors

Exposure Parameter	Value	Units	Notes
WHITE-FOOTED MOUSE			
Body Weight	0.022	kg	Green and Millar 1987 as cited in Sample and Suter 1994
Food Ingestion Rate	0.039	kg dry wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.15	kg wet wt./kg-day	Green and Millar 1987 as cited in Sample and Suter 1994 ingestion rate (kg wet wt./day) divided by body weight (kg) for rate in terms of g wet wt./g-day
Incidental Soil Ingestion Rate	2.00%	% of total mass of diet	Beyer et al. 1994
Water Ingestion Rate	0.3	L/kg-day	Oswald et al. 1993
SONG SPARROW			
Body Weight	0.032	kg	Sherman and Wasser 2010; average weight of song sparrow
Food Ingestion Rate	0.2141	kg dry wt./kg-day	Calculated using allometric equation for birds from Nagy 2001
Food Ingestion Rate	0.8566	kg wet wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	9%	% of total mass of diet	Beyer et al 1994, value for turkey
Water Ingestion Rate	0.005879	L/kg-day	Sample and Suter 1994, equation 19
AMERICAN ROBIN			
Body Weight	0.077	kg	USEPA 1993
Food Ingestion Rate	0.22	kg dry wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.89	kg wet wt./kg-day	EPA 1993
Incidental Soil Ingestion Rate	10.50%	% of total mass of diet	Value based on woodcock (Sample and Suter 1994)
Water Ingestion Rate	0.14	L/kg-day	EPA 1993
SOUTHERN SHORT-TAILED SHREW			
Body Weight	0.017213	kg	EPA 1993, average of reported range
Food Ingestion Rate	0.16	kg dry wt./kg-day	Calculated using allometric equation for mammals from Nagy 2001
Food Ingestion Rate	0.62	kg wet wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	13.00%	% of total mass of diet	Sample and Suter 1994, value for short-tailed shrew
Water Ingestion Rate	0.22	L/kg-day	EPA 1993, value for short-tailed shrew
RED-TAILED HAWK			
Body Weight	1.2	kg	USACHPPM 2004
Food Ingestion Rate	0.056	kg dry wt./kg-day	Calculated using allometric equation for birds from Nagy 1987
Food Ingestion Rate	0.224	kg wet wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	0.0	% of total mass of diet	Sample and Suter 1994
Water Ingestion Rate	0.057	L/kg-day	USACHPPM 2004
RED FOX			
Body Weight	4.5	kg	Sample and Suter 1994, value for red fox
Food Ingestion Rate	0.025	kg dry wt./kg-day	Sample and Suter 1994, mean value
Food Ingestion Rate	0.1	kg wet wt./kg-day	Sample and Suter 1994, food ingestion rate value (kg/day) for red fox
Incidental Soil Ingestion Rate	2.80%	% of total mass of diet	Value from Beyer et al. (1994), value for red fox
Water Ingestion Rate	0.085	L/kg-day	EPA 1993, value for red fox
CANADA GOOSE			
Body Weight	3.2367	kg	USEPA 1993, average of adult male and female weights given throughout year
Food Ingestion Rate	0.0078	kg dry wt./kg-day	USEPA 1993, converted assuming 75% food moisture (USACHPPM 2004)
Food Ingestion Rate	0.03	kg wet wt./kg-day	USEPA 1993, average of male and female winter and spring rates
Incidental Soil Ingestion Rate	8.20%	% of total mass of diet	Beyer et al. 1994
Water Ingestion Rate	0.04425	L/kg-day	USEPA 1993
MUSKRAT			
Body Weight	1.17	kg	EPA 1993, average of adult male and female weights given throughout year
Food Ingestion Rate	0.075	kg dry wt./kg-day	USEPA 1993, converted assuming 75% food moisture (USACHPPM 2004)
Food Ingestion Rate	0.3	kg wet wt./kg-day	USEPA 1993, average of greens and green and corn ingestion rates
Incidental Soil Ingestion Rate	2.00%	% of total mass of diet	Beyer et al. 1994, value for woodchuck
Water Ingestion Rate	0.975	L/kg-day	USEPA 1993, average of male and female rates
RACCOON			
Body Weight	5.78	kg	EPA 1993, average of adult male and female weights given throughout year
Food Ingestion Rate	0.05	kg dry wt./kg-day	EPA 1993, calculated using the presented allometric equation for food ingestion
Food Ingestion Rate	0.19	kg wet wt./kg-day	EPA 1993, converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	9.40%	% of total mass of diet	Beyer et al. 1994
Water Ingestion Rate	0.0825	L/kg-day	EPA 1993, average of male and female rates
GREAT BLUE HERON			
Body Weight	2.229	kg	USACHPPM 2004
Food Ingestion Rate	0.0450	kg dry wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.18	kg wet wt./kg-day	USACHPPM 2004
Incidental Sediment Ingestion Ra	2.00%	% of total mass of diet	Sample and Suter 1994
Water Ingestion Rate	0.045	L/kg-day	USACHPPM 2004
RIVER OTTER			
Body Weight	7.990	kg	EPA 1993, average of reported adult weights
Food Ingestion Rate	0.048	kg dry wt./kg-day	EPA 1993, calculated using the presented allometric equation for food ingestion
Food Ingestion Rate	0.19	kg wet wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Sediment Ingestion Ra	0.00%	% of total mass of diet	Based on rates given in Sample and Suter (1994) for other organisms with high percentage of fish in diet
Water Ingestion Rate	0.081	L/kg-day	EPA 1993, average of male and female rate
GREEN HERON			
Body Weight	0.240	kg	Average body weight, Cornell Lab of Ornithology, accessed April 2019
Food Ingestion Rate	0.0958	kg dry wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.38308	kg wet wt./kg-day	EPA 1993, equation 3-3
Incidental Sediment Ingestion Ra	2.00%	% of total mass of diet	Sample and Suter 1994, using Great Blue Heron
Water Ingestion Rate	0.09448	L/kg-day	EPA 1993, equation 3-15
CATTLE			
Body Weight	454	kg	Average body weight of beef cattle (Lyons et al 1999)
Food Ingestion Rate	0.025	kg dry wt./kg-day	Calculated assuming 2.5 percent of body weight (Lyons et al 1999)
Food Ingestion Rate	0.0284	kg wet wt./kg-day	Converted assuming 88% dry matter (University of Nebraska 2013)
Incidental Soil Ingestion Rate	2.13%	% of total mass of diet	API 2004, Table 1
Water Ingestion Rate	0.189	L/kg-day	Agriculture Canada 2002; summer estimate for water ingestion

Table 4-7
Soil Toxicity Reference Values for Plants and Soil Invertebrates

Chemical	Plant Toxicity Reference Value (mg/kg dry wt)	Toxicity Reference Value Source and Notes	Earthworm Toxicity Reference Value (mg/kg dry wt)	Toxicity Reference Value Source and Notes
Metals				
Aluminum	5.00E+01	Efroymson et al. 1997a	NA	---
Antimony	5.00E+00	Efroymson et al. 1997a	7.80E+01	USEPA 2005a
Arsenic	1.80E+01	USEPA 2005b	6.00E+01	Efroymson et al. 1997b
Barium	5.00E+02	Efroymson et al. 1997a	3.30E+02	USEPA 2005c
Beryllium	1.00E+01	Efroymson et al. 1997a	4.00E+01	USEPA 2005d
Cadmium	3.20E+01	USEPA 2005e	1.40E+02	USEPA 2005e
Chromium	1.00E+00	Efroymson et al. 1997a	4.00E-01	Efroymson et al. 1997b
Chromium, hexavalent	1.00E+00	EcoSSL value for trivalent	4.00E-01	EcoSSL value for trivalent
Cobalt	1.30E+01	USEPA 2005f	NA	---
Copper	7.00E+01	USEPA 2007b	8.00E+01	USEPA 2007b
Lead	1.20E+02	USEPA 2005g	1.70E+03	USEPA 2005g
Manganese	2.20E+02	USEPA 2007c	4.50E+02	USEPA 2007c
Mercury	3.00E-01	Efroymson et al. 1997a	1.00E-01	Efroymson et al. 1997b
Nickel	3.80E+01	USEPA 2007d	2.80E+02	USEPA 2007d
Selenium	5.20E-01	USEPA 2007f	4.10E+00	USEPA 2007f
Silver	5.60E+02	USEPA 2006	NA	---
Thallium	1.00E+00	Efroymson et al. 1997a	NA	---
Vanadium	2.00E+00	Efroymson et al. 1997a	NA	---
Zinc	1.60E+02	USEPA 2007g	1.20E+02	USEPA 2007g
PAHs				
1-Methylnaphthalene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
2-Methylnaphthalene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Acenaphthene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Acenaphthylene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Anthracene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Benzo(a)Anthracene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Benzo(a)Pyrene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Benzo(b)Fluoranthene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Benzo(g,h,i)Perylene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Benzo(k)Fluoranthene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Chrysene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Dibenzo(a,h)Anthracene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Fluoranthene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Fluorene	2.10E+01	Efroymson et al. 1997a, value for acenaphthene	3.10E+01	Efroymson et al. 1997b, value for acenaphthene
Indeno(1,2,3-Cd)Pyrene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Naphthalene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Phenanthrene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Pyrene	2.00E+01	Efroymson et al. 1997a, value for acenaphthene	3.00E+01	Efroymson et al. 1997b, value for acenaphthene
Total LMW PAHs	2.00E+01	Efroymson et al. 1997a	2.90E+01	USEPA 2007e
Total HMW PAHs	2.00E+01	Efroymson et al. 1997a	1.80E+01	USEPA 2007e
Total PAHs	2.00E+01	Efroymson et al. 1997a	1.80E+01	USEPA 2007e
Pesticides				
4,4'-DDD	NA	---	NA	---
4,4'-DDE	NA	---	NA	---
4,4'-DDT	NA	---	NA	---
alpha-Chlordane	2.20E+00	Region IV plant benchmark	2.90E-03	Region IV soil invertebrates

Table 4-7
Soil Toxicity Reference Values for Plants and Soil Invertebrates

Chemical	Plant Toxicity Reference Value (mg/kg dry wt)	Toxicity Reference Value Source and Notes	Earthworm Toxicity Reference Value (mg/kg dry wt)	Toxicity Reference Value Source and Notes
gamma-Chlordane	2.20E+00	Region IV plant benchmark	2.00E-02	Region IV soil invertebrates
SVOCs				
1,1-Biphenyl	6.00E+01	Efroymson et al. 1997a	6.00E+01	Efroymson et al 1997b
1,2,3-Trichlorobenzene	1.00E-02	Efroymson et al. 1997a	2.00E+01	Efroymson et al 1997b
4-chloroaniline			3.00E+01	Efroymson et al 1997b, value for 3-chloroaniline
4-methylphenol	NA	---	NA	---
Acetophenone	NA	---	NA	---
Bis(2-ethylhexyl)phthalate	1.00E+02	Efroymson et al. 1997a, value for diethyl phthalate	2.00E+02	Efroymson et al. 1997b, value for dimethyl phthalate
Butyl benzyl phthalate	1.00E+02	Efroymson et al. 1997a, value for diethyl phthalate	2.00E+02	Efroymson et al. 1997b, value for dimethyl phthalate
Caprolactam	NA	---	NA	---
Carbazole	NA	---	1.60E-01	Region IV soil invertebrate benchmark
Dalapon	NA	---	NA	---
Dibenzofuran	NA	---	NA	---
Diethyl phthalate	1.00E+02	Efroymson et al. 1997a	2.00E+02	Efroymson et al. 1997b, value for dimethyl phthalate
Dimethyl phthalate	2.00E+02	Efroymson et al. 1997a	2.00E+02	Efroymson et al. 1997b
Di-n-butyl phthalate	2.00E+02	Efroymson et al. 1997a	2.20E-01	Region IV soil invertebrates
Pentachlorophenol	3.00E+00	Efroymson et al. 1997a	6.00E+00	Efroymson et al. 1997b
Phenol	7.00E+01	Efroymson et al. 1997a	3.00E+01	Efroymson et al. 1997b
VOCs				
1,4-dioxane	NA	---	NA	---
2-Butanone	NA	---	1.00E+00	Region IV soil invertebrate benchmark
Acetone	NA	---	4.00E-02	Region IV soil invertebrate benchmark
Benzene	NA	---	1.20E-01	Region IV soil invertebrate benchmark
Carbon disulfide	NA	---	5.00E-03	Region IV soil invertebrate benchmark
Chloromethane (Methyl chloride)	NA	---	NA	---
Cyclohexane	NA	---	NA	---
Ethylbenzene	NA	---	2.70E-01	Region IV soil invertebrate benchmark
Isopropylbenzene (Cumene)	NA	---	4.00E-02	Region IV soil invertebrate benchmark
Methylene chloride	1.60E+03	Region IV plant benchmark	2.10E-01	Region IV soil invertebrate benchmark
Toluene	2.00E+02	Efroymson et al. 1997a	1.50E-01	Region IV soil invertebrate benchmark
Trichlorofluoromethane	NA	---	NA	---
Xylenes (m & p)	1.00E+02	Region IV plant benchmark	1.00E-01	Region IV soil invertebrate benchmark
Xylenes (o)	1.00E+02	Region IV plant benchmark	1.00E-01	Region IV soil invertebrate benchmark
Xylenes (Total)	1.00E+02	Region IV plant benchmark	1.00E-01	Region IV soil invertebrate benchmark

NOTES:
mg/kg dry wt = Milligram per kilogram of body weight per day.
NA = TRV not available.
PAH = Polycyclic aromatic hydrocarbon.
TRV = Toxicity Reference Value.
VOC = Volatile organic compound.

Table 4-8
Toxicity Reference Values for Mammals

Chemical	Mammalian NOAEL (mg/kg-bw day)	Mammalian NOAEL Source and Notes	Mammalian LOAEL (mg/kg-bw day)	Mammalian LOAEL Source and Notes
Metals				
Aluminum	1.93E+00	Sample et al. 1996	1.93E+01	Sample et al. 1996
Antimony	5.90E-02	USEPA 2005a	5.90E-01	Corresponding LOAEL from USEPA 2005a
Arsenic	1.04E+00	USEPA 2005b	1.66E+00	Corresponding LOAEL from USEPA 2005b
Barium	5.18E+01	USEPA 2005c	8.27E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2005c
Beryllium	5.32E-01	USEPA 2005d	6.73E-01	Geometric mean of LOAELs for growth and reproduction in USEPA 2005d
Cadmium	7.70E-01	USEPA 2005e	7.70E+00	Corresponding LOAEL from USEPA 2005e
Chromium	2.40E+00	USEPA 2008 value for trivalent chromium	5.82E+01	Geometric mean of LOAELs for growth and reproduction for trivalent chromium in USEPA 2008
Chromium, hexavalent	9.24E+00	USEPA 2008	3.84E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2008
Cobalt	7.33E+00	USEPA 2005f	1.89E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2005f
Copper	5.60E+00	USEPA 2007b	9.34E+00	Corresponding LOAEL from USEPA 2007b
Lead	4.70E+00	USEPA 2005g	8.90E+00	Corresponding LOAEL from USEPA 2005g
Manganese	5.15E+01	USEPA 2007c	1.46E+02	Geometric mean of LOAELs for growth and reproduction in USEPA 2007c
Mercury	1.32E+01	Sample et al. 1996	NA	---
Nickel	1.70E+00	USEPA 2007d	3.40E+00	Corresponding LOAEL from USEPA 2007d
Selenium	1.43E-01	USEPA 2007f	2.15E-01	Corresponding LOAEL from USEPA 2007f
Silver	6.02E+00	USEPA 2006	6.02E+01	Corresponding LOAEL from USEPA 2006
Thallium	7.40E-03	Sample et al. 1996	7.40E-02	Sample et al. 1996
Vanadium	4.16E+00	USEPA 2005h	8.31E+00	Corresponding LOAEL from USEPA 2005h
Zinc	7.54E+01	USEPA 2007g	2.98E+02	Geometric mean of LOAELs for growth and reproduction in USEPA 2007g
PAHs				
1-Methylnaphthalene	NA	---	NA	---
2-Methylnaphthalene	NA	---	NA	---
Acenaphthene	NA	---	NA	---
Acenaphthylene	NA	---	NA	---
Anthracene	NA	---	NA	---
Benzo(a)Anthracene	NA	---	NA	---
Benzo(a)Pyrene	1.00E+00	Sample et al. 1996	1.00E+01	Sample et al. 1996
Benzo(b)Fluoranthene	NA	---	NA	---
Benzo(g,h,i)Perylene	NA	---	NA	---
Benzo(k)Fluoranthene	NA	---	NA	---
Chrysene	NA	---	NA	---
Dibenzo(a,h)Anthracene	NA	---	NA	---
Fluoranthene	NA	---	NA	---
Fluorene	NA	---	NA	---
Indeno(1,2,3-Cd)Pyrene	NA	---	NA	---
Naphthalene	NA	---	NA	---
Phenanthrene	NA	---	NA	---
Pyrene	NA	---	NA	---
Total LMW PAHs	6.56E+01	USEPA 2007e	3.28E+02	Corresponding LOAEL from USEPA 2007e
Total HMW PAHs	6.15E-01	USEPA 2007e	3.01E+00	Corresponding LOAEL from USEPA 2007e
Total PAHs	NA	---	NA	---
Pesticides				
4,4'-DDD	8.00E-01	Sample et al. 1996, value for DDT	4.00E+00	Sample et al. 1996, value for DDT
4,4'-DDE	8.00E-01	Sample et al. 1996, value for DDT	4.00E+00	Sample et al. 1996, value for DDT
4,4'-DDT	8.00E-01	Sample et al. 1996, value for DDT	4.00E+00	Sample et al. 1996, value for DDT
alpha-Chlordane	4.60E+00	Sample et al 1996, value for chlordane	9.20E+00	Sample et al 1996, value for chlordane
gamma-Chlordane	4.60E+00	Sample et al 1996, value for chlordane	9.20E+00	Sample et al 1996, value for chlordane
SVOCs				
1,1-Biphenyl	NA	---	NA	---
1,2,3-Trichlorobenzene	1.48E+01	IRIS EPA 1998, value for 1,2,4-trichlorobenzene	5.36E+01	IRIS EPA 1998, value for 1,2,4-trichlorobenzene
4-chloroaniline	1.25E+00	IRIS EPA 1998, NOAEL derived from LOAEL	1.25E+01	IRIS EPA 1998
4-methylphenol	NA	---	NA	---
Acetophenone	NA	---	NA	---
Bis(2-ethylhexyl)phthalate	1.83E+01	Sample et al. 1996	1.83E+02	Sample et al. 1996
Butyl benzyl phthalate	5.50E+02	Sample et al. 1996, value for di-n-butyl phthalate	1.83E+03	Sample et al. 1996, value for di-n-butyl phthalate

Table 4-8
Toxicity Reference Values for Mammals

Chemical	Mammalian NOAEL (mg/kg-bw day)	Mammalian NOAEL Source and Notes	Mammalian LOAEL (mg/kg-bw day)	Mammalian LOAEL Source and Notes
Caprolactam	NA	---	NA	---
Carbazole	NA	---	NA	---
Dalapon	NA	---	NA	---
Dibenzofuran	NA	---	NA	---
Diethyl phthalate	4.58E+03	Sample et al. 1996	NA	---
Dimethyl phthalate	NA	---	NA	---
Di-n-butyl phthalate	5.50E+02	Sample et al. 1996	1833	Sample et al. 1996
Pentachlorophenol	2.40E-01	Sample et al. 1996	2.40E+00	Sample et al. 1996
Phenol	1.20E+01	USACHPPM 2008	3.60E+01	USACHPPM 2008
VOCs				
1,4-dioxane	NA	---	NA	---
2-Butanone	1.77E+03	Sample et al. 1996	4.57E+03	Sample et al. 1996
Acetone	1.00E+01	Sample et al. 1996	5.00E+01	Sample et al. 1996
Benzene	2.64E+01	Sample et al. 1996	2.64E+02	Sample et al. 1996
Carbon disulfide	2.64E+01	Sample et al. 1996	2.64E+02	Sample et al. 1996
Cyclohexane	NA	---	NA	---
Ethylbenzene	5.46E+01	Derived from Budavari et al. 1996	NA	---
Isopropylbenzene (Cumene)	NA	---	NA	---
Methylcyclohexane	NA	---	NA	---
Methylene chloride	5.85E+00	Sample et. al 1996	5.00E+01	Sample et. al 1996
Toluene	2.60E+01	Sample et. al 1996	2.60E+02	Sample et. al 1996
Trichlorofluoromethane	NA	---	NA	---
Xylenes (m & p)	2.10E+00	Sample et. al 1996, based on total xylenes	2.60E+00	Sample et. al 1996, based on total xylenes
Xylenes (o)	2.10E+00	Sample et. al 1996, based on total xylenes	2.60E+00	Sample et. al 1996, based on total xylenes
Xylenes (Total)	2.10E+00	Sample et. al 1996	2.60E+00	Sample et. al 1996

NOTES:
LOAEL = Lowest Observed Adverse Effect Level.
mg/kg dry wt = Milligram per kilogram of body weight per day.
NA = TRV not available.
NOAEL = No Observed Adverse Effect Level.
PAH = Polycyclic aromatic hydrocarbon.
SVOC = Semivolatile organic compound.
TRV = Toxicity Reference Value.
VOC = Volatile organic compound.

Table 4-9
Toxicity Reference Values for Birds

Chemical	Avian NOAEL (mg/kg-bw day)	Avian NOAEL Source and Notes	Avian LOAEL (mg/kg-bw day)	Avian LOAEL Source and Notes
Metals				
Aluminum	1.10E+02	Sample et al. 1996	NA	---
Antimony	NA	---	NA	---
Arsenic	2.24E+00	USEPA 2005b	7.40E+00	Sample et al. 1996
Barium	2.08E+01	Sample et al. 1996	4.17E+01	Sample et al. 1996
Beryllium	NA	---	NA	---
Cadmium	1.47E+00	USEPA 2005e	6.35E+00	Geometric mean of LOAELs for growth and reproduction in USEPA 2005e
Chromium	2.66E+00	USEPA 2008	1.56E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2008
Chromium, hexavalent	2.66E+00	USEPA 2008 value for triavalent chromium	1.56E+01	Geometric mean of LOAELs for growth and reproduction for trivalent chromium in USEPA 2008
Cobalt	7.61E+00	USEPA 2005f	1.83E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2005f
Copper	4.05E+00	USEPA 2007b	1.21E+01	Corresponding LOAEL from USEPA 2007b
Lead	1.63E+00	USEPA 2005g	3.26E+00	Corresponding LOAEL from USEPA 2005g
Magnesium	NA	---	NA	---
Manganese	1.79E+02	USEPA 2007c	3.77E+02	Geometric mean of LOAELs for growth and reproduction in USEPA 2007c
Mercury	4.50E-01	Sample et al. 1996	9.00E-01	Sample et al. 1996
Nickel	6.71E+00	USEPA 2007d	1.86E+01	Geometric mean of LOAELs for growth and reproduction in USEPA 2007d
Selenium	2.90E-01	USEPA 2007f	5.79E-01	Corresponding LOAEL from USEPA 2007f
Silver	2.02E+00	USEPA 2006	2.02E+01	Corresponding LOAEL from USEPA 2006
Thallium	NA	---	NA	---
Vanadium	3.44E-01	USEPA 2005h	6.88E-01	Corresponding LOAEL from USEPA 2005h
Zinc	6.61E+01	USEPA 2007g	1.71E+02	Geometric mean of LOAELs for growth and reproduction in USEPA 2007g
PAHs				
1-Methylnaphthalene	NA	---	NA	---
2-Methylnaphthalene	NA	---	NA	---
Acenaphthene	NA		NA	
Acenaphthylene	NA	---	NA	---
Anthracene	NA	---	NA	---
Benzo(a)Anthracene	NA	---	NA	---
Benzo(a)Pyrene	NA	---	NA	---
Benzo(b)Fluoranthene	NA	---	NA	---
Benzo(g,h,i)Perylene	NA	---	NA	---
Benzo(k)Fluoranthene	NA	---	NA	---
Chrysene	NA	---	NA	---
Dibenzo(a,h)Anthracene	NA	---	NA	---
Fluoranthene	NA	---	NA	---
Fluorene	NA		NA	
Indeno(1,2,3-Cd)Pyrene	NA	---	NA	---
Naphthalene	NA	---	NA	---
Phenanthrene	NA	---	NA	---
Pyrene	NA	---	NA	---
Total LMW PAHs	5.62E+03	USEPA 2007e did not derive value due to too few studies, value is from the only study not rejected for use (Landis Associates Inc. 1985)	NA	---
Total HMW PAHs	2.00E+00	USEPA 2007e did not derive value due to too few studies, valuse if from the only study not rejected for use (Trust et al. 1994)	2.00E+01	USEPA 2007e did not derive value due to too few studies, valuse if from the only study not rejected for use (Trust et al. 1994)
Total PAHs	NA	---	NA	---
Pesticides				
4,4'-DDD	2.80E-03	Sample et al. 1996, value for DDT	0.028	Sample et al. 1996, value for DDT
4,4'-DDE	2.80E-03	Sample et al. 1996, value for DDT	0.028	Sample et al. 1996, value for DDT
4,4'-DDT	2.80E-03	Sample et al. 1996, value for DDT	0.028	Sample et al. 1996, value for DDT
alpha-Chlordane	2.14E+00	Sample et al. 1996, value for Chlordane	1.07E+01	Sample et al. 1996, value for Chlordane
gamma-Chlordane	2.14E+00	Sample et al. 1996, value for Chlordane	1.07E+01	Sample et al. 1996, value for Chlordane
SVOCs				
1,1-Biphenyl	NA	---	NA	---
1,2,3-Trichlorobenzene	NA	---	NA	---

Table 4-9
Toxicity Reference Values for Birds

Chemical	Avian NOAEL (mg/kg-bw day)	Avian NOAEL Source and Notes	Avian LOAEL (mg/kg-bw day)	Avian LOAEL Source and Notes
4-chloroaniline	NA	---	NA	---
4-methylphenol	NA	---	NA	---
Acetophenone	NA	--	NA	--
Bis(2-ethylhexyl)phthalate	1.10E+00	Sample et al. 1996	NA	---
Butyl benzyl phthalate	1.10E-01	Sample et al. 1996, value for di-n-butyl phthalate	1.10E+00	Sample et al. 1996, value for di-n-butyl phthalate
Caprolactam	NA	---	NA	---
Carbazole	NA	---	NA	---
Dalapon	NA	---	NA	---
Dibenzofuran	NA	---	NA	---
Diethyl phthalate	1.10E-01	Sample et al. 1996, value for di-n-butyl phthalate	1.10E+00	Sample et al. 1996, value for di-n-butyl phthalate
Dimethyl phthalate	NA	---	NA	---
Di-n-butyl phthalate	1.10E-01	Sample et al. 1996	1.10E+00	Sample et al. 1996
Pentachlorophenol	NA	---	NA	---
Phenol	3.77E+00	Derived from Schafer et al. 1983	NA	---
VOCs				
1,4-dioxane	NA	---	NA	---
2-Butanone	NA	---	NA	---
Acetone	NA	---	NA	---
Benzene	NA	---	NA	---
Carbon disulfide	NA	---	NA	---
Chloroform	NA	---	NA	---
Chloromethane (Methyl chlori	NA	---	NA	---
Cyclohexane	NA	---	NA	---
Dichloroethene-1,2 (cis)	NA	---	NA	---
Ethylbenzene	NA	---	NA	---
Isopropylbenzene (Cumene)	NA	---	NA	---
Methylcyclohexane	NA	---	NA	---
Methylene chloride	NA	---	NA	---
Trichlorofluoromethane	NA	---	NA	---
Xylenes (m & p)	NA	---	NA	---
Xylenes (o)	NA	---	NA	---
Xylenes (Total)	NA	---	NA	---

NOTES:
LOAEL = Lowest Observed Adverse Effect Level.
mg/kg dry wt = Milligram per kilogram of body weight per day.
NA = TRV not available.
NOAEL = No Observed Adverse Effect Level.
TRV = Toxicity Reference Value.

Table 4-10
Sediment Toxicity Reference Values for Benthic Organism Exposures

Chemical	Threshold effects concentration (mg/kg dry wt.)	Probable effects concentration (mg/kg dry wt.)	Source
Metals			
Aluminum	NA	NA	---
Antimony	2.00E+00	2.50E+01	ER-L and ER-M values (Long and Morgan 1991)
Arsenic	5.90E+00	1.70E+01	Freshwater TEL and PEL values (MacDonald et al. 1996)
Barium	1.30E+02	NA	TEL value based on SLC approach using sensitive species HC5% (Leung et al. 2005)
Beryllium	1.10E+00	3.00E+01	Dutch Target and Intervention values for soil (Verbruggen et al. 2001)
Cadmium	5.96E-01	3.53E+00	Freshwater TEL and PEL values (MacDonald et al. 1996)
Chromium	3.73E+01	9.00E+01	Freshwater TEL and PEL values (MacDonald et al. 1996)
Chromium, hexavalent	3.73E+01	9.00E+01	Freshwater TEL and PEL values for trivalent chromium (MacDonald et al. 1996)
Cobalt	NA	NA	---
Copper	3.57E+01	1.97E+02	Freshwater TEL and PEL values (MacDonald et al. 1996)
Lead	3.50E+01	9.13E+01	Freshwater TEL and PEL values (MacDonald et al. 1996)
Manganese	4.60E+02	NA	Freshwater value is TEL (MacDonald et al. 1996)
Mercury	1.74E-01	4.86E-01	Freshwater TEL and PEL values (MacDonald et al. 1996)
Nickel	1.80E+01	3.60E+01	Freshwater TEL and PEL values (MacDonald et al. 1996)
Selenium	7.00E-01	1.00E+02	Dutch Target and Intervention values for soil (Verbruggen et al. 2001)
Silver	7.30E-01	1.77E+00	TEC and PEC values (MacDonald 1994)
Thallium	1.00E+00	1.50E+01	Dutch Target and Intervention values for soil (Verbruggen et al. 2001)
Vanadium	4.20E+01	2.50E+02	Dutch Target and Intervention values for soil (Verbruggen et al. 2001)
Zinc	1.23E+02	3.15E+02	Freshwater TEL and PEL values (MacDonald et al. 1996)
PAHs			
1-Methylnaphthalene	3.46E-02	3.91E-01	Freshwater TEL and PEL for naphthalene MacDonald et al. 1996
2-Methylnaphthalene	3.46E-02	3.91E-01	Freshwater TEL and PEL for naphthalene MacDonald et al. 1996
Acenaphthene	6.71E-03	8.89E-02	Freshwater TEL and PEL MacDonald et al. 1996
Acenaphthylene	5.87E-03	1.28E-01	Freshwater TEL and PEL MacDonald et al. 1996
Anthracene	4.69E-02	2.45E-01	Freshwater TEL and PEL MacDonald et al. 1996
Benzo(a)Anthracene	3.17E-02	3.85E-01	Freshwater TEL and PEL MacDonald et al. 1996
Benzo(a)Pyrene	3.19E-02	7.82E-01	Freshwater TEL and PEL MacDonald et al. 1996
Benzo(b)Fluoranthene	1.30E-01	1.11E+00	Marine T20 and T50 values from Field et al. 2002
Benzo(g,h,i)Perylene	1.70E-01	3.20E+00	Freshwater LEL and SEL from Persuad 1993
Benzo(k)Fluoranthene	2.40E-01	1.34E+01	Freshwater LEL and SEL from Persuad 1993
Chrysene	5.70E-02	8.62E-01	Freshwater TEL and PEL MacDonald et al. 1996
Dibenzo(a,h)Anthracene	6.22E-03	1.35E-01	Freshwater TEL and PEL MacDonald et al. 1996
Fluoranthene	1.11E-01	2.36E+00	Freshwater TEL and PEL MacDonald et al. 1996
Fluorene	2.12E-02	1.44E-01	Freshwater TEL and PEL MacDonald et al. 1996
Indeno(1,2,3-Cd)Pyrene	2.00E-01	3.20E+00	Freshwater LEL and SEL from Persuad 1993
Naphthalene	3.46E-02	3.91E-01	Freshwater TEL and PEL MacDonald et al. 1996
Phenanthrene	4.19E-02	5.15E-01	Freshwater TEL and PEL MacDonald et al. 1996
Pyrene	5.30E-02	8.75E-01	Freshwater TEL and PEL MacDonald et al. 1996
Total LMW PAHs	3.12E-01	1.44E+00	MacDonald et al. 1996
Total HMW PAHs	6.55E-01	6.68E+00	MacDonald et al. 1996
Total PAHs	1.68E+00	1.68E+01	MacDonald et al. 1996
Pesticides			
4,4'-DDD	3.54E-03	8.51E-03	Freshwater TEL and PEL MacDonald et al. 1996
4,4'-DDE	1.42E-03	6.75E-03	Freshwater TEL and PEL MacDonald et al. 1996
4,4'-DDT	1.19E-03	4.77E-03	Freshwater TEL and PEL MacDonald et al. 1996
alpha-Chlordane	4.50E-03	8.90E-03	Freshwater TEL and PEL MacDonald et al. 1996
gamma-Chlordane	4.50E-03	8.90E-03	Freshwater TEL and PEL MacDonald et al. 1996
SVOCs			
1,1-Biphenyl	1.70E-02	7.30E-02	Marine T20 and T50 values from Field et al. 2002
1,2,3-Trichlorobenzene	1.10E-02	5.00E+00	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
4-chloroaniline	5.00E-03	5.00E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
4-methylphenol	5.00E-02	1.40E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001) value for phenol
Acetophenone	NA	NA	---
Bis(2-ethylhexyl)phthalate	1.82E-01	2.65E+00	MacDonald et al. 1996
Butyl benzyl phthalate	1.00E-01	4.80E+01	Dutch Target and Intervention values for sediment from, target value is < 0.1 (Verbruggen et al. 2001)
Caprolactam	NA	NA	---
Carbazole	NA	NA	---
Dalapon	NA	NA	---
Dibenzofuran	NA	NA	---
Diethyl phthalate	5.30E-01	5.30E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Dimethyl phthalate	1.00E+00	8.40E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Di-n-butyl phthalate	7.00E+00	3.60E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Pentachlorophenol	NA	8.00E+00	Dutch Intervention value for sediment (Verbruggen et al. 2001)

Table 4-10
Sediment Toxicity Reference Values for Benthic Organism Exposures

Chemical	Threshold effects concentration (mg/kg dry wt.)	Probable effects concentration (mg/kg dry wt.)	Source
Phenol	5.00E-02	1.40E+01	Dutch Target and Intervention values for sediment from Verbruggen et al. 2001.
VOCs			
1,4-dioxane	NA	NA	---
2-Butanone	NA	3.50E+01	Dutch Intervention value for sediment (Verbruggen et al. 2001)
Acetone	2.30E+00	NA	Freshwater value from DiToro et al. 2000, assuming 1% OC
Benzene	1.00E-02	1.00E+00	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Carbon disulfide	8.50E-04	NA	Freshwater value is SQB calculated from Tier II secondary chronic value (Jones et al. 1997) assuming 1% OC
Chloroform	2.00E-02	1.00E+01	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Chloromethane (Methyl chloride)	2.10E+00	NA	Freshwater value from DiToro et al. 2000 assuming 1% OC
Cyclohexane	NA	NA	---
Dichloroethene-1,2 (cis)	2.00E-01	1.00E+03	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Ethylbenzene	9.70E+00	NA	Freshwater value from DiToro et al. 2000 assuming 1% OC
Isopropylbenzene (Cumene)	NA	NA	---
Methylcyclohexane	NA	NA	---
Methylene chloride	1.80E-02	3.90E+00	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Trichlorofluoromethane	NA	NA	---
Xylenes (m & p)	1.30E-01	1.70E+01	Dutch Target and Intervention m-xylene values for sediment (Verbruggen et al. 2001)
Xylenes (o)	8.90E-02	9.30E+00	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)
Xylenes (Total)	1.30E-01	9.30E+00	Dutch Target and Intervention values for sediment (Verbruggen et al. 2001)

NOTES:
LOAEL = Lowest Observed Adverse Effect Level.
mg/kg dry wt = Milligram per kilogram of body weight per day.
NA = TRV not available.
NOAEL = No Observed Adverse Effect Level.
OC = Organic carbon
TRV = Toxicity Reference Value.

Table 4-11
Surface Water Toxicity Reference Values for Aquatic Organism Exposures

Chemical	Chronic Surface Water TRV (ug/L)	Acute Surface Water TRV (ug/L)	Source for Surface Water TRVs
Metals			
Aluminum	6.80E+02	7.50E+02	Chronic value from EPA National Recommended Aquatic Life Criteria 2018 Aluminum Criteria Calculator; acute freshwater value from Suter and Tsao 1996
Antimony	1.90E+02	NA	EPA Region IV Freshwater Value
Arsenic	1.50E+02	3.40E+02	OWRB 2017
Barium	2.20E+02	NA	EPA Region IV Freshwater Value
Beryllium	1.10E+02	NA	EPA Region IV Freshwater Value
Cadmium	2.30E-01	1.88E+00	OWRB 2017
Chromium	6.98E+01	5.37E+02	OWRB 2017
Chromium, hexavalent	1.10E+01	1.60E+01	OWRB 2017
Cobalt	1.90E+01	NA	EPA Region IV Freshwater Value
Copper	1.20E+01	1.79E+01	OWRB 2017
Lead	2.90E+00	7.40E+01	OWRB 2017
Manganese	9.30E+01	NA	EPA Region IV Freshwater Value
Mercury	1.30E+00	2.40E+00	OWRB 2017
Nickel	4.89E+01	4.40E+02	OWRB 2017
Selenium	5.00E+00	2.00E+01	OWRB 2017
Silver	3.60E-01	2.84E+00	Chronic value is Tier II freshwater value from Suter and Tsao 1996; acute value is from OWRB 2017
Thallium	6.00E+00	1.40E+03	Chronic value EPA Region IV; acute value referenced from OWRB 2017
Vanadium	2.70E+01	NA	EPA Region IV Freshwater Value
Zinc	8.10E+01	1.10E+02	NAWQC (USEPA 2016); acute value referenced from OWRB 2017
PAHs			
1-Methylnaphthalene	2.10E+00	3.70E+01	Tier II freshwater value for 1-methylnaphthalene from Suter and Tsao 1996
2-Methylnaphthalene	2.10E+00	3.70E+01	Tier II freshwater value for 1-methylnaphthalene from Suter and Tsao 1996
Acenaphthene	2.30E+01	8.00E+01	NAWQ criteria from Suter and Tsao 1996
Acenaphthylene	4.84E+03	NA	USEPA Region 5 Ecological Screening Level, freshwater value (USEPA 2003)
Anthracene	7.30E-01	1.30E+01	Tier II freshwater value from Suter and Tsao 1996
Benzo(a)Anthracene	2.70E-02	4.90E-01	Tier II freshwater value from Suter and Tsao 1996
Benzo(a)Pyrene	1.40E-02	2.40E-01	Tier II freshwater value from Suter and Tsao 1996
Benzo(b)Fluoranthene	9.07E+00	NA	USEPA Region 5 Ecological Screening Level; freshwater value (USEPA 2003)
Benzo(g,h,i)Perylene	7.64E+00	NA	USEPA Region 5 Ecological Screening Level; freshwater value (USEPA 2003)
Benzo(k)Fluoranthene	NA	NA	---
Chrysene	NA	NA	---
Dibenzo(a,h)Anthracene	NA	NA	---
Fluoranthene	8.00E-01	NA	EPA Region IV Freshwater Value
Fluorene	3.90E+00	7.00E+01	Tier II freshwater value from Suter and Tsao 1996
Indeno(1,2,3-Cd)Pyrene	4.31E+00	NA	USEPA Region 5 Ecological Screening Level; freshwater value (USEPA 2003)
Naphthalene	2.10E+01	NA	EPA Region IV Freshwater Value
Phenanthrene	2.30E+00	NA	EPA Region IV Freshwater Value
Pyrene	NA	NA	---
Total LMW PAHs	NA	NA	---
Total HMW PAHs	NA	NA	---
Total PAHs	NA	NA	---
Pesticides			
4,4'-DDD	1.10E-02	1.90E-01	Tier II freshwater value from Suter and Tsao 1996
4,4'-DDE	NA	NA	---
4,4'-DDT	1.00E-04	1.10E+00	NAWQC (USEPA 2016)
alpha-Chlordane	4.30E-03	2.40E+00	NAWQC (USEPA 2016)
gamma-Chlordane	4.30E-03	2.40E+00	NAWQC (USEPA 2016)
SVOCs			
1,1-Biphenyl	1.40E+01	NA	Tier II freshwater value from Suter and Tsao 1996
1,2,3-Trichlorobenzene	8.00E+00	NA	USEPA Region 3 BTAG freshwater (USEPA 2006)
4-chloroaniline	5.00E+01	2.50E+02	NAWQC (USEPA 2016)
4-methylphenol	NA	NA	---
Acetophenone	NA	NA	---
Bis(2-ethylhexyl)phthalate	8.00E+00	NA	EPA Region IV Freshwater Value
Butyl benzyl phthalate	1.90E+01	NA	Tier II value from Suter and Tsao 1996, value for freshwater
Caprolactam	NA	NA	---

Table 4-11
Surface Water Toxicity Reference Values for Aquatic Organism Exposures

Chemical	Chronic Surface Water TRV (ug/L)	Acute Surface Water TRV (ug/L)	Source for Surface Water TRVs
Carbazole	NA	NA	---
Dalapon	NA	NA	---
Dibenzofuran	3.70E+00	6.60E+01	Tier II values from Suter and Tsao 1996, value for freshwater
Diethyl phthalate	2.10E+02	1.80E+03	Tier II values from Suter and Tsao 1996, value for freshwater
Dimethyl phthalate	3.00E+00	9.40E+02	NAWQC (USEPA 2016)
Di-n-butyl phthalate	3.50E+01	1.90E+02	Tier II values from Suter and Tsao 1996, value for freshwater
Pentachlorophenol	1.50E+01	1.90E+01	NAWQC (USEPA 2016)
Phenol	1.60E+02	NA	EPA Region IV Freshwater Value
VOCs			
1,4-dioxane	NA	NA	---
2-Butanone	1.40E+04	2.40E+05	Tier II freshwater values from Suter and Tsao 1996
Acetone	1.50E+03	2.80E+04	Tier II freshwater values from Suter and Tsao 1996
Benzene	2.20E+03	NA	OWRB 2017
Carbon disulfide	9.20E-01	1.70E+01	Tier II freshwater values from Suter and Tsao 1996
Chloroform	2.80E+01	4.90E+02	Tier II freshwater values from Suter and Tsao 1996
Chloromethane (Methyl chloride)	NA	NA	---
Cyclohexane	NA	NA	---
Dichloroethene-1,2 (cis)	5.90E+02	1.10E+03	Tier II freshwater values from Suter and Tsao 1996
Ethylbenzene	6.10E+01	NA	EPA Region IV; freshwater Value
Isopropylbenzene (Cumene)	NA	NA	---
Methylcyclohexane	NA	NA	---
Methylene chloride	2.20E+03	2.60E+04	Tier II freshwater value from Suter and Tsao 1996
Trichlorofluoromethane	NA	NA	---
Xylenes (m & p)	1.80E+00	3.20E+01	Tier II value for m-Xylene from Suter and Tsao 1996; value for freshwater
Xylenes (o)	NA	NA	---
Xylenes (Total)	1.30E+01	2.30E+02	Tier II value from Suter and Tsao 1996; value for freshwater

NOTES:
ug/L = Microgram per liter.
NA = TRV not available.
NAWQC = National Ambient Water Quality Criteria.
OWRB = Oklahoma Water Resources Board.
PAH = Polycyclic aromatic hydrocarbon.
SVOC = Semivolatile organic compound.
TRV = Toxicity Reference Value.
VOC = Volatile organic compound.

Table 5-1
Frequency of Detection and Exposure Point Concentrations
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Analyte	Surface Soil				Surface Water (Total Concentration)				Surface Water (Dissolved Concentration)		
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Background (mg/kg)	Frequency	Maximum (µg/L)	95UCLM (µg/L)	Background UPL (µg/L)	Frequency	Maximum (µg/L)	95UCLM (µg/L)
Metals											
Antimony	8/203	1.80E+00	5.41E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Arsenic	203/203	2.09E+01	2.67E+00	2.30E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Cadmium	114/203	8.02E+01	7.20E-01	5.30E-01	4/22	2.50E+01	2.50E+01	0.00E+00	7/22	9.60E+00	6.27E+00
Chromium	203/203	2.97E+01	8.90E+00	7.10E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Chromium, hexavalent	8/11	1.50E+00	1.10E+00	NA	0/1	0.00E+00	0.00E+00	0.00E+00	0/22	0.00E+00	0.00E+00
Cobalt	188/203	2.25E+01	3.20E+00	1.11E+01	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Copper	201/203	7.49E+03	2.25E+02	3.24E+00	2/22	2.69E+01	2.69E+01	0.00E+00	0/22	0.00E+00	0.00E+00
Lead	203/203	2.08E+04	3.46E+02	9.19E+00	8/22	1.81E+02	7.00E+01	0.00E+00	3/22	3.01E+01	3.01E+01
Manganese	203/203	1.43E+03	2.63E+02	5.05E+02	22/22	4.13E+02	2.45E+02	6.90E+02	16/22	1.67E+02	9.26E+01
Mercury	118/203	2.00E+00	2.06E-01	3.80E-02	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Nickel	202/203	4.07E+01	7.17E+00	5.60E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Selenium	37/203	1.60E+00	3.89E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Thallium	41/203	4.80E-01	4.50E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
Vanadium	203/203	7.92E+01	1.42E+01	1.12E+01	2/22	2.91E+01	2.91E+01	0.00E+00	0/22	0.00E+00	0.00E+00
Zinc	203/203	1.38E+04	4.70E+02	1.42E+01	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC
PAHs											
Total LMW PAHs	183/183	1.88E+02	1.15E+01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Total HMW PAHs	182/182	2.63E+02	1.40E+01	1.50E-03	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Pesticides											
4,4'-DDD	30/35	1.10E-01	3.17E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
4,4'-DDT	33/35	4.00E-02	1.63E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
gamma-Chlordane	32/35	5.00E-02	1.33E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
SVOCs											
1,1-Biphenyl	45/203	9.70E-01	2.27E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
4-methylphenol	3/201	1.50E-01	1.50E-01	0.00E+00	0/22	0.00E+00	0.00E+00	0.00E+00	--	--	--
Acetophenone	4/203	9.00E-02	9.00E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Bis(2-ethylhexyl)phthalate	12/203	5.00E-01	5.00E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Carbazole	20/203	4.00E+01	1.40E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Dibenzofuran	49/203	1.10E+00	1.33E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00			
Di-n-butyl phthalate	1/203	5.50E-02	5.50E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
VOCs											
1,4-dioxane	2/202	4.50E-03	4.50E-03	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00			
Carbon disulfide	1/68	6.30E-03	6.30E-03	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Cyclohexane	8/69	1.30E+01	2.44E-03	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Isopropylbenzene (Cumene)	7/69	1.70E+00	1.41E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Toluene	12/69	6.40E-01	1.09E-02	0.00E+00	0/16	0.00E+00	0.00E+00	0.00E+00	--	--	--
Xylenes (m & p)	12/69	2.40E+00	3.16E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--
Xylenes (o)	10/69	5.40E-01	6.49E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--	--

Table 5-2
Comparison of Exposure Point Concentrations in Soil to Plant TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Plant Toxicity Reference Value (mg/kg dry wt)	Maximum EPC (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM EPC (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals					
Antimony	5.00E+00	1.80E+00	3.60E-01	5.41E-01	1.08E-01
Arsenic	1.80E+01	2.09E+01	1.16E+00	2.67E+00	1.48E-01
Cadmium	3.20E+01	8.02E+01	**2.51E+00**	7.20E-01	2.25E-02
Chromium	1.00E+00	2.97E+01	**2.97E+01**	8.90E+00	**8.90E+00**
Chromium, hexavalent	1.00E+00	1.50E+00	**1.50E+00**	1.10E+00	1.10E+00
Cobalt	1.30E+01	2.25E+01	**1.73E+00**	3.20E+00	2.46E-01
Copper	7.00E+01	7.49E+03	**1.07E+02**	2.25E+02	**3.21E+00**
Lead	1.20E+02	2.08E+04	**1.73E+02**	3.46E+02	**2.88E+00**
Manganese	2.20E+02	1.43E+03	**6.50E+00**	2.63E+02	1.20E+00
Mercury	3.00E-01	2.00E+00	**6.67E+00**	2.06E-01	6.87E-01
Nickel	3.80E+01	4.07E+01	1.07E+00	7.17E+00	1.89E-01
Selenium	5.20E-01	1.60E+00	**3.08E+00**	3.89E-01	7.48E-01
Thallium	1.00E+00	4.80E-01	4.80E-01	4.50E-02	4.50E-02
Vanadium	2.00E+00	7.92E+01	**3.96E+01**	1.42E+01	**7.10E+00**
Zinc	1.60E+02	1.38E+04	**8.63E+01**	4.70E+02	**2.94E+00**
PAHs					
Total LMW PAHs	2.00E+01	1.88E+02	**9.39E+00**	1.15E+01	5.77E-01
Total HMW PAHs	2.00E+01	2.63E+02	**1.32E+01**	1.40E+01	6.99E-01
Pesticides					
4,4'-DDD	NA	1.10E-01	--	3.17E-02	--
4,4'-DDT	NA	4.00E-02	--	1.63E-02	--
gamma-Chlordane	2.20E+00	5.00E-02	2.27E-02	1.33E-02	6.05E-03
SVOCs					
1,1-Biphenyl	6.00E+01	9.70E-01	1.62E-02	2.27E-01	3.78E-03
4-methylphenol	NA	1.50E-01	--	1.50E-01	--
Acetophenone	NA	9.00E-02	--	9.00E-02	--
Bis(2-ethylhexyl)phthalate	1.00E+02	5.00E-01	5.00E-03	5.00E-01	5.00E-03
Carbazole	NA	4.00E+01	--	1.40E-01	--
Dibenzofuran	NA	1.10E+00	--	1.33E-02	--
Di-n-butyl phthalate	2.00E+02	5.50E-02	2.75E-04	5.50E-02	2.75E-04
VOCs					
1,4-dioxane	NA	4.50E-03	--	4.50E-03	--
Carbon disulfide	NA	6.30E-03	--	6.30E-03	--
Cyclohexane	NA	1.30E+01	--	2.44E-03	--
Isopropylbenzene (Cumene)	NA	1.70E+00	--	1.41E-01	--
Toluene	2.00E+02	6.40E-01	3.20E-03	1.09E-02	5.45E-05
Xylenes (m & p)	1.00E+02	2.40E+00	2.40E-02	3.16E-01	3.16E-03
Xylenes (o)	1.00E+02	5.40E-01	5.40E-03	6.49E-02	6.49E-04

Table 5-3
Comparison of Exposure Point Concentrations in Soil to Soil Invertebrate TRVs for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Invertebrate Toxicity Reference Value (mg/kg dry wt)	Maximum Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals					
Antimony	7.80E+01	1.80E+00	2.31E-02	5.41E-01	6.94E-03
Arsenic	6.00E+01	2.09E+01	3.48E-01	2.67E+00	4.45E-02
Cadmium	1.40E+02	8.02E+01	5.73E-01	7.20E-01	5.14E-03
Chromium	4.00E-01	2.97E+01	**7.43E+01**	8.90E+00	**2.23E+01**
Chromium, hexavalent	4.00E-01	1.50E+00	**3.75E+00**	1.10E+00	**2.75E+00**
Cobalt	NA	2.25E+01	--	3.20E+00	--
Copper	8.00E+01	7.49E+03	**9.36E+01**	2.25E+02	**2.81E+00**
Lead	1.70E+03	2.08E+04	**1.22E+01**	3.46E+02	2.04E-01
Manganese	4.50E+02	1.43E+03	**3.18E+00**	2.63E+02	5.84E-01
Mercury	1.00E-01	2.00E+00	**2.00E+01**	2.06E-01	**2.06E+00**
Nickel	2.80E+02	4.07E+01	1.45E-01	7.17E+00	2.56E-02
Selenium	4.10E+00	1.60E+00	3.90E-01	3.89E-01	9.49E-02
Thallium	NA	4.80E-01	--	4.50E-02	--
Vanadium	NA	7.92E+01	--	1.42E+01	--
Zinc	1.20E+02	1.38E+04	**1.15E+02**	4.70E+02	**3.92E+00**
PAHs					
Total LMW PAHs	2.90E+01	1.88E+02	**6.48E+00**	1.15E+01	3.98E-01
Total HMW PAHs	1.80E+01	2.63E+02	**1.46E+01**	1.40E+01	7.77E-01
Pesticides					
4,4'-DDD	NA	1.10E-01	--	3.17E-02	--
4,4'-DDT	NA	4.00E-02	--	1.63E-02	--
gamma-Chlordane	2.00E-02	5.00E-02	**2.50E+00**	1.33E-02	6.65E-01
SVOCs					
1,1-Biphenyl	6.00E+01	9.70E-01	1.62E-02	2.27E-01	3.78E-03
4-methylphenol	NA	1.50E-01	--	1.50E-01	--
Acetophenone	NA	9.00E-02	--	9.00E-02	--
Bis(2-ethylhexyl)phthalate	2.00E+02	5.00E-01	2.50E-03	5.00E-01	2.50E-03
Carbazole	1.60E-01	4.00E+01	**2.50E+02**	1.40E-01	8.75E-01
Dibenzofuran	NA	1.10E+00	--	1.33E-02	--
Di-n-butyl phthalate	2.20E-01	5.50E-02	2.50E-01	5.50E-02	2.50E-01
VOCs					
1,4-dioxane	NA	4.50E-03	--	4.50E-03	--
Carbon disulfide	5.00E-03	6.30E-03	1.26E+00	6.30E-03	1.26E+00
Cyclohexane	NA	1.30E+01	--	2.44E-03	--
Isopropylbenzene (Cumene)	4.00E-02	1.70E+00	**4.25E+01**	1.41E-01	**3.53E+00**
Toluene	1.50E-01	6.40E-01	**4.27E+00**	1.09E-02	7.27E-02
Xylenes (m & p)	1.00E-01	2.40E+00	**2.40E+01**	3.16E-01	**3.16E+00**
Xylenes (o)	1.00E-01	5.40E-01	**5.40E+00**	6.49E-02	6.49E-01

Table 5-4
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs				Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Metals										
Antimony	5.90E-02	5.90E-01	2.59E-01	1.69E-01	**5.34E+00**	2.78E-02	2.59E-02	1.69E-02	5.34E-01	2.78E-03
Arsenic	1.04E+00	1.66E+00	4.47E-02	2.95E-02	7.13E-01	1.66E-02	2.80E-02	1.85E-02	4.47E-01	1.04E-02
Cadmium	7.70E-01	7.70E+00	4.32E-01	2.83E-01	**5.65E+01**	2.54E-01	4.32E-02	2.83E-02	**5.65E+00**	2.54E-02
Chromium	2.40E+00	5.82E+01	1.54E-02	1.03E-02	8.66E-01	3.84E-02	6.35E-04	4.26E-04	3.57E-02	1.59E-03
Chromium, hexavalent	9.24E+00	3.84E+01	1.72E-04	1.17E-04	1.98E-01	9.60E-04	4.15E-05	2.81E-05	4.78E-02	2.31E-04
Cobalt	7.33E+00	1.89E+01	4.74E-03	3.17E-03	2.00E-01	9.82E-03	1.84E-03	1.23E-03	7.77E-02	3.81E-03
Copper	5.60E+00	9.34E+00	1.49E+00	1.01E+00	**2.85E+01**	1.06E+00	8.92E-01	6.03E-01	**1.71E+01**	6.36E-01
Lead	4.70E+00	8.90E+00	**4.01E+00**	**2.74E+00**	**1.70E+02**	**3.57E+00**	**2.12E+00**	1.45E+00	**8.98E+01**	**1.88E+00**
Manganese	5.15E+01	1.46E+02	2.92E-01	1.90E-01	7.51E-01	6.09E-02	1.03E-01	6.71E-02	2.66E-01	2.15E-02
Mercury	1.32E+01	NA	1.69E-03	1.10E-03	9.48E-03	8.33E-04	--	--	--	--
Nickel	1.70E+00	3.40E+00	5.78E-02	3.82E-02	**1.86E+00**	8.14E-02	2.89E-02	1.91E-02	9.29E-01	4.07E-02
Selenium	1.43E-01	2.15E-01	2.39E-01	1.55E-01	**1.64E+00**	1.46E-01	1.59E-01	1.03E-01	1.09E+00	9.68E-02
Thallium	7.40E-03	7.40E-02	6.01E-02	4.10E-02	**1.14E+01**	2.45E-01	6.01E-03	4.10E-03	1.14E+00	2.45E-02
Vanadium	4.16E+00	8.31E+00	2.09E-02	1.41E-02	**2.98E+00**	9.91E-02	1.04E-02	7.05E-03	1.49E+00	4.96E-02
Zinc	7.54E+01	2.98E+02	6.33E-01	4.15E-01	**7.70E+00**	1.87E-01	1.60E-01	1.05E-01	**1.95E+00**	4.73E-02
PAHs										
Total LMW PAHs	6.56E+01	3.28E+02	1.38E-02	9.00E-03	1.91E-01	2.05E-03	2.75E-03	1.80E-03	3.82E-02	4.09E-04
Total HMW PAHs	6.15E-01	3.01E+00	**2.06E+00**	1.34E+00	**2.85E+01**	3.06E-01	4.20E-01	2.75E-01	**5.82E+00**	6.25E-02
Pesticides										
4,4'-DDD	8.00E-01	4.00E+00	1.90E-04	1.27E-04	2.41E-02	9.92E-05	3.79E-05	0.00E+00	4.82E-03	1.98E-05
4,4'-DDT	8.00E-01	4.00E+00	4.75E-05	3.24E-05	8.76E-03	3.50E-05	9.51E-06	0.00E+00	1.75E-03	7.00E-06
gamma-Chlordane	4.60E+00	9.20E+00	9.86E-06	6.73E-06	1.90E-03	7.61E-06	4.93E-06	0.00E+00	9.52E-04	3.80E-06
SVOCs										
1,1-Biphenyl	NA	NA	--	--	--	--	--	--	--	--
4-methylphenol	NA	NA	--	--	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.83E+01	1.83E+02	2.17E-05	1.49E-05	4.79E-03	1.69E-02	2.17E-06	0.00E+00	4.79E-04	1.69E-03
Carbazole	NA	NA	--	--	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	5.50E+02	1.83E+03	4.01E-07	2.63E-07	1.75E-05	8.02E-08	1.20E-07	0.00E+00	5.26E-06	2.41E-08
VOCs										
1,4-dioxane	NA	NA	--	--	--	--	--	--	--	--
Carbon disulfide	2.64E+01	2.64E+02	3.86E-05	2.48E-05	5.03E-05	3.39E-06	3.86E-06	2.48E-06	5.03E-06	3.39E-07
Cyclohexane	NA	NA	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--	--	--
Toluene	2.60E+01	2.60E+02	1.27E-03	8.24E-04	4.31E-03	1.73E-05	1.27E-04	8.24E-05	4.31E-04	1.73E-06

Table 5-4
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs				Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Xylenes (m & p)	2.10E+00	2.60E+00	2.89E-02	1.87E-02	2.00E-01	8.04E-04	2.33E-02	1.51E-02	1.62E-01	6.49E-04
Xylenes (o)	2.10E+00	2.60E+00	6.50E-03	4.21E-03	4.50E-02	1.81E-04	5.25E-03	3.40E-03	3.64E-02	1.46E-04

Table 5-5
Comparison of 95UCLM Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Mammalian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs				95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Metals										
Antimony	5.90E-02	5.90E-01	7.79E-02	5.07E-02	**1.61E+00**	8.37E-03	7.79E-03	5.07E-03	1.61E-01	8.37E-04
Arsenic	1.04E+00	1.66E+00	1.18E-02	7.69E-03	1.24E-01	2.49E-03	7.38E-03	4.82E-03	7.79E-02	1.56E-03
Cadmium	7.70E-01	7.70E+00	3.65E-02	2.35E-02	1.31E+00	2.14E-02	3.65E-03	2.35E-03	1.31E-01	2.14E-03
Chromium	2.40E+00	5.82E+01	6.19E-03	4.09E-03	7.43E-01	1.53E-02	2.55E-04	1.69E-04	3.07E-02	6.30E-04
Chromium, hexavalent	9.24E+00	3.84E+01	1.26E-04	8.57E-05	2.02E-01	7.57E-04	3.05E-05	2.06E-05	4.86E-02	1.82E-04
Cobalt	7.33E+00	1.89E+01	6.75E-04	4.51E-04	2.85E-02	1.40E-03	2.62E-04	1.75E-04	1.10E-02	5.42E-04
Copper	5.60E+00	9.34E+00	1.46E-01	9.59E-02	1.43E+00	1.04E-01	8.77E-02	5.75E-02	8.56E-01	6.22E-02
Lead	4.70E+00	8.90E+00	1.19E-01	7.95E-02	**4.46E+00**	1.29E-01	6.30E-02	4.20E-02	**2.35E+00**	6.81E-02
Manganese	5.15E+01	1.46E+02	5.47E-02	3.55E-02	1.64E-01	1.15E-02	1.93E-02	1.26E-02	5.79E-02	4.06E-03
Mercury	1.32E+01	NA	4.70E-04	3.04E-04	5.23E-03	8.58E-05	--	--	--	--
Nickel	1.70E+00	3.40E+00	1.40E-02	9.19E-03	**2.24E+00**	3.17E-02	7.00E-03	4.60E-03	1.12E+00	1.59E-02
Selenium	1.43E-01	2.15E-01	5.05E-02	3.27E-02	5.48E-02	8.28E-02	3.36E-02	2.18E-02	3.65E-02	5.50E-02
Thallium	7.40E-03	7.40E-02	5.64E-03	3.85E-03	1.07E+00	2.30E-02	5.64E-04	3.85E-04	1.07E-01	2.30E-03
Vanadium	4.16E+00	8.31E+00	5.46E-03	3.61E-03	5.36E-01	1.83E-02	2.73E-03	1.81E-03	2.68E-01	9.14E-03
Zinc	7.54E+01	2.98E+02	8.02E-02	5.21E-02	1.45E+00	5.01E-02	2.03E-02	1.32E-02	3.67E-01	1.27E-02
PAHs										
Total LMW PAHs	6.56E+01	3.28E+02	8.45E-04	5.52E-04	1.17E-02	1.26E-04	1.69E-04	1.10E-04	2.34E-03	2.51E-05
Total HMW PAHs	6.15E-01	3.01E+00	1.09E-01	7.14E-02	**1.52E+00**	1.63E-02	2.23E-02	1.46E-02	3.10E-01	3.32E-03
Total PAHs	NA	NA	--	--	--	--	--	--	--	--
Pesticides										
4,4'-DDD	8.00E-01	4.00E+00	5.46E-05	3.66E-05	6.94E-03	2.77E-05	1.09E-05	7.33E-06	1.39E-03	5.55E-06
4,4'-DDT	8.00E-01	4.00E+00	1.94E-05	1.32E-05	3.57E-03	1.43E-05	3.87E-06	2.64E-06	7.14E-04	2.85E-06
gamma-Chlordane	4.60E+00	9.20E+00	2.62E-06	1.79E-06	5.06E-04	2.02E-06	1.31E-06	8.96E-07	2.53E-04	1.01E-06
SVOCs										
1,1-Biphenyl	NA	NA	--	--	--	--	--	--	--	--
4-methylphenol	NA	NA	--	--	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.83E+01	1.83E+02	2.17E-05	1.49E-05	4.79E-03	1.69E-02	2.17E-06	1.49E-06	4.79E-04	1.69E-03
Carbazole	NA	NA	--	--	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	5.50E+02	1.83E+03	4.01E-07	2.63E-07	1.75E-05	8.02E-08	1.20E-07	7.89E-08	5.26E-06	2.41E-08
VOCs										
1,4-dioxane	NA	NA	--	--	--	--	--	--	--	--
Carbon disulfide	2.64E+01	2.64E+02	3.86E-05	2.48E-05	5.03E-05	3.39E-06	3.86E-06	2.48E-06	5.03E-06	3.39E-07
Cyclohexane	NA	NA	--	--	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--	--	--

Table 5-5
Comparison of 95UCLM Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Mammalian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs				95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Toluene	2.60E+01	2.60E+02	2.17E-05	1.40E-05	7.34E-05	2.94E-07	2.17E-06	1.40E-06	7.34E-06	2.94E-08
Xylenes (m & p)	2.10E+00	2.60E+00	3.80E-03	2.46E-03	2.64E-02	1.06E-04	3.07E-03	1.99E-03	2.13E-02	8.55E-05
Xylenes (o)	2.10E+00	2.60E+00	7.81E-04	5.06E-04	5.41E-03	2.17E-05	6.31E-04	4.09E-04	4.37E-03	1.76E-05

Table 5-6
Comparison of Maximum Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Avian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Metals								
Antimony	NA	NA	--	--	--	--	--	--
Arsenic	2.24E+00	7.40E+00	4.23E-01	2.45E-03	2.58E-01	1.28E-01	7.42E-04	7.82E-02
Cadmium	1.47E+00	6.35E+00	**4.22E+01**	2.10E-01	**2.08E+00**	**9.77E+00**	4.86E-02	4.81E-01
Chromium	2.66E+00	1.56E+01	1.06E+00	5.93E-02	2.40E-01	1.80E-01	1.01E-02	4.09E-02
Chromium, hexavalent	2.66E+00	1.56E+01	9.86E-01	6.58E-03	1.21E-02	1.68E-01	1.12E-03	2.07E-03
Cobalt	7.61E+00	1.83E+01	2.61E-01	1.66E-02	7.15E-02	1.08E-01	6.87E-03	2.97E-02
Copper	4.05E+00	1.21E+01	**4.63E+01**	3.87E-01	**4.03E+01**	**1.55E+01**	1.29E-01	**1.35E+01**
Lead	1.63E+00	3.26E+00	**6.33E+02**	**3.02E+00**	**2.63E+02**	**3.17E+02**	**1.51E+00**	**1.32E+02**
Manganese	1.79E+02	3.77E+02	2.65E-01	2.64E-02	5.87E-01	1.26E-01	1.25E-02	2.79E-01
Mercury	4.50E-01	9.00E-01	3.75E-01	4.78E-02	3.45E-01	1.87E-01	2.39E-02	1.72E-01
Nickel	6.71E+00	1.86E+01	6.42E-01	3.67E-02	1.76E-01	2.32E-01	1.32E-02	6.36E-02
Selenium	2.90E-01	5.79E-01	1.13E+00	1.52E-01	7.40E-01	5.68E-01	7.62E-02	3.70E-01
Thallium	NA	NA	--	--	--	--	--	--
Vanadium	3.44E-01	6.88E-01	**5.05E+01**	**2.31E+00**	**4.86E+00**	**2.52E+01**	1.16E+00	**2.43E+00**
Zinc	6.61E+01	1.71E+02	**1.14E+01**	1.50E-01	**7.26E+00**	**4.41E+00**	5.78E-02	**2.80E+00**
PAHs								
Total LMW PAHs	5.62E+03	NA	3.01E-03	1.14E-06	1.41E-03	--	--	--
Total HMW PAHs	2.00E+00	2.00E+01	**1.18E+01**	4.47E-03	**5.56E+00**	1.18E+00	4.47E-04	5.56E-01
Pesticides								
4,4'-DDD	2.80E-03	2.80E-02	**9.66E+00**	1.88E-03	9.14E-01	9.66E-01	1.88E-04	9.14E-02
4,4'-DDT	2.80E-03	2.80E-02	**3.51E+00**	9.23E-06	2.99E-01	3.51E-01	9.23E-07	2.99E-02
gamma-Chlordane	2.14E+00	1.07E+01	5.74E-03	6.15E-09	4.83E-04	1.15E-03	1.23E-09	9.65E-05
SVOCs								
1,1-Biphenyl	NA	NA	--	--	--	--	--	--
4-methylphenol	NA	NA	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.10E+00	NA	1.12E-01	6.28E-01	9.11E-03	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--
Di-n-butyl phthalate	1.10E-01	1.10E+00	1.23E-01	1.15E-04	1.89E-02	1.23E-02	1.15E-05	1.89E-03
VOCs								
1,4-dioxane	NA	NA	--	--	--	--	--	--
Carbon disulfide	NA	NA	--	--	--	--	--	--
Cyclohexane	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Toluene	NA	NA	--	--	--	--	--	--
Xylenes (m & p)	NA	NA	--	--	--	--	--	--
Xylenes (o)	NA	NA	--	--	--	--	--	--

Table 5-7
Comparison of 95UCLM Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Avian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Metals								
Antimony	NA	NA	--	--	--	--	--	--
Arsenic	2.24E+00	7.40E+00	7.60E-02	5.25E-04	4.64E-02	2.30E-02	1.59E-04	1.40E-02
Cadmium	1.47E+00	6.35E+00	9.79E-01	2.21E-02	8.55E-02	2.27E-01	5.11E-03	1.98E-02
Chromium	2.66E+00	1.56E+01	9.43E-01	2.47E-02	7.20E-02	1.60E-01	4.21E-03	1.23E-02
Chromium, hexavalent	2.66E+00	1.56E+01	1.00E+00	5.24E-03	8.90E-03	1.71E-01	8.93E-04	1.52E-03
Cobalt	7.61E+00	1.83E+01	3.71E-02	2.35E-03	1.02E-02	1.54E-02	9.77E-04	4.22E-03
Copper	4.05E+00	1.21E+01	**2.52E+00**	2.33E-01	**1.98E+00**	8.45E-01	7.81E-02	6.62E-01
Lead	1.63E+00	3.26E+00	**1.73E+01**	4.94E-01	**5.15E+00**	**8.63E+00**	2.47E-01	**2.58E+00**
Manganese	1.79E+02	3.77E+02	5.93E-02	4.91E-03	1.08E-01	2.82E-02	2.33E-03	5.13E-02
Mercury	4.50E-01	9.00E-01	2.18E-01	4.92E-03	8.35E-02	1.09E-01	2.46E-03	4.18E-02
Nickel	6.71E+00	1.86E+01	8.10E-01	1.63E-02	3.64E-02	2.93E-01	5.90E-03	1.31E-02
Selenium	2.90E-01	5.79E-01	3.88E-01	8.93E-02	1.59E-01	1.94E-01	4.47E-02	7.96E-02
Thallium	NA	NA	--	--	--	--	--	--
Vanadium	3.44E-01	6.88E-01	**9.06E+00**	4.19E-01	8.71E-01	**4.53E+00**	2.09E-01	4.36E-01
Zinc	6.61E+01	1.71E+02	**2.33E+00**	1.17E-01	6.17E-01	8.99E-01	4.50E-02	2.38E-01
PAHs								
Total LMW PAHs	5.62E+03	NA	1.85E-04	6.98E-08	8.67E-05	--	--	--
Total HMW PAHs	2.00E+00	2.00E+01	6.30E-01	2.39E-04	2.95E-01	6.30E-02	2.39E-05	2.95E-02
Pesticides								
4,4'-DDD	2.80E-03	2.80E-02	**2.78E+00**	5.42E-04	2.63E-01	2.78E-01	5.42E-05	2.63E-02
4,4'-DDT	2.80E-03	2.80E-02	1.43E+00	3.76E-06	1.22E-01	1.43E-01	3.76E-07	1.22E-02
gamma-Chlordane	2.14E+00	1.07E+01	1.53E-03	1.64E-09	1.28E-04	3.06E-04	3.27E-10	2.57E-05
SVOCs								
1,1-Biphenyl	NA	NA	--	--	--	--	--	--
4-methylphenol	NA	NA	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.10E+00	NA	1.12E-01	6.28E-01	9.11E-03	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
Dibenzofuran	NA	NA			--			--
Di-n-butyl phthalate	1.10E-01	1.10E+00	1.23E-01	1.15E-04	1.89E-02	1.23E-02	1.15E-05	1.89E-03
VOCs								
1,4-dioxane	NA	NA	--	--	--	--	--	--
Carbon disulfide	NA	NA	--	--	--	--	--	--
Cyclohexane	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Toluene	NA	NA	--	--	--	--	--	--

Table 5-7
Comparison of 95UCLM Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Chemical	Avian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Xylenes (m & p)	NA	NA	--	--	--	--	--	--
Xylenes (o)	NA	NA	--	--	--	--	--	--

Table 5-8
Frequency of Detection and Exposure Point Concentrations
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Analyte	Surface Soil				Sediment				Surface Water (Total Concentration)				Surface Water (Dissolved Concentration)	
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Background (mg/kg)	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Background UPL (mg/kg)	Frequency	Maximum (µg/L)	95UCLM (µg/L)	Background UPL (µg/L)	Frequency	Maximum (µg/L)
Metals														
Antimony	25/383	6.90E+00	3.58E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Arsenic	382/383	2.21E+01	3.08E+00	2.30E+00	NO COPC	NO COPC	NO COPC	1.90E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Barium	376/377	6.07E+02	5.21E+01	5.15E+01	22/22	1.12E+02	5.72E+01	4.31E+01	20/22	2.36E+02	1.19E+02	7.36E+01	19/22	5.27E+01
Beryllium	168/383	4.30E+00	3.51E-01	2.10E-01	3/22	5.60E-01	5.60E-01	2.40E-01	0/22	0.00E+00	0.00E+00	0.00E+00	0/22	0.00E+00
Cadmium	80/383	6.20E+00	3.63E-01	5.30E-01	0/22	0.00E+00	0.00E+00	0.00E+00	4/22	2.50E+01	2.50E+01	0.00E+00	7/22	9.60E+00
Chromium	382/383	9.50E+01	7.63E+00	7.10E+00	NO COPC	NO COPC	NO COPC	6.70E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Cobalt	353/377	6.12E+01	4.93E+00	1.11E+01	NO COPC	NO COPC	NO COPC	4.30E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Copper	381/383	1.08E+02	1.23E+01	3.24E+00	22/22	1.25E+01	6.66E+00	5.00E+00	2/22	2.69E+01	2.69E+01	0.00E+00	0/22	0.00E+00
Lead	376/377	2.73E+03	7.89E+01	9.19E+00	22/22	2.24E+02	1.09E+02	1.28E+01	8/22	1.81E+02	7.00E+01	0.00E+00	3/22	3.01E+01
Manganese	383/383	7.40E+03	4.03E+02	5.05E+02	22/22	5.00E+02	2.62E+02	2.61E+02	22/22	4.13E+02	2.45E+02	6.90E+02	16/22	1.67E+02
Mercury	165/383	2.70E-01	2.96E-02	3.80E-02	NO COPC	NO COPC	NO COPC	1.60E-02	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Nickel	357/383	6.15E+01	6.60E+00	5.60E+00	NO COPC	NO COPC	NO COPC	6.20E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Selenium	81/383	8.90E+00	4.71E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Silver	32/383	4.70E+00	1.09E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Thallium	4/383	3.80E+00	3.80E+00	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
Vanadium	377/377	5.22E+01	1.17E+01	1.12E+01	22/22	2.34E+01	1.29E+01	1.08E+01	2/22	2.91E+01	2.91E+01	0.00E+00	0/22	0.00E+00
Zinc	382/383	1.11E+03	5.40E+01	1.42E+01	NO COPC	NO COPC	NO COPC	3.60E+01	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC
PAHs														
Total HMW PAHs	304/304	4.50E+01	1.16E+00	1.50E-03	NO COPC	NO COPC	NO COPC	7.60E-03	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Pesticides														
alpha-Chlordane	11/147	9.50E-03	6.36E-05	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
SVOCs														
Acetophenone	1/357	6.10E-02	6.10E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Bis(2-ethylhexyl)phthalate	92/355	9.80E-01	9.80E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Carbazole	15/357	4.38E-01	6.37E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Dibenzofuran	8/357	1.80E-01	3.99E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00		
Dimethyl phthalate	101/357	4.80E-01	1.44E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00		
Di-n-butyl phthalate	9/357	1.40E+00	6.42E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
VOCs														
Benzene	1/188	2.80E+00	2.80E+00	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Cyclohexane	5/188	4.10E+01	7.00E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Ethylbenzene	9/188	6.70E+00	4.15E-01	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Isopropylbenzene (Cumene)	3/188	3.20E+00	3.20E+00	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Toluene	104/188	3.20E-01	3.79E-03	0.00E+00	15/20	1.00E-02	2.82E-03	4.10E-03	0/16	0.00E+00	0.00E+00	0.00E+00	--	--
Xylenes (m & p)	38/188	5.90E-01	1.74E-02	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--
Xylenes (o)	12/188	2.80E-01	8.77E-03	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	NO COPC	NO COPC	NO COPC	0.00E+00	--	--

Table 5-9

Comparison of Exposure Point Concentrations in Soil to Plant TRVs

for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Plant Toxicity Reference Value (mg/kg dry wt)	Maximum EPC (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM EPC (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals					
Antimony	5.00E+00	6.90E+00	1.38E+00	3.58E-01	7.16E-02
Arsenic	1.80E+01	2.21E+01	1.23E+00	3.08E+00	1.71E-01
Barium	5.00E+02	6.07E+02	1.21E+00	5.21E+01	1.04E-01
Beryllium	1.00E+01	4.30E+00	4.30E-01	3.51E-01	3.51E-02
Cadmium	3.20E+01	6.20E+00	1.94E-01	3.63E-01	1.13E-02
Chromium	1.00E+00	9.50E+01	**9.50E+01**	7.63E+00	**7.63E+00**
Cobalt	1.30E+01	6.12E+01	**4.71E+00**	4.93E+00	3.79E-01
Copper	7.00E+01	1.08E+02	**1.54E+00**	1.23E+01	1.75E-01
Lead	1.20E+02	2.73E+03	**2.28E+01**	7.89E+01	6.57E-01
Manganese	2.20E+02	7.40E+03	**3.36E+01**	4.03E+02	**1.83E+00**
Mercury	3.00E-01	2.70E-01	9.00E-01	2.96E-02	9.87E-02
Nickel	3.80E+01	6.15E+01	**1.62E+00**	6.60E+00	1.74E-01
Selenium	5.20E-01	8.90E+00	**1.71E+01**	4.71E-01	9.06E-01
Silver	5.60E+02	4.70E+00	8.39E-03	1.09E-01	1.95E-04
Thallium	1.00E+00	3.80E+00	**3.80E+00**	3.80E+00	**3.80E+00**
Vanadium	2.00E+00	5.22E+01	**2.61E+01**	1.17E+01	**5.86E+00**
Zinc	1.60E+02	1.11E+03	**6.94E+00**	5.40E+01	3.38E-01
PAHs					
Total HMW PAHs	2.00E+01	4.50E+01	**2.25E+00**	1.16E+00	5.80E-02
Pesticides					
alpha-Chlordane	2.20E+00	9.50E-03	4.32E-03	6.36E-05	2.89E-05
SVOCs					
Acetophenone	NA	6.10E-02	--	6.10E-02	--
Bis(2-ethylhexyl)phthalate	1.00E+02	9.80E-01	9.80E-03	9.80E-01	9.80E-03
Carbazole	NA	4.38E-01	--	6.37E-02	--
Dibenzofuran	NA	1.80E-01	--	3.99E-02	--
Dimethyl phthalate	2.00E+02	4.80E-01	2.40E-03	1.44E-01	7.20E-04
Di-n-butyl phthalate	2.00E+02	1.40E+00	7.00E-03	6.42E-02	3.21E-04
VOCs					
Benzene	NA	2.80E+00	--	2.80E+00	--
Cyclohexane	NA	4.10E+01	--	7.00E-01	--
Ethylbenzene	NA	6.70E+00	--	4.15E-01	--
Isopropylbenzene (Cumene)	NA	3.20E+00	--	3.20E+00	--
Toluene	2.00E+02	3.20E-01	1.60E-03	3.79E-03	1.90E-05
Xylenes (m & p)	1.00E+02	5.90E-01	5.90E-03	1.74E-02	1.74E-04
Xylenes (o)	1.00E+02	2.80E-01	2.80E-03	8.77E-03	8.77E-05

Table 5-10
Comparison of Exposure Point Concentrations in Soil to Soil Invertebrate TRVs for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Invertebrate Toxicity Reference Value (mg/kg dry wt)	Maximum Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals					
Antimony	7.80E+01	6.90E+00	8.85E-02	3.58E-01	4.59E-03
Arsenic	6.00E+01	2.21E+01	3.68E-01	3.08E+00	5.13E-02
Barium	3.30E+02	6.07E+02	**1.84E+00**	5.21E+01	1.58E-01
Beryllium	4.00E+01	4.30E+00	1.08E-01	3.51E-01	8.78E-03
Cadmium	1.40E+02	6.20E+00	4.43E-02	3.63E-01	2.59E-03
Chromium	4.00E-01	9.50E+01	**2.38E+02**	7.63E+00	**1.91E+01**
Cobalt	NA	6.12E+01	--	4.93E+00	--
Copper	8.00E+01	1.08E+02	1.35E+00	1.23E+01	1.53E-01
Lead	1.70E+03	2.73E+03	**1.61E+00**	7.89E+01	4.64E-02
Manganese	4.50E+02	7.40E+03	**1.64E+01**	4.03E+02	8.95E-01
Mercury	1.00E-01	2.70E-01	**2.70E+00**	2.96E-02	2.96E-01
Nickel	2.80E+02	6.15E+01	2.20E-01	6.60E+00	2.36E-02
Selenium	4.10E+00	8.90E+00	**2.17E+00**	4.71E-01	1.15E-01
Silver	NA	4.70E+00	--	1.09E-01	--
Thallium	NA	3.80E+00	--	3.80E+00	--
Vanadium	NA	5.22E+01	--	1.17E+01	--
Zinc	1.20E+02	1.11E+03	**9.25E+00**	5.40E+01	4.50E-01
PAHs					
Total HMW PAHs	1.80E+01	4.50E+01	**2.50E+00**	1.16E+00	6.44E-02
Pesticides					
alpha-Chlordane	2.90E-03	9.50E-03	**3.28E+00**	6.36E-05	2.19E-02
SVOCs					
Acetophenone	NA	6.10E-02	--	6.10E-02	--
Bis(2-ethylhexyl)phthalate	2.00E+02	9.80E-01	4.90E-03	9.80E-01	4.90E-03
Carbazole	1.60E-01	4.38E-01	**2.74E+00**	6.37E-02	3.98E-01
Dibenzofuran	NA	1.80E-01	--	3.99E-02	--
Dimethyl phthalate	2.00E+02	4.80E-01	2.40E-03	1.44E-01	7.20E-04
Di-n-butyl phthalate	2.20E-01	1.40E+00	**6.36E+00**	6.42E-02	2.92E-01
VOCs					
Benzene	1.20E-01	2.80E+00	**2.33E+01**	2.80E+00	**2.33E+01**
Ethylbenzene	2.70E-01	6.70E+00	**2.48E+01**	4.15E-01	**1.54E+00**
Isopropylbenzene (Cumene)	4.00E-02	3.20E+00	**8.00E+01**	3.20E+00	**8.00E+01**
Toluene	1.50E-01	3.20E-01	**2.13E+00**	3.79E-03	2.53E-02
Xylenes (m & p)	1.00E-01	5.90E-01	**5.90E+00**	1.74E-02	1.74E-01
Xylenes (o)	1.00E-01	2.80E-01	**2.80E+00**	8.77E-03	8.77E-02

Table 5-11
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs				Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Metals										
Antimony	5.90E-02	5.90E-01	9.94E-01	6.47E-01	**2.05E+01**	1.07E-01	9.94E-02	6.47E-02	**2.05E+00**	1.07E-02
Arsenic	1.04E+00	1.66E+00	4.64E-02	3.07E-02	7.49E-01	1.75E-02	2.91E-02	1.93E-02	4.69E-01	1.10E-02
Barium	5.18E+01	8.27E+01	7.83E-02	5.10E-02	5.28E-01	1.90E-02	4.91E-02	3.20E-02	3.31E-01	1.19E-02
Beryllium	5.32E-01	6.73E-01	9.37E-03	6.32E-03	**1.64E+00**	2.08E-01	7.41E-03	5.00E-03	1.30E+00	1.64E-01
Cadmium	7.70E-01	7.70E+00	1.00E-01	6.51E-02	**7.28E+00**	5.97E-02	1.00E-02	6.51E-03	7.28E-01	5.97E-03
Chromium	2.40E+00	5.82E+01	4.43E-02	2.99E-02	1.37E+00	2.83E-02	1.83E-03	1.23E-03	5.64E-02	1.17E-03
Cobalt	7.33E+00	1.89E+01	1.29E-02	8.62E-03	5.45E-01	2.67E-02	5.00E-03	3.34E-03	2.11E-01	1.04E-02
Copper	5.60E+00	9.34E+00	1.02E-01	6.63E-02	8.98E-01	8.15E-02	6.09E-02	3.98E-02	5.39E-01	4.89E-02
Lead	4.70E+00	8.90E+00	6.45E-01	4.36E-01	**2.74E+01**	6.00E-01	3.41E-01	2.30E-01	**1.45E+01**	3.17E-01
Manganese	5.15E+01	1.46E+02	**1.50E+00**	9.76E-01	**3.48E+00**	3.12E-01	5.31E-01	3.45E-01	1.23E+00	1.10E-01
Mercury	1.32E+01	NA	5.46E-04	3.54E-04	5.49E-03	1.13E-04	--	--	--	--
Nickel	1.70E+00	3.40E+00	8.15E-02	5.39E-02	**1.96E+00**	1.04E-01	4.08E-02	2.70E-02	9.82E-01	5.18E-02
Selenium	1.43E-01	2.15E-01	**1.58E+00**	1.02E+00	**6.25E+00**	3.06E-01	1.05E+00	6.81E-01	**4.15E+00**	2.04E-01
Silver	6.02E+00	6.02E+01	1.27E-02	8.22E-03	**1.87E+00**	1.03E-02	1.27E-03	8.22E-04	1.87E-01	1.03E-03
Thallium	7.40E-03	7.40E-02	4.76E-01	3.25E-01	**8.99E+01**	**1.94E+00**	4.76E-02	3.25E-02	**8.99E+00**	1.94E-01
Vanadium	4.16E+00	8.31E+00	1.45E-02	9.73E-03	**1.97E+00**	6.55E-02	7.24E-03	4.87E-03	9.84E-01	3.28E-02
Zinc	7.54E+01	2.98E+02	1.33E-01	8.64E-02	**2.05E+00**	5.90E-02	3.36E-02	2.19E-02	5.20E-01	1.50E-02
PAHs										
Total HMW PAHs	6.15E-01	3.01E+00	3.52E-01	2.30E-01	**4.88E+00**	5.23E-02	7.19E-02	4.70E-02	9.96E-01	1.07E-02
Pesticides										
alpha-Chlordane	4.60E+00	9.20E+00	2.34E-06	1.58E-06	3.62E-04	1.09E-05	1.17E-06	0.00E+00	1.81E-04	5.44E-06
SVOCs										
Acetophenone	NA	NA	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.83E+01	1.83E+02	4.25E-05	2.92E-05	9.38E-03	3.31E-02	4.25E-06	0.00E+00	9.38E-04	3.31E-03
Carbazole	NA	NA	--	--	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--	--	--
Dimethyl phthalate	NA	NA	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	5.50E+02	1.83E+03	1.02E-05	6.69E-06	4.46E-04	2.04E-06	3.06E-06	0.00E+00	1.34E-04	6.13E-07
VOCs										
Benzene	2.64E+01	2.64E+02	1.13E-02	7.33E-03	1.86E-02	7.44E-05	1.13E-03	7.33E-04	1.86E-03	7.44E-06
Cyclohexane	NA	NA	--	--	--	--	--	--	--	--
Ethylbenzene	5.46E+01	NA	3.35E-03	2.17E-03	2.15E-02	8.62E-05	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--	--	--
Toluene	2.60E+01	2.60E+02	6.36E-04	4.12E-04	2.16E-03	8.63E-06	6.36E-05	4.12E-05	2.16E-04	8.63E-07

Table 5-11
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs				Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Xylenes (m & p)	2.10E+00	2.60E+00	7.10E-03	4.60E-03	4.92E-02	1.98E-04	5.73E-03	3.72E-03	3.97E-02	1.60E-04
Xylenes (o)	2.10E+00	2.60E+00	3.37E-03	2.18E-03	2.34E-02	9.37E-05	2.72E-03	1.76E-03	1.89E-02	7.57E-05
Xylenes (Total)	2.10E+00	2.60E+00	6.57E-03	4.26E-03	4.92E-02	1.98E-04	5.31E-03	3.44E-03	3.97E-02	1.60E-04

Table 5-12
Comparison of 95UCLM Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Mammalian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs				95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs			
			Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals	Terrestrial Herbivorous Mammals	Terrestrial Herbivorous Mammals	Terrestrial Insectivorous Mammals	Predatory Mammals
	NOAEL	LOAEL	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox	White-Footed Mouse	Beef Cattle	Southern Short-Tailed Shrew	Red Fox
Metals										
Antimony	5.90E-02	5.90E-01	5.16E-02	3.36E-02	1.06E+00	5.54E-03	5.16E-03	3.36E-03	1.06E-01	5.54E-04
Arsenic	1.04E+00	1.66E+00	1.28E-02	8.38E-03	1.40E-01	2.82E-03	8.03E-03	5.25E-03	8.77E-02	1.77E-03
Barium	5.18E+01	8.27E+01	7.30E-03	4.74E-03	4.57E-02	2.77E-03	4.57E-03	2.97E-03	2.87E-02	1.74E-03
Beryllium	5.32E-01	6.73E-01	7.65E-04	5.16E-04	1.34E-01	1.70E-02	6.05E-04	4.08E-04	1.06E-01	1.34E-02
Cadmium	7.70E-01	7.70E+00	2.80E-02	1.80E-02	7.62E-01	1.60E-02	2.80E-03	1.80E-03	7.62E-02	1.60E-03
Chromium	2.40E+00	5.82E+01	5.63E-03	3.71E-03	7.39E-01	2.86E-03	2.32E-04	1.53E-04	3.05E-02	1.18E-04
Cobalt	7.33E+00	1.89E+01	1.04E-03	6.94E-04	4.39E-02	2.15E-03	4.03E-04	2.69E-04	1.70E-02	8.35E-04
Copper	5.60E+00	9.34E+00	3.93E-02	2.55E-02	3.32E-01	5.13E-02	2.36E-02	1.53E-02	1.99E-01	3.08E-02
Lead	4.70E+00	8.90E+00	4.27E-02	2.81E-02	1.24E+00	5.26E-02	2.25E-02	1.48E-02	6.56E-01	2.78E-02
Manganese	5.15E+01	1.46E+02	8.30E-02	5.39E-02	2.39E-01	1.73E-02	2.93E-02	1.91E-02	8.44E-02	6.13E-03
Mercury	1.32E+01	NA	1.61E-04	1.04E-04	3.96E-03	1.23E-05	--	--	--	--
Nickel	1.70E+00	3.40E+00	1.31E-02	8.60E-03	**2.28E+00**	3.04E-02	6.55E-03	4.30E-03	1.14E+00	1.52E-02
Selenium	1.43E-01	2.15E-01	6.23E-02	4.04E-02	6.45E-01	8.92E-02	4.14E-02	2.69E-02	4.29E-01	5.93E-02
Silver	6.02E+00	6.02E+01	2.94E-04	1.91E-04	4.33E-02	2.39E-04	2.94E-05	1.91E-05	4.33E-03	2.39E-05
Thallium	7.40E-03	7.40E-02	4.76E-01	3.25E-01	**8.99E+01**	**1.94E+00**	4.76E-02	3.25E-02	**8.99E+00**	1.94E-01
Vanadium	4.16E+00	8.31E+00	4.87E-03	3.21E-03	4.42E-01	1.52E-02	2.44E-03	1.61E-03	2.21E-01	7.59E-03
Zinc	7.54E+01	2.98E+02	2.34E-02	1.51E-02	6.65E-01	3.95E-02	5.92E-03	3.84E-03	1.69E-01	1.00E-02
PAHs										
Total HMW PAHs	6.15E-01	3.01E+00	9.08E-03	5.94E-03	1.26E-01	1.35E-03	1.86E-03	1.21E-03	2.57E-02	2.77E-04
Pesticides										
alpha-Chlordane	4.60E+00	9.20E+00	1.57E-08	1.06E-08	2.42E-06	7.29E-08	7.83E-09	5.29E-09	1.21E-06	3.64E-08
SVOCs										
Acetophenone	NA	NA	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.83E+01	1.83E+02	4.25E-05	2.92E-05	9.38E-03	3.31E-02	4.25E-06	2.92E-06	9.38E-04	3.31E-03
Carbazole	NA	NA	--	--	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--	--	--
Dimethyl phthalate	NA	NA	--	--	--	--	--	--	--	--
Di-n-butyl phthalate	5.50E+02	1.83E+03	4.68E-07	3.07E-07	2.04E-05	9.37E-08	1.41E-07	9.21E-08	6.13E-06	2.81E-08
VOCs										
Benzene	2.64E+01	2.64E+02	1.13E-02	7.33E-03	1.86E-02	7.44E-05	1.13E-03	7.33E-04	1.86E-03	7.44E-06
Cyclohexane	NA	NA	--	--	--	--	--	--	--	--
Ethylbenzene	5.46E+01	NA	2.07E-04	1.35E-04	1.33E-03	5.34E-06	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--	--	--
Toluene	2.60E+01	2.60E+02	7.54E-06	4.88E-06	2.55E-05	1.02E-07	7.54E-07	4.88E-07	2.55E-06	1.02E-08
Xylenes (m & p)	2.10E+00	2.60E+00	2.09E-04	1.36E-04	1.45E-03	5.83E-06	1.69E-04	1.10E-04	1.17E-03	4.71E-06
Xylenes (o)	2.10E+00	2.60E+00	1.05E-04	6.84E-05	7.31E-04	2.94E-06	8.52E-05	5.52E-05	5.91E-04	2.37E-06
Xylenes (Total)	2.10E+00	2.60E+00	1.94E-04	1.26E-04	1.45E-03	5.83E-06	1.56E-04	1.01E-04	1.17E-03	4.71E-06

Table 5-13
Comparison of Maximum Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Avian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Metals								
Antimony	NA	NA	--	--	--	--	--	--
Arsenic	2.24E+00	7.40E+00	4.44E-01	2.56E-03	2.71E-01	1.34E-01	7.76E-04	8.21E-02
Barium	2.08E+01	4.17E+01	**1.72E+00**	5.89E-02	**1.52E+00**	8.59E-01	2.94E-02	7.57E-01
Beryllium	NA	NA	--	--	--	--	--	--
Cadmium	1.47E+00	6.35E+00	**5.45E+00**	6.11E-02	3.29E-01	1.26E+00	1.42E-02	7.62E-02
Chromium	2.66E+00	1.56E+01	**1.57E+00**	3.86E-04	7.69E-01	2.68E-01	6.57E-05	1.31E-01
Cobalt	7.61E+00	1.83E+01	7.09E-01	4.50E-02	1.95E-01	2.94E-01	1.87E-02	8.08E-02
Copper	4.05E+00	1.21E+01	**1.63E+00**	2.10E-01	1.18E+00	5.47E-01	7.02E-02	3.96E-01
Lead	1.63E+00	3.26E+00	**1.04E+02**	1.23E+00	**3.63E+01**	**5.21E+01**	6.16E-01	**1.82E+01**
Manganese	1.79E+02	3.77E+02	1.21E+00	1.36E-01	**3.04E+00**	5.74E-01	6.47E-02	1.44E+00
Mercury	4.50E-01	9.00E-01	2.28E-01	6.45E-03	9.82E-02	1.14E-01	3.23E-03	4.91E-02
Nickel	6.71E+00	1.86E+01	6.63E-01	4.44E-02	2.58E-01	2.40E-01	1.61E-02	9.31E-02
Selenium	2.90E-01	5.79E-01	**4.25E+00**	2.90E-01	**4.80E+00**	**2.13E+00**	1.45E-01	**2.40E+00**
Silver	2.02E+00	2.02E+01	**7.98E+00**	6.53E-02	2.46E-01	7.98E-01	6.53E-03	2.46E-02
Thallium	NA	NA	--	--	--	--	--	--
Vanadium	3.44E-01	6.88E-01	**3.33E+01**	**1.53E+00**	**3.20E+00**	**1.66E+01**	7.63E-01	**1.60E+00**
Zinc	6.61E+01	1.71E+02	**3.26E+00**	1.24E-01	1.10E+00	1.26E+00	4.80E-02	4.25E-01
PAHs								
Total HMW PAHs	2.00E+00	2.00E+01	**2.03E+00**	7.66E-04	9.51E-01	2.03E-01	7.66E-05	9.51E-02
Pesticides								
alpha-Chlordane	2.14E+00	1.07E+01	1.09E-03	4.55E-05	9.73E-05	2.18E-04	9.09E-06	1.95E-05
SVOCs								
Acetophenone	NA	NA	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.10E+00	NA	2.19E-01	1.23E+00	1.78E-02	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--
Dimethyl phthalate	NA	NA	--	--	--	--	--	--
Di-n-butyl phthalate	1.10E-01	1.10E+00	**3.13E+00**	2.92E-03	4.82E-01	3.13E-01	2.92E-04	4.82E-02
VOCs								
Benzene	NA	NA	--	--	--	--	--	--
Cyclohexane	NA	NA	--	--	--	--	--	--
Ethylbenzene	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Toluene	NA	NA	--	--	--	--	--	--
Xylenes (m & p)	NA	NA	--	--	--	--	--	--
Xylenes (o)	NA	NA	--	--	--	--	--	--
Xylenes (Total)	NA	NA	--	--	--	--	--	--

Table 5-14
Comparison of 95UCLM Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Avian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Metals								
Antimony	NA	NA	--	--	--	--	--	--
Arsenic	2.24E+00	7.40E+00	8.54E-02	5.79E-04	5.20E-02	2.58E-02	1.75E-04	1.57E-02
Barium	2.08E+01	4.17E+01	1.48E-01	1.08E-02	1.30E-01	7.41E-02	5.37E-03	6.50E-02
Beryllium	NA	NA	--	--	--	--	--	--
Cadmium	1.47E+00	6.35E+00	5.68E-01	1.61E-02	5.71E-02	1.32E-01	3.73E-03	1.32E-02
Chromium	2.66E+00	1.56E+01	9.41E-01	3.86E-04	6.18E-02	1.60E-01	6.57E-05	1.05E-02
Cobalt	7.61E+00	1.83E+01	5.71E-02	3.63E-03	1.57E-02	2.37E-02	1.51E-03	6.51E-03
Copper	4.05E+00	1.21E+01	6.40E-01	1.53E-01	3.37E-01	2.14E-01	5.13E-02	1.13E-01
Lead	1.63E+00	3.26E+00	**4.86E+00**	2.58E-01	1.37E+00	**2.43E+00**	1.29E-01	6.84E-01
Manganese	1.79E+02	3.77E+02	8.58E-02	7.47E-03	1.65E-01	4.08E-02	3.55E-03	7.85E-02
Mercury	4.50E-01	9.00E-01	1.66E-01	7.07E-04	2.72E-02	8.31E-02	3.54E-04	1.36E-02
Nickel	6.71E+00	1.86E+01	8.25E-01	1.57E-02	3.38E-02	2.98E-01	5.68E-03	1.22E-02
Selenium	2.90E-01	5.79E-01	4.48E-01	9.60E-02	1.96E-01	2.24E-01	4.81E-02	9.80E-02
Silver	2.02E+00	2.02E+01	1.85E-01	1.51E-03	5.70E-03	1.85E-02	1.51E-04	5.70E-04
Thallium	NA	NA	--	--	--	--	--	--
Vanadium	3.44E-01	6.88E-01	**7.47E+00**	3.46E-01	7.19E-01	**3.74E+00**	1.73E-01	3.59E-01
Zinc	6.61E+01	1.71E+02	1.08E+00	9.95E-02	1.60E-01	4.18E-01	3.84E-02	6.15E-02
PAHs								
Total HMW PAHs	2.00E+00	2.00E+01	5.23E-02	2.08E-05	2.45E-02	5.23E-03	2.08E-06	2.45E-03
Pesticides								
alpha-Chlordane	2.14E+00	1.07E+01	7.31E-06	3.04E-07	6.51E-07	1.46E-06	6.09E-08	1.30E-07
SVOCs								
Acetophenone	NA	NA	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	1.10E+00	NA	2.19E-01	1.23E+00	1.78E-02	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
Dibenzofuran	NA	NA	--	--	--	--	--	--
Dimethyl phthalate	NA	NA	--	--	--	--	--	--
Di-n-butyl phthalate	1.10E-01	1.10E+00	1.43E-01	1.34E-04	2.21E-02	1.43E-02	1.34E-05	2.21E-03
VOCs								
Benzene	NA	NA	--	--	--	--	--	--
Cyclohexane	NA	NA	--	--	--	--	--	--
Ethylbenzene	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Toluene	NA	NA	--	--	--	--	--	--

Table 5-14
Comparison of 95UCLM Modeled Wildlife Doses to Birds to Avian TRVs
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Chemical	Avian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds	Terrestrial Insectivorous Birds	Predatory Birds	Terrestrial Herbivorous Birds
	NOAEL	LOAEL	American Robin	Red-Tailed Hawk	Song Sparrow	American Robin	Red-Tailed Hawk	Song Sparrow
Xylenes (m & p)	NA	NA	--	--	--	--	--	--
Xylenes (o)	NA	NA	--	--	--	--	--	--
Xylenes (Total)	NA	NA	--	--	--	--	--	--

Table 6-1
Frequency of Detection and Exposure Point Concentrations
for Aquatic Receptors in Ponds

Analyte	Sediment				Surface Water (Total Concentration)				Surface Water (Dissolved Concentration)		
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Background UPL (mg/kg)	Frequency	Maximum (µg/L)	95UCLM (µg/L)	Background UPL (µg/L)	Frequency	Maximum (µg/L)	95UCLM (µg/L)
Metals											
Aluminum	22/22	1.69E+04	8.91E+03	5.79E+03	9/22	1.91E+04	6.89E+03	7.57E+02	4/22	4.66E+02	4.66E+02
Barium	22/22	1.12E+02	5.72E+01	4.31E+01	20/22	2.36E+02	1.19E+02	7.36E+01	19/22	5.27E+01	4.68E+01
Beryllium	3/22	5.60E-01	5.60E-01	2.40E-01	0/22	0.00E+00	0.00E+00	0.00E+00	0/22	0.00E+00	0.00E+00
Cadmium	0/22	NO COPC	NO COPC	0.00E+00	4/22	2.50E+01	2.50E+01	0.00E+00	7/22	9.60E+00	6.27E+00
Chromium, hexavalent	1/1	4.80E+00	4.80E+00	5.30E-01	0/1	0.00E+00	0.00E+00	0.00E+00	0/22	0.00E+00	0.00E+00
Copper	22/22	1.25E+01	6.66E+00	5.00E+00	2/22	2.69E+01	2.69E+01	0.00E+00	0/22	0.00E+00	0.00E+00
Lead	22/22	2.24E+02	1.09E+02	1.28E+01	8/22	1.81E+02	7.00E+01	0.00E+00	3/22	3.01E+01	3.01E+01
Manganese	22/22	5.00E+02	2.62E+02	2.61E+02	22/22	4.13E+02	2.45E+02	6.90E+02	16/22	1.67E+02	9.26E+01
Vanadium	22/22	2.34E+01	1.29E+01	1.08E+01	2/22	2.91E+01	2.91E+01	0.00E+00	0/22	0.00E+00	0.00E+00
PAHs											
2-Methylnaphthalene	7/22	5.90E-02	2.89E-02	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Acenaphthylene	8/22	7.30E-03	4.87E-03	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(a)Anthracene	18/22	3.50E-01	9.64E-02	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(a)Pyrene	17/22	2.00E-01	5.26E-02	1.80E-03	7/17	6.00E-02	6.00E-02	0.00E+00	--	--	--
Benzo(b)Fluoranthene	20/22	2.10E-01	5.28E-02	2.10E-03	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(g,h,i)Perylene	18/22	2.20E-01	6.75E-02	9.00E-03	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Chrysene	20/22	7.50E-01	2.02E-01	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Dibenzo(a,h)Anthracene	9/22	5.80E-02	3.69E-02	9.30E-03	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Phenanthrene	13/22	7.10E-01	1.99E-01	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Pyrene	19/22	7.30E-01	2.00E-01	9.20E-03	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Total LMW PAHs	13/13	8.60E-01	2.88E-01	0.00E+00	0/17	0.00E+00	0.00E+00	0.00E+00	--	--	--
Total HMW PAHs	20/20	1.64E+00	2.73E-01	7.60E-03	2/2	3.70E-02	3.70E-02	0.00E+00	--	--	--
Total PAHs	20/20	3.66E+00	6.32E-01	1.60E-02	9/9	6.00E-02	5.20E-02	0.00E+00	--	--	--
SVOCs											
4-methylphenol	3/22	1.40E-01	1.40E-01	0.00E+00	0/22	0.00E+00	0.00E+00	0.00E+00	--	--	--
VOCs											
Acetone	18/22	8.60E-01	2.48E-01	0.00E+00	11/16	9.30E+00	4.56E+00	0.00E+00	--	--	--
Toluene	15/20	1.00E-02	2.82E-03	4.10E-03	0/16	0.00E+00	0.00E+00	0.00E+00	--	--	--

Table 6-2
Comparison of Exposure Point Concentrations in Sediment to Benthic Organism TRVs for Aquatic Receptors in Ponds

Chemical	Sediment Toxicity Reference Value (mg/kg)	Frequency of Detection	Maximum Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals						
Aluminum	NA	22/22	1.69E+04	--	8.91E+03	--
Barium	1.30E+02	22/22	1.12E+02	8.62E-01	5.72E+01	4.40E-01
Beryllium	1.10E+00	3/22	5.60E-01	5.09E-01	5.60E-01	5.09E-01
Chromium, hexavalent	3.73E+01	1/1	4.80E+00	1.29E-01	4.80E+00	1.29E-01
Copper	3.57E+01	22/22	1.25E+01	3.50E-01	6.66E+00	1.87E-01
Lead	3.50E+01	22/22	2.24E+02	**6.40E+00**	1.09E+02	**3.11E+00**
Manganese	4.60E+02	22/22	5.00E+02	1.09E+00	2.62E+02	5.70E-01
Vanadium	4.20E+01	22/22	2.34E+01	5.57E-01	1.29E+01	3.07E-01
PAHs						
2-Methylnaphthalene	3.46E-02	7/22	5.90E-02	**1.71E+00**	2.89E-02	8.35E-01
Acenaphthylene	5.87E-03	8/22	7.30E-03	1.24E+00	4.87E-03	8.30E-01
Benzo(a)Anthracene	3.17E-02	18/22	3.50E-01	**1.10E+01**	9.64E-02	**3.04E+00**
Benzo(a)Pyrene	3.19E-02	17/22	2.00E-01	**6.27E+00**	5.26E-02	**1.65E+00**
Benzo(b)Fluoranthene	1.30E-01	20/22	2.10E-01	**1.62E+00**	5.28E-02	4.06E-01
Benzo(g,h,i)Perylene	1.70E-01	18/22	2.20E-01	1.29E+00	6.75E-02	3.97E-01
Chrysene	5.70E-02	20/22	7.50E-01	**1.32E+01**	2.02E-01	**3.54E+00**
Dibenzo(a,h)Anthracene	6.22E-03	9/22	5.80E-02	**9.32E+00**	3.69E-02	**5.93E+00**
Phenanthrene	4.19E-02	13/22	7.10E-01	**1.69E+01**	1.99E-01	**4.75E+00**
Pyrene	5.30E-02	19/22	7.30E-01	**1.38E+01**	2.00E-01	**3.77E+00**
Total PAHs	1.68E+00	20/20	3.66E+00	**2.18E+00**	6.32E-01	3.75E-01
SVOCs						
4-methylphenol	5.00E-02	3/22	1.40E-01	**2.80E+00**	1.40E-01	**2.80E+00**
VOCs						
Acetone	2.30E+00	18/22	8.60E-01	3.74E-01	2.48E-01	1.08E-01
Toluene	1.00E-02	15/20	1.00E-02	**1.00E+00**	2.82E-03	2.82E-01

Table 6-3
Simultaneous Extracted Metals and Acid Volatile Sulfide Results in Ponds

Sample ID	∑SEM (µmol/g)	AVS (µmol/g)	∑SEM-AVS	Fraction Organic Carbon (f_{OC})	(∑SEM-AVS)/f_{OC} (µmol/g_{oc})
P1-SD-01-0.5	1.31	0.63	0.7	0.011	60.40
P1-SD-02-0.5	1.39	0.63	0.8	0.016	47.86
P1-SD-04-0.5	1.73	0.84	0.9	0.007	**134.25**
P2-SD-01-0.5	0.18	0.63	-0.5	0.002	-226.29
P2-SD-03-0.5	0.10	0.63	-0.5	0.002	-262.91
P3-SD-01-0.5	0.21	0.63	-0.4	0.007	-59.70
P3-SD-02-0.5	0.19	0.63	-0.4	0.007	-63.23
P3-SD-03-0.5	0.12	0.63	-0.5	0.002	-256.48
P4-SD-01-0.5	0.08	0.63	-0.5	0.003	-165.58
P4-SD-03-0.5	0.15	0.63	-0.5	0.008	-63.26
P5-SD-01-0.5	0.15	0.63	-0.5	0.004	-130.98
P5-SD-03-0.5	0.07	0.63	-0.6	0.002	-244.32
P6-SD-01-0.5	0.20	1.80	-1.6	0.006	-276.05
P6-SD-02-0.5	0.24	2.5	-2.3	0.010	-230.60
P6-SD-04-0.5	0.18	1.2	-1.0	0.004	-232.22
P6-SD-05-0.5	0.34	3.00	-2.7	0.012	-231.52
P6-SD-07-0.5	0.39	3.4	-3.0	0.010	-294.64
P7-SD-01-0.5	0.32	0.63	-0.3	0.008	-36.81
P7-SD-03-0.5	0.41	1.1	-0.7	0.007	-94.72
P7-SD-05-0.5	0.11	0.6	-0.5	0.005	-113.92
P7-SD-06-0.5	0.15	1.10	-0.9	0.007	-133.25
P8-SD-01-0.5	0.37	0.63	-0.3	0.005	-55.19

NOTES:

1. [∑SEM-AVS]/f_{OC} values less than 130 µmol/g are not toxic to benthic organisms.

SEM = Simultaneously extracted metals.
AVS = Acid volatile sulfide.
f_{OC} = Fraction organic carbon.
µmol/g = Micromoles per gram.
µmol/g_{oc} = Micromoles per gram of organic carbon.

Table 6-4
Comparison of Exposure Point Concentrations in Surface Water to Aquatic Organism TRVs
for Aquatic Receptors in Ponds

Chemical	Surface Water Toxicity Reference Value (µg/L)	Dissolved Concentrations					Total Concentrations				
		Frequency of Detection	Maximum EPC (µg/L)	HQ for Maximum EPC	95UCLM EPC (µg/L)	HQ for 95UCLM EPC	Frequency of Detection	Maximum EPC (µg/L)	HQ for Maximum EPC	95UCLM EPC (µg/L)	HQ for 95UCLM EPC
Metals											
Aluminum	6.80E+02	4/22	4.66E+02	6.85E-01	4.66E+02	6.85E-01	9/22	1.91E+04	**2.81E+01**	6.89E+03	**1.01E+01**
Barium	2.20E+02	19/22	5.27E+01	2.40E-01	4.68E+01	2.13E-01	20/22	2.36E+02	1.07E+00	1.19E+02	5.41E-01
Beryllium	1.10E+02	0/22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0/22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	2.30E-01	7/22	9.60E+00	**4.17E+01**	6.27E+00	**2.73E+01**	4/22	2.50E+01	**1.09E+02**	2.50E+01	**1.09E+02**
Chromium, hexavalent	1.10E+01	0/22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0/1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	1.20E+01	0/22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2/22	2.69E+01	**2.24E+00**	2.69E+01	**2.24E+00**
Lead	2.90E+00	3/22	3.01E+01	**1.04E+01**	3.01E+01	**1.04E+01**	8/22	1.81E+02	**6.24E+01**	7.00E+01	**2.41E+01**
Manganese	9.30E+01	16/22	1.67E+02	**1.80E+00**	9.26E+01	9.96E-01	22/22	4.13E+02	**4.44E+00**	2.45E+02	**2.63E+00**
Vanadium	2.70E+01	0/22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2/22	2.91E+01	1.08E+00	2.91E+01	1.08E+00
PAHs											
2-Methylnaphthalene	2.10E+00	--	--	--	--	--	0/17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	4.84E+03	--	--	--	--	--	0/17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)Pyrene	1.40E-02	--	--	--	--	--	7/17	6.00E-02	**4.29E+00**	6.00E-02	**4.29E+00**
Benzo(b)Fluoranthene	9.07E+00	--	--	--	--	--	0/17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)Perylene	7.64E+00	--	--	--	--	--	0/17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chrysene	NA	--	--	--	--	--	0/17	0.00E+00	--	0.00E+00	--
Dibenzo(a,h)Anthracene	NA	--	--	--	--	--	0/17	0.00E+00	--	0.00E+00	--
Phenanthrene	2.30E+00	--	--	--	--	--	0/17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	NA	--	--	--	--	--	0/17	0.00E+00	--	0.00E+00	--
Total PAHs	NA	--	--	--	--	--	9/9	6.00E-02	--	5.20E-02	--
SVOCs											
4-methylphenol	NA	--	--	--	--	--	0/22	0.00E+00	--	0.00E+00	--
VOCs											
Acetone	1.50E+03	--	--	--	--	--	11/16	9.30E+00	6.20E-03	4.56E+00	3.04E-03
Toluene	8.75E+02	--	--	--	--	--	0/16	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6-5
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs for Aquatic Receptors in Ponds

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals	Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
	NOAEL	LOAEL	Muskrat	Raccoon	River Otter	Muskrat	Raccoon	River Otter
Metals								
Aluminum	1.93E+00	1.93E+01	**1.87E+01**	**4.61E+02**	**5.93E+00**	**1.87E+00**	**4.61E+01**	5.93E-01
Barium	5.18E+01	8.27E+01	2.89E-02	1.14E-01	3.87E-03	1.81E-02	7.14E-02	2.42E-03
Beryllium	5.32E-01	6.73E-01	2.37E-03	5.53E-02	0.00E+00	1.87E-03	4.37E-02	0.00E+00
Chromium, hexavalent	9.24E+00	3.84E+01	1.07E-03	1.40E-02	0.00E+00	2.58E-04	3.37E-03	0.00E+00
Copper	5.60E+00	9.34E+00	7.55E-02	5.73E-01	4.28E-01	4.53E-02	3.44E-01	2.57E-01
Lead	4.70E+00	8.90E+00	1.71E-01	3.69E-01	8.63E-02	9.04E-02	1.95E-01	4.56E-02
Manganese	5.15E+01	1.46E+02	1.99E-01	5.10E-01	6.17E-01	7.04E-02	1.80E-01	2.18E-01
Vanadium	4.16E+00	8.31E+00	1.29E-02	2.96E-01	9.02E-04	6.44E-03	1.48E-01	4.52E-04
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthylene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	1.00E+00	1.00E+01	4.89E-04	1.30E-03	5.93E-02	4.89E-05	1.30E-04	5.93E-03
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	6.56E+01	3.28E+02	1.22E-04	5.26E-04	0.00E+00	2.45E-05	1.05E-04	0.00E+00
Total HMW PAHs	6.15E-01	3.01E+00	2.49E-02	3.93E-02	4.13E-02	5.09E-03	8.04E-03	8.44E-03
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
VOCs								
Acetone	1.00E+01	5.00E+01	3.44E-01	1.99E-01	6.40E-04	6.88E-02	3.97E-02	1.28E-04
Toluene	2.60E+01	2.60E+02	3.86E-05	8.88E-04	0.00E+00	3.86E-06	8.88E-05	0.00E+00

Table 6-6
Comparison of 95UCLM Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Aquatic Receptors in Ponds

Chemical	Mammalian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals	Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
	NOAEL	LOAEL	Muskrat	Raccoon	River Otter	Muskrat	Raccoon	River Otter
Metals								
Aluminum	1.93E+00	1.93E+01	**9.38E+00**	**2.43E+02**	**2.14E+00**	9.38E-01	**2.43E+01**	2.14E-01
Barium	5.18E+01	8.27E+01	1.48E-02	5.82E-02	1.95E-03	9.26E-03	3.65E-02	1.22E-03
Beryllium	5.32E-01	6.73E-01	2.37E-03	5.53E-02	0.00E+00	1.87E-03	4.37E-02	0.00E+00
Chromium, hexavalent	9.24E+00	3.84E+01	1.07E-03	1.40E-02	0.00E+00	2.58E-04	3.37E-03	0.00E+00
Copper	5.60E+00	9.34E+00	5.84E-02	3.05E-01	4.28E-01	3.50E-02	1.83E-01	2.57E-01
Lead	4.70E+00	8.90E+00	9.79E-02	1.79E-01	3.34E-02	5.17E-02	9.46E-02	1.76E-02
Manganese	5.15E+01	1.46E+02	1.04E-01	2.68E-01	3.66E-01	3.69E-02	9.46E-02	1.29E-01
Vanadium	4.16E+00	8.31E+00	8.03E-03	1.63E-01	9.02E-04	4.02E-03	8.18E-02	4.52E-04
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthylene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	1.00E+00	1.00E+01	1.42E-04	3.44E-04	5.93E-02	1.42E-05	3.44E-05	5.93E-03
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	6.56E+01	3.28E+02	4.10E-05	1.76E-04	0.00E+00	8.19E-06	3.53E-05	0.00E+00
Total HMW PAHs	6.15E-01	3.01E+00	4.16E-03	6.55E-03	4.13E-02	8.50E-04	1.34E-03	8.44E-03
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
VOCs								
Acetone	1.00E+01	5.00E+01	9.95E-02	5.74E-02	3.14E-04	1.99E-02	1.15E-02	6.27E-05
Toluene	2.60E+01	2.60E+02	1.09E-05	2.51E-04	0.00E+00	1.09E-06	2.51E-05	0.00E+00

Table 6-7
Comparison of Maximum Modeled Wildlife Doses to Birds to Avian TRVs
for Aquatic Receptors in Ponds

Chemical	Avian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds	Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds
	NOAEL	LOAEL	Canada Goose	Green Heron	Great Blue Heron	Canada Goose	Green Heron	Great Blue Heron
Metals								
Aluminum	1.10E+02	NA	1.10E-01	4.92E-01	2.31E-01	--	--	--
Barium	2.08E+01	4.17E+01	1.02E-02	2.88E-02	1.35E-02	5.08E-03	1.44E-02	6.75E-03
Beryllium	NA	NA	--	--	--	--	--	--
Chromium, hexavalent	2.66E+00	1.56E+01	1.25E-03	3.46E-03	1.62E-03	2.13E-04	5.88E-04	2.76E-04
Copper	4.05E+00	1.21E+01	1.24E-02	1.19E+00	5.58E-01	4.14E-03	3.97E-01	1.87E-01
Lead	1.63E+00	3.26E+00	1.18E-01	7.52E-01	3.54E-01	5.92E-02	3.76E-01	1.77E-01
Manganese	1.79E+02	3.77E+02	7.29E-03	3.59E-01	1.69E-01	3.46E-03	1.71E-01	8.02E-02
Vanadium	3.44E-01	6.88E-01	4.99E-02	1.46E-01	6.88E-02	2.49E-02	7.32E-02	3.44E-02
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthylene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	NA	NA	--	--	--	--	--	--
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Benzo(k)Fluoranthene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	5.62E+03	NA	2.21E-07	2.93E-07	1.38E-07	--	--	--
Total HMW PAHs	2.00E+00	2.00E+01	1.19E-03	2.69E-02	1.26E-02	1.19E-04	2.69E-03	1.26E-03
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
VOCs								
Acetone	NA	NA	--	--	--	--	--	--
Toluene	NA	NA	--	--	--	--	--	--

Table 6-8
Frequency of Detection and Exposure Point Concentrations
for Aquatic Receptors in Streams

Analyte	Sediment				Surface Water (Total Concentration)				Surface Water (Dissolved Concentration)		
	Frequency	Maximum (mg/kg)	95UCLM (mg/kg)	Background UPL (mg/kg)	Frequency	Maximum (µg/L)	95UCLM (µg/L)	Background UPL (µg/L)	Frequency	Maximum (µg/L)	95UCLM (µg/L)
Metals											
Aluminum	18/18	1.41E+04	6.41E+03	5.79E+03	13/30	9.48E+02	3.76E+02	7.57E+02	9/31	2.15E+02	1.27E+02
Barium	18/18	1.47E+02	6.43E+01	4.31E+01	30/30	2.24E+02	1.53E+02	7.36E+01	31/31	2.20E+02	1.47E+02
Beryllium	3/18	2.60E-01	2.60E-01	2.40E-01	0/30	0.00E+00	0.00E+00	0.00E+00	0/31	0.00E+00	0.00E+00
Chromium, hexavalent	4/4	3.80E+00	3.80E+00	5.30E-01	4/15	3.42E-01	3.42E-01	0.00E+00	4/16	3.30E-01	3.30E-01
Lead	18/18	9.17E+01	4.27E+01	1.28E+01	5/30	1.91E+01	3.40E+00	0.00E+00	5/31	6.10E+00	1.41E+00
Manganese	18/18	1.02E+03	3.89E+02	2.61E+02	30/30	1.08E+03	4.09E+02	6.90E+02	31/31	1.10E+03	3.89E+02
Vanadium	18/18	3.08E+01	1.57E+01	1.08E+01	2/30	2.40E+00	2.40E+00	0.00E+00	2/31	6.40E-01	6.40E-01
Zinc	18/18	1.34E+02	5.51E+01	3.60E+01	6/30	8.59E+01	1.64E+01	0.00E+00	6/31	7.94E+01	1.20E+01
PAHs											
2-Methylnaphthalene	2/18	1.00E-01	1.00E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Acenaphthene	3/18	7.90E-02	7.90E-02	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Anthracene	12/18	4.20E-01	1.43E-01	1.40E-03	1/28	2.00E-01	2.00E-01	0.00E+00	--	--	--
Benzo(a)Anthracene	17/18	1.60E+00	5.58E-01	0.00E+00	1/28	1.00E-01	1.00E-01	0.00E+00	--	--	--
Benzo(a)Pyrene	15/18	1.20E+00	3.91E-01	1.80E-03	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(b)Fluoranthene	18/18	1.60E+00	3.36E-01	2.10E-03	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(g,h,i)Perylene	18/18	7.30E-01	1.49E-01	9.00E-03	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Benzo(k)Fluoranthene	11/18	1.70E+00	5.25E-01	1.50E-02	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Chrysene	18/18	5.10E+00	1.64E+00	0.00E+00	1/28	2.00E-01	2.00E-01	0.00E+00	--	--	--
Dibenzo(a,h)Anthracene	11/18	2.90E-01	9.53E-02	9.30E-03	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Fluoranthene	16/18	6.60E-01	2.65E-01	4.60E-03	1/28	2.00E-01	2.00E-01	0.00E+00	--	--	--
Fluorene	7/18	5.40E-01	1.69E-01	1.20E-02	1/28	4.00E-01	4.00E-01	0.00E+00	--	--	--
Indeno(1,2,3-Cd)Pyrene	17/18	3.50E-01	1.13E-01	1.50E-03	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Phenanthrene	13/18	8.70E+00	2.68E+00	0.00E+00	3/28	1.50E+00	1.50E+00	0.00E+00	--	--	--
Pyrene	17/18	3.30E+00	1.20E+00	9.20E-03	1/28	7.00E-01	7.00E-01	0.00E+00	--	--	--
Total LMW PAHs	13/13	9.75E+00	4.12E+00	0.00E+00	1/1	2.10E+00	2.10E+00	0.00E+00	--	--	--
Total HMW PAHs	18/18	8.93E+00	3.09E+00	7.60E-03	3/3	1.10E+00	1.10E+00	0.00E+00	--	--	--
Total PAHs	18/18	1.77E+01	7.41E+00	1.60E-02	3/3	3.50E+00	3.50E+00	0.00E+00	--	--	--
SVOCs											
4-methylphenol	1/18	2.80E-01	2.80E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Acetophenone	1/18	3.70E-02	3.70E-02	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Carbazole	2/18	2.10E-01	2.10E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
VOCs											
Cyclohexane	2/18	8.00E-01	8.00E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Isopropylbenzene (Cumene)	2/18	6.50E-01	6.50E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Methylcyclohexane	2/18	4.40E+00	4.40E+00	1.80E-02	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Trichlorofluoromethane	1/18	9.50E-04	9.50E-03	2.80E-04	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Xylenes (m & p)	1/18	7.70E-01	7.70E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Xylenes (o)	1/18	7.00E-01	7.00E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--
Xylenes (Total)	1/18	7.70E-01	7.70E-01	0.00E+00	0/28	0.00E+00	0.00E+00	0.00E+00	--	--	--

Table 6-9
Comparison of Exposure Point Concentrations in Sediment to Benthic Organism TRVs
for Aquatic Receptors in Streams

Chemical	Sediment Toxicity Reference Value (mg/kg)	Frequency of Detection	Maximum Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for Maximum EPC	95UCLM Exposure Point Concentration (mg/kg dry wt)	Hazard Quotient for 95UCLM EPC
Metals						
Aluminum	NA	18/18	1.41E+04	--	6.41E+03	--
Barium	1.30E+02	18/18	1.47E+02	1.13E+00	6.43E+01	4.95E-01
Beryllium	1.10E+00	3/18	2.60E-01	2.36E-01	2.60E-01	2.36E-01
Chromium, hexavalent	3.73E+01	4/4	3.80E+00	1.02E-01	3.80E+00	1.02E-01
Lead	3.50E+01	18/18	9.17E+01	**2.62E+00**	4.27E+01	1.22E+00
Manganese	4.60E+02	18/18	1.02E+03	**2.22E+00**	3.89E+02	8.46E-01
Vanadium	4.20E+01	18/18	3.08E+01	7.33E-01	1.57E+01	3.75E-01
Zinc	1.23E+02	18/18	1.34E+02	1.09E+00	5.51E+01	4.48E-01
PAHs						
2-Methylnaphthalene	3.46E-02	2/18	1.00E-01	**2.89E+00**	1.00E-01	**2.89E+00**
Acenaphthene	6.71E-03	3/18	7.90E-02	**1.18E+01**	7.90E-02	**1.18E+01**
Anthracene	4.69E-02	12/18	4.20E-01	**8.96E+00**	1.43E-01	**3.04E+00**
Benzo(a)Anthracene	3.17E-02	17/18	1.60E+00	**5.05E+01**	5.58E-01	**1.76E+01**
Benzo(a)Pyrene	3.19E-02	15/18	1.20E+00	**3.76E+01**	3.91E-01	**1.23E+01**
Benzo(b)Fluoranthene	1.30E-01	18/18	1.60E+00	**1.23E+01**	3.36E-01	**2.58E+00**
Benzo(g,h,i)Perylene	1.70E-01	18/18	7.30E-01	**4.29E+00**	1.49E-01	8.79E-01
Benzo(k)Fluoranthene	2.40E-01	11/18	1.70E+00	**7.08E+00**	5.25E-01	**2.19E+00**
Chrysene	5.70E-02	18/18	5.10E+00	**8.95E+01**	1.64E+00	**2.87E+01**
Dibenzo(a,h)Anthracene	6.22E-03	11/18	2.90E-01	**4.66E+01**	9.53E-02	**1.53E+01**
Fluoranthene	1.11E-01	16/18	6.60E-01	**5.95E+00**	2.65E-01	**2.39E+00**
Fluorene	2.12E-02	7/18	5.40E-01	**2.55E+01**	1.69E-01	**7.98E+00**
Indeno(1,2,3-Cd)Pyrene	2.00E-01	17/18	3.50E-01	**1.75E+00**	1.13E-01	5.64E-01
Phenanthrene	4.19E-02	13/18	8.70E+00	**2.08E+02**	2.68E+00	**6.41E+01**
Pyrene	5.30E-02	17/18	3.30E+00	**6.23E+01**	1.20E+00	**2.27E+01**
Total PAHs	1.68E+00	18/18	1.77E+01	**1.05E+01**	7.41E+00	**4.40E+00**
SVOCs						
4-methylphenol	5.00E-02	1/18	2.80E-01	**5.60E+00**	2.80E-01	**5.60E+00**
Acetophenone	NA	1/18	3.70E-02	--	3.70E-02	--
Carbazole	NA	2/18	2.10E-01	--	2.10E-01	--
VOCs						
Cyclohexane	NA	2/18	8.00E-01	--	8.00E-01	--
Isopropylbenzene (Cumene)	NA	2/18	6.50E-01	--	6.50E-01	--
Methylcyclohexane	NA	2/18	4.40E+00	--	4.40E+00	--
Trichlorofluoromethane	NA	1/18	9.50E-04	--	9.50E-03	--
Xylenes (m & p)	1.30E-01	1/18	7.70E-01	**5.92E+00**	7.70E-01	**5.92E+00**
Xylenes (o)	8.90E-02	1/18	7.00E-01	**7.87E+00**	7.00E-01	**7.87E+00**
Xylenes (Total)	1.30E-01	1/18	7.70E-01	**5.92E+00**	7.70E-01	**5.92E+00**

Table 6-10
Simultaneous Extracted Metals and Acid Volatile Sulfide Results in Streams

Sample ID	∑SEM (µmol/g)	AVS (µmol/g)	∑SEM-AVS	Fraction Organic Carbon (f_{OC})	(∑SEM-AVS)/f_{OC} (µmol/g_{oc})
C1-SD-0.5	0.12	0.63	-0.5	0.002	-232.84
ET-SD-01-0.5	0.36	0.63	-0.3	0.005	-58.88
ET-SD-02-0.5	0.17	0.63	-0.5	0.006	-78.91
ET-SD-03-0.5	0.35	0.63	-0.3	0.006	-49.14
ET-SD-04-0.5	0.52	0.63	-0.1	0.004	-26.43
ET-SD-05-0.5	1.82	4.50	-2.7	0.005	-515.39
ET-SD-07-0.5	0.15	0.63	-0.5	0.003	-165.64
ETUC-SD-0.5	0.21	0.63	-0.4	0.002	-207.90
SCBR-SD-02-0.5	0.18	0.63	-0.4	0.002	-223.35
SCPPE-SD-01-0.5	0.37	0.63	-0.3	0.002	-130.33
SCPPE-SD-03-0.5	0.39	0.63	-0.2	0.002	-122.34
SC-SD-02-0.5	0.31	0.63	-0.3	0.002	-162.42
SC-SD-04-0.5	0.48	0.63	-0.1	0.002	-64.57
SC-SD-06-0.5	0.55	0.63	-0.1	0.002	-37.70
SC-SD-08-0.5	0.18	0.63	-0.4	0.002	-194.84
SC-SD-21	0.20	0.91	-0.7	--	--
SC-SD-22	1.04	3.9	-2.9	--	--
SC-SD-22-DUP	1.30	5.4	-4.1	--	--
SCUC1a-SD-0.5	0.28	0.74	-0.5	0.008	-57.05
SCUC1c-SD-0.5	0.31	0.63	-0.3	0.002	-159.46
WT-SD-01-0.5	0.59	0.63	0.0	0.004	-9.17
WT-SD-01-0.5-D	0.73	0.63	0.1	0.005	19.84
WT-SD-06-0.5	1.06	0.63	0.4	0.010	45.40
WTUC-SD-0.5	0.22	0.63	-0.4	0.002	-177.89

NOTES:

1. [∑SEM-AVS]/f_{OC} values less than 130 µmol/g are not toxic to benthic organisms.

-- = Not applicable

SEM = Simultaneously extracted metals.

AVS = Acid volatile sulfide.

f_{OC} = Fraction organic carbon.

µmol/g = Micromoles per gram.

µmol/g_{oc} = Micromoles per gram of organic carbon.

Table 6-11
Comparison of Exposure Point Concentrations in Surface Water to Aquatic Organism TRVs
for Aquatic Receptors in Streams

Chemical	Surface Water Toxicity Reference Value (µg/L)	Dissolved Concentrations					Total Concentrations				
		Frequency of Detection	Maximum EPC (µg/L)	HQ for Maximum EPC	95UCLM EPC (µg/L)	HQ for 95UCLM EPC	Frequency of Detection	Maximum EPC (µg/L)	HQ for Maximum EPC	95UCLM EPC (µg/L)	HQ for 95UCLM EPC
Metals											
Aluminum	6.80E+02	9/31	2.15E+02	3.16E-01	1.27E+02	1.87E-01	13/30	9.48E+02	1.39E+00	3.76E+02	5.53E-01
Barium	2.20E+02	31/31	2.20E+02	1.00E+00	1.47E+02	6.66E-01	30/30	2.24E+02	1.02E+00	1.53E+02	6.95E-01
Beryllium	1.10E+02	0/31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0/30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium, hexavalent	1.10E+01	4/16	3.30E-01	3.00E-02	3.30E-01	3.00E-02	4/15	3.42E-01	3.11E-02	3.42E-01	3.11E-02
Lead	2.90E+00	5/31	6.10E+00	**2.10E+00**	1.41E+00	4.86E-01	5/30	1.91E+01	**6.59E+00**	3.40E+00	1.17E+00
Manganese	9.30E+01	31/31	1.10E+03	**1.18E+01**	3.89E+02	**4.18E+00**	30/30	1.08E+03	**1.16E+01**	4.09E+02	**4.40E+00**
Vanadium	2.70E+01	2/31	6.40E-01	2.37E-02	6.40E-01	2.37E-02	2/30	2.40E+00	8.89E-02	2.40E+00	8.89E-02
Zinc	8.10E+01	6/31	7.94E+01	9.80E-01	1.20E+01	1.48E-01	6/30	8.59E+01	1.06E+00	1.64E+01	2.02E-01
PAHs											
2-Methylnaphthalene	2.10E+00	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acenaphthene	2.30E+01	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	7.30E-01	--	--	--	--	--	1/28	2.00E-01	2.74E-01	2.00E-01	2.74E-01
Benzo(a)Anthracene	2.70E-02	--	--	--	--	--	1/28	1.00E-01	**3.70E+00**	1.00E-01	**3.70E+00**
Benzo(a)Pyrene	1.40E-02	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)Fluoranthene	9.07E+00	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)Perylene	7.64E+00	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)Fluoranthene	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Chrysene	NA	--	--	--	--	--	1/28	2.00E-01	--	2.00E-01	--
Dibenzo(a,h)Anthracene	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Fluoranthene	8.00E-01	--	--	--	--	--	1/28	2.00E-01	2.50E-01	2.00E-01	2.50E-01
Fluorene	3.90E+00	--	--	--	--	--	1/28	4.00E-01	1.03E-01	4.00E-01	1.03E-01
Indeno(1,2,3-Cd)Pyrene	4.31E+00	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	2.30E+00	--	--	--	--	--	3/28	1.50E+00	6.52E-01	1.50E+00	6.52E-01
Pyrene	NA	--	--	--	--	--	1/28	7.00E-01	--	7.00E-01	--
Total PAHs	NA	--	--	--	--	--	3/3	3.50E+00	--	3.50E+00	--
SVOCs											
4-methylphenol	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Acetophenone	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Carbazole	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
VOCs											
Cyclohexane	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Isopropylbenzene (Cumene)	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Methylcyclohexane	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Trichlorofluoromethane	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Xylenes (m & p)	1.80E+00	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (o)	NA	--	--	--	--	--	0/28	0.00E+00	--	0.00E+00	--
Xylenes (Total)	1.30E+01	--	--	--	--	--	0/28	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6-12
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Aquatic Receptors in Streams

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals	Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
	NOAEL	LOAEL	Muskrat	Raccoon	River Otter	Muskrat	Raccoon	River Otter
Metals								
Aluminum	1.93E+00	1.93E+01	**1.33E+01**	**3.84E+02**	2.94E-01	1.33E+00	**3.84E+01**	2.94E-02
Barium	5.18E+01	8.27E+01	3.75E-02	1.49E-01	3.67E-03	2.35E-02	9.36E-02	2.30E-03
Beryllium	5.32E-01	6.73E-01	1.10E-03	2.57E-02	0.00E+00	8.70E-04	2.03E-02	0.00E+00
Chromium, hexavalent	9.24E+00	3.84E+01	8.59E-04	1.11E-02	1.42E-03	2.07E-04	2.67E-03	3.43E-04
Lead	4.70E+00	8.90E+00	8.38E-02	1.50E-01	9.11E-03	4.43E-02	7.93E-02	4.81E-03
Manganese	5.15E+01	1.46E+02	4.07E-01	1.04E+00	**1.61E+00**	1.44E-01	3.68E-01	5.70E-01
Vanadium	4.16E+00	8.31E+00	1.43E-02	3.89E-01	7.44E-05	7.18E-03	1.95E-01	3.73E-05
Zinc	7.54E+01	2.98E+02	7.58E-02	4.14E-01	1.39E-02	1.92E-02	1.05E-01	3.52E-03
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthene	NA	NA	--	--	--	--	--	--
Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	1.00E+00	1.00E+01	2.82E-03	7.74E-03	0.00E+00	2.82E-04	7.74E-04	0.00E+00
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Benzo(k)Fluoranthene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Fluoranthene	NA	NA	--	--	--	--	--	--
Fluorene	NA	NA	--	--	--	--	--	--
Indeno(1,2,3-Cd)Pyrene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	6.56E+01	3.28E+02	1.40E-03	5.97E-03	2.20E-02	2.79E-04	1.19E-03	4.40E-03
Total HMW PAHs	6.15E-01	3.01E+00	1.36E-01	2.14E-01	1.23E+00	2.78E-02	4.38E-02	2.51E-01
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
VOCs								
Cyclohexane	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Methylcyclohexane	NA	NA	--	--	--	--	--	--
Trichlorofluoromethane	NA	NA	--	--	--	--	--	--
Xylenes (m & p)	2.10E+00	2.60E+00	1.80E-02	8.46E-01	0.00E+00	1.45E-02	6.84E-01	0.00E+00

Table 6-12
Comparison of Maximum Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Aquatic Receptors in Streams

Chemical	Mammalian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals	Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
	NOAEL	LOAEL	Muskrat	Raccoon	River Otter	Muskrat	Raccoon	River Otter
Xylenes (o)	2.10E+00	2.60E+00	1.63E-02	7.70E-01	0.00E+00	1.32E-02	6.22E-01	0.00E+00
Xylenes (Total)	2.10E+00	2.60E+00	1.66E-02	8.46E-01	0.00E+00	1.34E-02	6.84E-01	0.00E+00

Table 6-13
Comparison of 95UCLM Modeled Wildlife Doses to Mammals to Mammalian TRVs
for Aquatic Receptors in Streams

Chemical	Mammalian TRVs (mg/kg-bw day)		95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs			95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals	Aquatic Herbivorous Mammals	Aquatic Insectivorous Mammals	Piscivorous Mammals
	NOAEL	LOAEL	Muskrat	Raccoon	River Otter	Muskrat	Raccoon	River Otter
Metals								
Aluminum	1.93E+00	1.93E+01	**6.03E+00**	**1.74E+02**	1.17E-01	6.03E-01	**1.74E+01**	1.17E-02
Barium	5.18E+01	8.27E+01	1.67E-02	6.54E-02	2.51E-03	1.05E-02	4.10E-02	1.57E-03
Beryllium	5.32E-01	6.73E-01	1.10E-03	2.57E-02	0.00E+00	8.70E-04	2.03E-02	0.00E+00
Chromium, hexavalent	9.24E+00	3.84E+01	8.59E-04	1.11E-02	1.42E-03	2.07E-04	2.67E-03	3.43E-04
Lead	4.70E+00	8.90E+00	4.86E-02	6.99E-02	1.62E-03	2.57E-02	3.69E-02	8.56E-04
Manganese	5.15E+01	1.46E+02	1.55E-01	3.98E-01	6.11E-01	5.50E-02	1.41E-01	2.16E-01
Vanadium	4.16E+00	8.31E+00	7.41E-03	1.99E-01	7.44E-05	3.71E-03	9.95E-02	3.73E-05
Zinc	7.54E+01	2.98E+02	4.56E-02	1.70E-01	2.64E-03	1.16E-02	4.32E-02	6.69E-04
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthene	NA	NA	--	--	--	--	--	--
Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	1.00E+00	1.00E+01	9.21E-04	2.52E-03	0.00E+00	9.21E-05	2.52E-04	0.00E+00
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Benzo(k)Fluoranthene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Fluoranthene	NA	NA	--	--	--	--	--	--
Fluorene	NA	NA	--	--	--	--	--	--
Indeno(1,2,3-Cd)Pyrene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	6.56E+01	3.28E+02	5.96E-04	2.53E-03	2.20E-02	1.19E-04	5.05E-04	4.40E-03
Total HMW PAHs	6.15E-01	3.01E+00	4.74E-02	7.43E-02	1.23E+00	9.69E-03	1.52E-02	2.51E-01
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
VOCs								
Cyclohexane	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Methylcyclohexane	NA	NA	--	--	--	--	--	--
Trichlorofluoromethane	NA	NA	--	--	--	--	--	--
Xylenes (m & p)	2.10E+00	2.60E+00	1.80E-02	8.46E-01	0.00E+00	1.45E-02	6.84E-01	0.00E+00
Xylenes (o)	2.10E+00	2.60E+00	1.63E-02	7.70E-01	0.00E+00	1.32E-02	6.22E-01	0.00E+00
Xylenes (Total)	2.10E+00	2.60E+00	1.66E-02	8.46E-01	0.00E+00	1.34E-02	6.84E-01	0.00E+00

Table 6-14
Comparison of Maximum Modeled Wildlife Doses to Birds to Avian TRVs
for Aquatic Receptors in Streams

Chemical	Avian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds	Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds
	NOAEL	LOAEL	Canada Goose	Green Heron	Great Blue Heron	Canada Goose	Green Heron	Great Blue Heron
Metals								
Aluminum	1.10E+02	NA	8.60E-02	2.56E-01	1.20E-01	--	--	--
Barium	2.08E+01	4.17E+01	1.32E-02	3.11E-02	1.46E-02	6.58E-03	1.55E-02	7.28E-03
Beryllium	NA	NA	--	--	--	--	--	--
Chromium, hexavalent	2.66E+00	1.56E+01	9.97E-04	1.26E-02	5.92E-03	1.70E-04	2.14E-03	1.01E-03
Lead	1.63E+00	3.26E+00	5.22E-02	1.59E-01	7.49E-02	2.61E-02	7.97E-02	3.74E-02
Manganese	1.79E+02	3.77E+02	1.49E-02	9.36E-01	4.40E-01	7.10E-03	4.45E-01	2.09E-01
Vanadium	3.44E-01	6.88E-01	6.10E-02	1.73E-01	8.12E-02	3.05E-02	8.64E-02	4.06E-02
Zinc	6.61E+01	1.71E+02	9.93E-03	3.54E-02	1.66E-02	3.83E-03	1.36E-02	6.41E-03
PAHs								
2-Methylnaphthalene	NA	NA	--	--	--	--	--	--
Acenaphthene	NA	NA	--	--	--	--	--	--
Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Anthracene	NA	NA	--	--	--	--	--	--
Benzo(a)Pyrene	NA	NA	--	--	--	--	--	--
Benzo(b)Fluoranthene	NA	NA	--	--	--	--	--	--
Benzo(g,h,i)Perylene	NA	NA	--	--	--	--	--	--
Benzo(k)Fluoranthene	NA	NA	--	--	--	--	--	--
Chrysene	NA	NA	--	--	--	--	--	--
Dibenzo(a,h)Anthracene	NA	NA	--	--	--	--	--	--
Fluoranthene	NA	NA	--	--	--	--	--	--
Fluorene	NA	NA	--	--	--	--	--	--
Indeno(1,2,3-Cd)Pyrene	NA	NA	--	--	--	--	--	--
Phenanthrene	NA	NA	--	--	--	--	--	--
Pyrene	NA	NA	--	--	--	--	--	--
Total LMW PAHs	5.62E+03	NA	2.52E-06	5.15E-04	2.42E-04	--	--	--
Total HMW PAHs	2.00E+00	2.00E+01	6.47E-03	7.62E-01	3.58E-01	6.47E-04	7.62E-02	3.58E-02
SVOCs								
4-methylphenol	NA	NA	--	--	--	--	--	--
Acetophenone	NA	NA	--	--	--	--	--	--
Carbazole	NA	NA	--	--	--	--	--	--
VOCs								
Cyclohexane	NA	NA	--	--	--	--	--	--
Isopropylbenzene (Cumene)	NA	NA	--	--	--	--	--	--
Methylcyclohexane	NA	NA	--	--	--	--	--	--

Table 6-14
Comparison of Maximum Modeled Wildlife Doses to Birds to Avian TRVs
for Aquatic Receptors in Streams

Chemical	Avian TRVs (mg/kg-bw day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs			Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs		
			Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds	Aquatic Herbivorous Birds	Piscivorous Birds	Piscivorous Birds
	NOAEL	LOAEL	Canada Goose	Green Heron	Great Blue Heron	Canada Goose	Green Heron	Great Blue Heron
Trichlorofluoromethane	NA	NA	--	--	--	--	--	--
Xylenes (m & p)	NA	NA	--	--	--	--	--	--
Xylenes (o)	NA	NA	--	--	--	--	--	--
Xylenes (Total)	NA	NA	--	--	--	--	--	--

Table 8-1
Summary of SLERA Results for Wilcox Oil Company

Area	Receptor*	COPC	HQ greater than 5?	Maximum exceeds alternative TRV/LOAEL based TRV?	95UCLM exceeds TRV/NOAEL based TRV?	95UCLM exceeds LOAEL based TRV?	Maximum more than 5x background?	Expected to pose risk to receptor?	Notes
Wilcox and Lorraine Process Area	Plants	Cadmium	NO	--	NO	--	YES	NO	--
		Chromium	YES	--	YES	--	YES	YES	
		Cobalt	NO	--	NO	--	NO	NO	
		Copper	YES	--	YES	--	YES	YES	--
		Lead	YES	--	YES	--	YES	YES	--
		Manganese	YES	--	YES	--	NO	NO	--
		Mercury	YES	--	NO	--	YES	NO	--
		Selenium	NO	--	NO	--	YES	NO	--
		Vanadium	YES	--	YES	--	YES	YES	--
		Zinc	YES	--	YES	--	YES	YES	--
		HMW PAHs	YES	--	NO	--	YES	NO	--
		LMW PAHs	YES	--	NO	--	YES	NO	--
	Soil Invertebrates	Chromium	YES	--	YES	--	YES	YES	--
		Chromium VI	NO	--	YES	--	--	YES	Low potential for risk
		Copper	YES	--	YES	--	YES	YES	--
		Lead	YES	--	NO	--	YES	NO	--
		Manganese	NO	--	NO	--	NO	NO	--
		Mercury	YES	--	YES	--	YES	YES	--
		Zinc	YES	--	YES	--	YES	YES	--
		LMW PAHs	YES	--	NO	--	YES	NO	--
		HMW PAHs	YES	--	NO	--	YES	NO	--
		Gamma-chlordane	NO	--	NO	--	--	NO	--
		Carbazole	YES	--	NO	--	YES	NO	--
		Isopropylbenzene	YES	--	YES	--	YES	YES	--
		Toluene	NO	--	NO	--	YES	NO	--
		Xylenes (m&p)	YES	--	YES	--	YES	YES	--
		Xylenes (o)	YES	--	NO	--	YES	NO	--
	Terrestrial Insectivorous Mammals	Antimony	YES	NO	NO	NO	YES	NO	--
		Cadmium	YES	YES	NO	NO	YES	NO	--
		Copper	YES	NO	NO	NO	YES	NO	--
		Lead	YES	YES	YES	YES	YES	YES	--
		Nickel	NO	NO	YES	NO	YES	NO	--
		Selenium	NO	NO	NO	NO	YES	NO	--
		Thallium	YES	NO	NO	NO	YES	NO	--
		Vanadium	NO	NO	NO	NO	YES	NO	--
		Zinc	YES	YES	NO	NO	YES	NO	--
		HMW PAHs	YES	YES	YES	NO	YES	NO	--

Table 8-1
Summary of SLERA Results for Wilcox Oil Company

Area	Receptor*	COPC	HQ greater than 5?	Maximum exceeds alternative TRV/LOAEL based TRV?	95UCLM exceeds TRV/NOAEL based TRV?	95UCLM exceeds LOAEL based TRV?	Maximum more than 5x background?	Expected to pose risk to receptor?	Notes
Wilcox and Lorraine Process Area (cont.)	Terrestrial Herbivorous Mammals (white-footed mouse)	Lead	NO	YES	NO	NO	YES	NO	--
		HMW PAHs	NO	NO	NO	NO	YES	NO	--
	Terrestrial Herbivorous Mammals (cattle)	Lead	NO	NO	NO	NO	YES	NO	--
	Predatory Mammals	Lead	NO	NO	NO	NO	YES	NO	--
	Terrestrial Insectivorous Birds	Cadmium	YES	YES	NO	NO	YES	NO	--
		Copper	YES	YES	YES	NO	YES	NO	--
		Lead	YES	YES	YES	YES	YES	YES	--
		Vanadium	YES	YES	YES	YES	YES	YES	--
		Zinc	YES	YES	YES	NO	YES	NO	--
		4,4'-DDD	YES	NO	YES	NO	--	NO	--
		4,4'-DDT	NO	NO	NO	NO	--	NO	--
		HMW PAHs	YES	YES	NO	NO	YES	NO	--
	Terrestrial Herbivorous Birds	Copper	YES	YES	YES	NO	YES	YES	--
		Lead	YES	YES	YES	YES	YES	YES	--
		Vanadium	YES	YES	NO	NO	YES	NO	--
		Zinc	YES	YES	NO	NO	YES	NO	--
		HMW PAHs	YES	NO	NO	NO	YES	NO	--
	Predatory Birds	Lead	NO	YES	NO	NO	YES	NO	--
		Vanadium	NO	YES	NO	NO	YES	NO	--
North Tank Farm, Loading Dock Area, and East Tank Farm	Plants	Chromium	YES	--	YES	--	NO	YES	--
		Cobalt	NO	--	NO	--	NO	NO	--
		Copper	NO	--	NO	--	YES	NO	--
		Lead	YES	--	NO	--	YES	NO	--
		Manganese	YES	--	YES	--	YES	YES	--
		Nickel	NO	--	NO	--	YES	NO	--
		Selenium	YES	--	NO	--	YES	NO	--
		Thallium	NO	--	YES	--	YES	NO	--
		Vanadium	YES	--	YES	--	NO	YES	--
		Zinc	YES	--	NO	--	YES	NO	--
		HMW PAHs	NO	--	NO	--	YES	NO	--
	Soil Invertebrates	Barium	NO	--	NO	--	YES	NO	--
		Chromium	YES	--	YES	--	NO	YES	--
		Lead	NO	--	NO	--	YES	NO	--
		Manganese	YES	--	YES	--	YES	NO	--
		Mercury	NO	--	NO	--	YES	NO	--
		Selenium	NO	--	NO	--	YES	NO	--

Table 8-1
Summary of SLERA Results for Wilcox Oil Company

Area	Receptor*	COPC	HQ greater than 5?	Maximum exceeds alternative TRV/LOAEL based TRV?	95UCLM exceeds TRV/NOAEL based TRV?	95UCLM exceeds LOAEL based TRV?	Maximum more than 5x background?	Expected to pose risk to receptor?	Notes
North Tank Farm, Loading Dock Area, and East Tank Farm	Soil Invertebrates	Zinc	YES	--	NO	--	YES	NO	--
		HMW PAHs	NO	--	NO	--	YES	NO	--
		Carbazole	NO	--	NO	--	YES	NO	--
		Di-n-butylphthalate	YES	--	NO	--	YES	NO	--
		Benzene	YES	--	YES	--	YES	NO	Low frequency of detection
		Ethylbenzene	YES	--	NO	--	YES	NO	Low frequency of detection
		Alpha-chlordane	NO	--	NO	--	--	NO	Low frequency of detection
		Isopropylbenzene	YES	--	YES	--	YES	YES	Risk is specific to the Loading Dock Area
		Toluene	NO	--	NO	--	YES	NO	--
		Xylenes (m&p)	YES	--	YES	--	YES	NO	Low frequency of detection
		Xylenes (o)	NO	--	NO	--	YES	NO	Low frequency of detection
	Terrestrial Insectivorous Mammals	Antimony	YES	YES	YES	NO	YES	NO	--
		Beryllium	NO	NO	NO	NO	NO	NO	--
		Cadmium	YES	NO	NO	NO	YES	NO	--
		Lead	YES	YES	NO	NO	YES	NO	--
		Manganese	NO	NO	NO	NO	YES	NO	--
		Nickel	NO	NO	YES	NO	YES	NO	--
		Selenium	YES	YES	NO	NO	YES	NO	--
		Silver	NO	NO	NO	NO	YES	NO	Low frequency of detection
		Thallium	YES	YES	YES	YES	YES	NO	Low frequency of detection
		Vanadium	NO	NO	NO	NO	NO	NO	--
		Zinc	NO	NO	NO	NO	YES	NO	--
		HMW PAHs	YES	NO	NO	NO	YES	NO	--
	Terrestrial Insectivorous Birds	Barium	NO	NO	NO	NO	YES	NO	--
		Cadmium	YES	NO	NO	NO	YES	NO	--
		Chromium	NO	NO	NO	NO	YES	NO	--
		Copper	NO	NO	NO	NO	YES	NO	--
		Lead	YES	YES	YES	YES	YES	YES	--
		Selenium	NO	YES	NO	NO	YES	NO	--
		Silver	YES	NO	NO	NO	YES	NO	--
		Vanadium	YES	YES	YES	YES	NO	YES	--
		Zinc	NO	NO	NO	NO	YES	NO	--
		Di-n-butylphthalate	NO	NO	NO	NO	YES	NO	--
		HMW PAHs	NO	NO	NO	NO	YES	NO	--
	Terrestrial Herbivorous Birds	Barium	NO	NO	NO	NO	YES	NO	--
		Lead	YES	YES	NO	NO	YES	NO	--
		Manganese	NO	NO	NO	NO	YES	NO	--
		Vanadium	NO	YES	NO	NO	NO	NO	--
	Predatory Birds	Vanadium	NO	NO	NO	NO	YES	NO	--

Table 8-1
Summary of SLERA Results for Wilcox Oil Company

Area	Receptor*	COPC	HQ greater than 5?	Maximum exceeds alternative TRV/LOAEL based TRV?	95UCLM exceeds TRV/NOAEL based TRV?	95UCLM exceeds LOAEL based TRV?	Maximum more than 5x background?	Expected to pose risk to receptor?	Notes
Ponds	Benthic Invertebrates	Lead	YES	--	YES	--	YES	NO	SEM/AVS results indicate lead is not bioavailable
		4-methylphenol	NO	--	NO	--	YES	NO	--
		Total PAHs	NO	--	NO	--	YES	NO	--
	Aquatic Organisms	Cadmium	YES	--	YES	--	YES	YES	Risks are specific to Ponds, 1,2, and 3
		Lead	YES	--	YES	--	YES	YES	Risk is specific to Pond 1
		Manganese	NO	--	NO	--	NO	NO	--
		Benzo(a)pyrene	NO	--	NO	--	YES	YES	Risks are specific to Ponds, 3,5, and 7
	Aquatic Herbivorous Mammals	Aluminum	YES	YES	YES	NO	NO	NO	Aluminum is not a COPC in sediment. Surface water is below the site screening criteria. Site pH measurments favor non-bioavailability of aluminum.
	Aquatic Insectivorous Mammals	Aluminum	YES	YES	YES	YES	NO	NO	Aluminum is not a COPC in sediment. Surface water is below the site screening criteria. Site pH measurments favor non-bioavailability of aluminum.
	Piscivorous Mammals	Aluminum	YES	NO	YES	NO	NO	NO	Aluminum is not a COPC in sediment. Surface water is below the site screening criteria. Site pH measurments favor non-bioavailability of aluminum.
Streams	Benthic Invertebrates	Lead	NO	--	YES	--	NO	NO	SEM/AVS results indicate lead is not bioavailable
		Manganese	NO	--	NO	--	NO	NO	
		Xylenes (m&p)	YES	--	YES	--	YES	NO	--
		Xylenes (o)	YES	--	YES	--	YES	NO	--
		4-methylphenol	YES	--	YES	--	YES	NO	--
		Total PAHs	YES	--	YES	--	YES	YES	--
	Aquatic Organisms	Lead	NO	--	NO	--	YES	NO	--
		Manganese	YES	--	NO	--	YES	YES	Risks are specific to Sand Creek and West Tributary
		Benzo(a)anthracene	NO	--	YES	--	YES	NO	--
	Aquatic Herbivorous Mammals	Aluminum	YES	YES	YES	NO	NO	NO	Aluminum is not a COPC in sediment. Surface water is below the site screening criteria. Site pH measurments favor non-bioavailability of aluminum.
	Aquatic Insectivorous Mammals	Aluminum	YES	YES	YES	YES	NO	NO	Aluminum is not a COPC in sediment. Surface water is below the site screening criteria. Site pH measurments favor non-bioavailability of aluminum.
		Manganese	NO	NO	NO	NO	YES	NO	--

Table 8-1
Summary of SLERA Results for Wilcox Oil Company

Area	Receptor*	COPC	HQ greater than 5?	Maximum exceeds alternative TRV/LOAEL based TRV?	95UCLM exceeds TRV/NOAEL based TRV?	95UCLM exceeds LOAEL based TRV?	Maximum more than 5x background?	Expected to pose risk to receptor?	Notes
Streams	Piscivorous Mammals	Manganese	NO	NO	NO	NO	YES	NO	--
		HMW PAHs	NO	NO	YES	NO	YES	NO	--

NOTES:
COPCs with maximum concentration exceeding TRV/NOAEL based TRV are listed in this table.
*Only receptors with exceedances are listed here.
-- indicates value is not available or does not apply
COPC = Chemical of potential concern.
HMW = High molecular weight.
LOAEL = Lowest Observed Adverse Effect Level.
NOAEL = No Observed Adverse Effect Level.
PAH = Polycyclic aromatic compound.
SEM/AVS = Simultaneously extracted metals/acid volatile sulfide.
TRV = Toxicity reference value.
UCLM = Upper confidence limit of the mean.

APPENDIX A

Food Web Calculations

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Table A-1
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	2.00E-01	3.60E-01	1.39E-03	1.39E-02	0.00E+00	1.53E-02
Arsenic	2.09E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.58E-01	1.62E-02	2.93E-02	1.02E-03	4.64E-02
Cadmium	8.02E+01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	6.81E+00	6.20E-02	2.63E-01	7.50E-03	3.32E-01
Chromium	2.97E+01	1.80E-02	7.50E-03	2.23E-01	2.30E-02	8.61E-03	5.40E-03	3.70E-02
Chromium, hexavalent	1.50E+00	0.00E+00	7.50E-03	1.13E-02	1.16E-03	4.35E-04	0.00E+00	1.59E-03
Cobalt	2.25E+01	0.00E+00	2.00E-02	4.50E-01	1.74E-02	1.74E-02	0.00E+00	3.48E-02
Copper	7.49E+03	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	6.56E+01	5.79E+00	2.54E+00	8.07E-03	8.33E+00
Lead	2.08E+04	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.01E+01	1.61E+01	2.71E+00	5.43E-02	1.88E+01
Manganese	1.43E+03	4.13E-01	2.50E-01	3.58E+02	1.11E+00	1.38E+01	1.24E-01	1.50E+01
Mercury	2.00E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.39E-01	1.55E-03	2.08E-02	0.00E+00	2.24E-02
Nickel	4.07E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	1.73E+00	3.15E-02	6.69E-02	0.00E+00	9.83E-02
Selenium	1.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	8.53E-01	1.24E-03	3.30E-02	0.00E+00	3.42E-02
Thallium	4.80E-01	0.00E+00	4.00E-03	1.92E-03	3.71E-04	7.42E-05	0.00E+00	4.45E-04
Vanadium	7.92E+01	2.91E-02	5.50E-03	4.36E-01	6.12E-02	1.68E-02	8.73E-03	8.68E-02
Zinc	1.38E+04	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	9.59E+02	1.07E+01	3.70E+01	1.11E-02	4.77E+01
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	1.04E-01	1.96E+01	1.45E-01	7.58E-01	0.00E+00	9.03E-01
Total HMW PAHs	2.63E+02	3.70E-05	1.04E-01	2.75E+01	2.03E-01	1.06E+00	1.11E-05	1.26E+00
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	1.57E-02	1.72E-03	8.50E-05	6.66E-05	0.00E+00	1.52E-04
4,4'-DDT	4.00E-02	0.00E+00	4.61E-03	1.84E-04	3.09E-05	7.12E-06	0.00E+00	3.80E-05
gamma-Chlordane	5.00E-02	0.00E+00	3.48E-03	1.74E-04	3.86E-05	6.73E-06	0.00E+00	4.54E-05

Table A-1
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	2.60E-01	2.52E-01	7.50E-04	9.74E-03	0.00E+00	1.05E-02
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	3.74E-01	1.16E-04	1.45E-02	0.00E+00	1.46E-02
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	6.95E-05	1.46E-02	0.00E+00	1.47E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	3.86E-04	1.06E-05	0.00E+00	3.97E-04
Carbazole	4.00E+01	0.00E+00	5.26E-01	2.10E+01	3.09E-02	8.13E-01	0.00E+00	8.44E-01
Dibenzofuran	1.10E+00	0.00E+00	2.78E-01	3.06E-01	8.50E-04	1.18E-02	0.00E+00	1.27E-02
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	4.25E-05	1.78E-04	0.00E+00	2.21E-04
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	3.48E-06	1.03E-02	0.00E+00	1.03E-02
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	4.87E-06	7.13E-04	3.00E-04	1.02E-03
Cyclohexane	1.30E+01	0.00E+00	5.62E-01	7.31E+00	1.00E-02	2.82E-01	0.00E+00	2.92E-01
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	3.93E-01	6.67E-01	1.31E-03	2.58E-02	0.00E+00	2.71E-02
Toluene	6.40E-01	0.00E+00	1.32E+00	8.43E-01	4.95E-04	3.26E-02	0.00E+00	3.31E-02
Xylenes (m & p)	2.40E+00	0.00E+00	6.34E-01	1.52E+00	1.85E-03	5.88E-02	0.00E+00	6.06E-02
Xylenes (o)	5.40E-01	0.00E+00	6.34E-01	3.42E-01	4.17E-04	1.32E-02	0.00E+00	1.36E-02

Table A-2
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	2.00E-01	1.08E-01	4.18E-04	4.18E-03	0.00E+00	4.60E-03
Arsenic	2.67E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.37E-01	2.06E-03	9.17E-03	1.02E-03	1.22E-02
Cadmium	7.20E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	5.19E-01	5.56E-04	2.01E-02	7.50E-03	2.81E-02
Chromium	8.90E+00	1.80E-02	7.50E-03	6.68E-02	6.88E-03	2.58E-03	5.40E-03	1.49E-02
Chromium, hexavalent	1.10E+00	0.00E+00	7.50E-03	8.25E-03	8.50E-04	3.19E-04	0.00E+00	1.17E-03
Cobalt	3.20E+00	0.00E+00	2.00E-02	6.40E-02	2.47E-03	2.47E-03	0.00E+00	4.95E-03
Copper	2.25E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.65E+01	1.74E-01	6.37E-01	8.07E-03	8.19E-01
Lead	3.46E+02	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.04E+00	2.67E-01	2.72E-01	2.10E-02	5.60E-01
Manganese	2.63E+02	2.45E-01	2.50E-01	6.58E+01	2.03E-01	2.54E+00	7.35E-02	2.82E+00
Mercury	2.06E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.56E-01	1.59E-04	6.04E-03	0.00E+00	6.20E-03
Nickel	7.17E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.72E-01	5.54E-03	1.82E-02	0.00E+00	2.38E-02
Selenium	3.89E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	1.79E-01	3.01E-04	6.92E-03	0.00E+00	7.22E-03
Thallium	4.50E-02	0.00E+00	4.00E-03	1.80E-04	3.48E-05	6.95E-06	0.00E+00	4.17E-05
Vanadium	1.42E+01	2.91E-02	5.50E-03	7.81E-02	1.10E-02	3.02E-03	8.73E-03	2.27E-02
Zinc	4.70E+02	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	1.47E+02	3.63E-01	5.67E+00	1.11E-02	6.05E+00
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	1.04E-01	1.20E+00	8.91E-03	4.65E-02	0.00E+00	5.54E-02
Total HMW PAHs	1.40E+01	3.70E-05	1.04E-01	1.46E+00	1.08E-02	5.64E-02	1.11E-05	6.72E-02
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	1.57E-02	4.97E-04	2.45E-05	1.92E-05	0.00E+00	4.37E-05
4,4'-DDT	1.63E-02	0.00E+00	4.61E-03	7.51E-05	1.26E-05	2.90E-06	0.00E+00	1.55E-05
gamma-Chlordane	1.33E-02	0.00E+00	3.48E-03	4.63E-05	1.03E-05	1.79E-06	0.00E+00	1.21E-05

Table A-2
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	2.60E-01	5.90E-02	1.75E-04	2.28E-03	0.00E+00	2.45E-03
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	3.74E-01	1.16E-04	1.45E-02	0.00E+00	1.46E-02
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	6.95E-05	1.46E-02	0.00E+00	1.47E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	3.86E-04	1.06E-05	0.00E+00	3.97E-04
Carbazole	1.40E-01	0.00E+00	5.26E-01	7.37E-02	1.08E-04	2.85E-03	0.00E+00	2.95E-03
Dibenzofuran	1.33E-02	0.00E+00	2.78E-01	3.69E-03	1.03E-05	1.43E-04	0.00E+00	1.53E-04
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	4.25E-05	1.78E-04	0.00E+00	2.21E-04
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	3.48E-06	1.03E-02	0.00E+00	1.03E-02
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	4.87E-06	7.13E-04	3.00E-04	1.02E-03
Cyclohexane	2.44E-03	0.00E+00	5.62E-01	1.37E-03	1.89E-06	5.30E-05	0.00E+00	5.49E-05
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	3.93E-01	5.54E-02	1.09E-04	2.14E-03	0.00E+00	2.25E-03
Toluene	1.09E-02	0.00E+00	1.32E+00	1.44E-02	8.42E-06	5.55E-04	0.00E+00	5.63E-04
Xylenes (m & p)	3.16E-01	0.00E+00	6.34E-01	2.00E-01	2.44E-04	7.74E-03	0.00E+00	7.98E-03
Xylenes (o)	6.49E-02	0.00E+00	6.34E-01	4.11E-02	5.02E-05	1.59E-03	0.00E+00	1.64E-03

Table A-3
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	2.00E-01	3.60E-01	9.59E-04	9.00E-03	0.00E+00	9.96E-03
Arsenic	2.09E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.58E-01	1.11E-02	1.89E-02	6.44E-04	3.07E-02
Cadmium	8.02E+01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	6.81E+00	4.27E-02	1.70E-01	4.74E-03	2.18E-01
Chromium	2.97E+01	1.80E-02	7.50E-03	2.23E-01	1.58E-02	5.57E-03	3.41E-03	2.48E-02
Chromium, hexavalent	1.50E+00	0.00E+00	7.50E-03	1.13E-02	7.99E-04	2.81E-04	0.00E+00	1.08E-03
Cobalt	2.25E+01	0.00E+00	2.00E-02	4.50E-01	1.20E-02	1.13E-02	0.00E+00	2.32E-02
Copper	7.49E+03	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	6.56E+01	3.99E+00	1.64E+00	5.10E-03	5.63E+00
Lead	2.08E+04	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.01E+01	1.11E+01	1.75E+00	3.43E-02	1.29E+01
Manganese	1.43E+03	4.13E-01	2.50E-01	3.58E+02	7.61E-01	8.94E+00	7.82E-02	9.78E+00
Mercury	2.00E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.39E-01	1.07E-03	1.35E-02	0.00E+00	1.45E-02
Nickel	4.07E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	1.73E+00	2.17E-02	4.33E-02	0.00E+00	6.49E-02
Selenium	1.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	8.53E-01	8.52E-04	2.13E-02	0.00E+00	2.22E-02
Thallium	4.80E-01	0.00E+00	4.00E-03	1.92E-03	2.56E-04	4.80E-05	0.00E+00	3.04E-04
Vanadium	7.92E+01	2.91E-02	5.50E-03	4.36E-01	4.22E-02	1.09E-02	5.51E-03	5.86E-02
Zinc	1.38E+04	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	9.59E+02	7.35E+00	2.40E+01	6.99E-03	3.13E+01
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	1.04E-01	1.96E+01	1.00E-01	4.90E-01	0.00E+00	5.90E-01
Total HMW PAHs	2.63E+02	3.70E-05	1.04E-01	2.75E+01	1.40E-01	6.86E-01	7.01E-06	8.26E-01
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	1.57E-02	1.72E-03	5.86E-05	4.31E-05	0.00E+00	1.02E-04
4,4'-DDT	4.00E-02	0.00E+00	4.61E-03	1.84E-04	2.13E-05	4.61E-06	0.00E+00	2.59E-05
gamma-Chlordane	5.00E-02	0.00E+00	3.48E-03	1.74E-04	2.66E-05	4.35E-06	0.00E+00	3.10E-05

Table A-3
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	2.60E-01	2.52E-01	5.17E-04	6.30E-03	0.00E+00	6.82E-03
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	3.74E-01	7.99E-05	9.36E-03	0.00E+00	9.44E-03
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	4.79E-05	9.44E-03	0.00E+00	9.49E-03
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	2.66E-04	6.85E-06	0.00E+00	2.73E-04
Carbazole	4.00E+01	0.00E+00	5.26E-01	2.10E+01	2.13E-02	5.26E-01	0.00E+00	5.47E-01
Dibenzofuran	1.10E+00	0.00E+00	2.78E-01	3.06E-01	5.86E-04	7.64E-03	0.00E+00	8.22E-03
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	2.93E-05	1.15E-04	0.00E+00	1.45E-04
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	2.40E-06	6.67E-03	0.00E+00	6.67E-03
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	3.35E-06	4.61E-04	1.89E-04	6.54E-04
Cyclohexane	1.30E+01	0.00E+00	5.62E-01	7.31E+00	6.92E-03	1.83E-01	0.00E+00	1.90E-01
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	3.93E-01	6.67E-01	9.05E-04	1.67E-02	0.00E+00	1.76E-02
Toluene	6.40E-01	0.00E+00	1.32E+00	8.43E-01	3.41E-04	2.11E-02	0.00E+00	2.14E-02
Xylenes (m & p)	2.40E+00	0.00E+00	6.34E-01	1.52E+00	1.28E-03	3.80E-02	0.00E+00	3.93E-02
Xylenes (o)	5.40E-01	0.00E+00	6.34E-01	3.42E-01	2.88E-04	8.56E-03	0.00E+00	8.84E-03

Table A-4
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	2.00E-01	1.08E-01	2.88E-04	2.71E-03	0.00E+00	2.99E-03
Arsenic	2.67E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.37E-01	1.42E-03	5.93E-03	6.44E-04	7.99E-03
Cadmium	7.20E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	5.19E-01	3.83E-04	1.30E-02	4.74E-03	1.81E-02
Chromium	8.90E+00	1.80E-02	7.50E-03	6.68E-02	4.74E-03	1.67E-03	3.41E-03	9.82E-03
Chromium, hexavalent	1.10E+00	0.00E+00	7.50E-03	8.25E-03	5.86E-04	2.06E-04	0.00E+00	7.92E-04
Cobalt	3.20E+00	0.00E+00	2.00E-02	6.40E-02	1.70E-03	1.60E-03	0.00E+00	3.30E-03
Copper	2.25E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.65E+01	1.20E-01	4.12E-01	5.10E-03	5.37E-01
Lead	3.46E+02	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.04E+00	1.84E-01	1.76E-01	1.33E-02	3.74E-01
Manganese	2.63E+02	2.45E-01	2.50E-01	6.58E+01	1.40E-01	1.64E+00	4.64E-02	1.83E+00
Mercury	2.06E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.56E-01	1.10E-04	3.91E-03	0.00E+00	4.02E-03
Nickel	7.17E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.72E-01	3.82E-03	1.18E-02	0.00E+00	1.56E-02
Selenium	3.89E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	1.79E-01	2.07E-04	4.47E-03	0.00E+00	4.68E-03
Thallium	4.50E-02	0.00E+00	4.00E-03	1.80E-04	2.40E-05	4.50E-06	0.00E+00	2.85E-05
Vanadium	1.42E+01	2.91E-02	5.50E-03	7.81E-02	7.56E-03	1.95E-03	5.51E-03	1.50E-02
Zinc	4.70E+02	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	1.47E+02	2.50E-01	3.67E+00	6.99E-03	3.93E+00
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	1.04E-01	1.20E+00	6.14E-03	3.01E-02	0.00E+00	3.62E-02
Total HMW PAHs	1.40E+01	3.70E-05	1.04E-01	1.46E+00	7.44E-03	3.65E-02	7.01E-06	4.39E-02

Table A-4
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	1.57E-02	4.97E-04	1.69E-05	1.24E-05	0.00E+00	2.93E-05
4,4'-DDT	1.63E-02	0.00E+00	4.61E-03	7.51E-05	8.68E-06	1.88E-06	0.00E+00	1.06E-05
gamma-Chlordane	1.33E-02	0.00E+00	3.48E-03	4.63E-05	7.08E-06	1.16E-06	0.00E+00	8.24E-06
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	2.60E-01	2.12E+00	1.21E-04	5.30E-02	0.00E+00	5.32E-02
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	1.69E+00	7.99E-05	4.21E-02	0.00E+00	4.22E-02
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	4.79E-05	9.44E-03	0.00E+00	9.49E-03
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	2.66E-04	6.85E-06	0.00E+00	2.73E-04
Carbazole	1.40E-01	0.00E+00	5.26E-01	7.37E-02	7.46E-05	1.84E-03	0.00E+00	1.92E-03
Dibenzofuran	1.33E-02	0.00E+00	2.78E-01	4.39E-01	7.08E-06	1.10E-02	0.00E+00	1.10E-02
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	2.93E-05	1.15E-04	0.00E+00	1.45E-04
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	2.40E-06	6.67E-03	0.00E+00	6.67E-03
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	3.35E-06	4.61E-04	1.89E-04	6.54E-04
Cyclohexane	2.44E-03	0.00E+00	5.62E-01	1.37E-03	1.30E-06	3.43E-05	0.00E+00	3.56E-05
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	3.93E-01	5.54E-02	7.51E-05	1.38E-03	0.00E+00	1.46E-03
Toluene	1.09E-02	0.00E+00	1.32E+00	1.44E-02	5.80E-06	3.59E-04	0.00E+00	3.65E-04
Xylenes (m & p)	3.16E-01	0.00E+00	6.34E-01	2.00E-01	1.68E-04	5.01E-03	0.00E+00	5.18E-03
Xylenes (o)	6.49E-02	0.00E+00	6.34E-01	4.11E-02	3.46E-05	1.03E-03	0.00E+00	1.06E-03

Table A-5
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	1.00E+00	1.80E+00	3.63E-02	2.79E-01	0.00E+00	3.15E-01
Arsenic	2.09E+01	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	2.06E+00	4.21E-01	3.20E-01	7.58E-04	7.42E-01
Cadmium	8.02E+01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	2.70E+02	1.62E+00	4.19E+01	5.58E-03	4.35E+01
Chromium	2.97E+01	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	9.52E+00	5.98E-01	1.48E+00	4.01E-03	2.08E+00
Chromium, hexavalent	1.50E+00	0.00E+00	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.16E+01	3.02E-02	1.80E+00	0.00E+00	1.83E+00
Cobalt	2.25E+01	0.00E+00	2.91E-01	6.55E+00	4.53E-01	1.01E+00	0.00E+00	1.47E+00
Copper	7.49E+03	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	5.63E+01	1.51E+02	8.72E+00	6.00E-03	1.60E+02
Lead	2.08E+04	1.81E-01	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	2.45E+03	4.19E+02	3.80E+02	4.04E-02	8.00E+02
Manganese	1.43E+03	4.13E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	6.32E+01	2.88E+01	9.79E+00	9.21E-02	3.87E+01
Mercury	2.00E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	5.48E-01	4.03E-02	8.49E-02	0.00E+00	1.25E-01
Nickel	4.07E+01	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	1.51E+01	8.20E-01	2.34E+00	0.00E+00	3.16E+00
Selenium	1.60E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	1.31E+00	3.22E-02	2.03E-01	0.00E+00	2.35E-01
Thallium	4.80E-01	0.00E+00	1.00E+00	4.80E-01	9.67E-03	7.44E-02	0.00E+00	8.41E-02
Vanadium	7.92E+01	2.91E-02	8.80E-01	6.97E+01	1.60E+00	1.08E+01	6.49E-03	1.24E+01
Zinc	1.38E+04	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	1.95E+03	2.78E+02	3.02E+02	8.23E-03	5.80E+02
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	3.00E-01	5.63E+01	3.78E+00	8.73E+00	0.00E+00	1.25E+01
Total HMW PAHs	2.63E+02	3.70E-05	3.00E-01	7.89E+01	5.30E+00	1.22E+01	8.25E-06	1.75E+01
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	1.00E+00	1.10E-01	2.22E-03	1.71E-02	0.00E+00	1.93E-02

Table A-5
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
4,4'-DDT	4.00E-02	0.00E+00	1.00E+00	4.00E-02	8.06E-04	6.20E-03	0.00E+00	7.01E-03
gamma-Chlordane	5.00E-02	0.00E+00	1.00E+00	5.00E-02	1.01E-03	7.75E-03	0.00E+00	8.76E-03
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	1.00E+00	9.70E-01	1.95E-02	1.50E-01	0.00E+00	1.70E-01
4-methylphenol	1.50E-01	0.00E+00	1.00E+00	1.50E-01	3.02E-03	2.33E-02	0.00E+00	2.63E-02
Acetophenone	9.00E-02	0.00E+00	1.00E+00	9.00E-02	1.81E-03	1.40E-02	0.00E+00	1.58E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	1.00E+00	5.00E-01	1.01E-02	7.75E-02	0.00E+00	8.76E-02
Carbazole	4.00E+01	0.00E+00	1.00E+00	4.00E+01	8.06E-01	6.20E+00	0.00E+00	7.01E+00
Dibenzofuran	1.10E+00	0.00E+00	1.00E+00	1.10E+00	2.22E-02	1.71E-01	0.00E+00	1.93E-01
Di-n-butyl phthalate	5.50E-02	0.00E+00	1.00E+00	5.50E-02	1.11E-03	8.53E-03	0.00E+00	9.63E-03
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	1.00E+00	4.50E-03	9.07E-05	6.98E-04	0.00E+00	7.88E-04
Carbon disulfide	6.30E-03	1.00E-03	1.00E+00	6.30E-03	1.27E-04	9.77E-04	2.23E-04	1.33E-03
Cyclohexane	1.30E+01	0.00E+00	1.00E+00	1.30E+01	2.62E-01	2.02E+00	0.00E+00	2.28E+00
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	1.00E+00	1.70E+00	3.43E-02	2.64E-01	0.00E+00	2.98E-01
Toluene	6.40E-01	0.00E+00	1.00E+00	6.40E-01	1.29E-02	9.92E-02	0.00E+00	1.12E-01
Xylenes (m & p)	2.40E+00	0.00E+00	1.00E+00	2.40E+00	4.84E-02	3.72E-01	0.00E+00	4.20E-01
Xylenes (o)	5.40E-01	0.00E+00	1.00E+00	5.40E-01	1.09E-02	8.37E-02	0.00E+00	9.46E-02

Table A-6
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	1.00E+00	5.41E-01	1.09E-02	8.39E-02	0.00E+00	9.48E-02
Arsenic	2.67E+00	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	4.83E-01	5.37E-02	7.48E-02	7.58E-04	1.29E-01
Cadmium	7.20E-01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	6.38E+00	1.45E-02	9.89E-01	5.58E-03	1.01E+00
Chromium	8.90E+00	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.03E+01	1.79E-01	1.60E+00	4.01E-03	1.78E+00
Chromium, hexavalent	1.10E+00	0.00E+00	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.19E+01	2.22E-02	1.84E+00	0.00E+00	1.86E+00
Cobalt	3.20E+00	0.00E+00	2.91E-01	9.31E-01	6.45E-02	1.44E-01	0.00E+00	2.09E-01
Copper	2.25E+02	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	2.23E+01	4.53E+00	3.46E+00	6.00E-03	8.00E+00
Lead	3.46E+02	7.00E-02	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	9.00E+01	6.97E+00	1.40E+01	1.56E-02	2.09E+01
Manganese	2.63E+02	2.45E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	1.99E+01	5.30E+00	3.09E+00	5.46E-02	8.44E+00
Mercury	2.06E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	4.19E-01	4.15E-03	6.49E-02	0.00E+00	6.91E-02
Nickel	7.17E+00	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	2.37E+01	1.45E-01	3.67E+00	0.00E+00	3.82E+00
Selenium	3.89E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	NA	7.84E-03	NA	0.00E+00	7.84E-03
Thallium	4.50E-02	0.00E+00	1.00E+00	4.50E-02	9.07E-04	6.98E-03	0.00E+00	7.88E-03
Vanadium	1.42E+01	2.91E-02	8.80E-01	1.25E+01	2.86E-01	1.94E+00	6.49E-03	2.23E+00
Zinc	4.70E+02	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	6.44E+02	9.47E+00	9.97E+01	8.23E-03	1.09E+02
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	3.00E-01	3.46E+00	2.32E-01	5.36E-01	0.00E+00	7.68E-01
Total HMW PAHs	1.40E+01	3.70E-05	3.00E-01	4.19E+00	2.82E-01	6.50E-01	8.25E-06	9.32E-01

Table A-6
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	1.00E+00	3.17E-02	6.39E-04	4.91E-03	0.00E+00	5.55E-03
4,4'-DDT	1.63E-02	0.00E+00	1.00E+00	1.63E-02	3.28E-04	2.53E-03	0.00E+00	2.85E-03
gamma-Chlordane	1.33E-02	0.00E+00	1.00E+00	1.33E-02	2.68E-04	2.06E-03	0.00E+00	2.33E-03
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	1.00E+00	2.27E-01	4.57E-03	3.52E-02	0.00E+00	3.98E-02
4-methylphenol	1.50E-01	0.00E+00	1.00E+00	1.50E-01	3.02E-03	2.33E-02	0.00E+00	2.63E-02
Acetophenone	9.00E-02	0.00E+00	1.00E+00	9.00E-02	1.81E-03	1.40E-02	0.00E+00	1.58E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	1.00E+00	5.00E-01	1.01E-02	7.75E-02	0.00E+00	8.76E-02
Carbazole	1.40E-01	0.00E+00	1.00E+00	1.40E-01	2.82E-03	2.17E-02	0.00E+00	2.45E-02
Dibenzofuran	1.33E-02	0.00E+00	1.00E+00	1.33E-02	2.68E-04	2.06E-03	0.00E+00	2.33E-03
Di-n-butyl phthalate	5.50E-02	0.00E+00	1.00E+00	5.50E-02	1.11E-03	8.53E-03	0.00E+00	9.63E-03
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	1.00E+00	4.50E-03	9.07E-05	6.98E-04	0.00E+00	7.88E-04
Carbon disulfide	6.30E-03	1.00E-03	1.00E+00	6.30E-03	1.27E-04	9.77E-04	2.23E-04	1.33E-03
Cyclohexane	2.44E-03	0.00E+00	1.00E+00	2.44E-03	4.92E-05	3.78E-04	0.00E+00	4.27E-04
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	1.00E+00	1.41E-01	2.84E-03	2.19E-02	0.00E+00	2.47E-02
Toluene	1.09E-02	0.00E+00	1.00E+00	1.09E-02	2.20E-04	1.69E-03	0.00E+00	1.91E-03
Xylenes (m & p)	3.16E-01	0.00E+00	1.00E+00	3.16E-01	6.37E-03	4.90E-02	0.00E+00	5.53E-02
Xylenes (o)	6.49E-02	0.00E+00	1.00E+00	6.49E-02	1.31E-03	1.01E-02	0.00E+00	1.14E-02

Table A-7
Wildlife Exposure Modeling of Maximum Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	1.00E+00	1.53E-02	1.26E-03	3.83E-04	0.00E+00	1.64E-03
Arsenic	2.09E+01	3.40E-03	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	9.46E-02	1.46E-02	2.36E-03	2.89E-04	1.73E-02
Cadmium	8.02E+01	2.50E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	5.49E+00	5.61E-02	1.37E-01	2.13E-03	1.95E-01
Chromium	2.97E+01	1.80E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	2.80E+00	2.08E-02	6.99E-02	1.53E-03	9.22E-02
Chromium, hexavalent	1.50E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	3.13E-01	1.05E-03	7.82E-03	0.00E+00	8.87E-03
Cobalt	2.25E+01	0.00E+00	1.00E-01	2.25E+00	1.58E-02	5.63E-02	0.00E+00	7.20E-02
Copper	7.49E+03	2.69E-02	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	2.79E+01	5.24E+00	6.99E-01	2.29E-03	5.94E+00
Lead	2.08E+04	1.81E-01	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	8.76E+01	1.46E+01	2.19E+00	1.54E-02	1.68E+01
Manganese	1.43E+03	4.13E-01	5.87E-02	8.39E+01	1.00E+00	2.10E+00	3.51E-02	3.13E+00
Mercury	2.00E+00	0.00E+00	1.92E-01	3.84E-01	1.40E-03	9.60E-03	0.00E+00	1.10E-02
Nickel	4.07E+01	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	4.39E+00	2.85E-02	1.10E-01	0.00E+00	1.38E-01
Selenium	1.60E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	7.88E-01	1.12E-03	1.97E-02	0.00E+00	2.08E-02
Thallium	4.80E-01	0.00E+00	1.23E-01	5.90E-02	3.36E-04	1.48E-03	0.00E+00	1.81E-03
Vanadium	7.92E+01	2.91E-02	1.79E-01	1.42E+01	5.54E-02	3.54E-01	2.47E-03	4.12E-01
Zinc	1.38E+04	3.69E-02	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.77E+02	9.66E+00	4.42E+00	3.14E-03	1.41E+01
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	1.26E-01	1.14E-01	1.31E-01	2.85E-03	0.00E+00	1.34E-01

Table A-7
Wildlife Exposure Modeling of Maximum Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Total HMW PAHs	2.63E+02	3.70E-05	1.26E-01	1.60E-01	1.84E-01	3.99E-03	3.15E-06	1.88E-01
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	8.55E-04	9.41E-05	7.70E-05	2.35E-06	0.00E+00	7.94E-05
4,4'-DDT	4.00E-02	0.00E+00	1.15E-05	4.61E-07	2.80E-05	1.15E-08	0.00E+00	2.80E-05
gamma-Chlordane	5.00E-02	0.00E+00	4.70E-06	2.35E-07	3.50E-05	5.87E-09	0.00E+00	3.50E-05
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	5.78E-04	5.61E-04	6.79E-04	1.40E-05	0.00E+00	6.93E-04
4-methylphenol	1.50E-01	0.00E+00	1.15E-05	1.73E-06	1.05E-04	4.33E-08	0.00E+00	1.05E-04
Acetophenone	9.00E-02	0.00E+00	4.70E-06	4.23E-07	6.30E-05	1.06E-08	0.00E+00	6.30E-05
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	2.47E+01	1.23E+01	3.50E-04	3.08E-01	0.00E+00	3.09E-01
Carbazole	4.00E+01	0.00E+00	1.71E-04	6.83E-03	2.80E-02	1.71E-04	0.00E+00	2.82E-02
Dibenzofuran	1.10E+00	0.00E+00	5.15E-04	5.67E-04	7.70E-04	1.42E-05	0.00E+00	7.84E-04
Di-n-butyl phthalate	5.50E-02	0.00E+00	4.09E-03	2.25E-04	3.85E-05	5.63E-06	0.00E+00	4.41E-05
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	4.81E-08	2.16E-10	3.15E-06	5.41E-12	0.00E+00	3.15E-06
Carbon disulfide	6.30E-03	1.00E-03	8.75E-06	5.51E-08	4.41E-06	1.38E-09	8.50E-05	8.94E-05
Cyclohexane	1.30E+01	0.00E+00	1.52E-04	1.98E-03	9.10E-03	4.94E-05	0.00E+00	9.15E-03
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	2.83E-04	4.81E-04	1.19E-03	1.20E-05	0.00E+00	1.20E-03
Toluene	6.40E-01	0.00E+00	3.48E-05	2.23E-05	4.48E-04	5.57E-07	0.00E+00	4.49E-04
Xylenes (m & p)	2.40E+00	0.00E+00	1.24E-04	2.97E-04	1.68E-03	7.42E-06	0.00E+00	1.69E-03
Xylenes (o)	5.40E-01	0.00E+00	1.24E-04	6.68E-05	3.78E-04	1.67E-06	0.00E+00	3.80E-04

Table A-8
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Mammals (Red Fox) from Media
for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	1.00E+00	4.60E-03	3.79E-04	1.15E-04	0.00E+00	4.94E-04
Arsenic	2.67E+00	3.40E-03	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	1.75E-02	1.87E-03	4.38E-04	2.89E-04	2.59E-03
Cadmium	7.20E-01	2.50E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	5.54E-01	5.04E-04	1.39E-02	2.13E-03	1.65E-02
Chromium	8.90E+00	1.80E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	1.16E+00	6.23E-03	2.89E-02	1.53E-03	3.66E-02
Chromium, hexavalent	1.10E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	2.49E-01	7.70E-04	6.23E-03	0.00E+00	7.00E-03
Cobalt	3.20E+00	0.00E+00	1.00E-01	3.20E-01	2.24E-03	8.00E-03	0.00E+00	1.02E-02
Copper	2.25E+02	2.69E-02	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.68E+01	1.58E-01	4.21E-01	2.29E-03	5.81E-01
Lead	3.46E+02	7.00E-02	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	1.43E+01	2.42E-01	3.58E-01	5.95E-03	6.06E-01
Manganese	2.63E+02	2.45E-01	5.87E-02	1.54E+01	1.84E-01	3.86E-01	2.08E-02	5.91E-01
Mercury	2.06E-01	0.00E+00	1.92E-01	3.96E-02	1.44E-04	9.89E-04	0.00E+00	1.13E-03
Nickel	7.17E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	1.96E+00	5.02E-03	4.89E-02	0.00E+00	5.40E-02
Selenium	3.89E-01	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	4.62E-01	2.72E-04	1.16E-02	0.00E+00	1.18E-02
Thallium	4.50E-02	0.00E+00	1.23E-01	5.54E-03	3.15E-05	1.38E-04	0.00E+00	1.70E-04
Vanadium	1.42E+01	2.91E-02	1.79E-01	2.54E+00	9.94E-03	6.35E-02	2.47E-03	7.60E-02
Zinc	4.70E+02	3.69E-02	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.38E+02	3.29E-01	3.44E+00	3.14E-03	3.78E+00
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	1.26E-01	7.00E-03	8.07E-03	1.75E-04	0.00E+00	8.25E-03
Total HMW PAHs	1.40E+01	3.70E-05	1.26E-01	8.49E-03	9.79E-03	2.12E-04	3.15E-06	1.00E-02

Table A-8
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	8.55E-04	3.74E-08	2.22E-05	9.34E-10	0.00E+00	2.22E-05
4,4'-DDT	1.63E-02	0.00E+00	1.15E-05	1.88E-07	1.14E-05	4.70E-09	0.00E+00	1.14E-05
gamma-Chlordane	1.33E-02	0.00E+00	4.70E-06	6.25E-08	9.31E-06	1.56E-09	0.00E+00	9.31E-06
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	5.78E-04	1.31E-04	1.59E-04	3.28E-06	0.00E+00	1.62E-04
4-methylphenol	1.50E-01	0.00E+00	1.15E-05	1.73E-06	1.05E-04	4.33E-08	0.00E+00	1.05E-04
Acetophenone	9.00E-02	0.00E+00	4.70E-06	4.23E-07	6.30E-05	1.06E-08	0.00E+00	6.30E-05
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	2.47E+01	1.23E+01	3.50E-04	3.08E-01	0.00E+00	3.09E-01
Carbazole	1.40E-01	0.00E+00	1.71E-04	2.39E-05	9.80E-05	5.97E-07	0.00E+00	9.86E-05
Dibenzofuran	1.33E-02	0.00E+00	5.15E-04	6.85E-06	9.31E-06	1.71E-07	0.00E+00	9.48E-06
Di-n-butyl phthalate	5.50E-02	0.00E+00	4.09E-03	2.25E-04	3.85E-05	5.63E-06	0.00E+00	4.41E-05
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	4.81E-08	2.16E-10	3.15E-06	5.41E-12	0.00E+00	3.15E-06
Carbon disulfide	6.30E-03	1.00E-03	8.75E-06	5.51E-08	4.41E-06	1.38E-09	8.50E-05	8.94E-05
Cyclohexane	2.44E-03	0.00E+00	1.52E-04	3.71E-07	1.71E-06	9.28E-09	0.00E+00	1.72E-06
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	2.83E-04	3.99E-05	9.87E-05	9.98E-07	0.00E+00	9.97E-05
Toluene	1.09E-02	0.00E+00	3.48E-05	3.80E-07	7.63E-06	9.49E-09	0.00E+00	7.64E-06
Xylenes (m & p)	3.16E-01	0.00E+00	1.24E-04	3.91E-05	2.21E-04	9.77E-07	0.00E+00	2.22E-04
Xylenes (o)	6.49E-02	0.00E+00	1.24E-04	8.02E-06	4.54E-05	2.01E-07	0.00E+00	4.56E-05

Table A-9
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	1.00E+00	1.80E+00	4.21E-02	4.01E-01	0.00E+00	4.43E-01
Arsenic	2.09E+01	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	2.06E+00	4.88E-01	4.59E-01	4.76E-04	9.48E-01
Cadmium	8.02E+01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	2.70E+02	1.87E+00	6.02E+01	3.50E-03	6.20E+01
Chromium	2.97E+01	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	9.52E+00	6.94E-01	2.12E+00	2.52E-03	2.82E+00
Chromium, hexavalent	1.50E+00	0.00E+00	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.16E+01	3.50E-02	2.59E+00	0.00E+00	2.62E+00
Cobalt	2.25E+01	0.00E+00	2.91E-01	6.55E+00	5.26E-01	1.46E+00	0.00E+00	1.98E+00
Copper	7.49E+03	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	5.63E+01	1.75E+02	1.25E+01	3.77E-03	1.88E+02
Lead	2.08E+04	1.81E-01	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	2.45E+03	4.86E+02	5.46E+02	2.53E-02	1.03E+03
Manganese	1.43E+03	4.13E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	6.32E+01	3.34E+01	1.41E+01	5.78E-02	4.75E+01
Mercury	2.00E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	5.48E-01	4.67E-02	1.22E-01	0.00E+00	1.69E-01
Nickel	4.07E+01	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	1.51E+01	9.51E-01	3.36E+00	0.00E+00	4.31E+00
Selenium	1.60E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	1.31E+00	3.74E-02	2.91E-01	0.00E+00	3.29E-01
Thallium	4.80E-01	0.00E+00	1.00E+00	4.80E-01	1.12E-02	1.07E-01	0.00E+00	1.18E-01
Vanadium	7.92E+01	2.91E-02	8.80E-01	6.97E+01	1.85E+00	1.55E+01	4.07E-03	1.74E+01
Zinc	1.38E+04	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	1.95E+03	3.22E+02	4.34E+02	5.17E-03	7.56E+02
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	3.00E-01	5.63E+01	4.39E+00	1.25E+01	0.00E+00	1.69E+01
Total HMW PAHs	2.63E+02	3.70E-05	3.00E-01	7.89E+01	6.14E+00	1.76E+01	5.18E-06	2.37E+01
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	1.00E+00	1.10E-01	2.57E-03	2.45E-02	0.00E+00	2.70E-02

Table A-9
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
4,4'-DDT	4.00E-02	0.00E+00	1.00E+00	4.00E-02	9.35E-04	8.90E-03	0.00E+00	9.83E-03
gamma-Chlordane	5.00E-02	0.00E+00	1.00E+00	5.00E-02	1.17E-03	1.11E-02	0.00E+00	1.23E-02
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	1.00E+00	9.70E-01	2.27E-02	2.16E-01	0.00E+00	2.38E-01
4-methylphenol	1.50E-01	0.00E+00	1.00E+00	1.50E-01	3.50E-03	3.34E-02	0.00E+00	3.69E-02
Acetophenone	9.00E-02	0.00E+00	1.00E+00	9.00E-02	2.10E-03	2.00E-02	0.00E+00	2.21E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	1.00E+00	5.00E-01	1.17E-02	1.11E-01	0.00E+00	1.23E-01
Carbazole	4.00E+01	0.00E+00	1.00E+00	4.00E+01	9.35E-01	8.90E+00	0.00E+00	9.83E+00
Dibenzofuran	1.10E+00	0.00E+00	1.00E+00	1.10E+00	2.57E-02	2.45E-01	0.00E+00	2.70E-01
Di-n-butyl phthalate	5.50E-02	0.00E+00	1.00E+00	5.50E-02	1.28E-03	1.22E-02	0.00E+00	1.35E-02
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	1.00E+00	4.50E-03	1.05E-04	1.00E-03	0.00E+00	1.11E-03
Carbon disulfide	6.30E-03	1.00E-03	1.00E+00	6.30E-03	1.47E-04	1.40E-03	1.40E-04	1.69E-03
Cyclohexane	1.30E+01	0.00E+00	1.00E+00	1.30E+01	3.04E-01	2.89E+00	0.00E+00	3.20E+00
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	1.00E+00	1.70E+00	3.97E-02	3.78E-01	0.00E+00	4.18E-01
Toluene	6.40E-01	0.00E+00	1.00E+00	6.40E-01	1.50E-02	1.42E-01	0.00E+00	1.57E-01
Xylenes (m & p)	2.40E+00	0.00E+00	1.00E+00	2.40E+00	5.61E-02	5.34E-01	0.00E+00	5.90E-01
Xylenes (o)	5.40E-01	0.00E+00	1.00E+00	5.40E-01	1.26E-02	1.20E-01	0.00E+00	1.33E-01

Table A-10
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	1.00E+00	5.41E-01	1.26E-02	1.20E-01	0.00E+00	1.33E-01
Arsenic	2.67E+00	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	4.83E-01	6.23E-02	1.07E-01	4.76E-04	1.70E-01
Cadmium	7.20E-01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	6.38E+00	1.68E-02	1.42E+00	3.50E-03	1.44E+00
Chromium	8.90E+00	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.03E+01	2.08E-01	2.30E+00	2.52E-03	2.51E+00
Chromium, hexavalent	1.10E+00	0.00E+00	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.19E+01	2.57E-02	2.64E+00	0.00E+00	2.67E+00
Cobalt	3.20E+00	0.00E+00	2.91E-01	9.31E-01	7.48E-02	2.07E-01	0.00E+00	2.82E-01
Copper	2.25E+02	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	2.23E+01	5.26E+00	4.96E+00	3.77E-03	1.02E+01
Lead	3.46E+02	7.00E-02	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	9.00E+01	8.08E+00	2.00E+01	9.80E-03	2.81E+01
Manganese	2.63E+02	2.45E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	1.99E+01	6.14E+00	4.43E+00	3.43E-02	1.06E+01
Mercury	2.06E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	4.19E-01	4.81E-03	9.32E-02	0.00E+00	9.80E-02
Nickel	7.17E+00	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	2.37E+01	1.68E-01	5.27E+00	0.00E+00	5.44E+00
Selenium	3.89E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	4.64E-01	9.09E-03	1.03E-01	0.00E+00	1.12E-01
Thallium	4.50E-02	0.00E+00	1.00E+00	4.50E-02	1.05E-03	1.00E-02	0.00E+00	1.11E-02
Vanadium	1.42E+01	2.91E-02	8.80E-01	1.25E+01	3.32E-01	2.78E+00	4.07E-03	3.12E+00
Zinc	4.70E+02	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	6.44E+02	1.10E+01	1.43E+02	5.17E-03	1.54E+02
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	3.00E-01	3.46E+00	2.69E-01	7.70E-01	0.00E+00	1.04E+00
Total HMW PAHs	1.40E+01	3.70E-05	3.00E-01	4.19E+00	3.27E-01	9.33E-01	5.18E-06	1.26E+00

Table A-10
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	1.00E+00	3.17E-02	7.41E-04	7.05E-03	0.00E+00	7.79E-03
4,4'-DDT	1.63E-02	0.00E+00	1.00E+00	1.63E-02	3.81E-04	3.63E-03	0.00E+00	4.01E-03
gamma-Chlordane	1.33E-02	0.00E+00	1.00E+00	1.33E-02	3.11E-04	2.96E-03	0.00E+00	3.27E-03
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	1.00E+00	2.27E-01	5.30E-03	5.05E-02	0.00E+00	5.58E-02
4-methylphenol	1.50E-01	0.00E+00	1.00E+00	1.50E-01	3.50E-03	3.34E-02	0.00E+00	3.69E-02
Acetophenone	9.00E-02	0.00E+00	1.00E+00	9.00E-02	2.10E-03	2.00E-02	0.00E+00	2.21E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	1.00E+00	5.00E-01	1.17E-02	1.11E-01	0.00E+00	1.23E-01
Carbazole	1.40E-01	0.00E+00	1.00E+00	1.40E-01	3.27E-03	3.12E-02	0.00E+00	3.44E-02
Dibenzofuran	1.33E-02	0.00E+00	1.00E+00	1.33E-02	3.11E-04	2.96E-03	0.00E+00	3.27E-03
Di-n-butyl phthalate	5.50E-02	0.00E+00	1.00E+00	5.50E-02	1.28E-03	1.22E-02	0.00E+00	1.35E-02
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	1.00E+00	4.50E-03	1.05E-04	1.00E-03	0.00E+00	1.11E-03
Carbon disulfide	6.30E-03	1.00E-03	1.00E+00	6.30E-03	1.47E-04	1.40E-03	1.40E-04	1.69E-03
Cyclohexane	2.44E-03	0.00E+00	1.00E+00	2.44E-03	5.70E-05	5.43E-04	0.00E+00	6.00E-04
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	1.00E+00	1.41E-01	3.29E-03	3.14E-02	0.00E+00	3.47E-02
Toluene	1.09E-02	0.00E+00	1.00E+00	1.09E-02	2.55E-04	2.43E-03	0.00E+00	2.68E-03
Xylenes (m & p)	3.16E-01	0.00E+00	1.00E+00	3.16E-01	7.38E-03	7.03E-02	0.00E+00	7.77E-02
Xylenes (o)	6.49E-02	0.00E+00	1.00E+00	6.49E-02	1.52E-03	1.44E-02	0.00E+00	1.60E-02

Table A-11
Wildlife Exposure Modeling of Maximum Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	1.00E+00	1.53E-02	0.00E+00	8.57E-04	0.00E+00	8.57E-04
Arsenic	2.09E+01	3.40E-03	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	9.46E-02	0.00E+00	5.30E-03	1.94E-04	5.49E-03
Barium	NO COPC	2.36E-01	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	NA	0.00E+00	NA	1.35E-02	1.35E-02
Beryllium	NO COPC	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	8.02E+01	2.50E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	5.49E+00	0.00E+00	3.07E-01	1.43E-03	3.09E-01
Calcium	7.21E+04	2.19E+01	1.48E-04	1.07E+01	0.00E+00	5.98E-01	1.25E+00	1.85E+00
Chromium	2.97E+01	1.80E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	2.80E+00	0.00E+00	1.57E-01	1.03E-03	1.58E-01
Chromium, hexavalent	1.50E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	3.13E-01	0.00E+00	1.75E-02	0.00E+00	1.75E-02
Cobalt	2.25E+01	0.00E+00	1.00E-01	2.25E+00	0.00E+00	1.26E-01	0.00E+00	1.26E-01
Copper	7.49E+03	2.69E-02	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	2.79E+01	0.00E+00	1.56E+00	1.53E-03	1.57E+00
Iron	4.75E+04	1.94E+01	4.24E-03	2.01E+02	0.00E+00	1.13E+01	1.11E+00	1.24E+01
Lead	2.08E+04	1.81E-01	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	8.76E+01	0.00E+00	4.91E+00	1.03E-02	4.92E+00
Magnesium	3.30E+04	7.73E+00	9.93E-01	3.28E+04	0.00E+00	1.83E+03	4.41E-01	1.83E+03
Manganese	1.43E+03	4.13E-01	5.87E-02	8.39E+01	0.00E+00	4.70E+00	2.35E-02	4.72E+00
Mercury	2.00E+00	0.00E+00	1.92E-01	3.84E-01	0.00E+00	2.15E-02	0.00E+00	2.15E-02
Nickel	4.07E+01	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	4.39E+00	0.00E+00	2.46E-01	0.00E+00	2.46E-01
Potassium	2.78E+03	7.47E+00	4.24E-03	1.18E+01	0.00E+00	6.60E-01	4.26E-01	1.09E+00
Selenium	1.60E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	7.88E-01	0.00E+00	4.41E-02	0.00E+00	4.41E-02
Silver	NO COPC	NO COPC	5.01E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.55E+03	2.57E+01	1.17E-02	1.81E+01	0.00E+00	1.02E+00	1.46E+00	2.48E+00
Thallium	4.80E-01	0.00E+00	1.23E-01	5.90E-02	0.00E+00	3.31E-03	0.00E+00	3.31E-03
Vanadium	7.92E+01	2.91E-02	1.79E-01	1.42E+01	0.00E+00	7.94E-01	1.66E-03	7.96E-01

Table A-11
Wildlife Exposure Modeling of Maximum Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Zinc	1.38E+04	3.69E-02	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.77E+02	0.00E+00	9.90E+00	2.10E-03	9.90E+00
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	1.26E-01	1.14E-01	0.00E+00	6.39E-03	0.00E+00	6.39E-03
Total HMW PAHs	2.63E+02	3.70E-05	1.26E-01	1.60E-01	0.00E+00	8.94E-03	2.11E-06	8.95E-03
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	8.55E-04	9.41E-05	0.00E+00	5.27E-06	0.00E+00	5.27E-06
4,4'-DDT	4.00E-02	0.00E+00	1.15E-05	4.61E-07	0.00E+00	2.58E-08	0.00E+00	2.58E-08
gamma-Chlordane	5.00E-02	0.00E+00	4.70E-06	2.35E-07	0.00E+00	1.32E-08	0.00E+00	1.32E-08
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	5.78E-04	5.61E-04	0.00E+00	3.14E-05	0.00E+00	3.14E-05
4-methylphenol	1.50E-01	0.00E+00	1.15E-05	1.73E-06	0.00E+00	9.69E-08	0.00E+00	9.69E-08
Acetophenone	9.00E-02	0.00E+00	4.70E-06	4.23E-07	0.00E+00	2.37E-08	0.00E+00	2.37E-08
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	2.47E+01	1.23E+01	0.00E+00	6.91E-01	0.00E+00	6.91E-01
Carbazole	4.00E+01	0.00E+00	1.71E-04	6.83E-03	0.00E+00	3.82E-04	0.00E+00	3.82E-04
Dibenzofuran	1.10E+00	0.00E+00	5.15E-04	5.67E-04	0.00E+00	3.17E-05	0.00E+00	3.17E-05
Di-n-butyl phthalate	5.50E-02	0.00E+00	4.09E-03	2.25E-04	0.00E+00	1.26E-05	0.00E+00	1.26E-05
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	4.81E-08	2.16E-10	0.00E+00	1.21E-11	0.00E+00	1.21E-11
Carbon disulfide	6.30E-03	1.00E-03	8.75E-06	5.51E-08	0.00E+00	3.09E-09	5.70E-05	5.70E-05
Cyclohexane	1.30E+01	0.00E+00	1.52E-04	1.98E-03	0.00E+00	1.11E-04	0.00E+00	1.11E-04
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	2.83E-04	4.81E-04	0.00E+00	2.70E-05	0.00E+00	2.70E-05
Toluene	6.40E-01	0.00E+00	3.48E-05	2.23E-05	0.00E+00	1.25E-06	0.00E+00	1.25E-06
Xylenes (m & p)	2.40E+00	0.00E+00	1.24E-04	2.97E-04	0.00E+00	1.66E-05	0.00E+00	1.66E-05
Xylenes (o)	5.40E-01	0.00E+00	1.24E-04	6.68E-05	0.00E+00	3.74E-06	0.00E+00	3.74E-06

Table A-12
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	1.00E+00	4.60E-03	0.00E+00	2.58E-04	0.00E+00	2.58E-04
Arsenic	2.67E+00	3.40E-03	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	1.75E-02	0.00E+00	9.82E-04	1.94E-04	1.18E-03
Barium	NO COPC	1.19E-01	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	NA	0.00E+00	NA	6.78E-03	6.78E-03
Beryllium	NO COPC	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	7.20E-01	2.50E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	5.54E-01	0.00E+00	3.10E-02	1.43E-03	3.25E-02
Calcium	7.29E+03	1.96E+01	1.48E-04	1.08E+00	0.00E+00	6.05E-02	1.11E+00	1.17E+00
Chromium	8.90E+00	1.80E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	1.16E+00	0.00E+00	6.47E-02	1.03E-03	6.57E-02
Chromium, hexavalent	1.10E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	2.49E-01	0.00E+00	1.39E-02	0.00E+00	1.39E-02
Cobalt	3.20E+00	0.00E+00	1.00E-01	3.20E-01	0.00E+00	1.79E-02	0.00E+00	1.79E-02
Copper	2.25E+02	2.69E-02	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.68E+01	0.00E+00	9.43E-01	1.53E-03	9.45E-01
Iron	1.11E+04	8.95E+00	4.24E-03	4.71E+01	0.00E+00	2.64E+00	5.10E-01	3.15E+00
Lead	3.46E+02	7.00E-02	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	1.43E+01	0.00E+00	8.02E-01	3.99E-03	8.06E-01
Magnesium	2.12E+03	5.41E+00	9.93E-01	2.10E+03	0.00E+00	1.18E+02	3.08E-01	1.18E+02
Manganese	2.63E+02	2.45E-01	5.87E-02	1.54E+01	0.00E+00	8.65E-01	1.40E-02	8.78E-01
Mercury	2.06E-01	0.00E+00	1.92E-01	3.96E-02	0.00E+00	2.21E-03	0.00E+00	2.21E-03
Nickel	7.17E+00	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	1.96E+00	0.00E+00	1.10E-01	0.00E+00	1.10E-01
Potassium	6.64E+02	5.76E+00	4.24E-03	2.81E+00	0.00E+00	1.58E-01	3.28E-01	4.86E-01
Selenium	3.89E-01	0.00E+00	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	4.62E-01	0.00E+00	2.59E-02	0.00E+00	2.59E-02
Silver	NO COPC	NO COPC	5.01E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.02E+02	1.52E+01	1.17E-02	1.20E+00	0.00E+00	6.71E-02	8.68E-01	9.35E-01
Thallium	4.50E-02	0.00E+00	1.23E-01	5.54E-03	0.00E+00	3.10E-04	0.00E+00	3.10E-04
Vanadium	1.42E+01	2.91E-02	1.79E-01	2.54E+00	0.00E+00	1.42E-01	1.66E-03	1.44E-01

Table A-12
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
			Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Zinc	4.70E+02	3.69E-02	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.38E+02	0.00E+00	7.71E+00	2.10E-03	7.72E+00
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	1.26E-01	7.00E-03	0.00E+00	3.92E-04	0.00E+00	3.92E-04
Total HMW PAHs	1.40E+01	3.70E-05	1.26E-01	8.49E-03	0.00E+00	4.75E-04	2.11E-06	4.78E-04
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	8.55E-04	2.71E-05	0.00E+00	1.52E-06	0.00E+00	1.52E-06
4,4'-DDT	1.63E-02	0.00E+00	1.15E-05	1.88E-07	0.00E+00	1.05E-08	0.00E+00	1.05E-08
gamma-Chlordane	1.33E-02	0.00E+00	4.70E-06	6.25E-08	0.00E+00	3.50E-09	0.00E+00	3.50E-09
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	5.78E-04	1.31E-04	0.00E+00	7.35E-06	0.00E+00	7.35E-06
4-methylphenol	1.50E-01	0.00E+00	1.15E-05	1.73E-06	0.00E+00	9.69E-08	0.00E+00	9.69E-08
Acetophenone	9.00E-02	0.00E+00	4.70E-06	4.23E-07	0.00E+00	2.37E-08	0.00E+00	2.37E-08
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	2.47E+01	1.23E+01	0.00E+00	6.91E-01	0.00E+00	6.91E-01
Carbazole	1.40E-01	0.00E+00	1.71E-04	2.39E-05	0.00E+00	1.34E-06	0.00E+00	1.34E-06
Dibenzofuran	1.33E-02	0.00E+00	5.15E-04	6.85E-06	0.00E+00	3.84E-07	0.00E+00	3.84E-07
Di-n-butyl phthalate	5.50E-02	0.00E+00	4.09E-03	2.25E-04	0.00E+00	1.26E-05	0.00E+00	1.26E-05
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	4.81E-08	2.16E-10	0.00E+00	1.21E-11	0.00E+00	1.21E-11
Carbon disulfide	6.30E-03	1.00E-03	8.75E-06	5.51E-08	0.00E+00	3.09E-09	5.70E-05	5.70E-05
Cyclohexane	2.44E-03	0.00E+00	1.52E-04	3.71E-07	0.00E+00	2.08E-08	0.00E+00	2.08E-08
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	2.83E-04	3.99E-05	0.00E+00	2.24E-06	0.00E+00	2.24E-06
Toluene	1.09E-02	0.00E+00	3.48E-05	3.80E-07	0.00E+00	2.13E-08	0.00E+00	2.13E-08
Xylenes (m & p)	3.16E-01	0.00E+00	1.24E-04	3.91E-05	0.00E+00	2.19E-06	0.00E+00	2.19E-06
Xylenes (o)	6.49E-02	0.00E+00	1.24E-04	8.02E-06	0.00E+00	4.49E-07	0.00E+00	4.49E-07

Table A-13
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	1.80E+00	0.00E+00	2.00E-01	3.60E-01	3.58E-02	7.71E-02	0.00E+00	1.13E-01
Arsenic	2.09E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.58E-01	4.16E-01	1.62E-01	2.00E-05	5.78E-01
Cadmium	8.02E+01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	6.81E+00	1.60E+00	1.46E+00	1.47E-04	3.05E+00
Chromium	2.97E+01	1.80E-02	7.50E-03	2.23E-01	5.91E-01	4.77E-02	1.06E-04	6.39E-01
Chromium, hexavalent	1.50E+00	0.00E+00	7.50E-03	1.13E-02	2.99E-02	2.41E-03	0.00E+00	3.23E-02
Cobalt	2.25E+01	0.00E+00	2.00E-02	4.50E-01	4.48E-01	9.64E-02	0.00E+00	5.44E-01
Copper	7.49E+03	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	6.56E+01	1.49E+02	1.41E+01	1.58E-04	1.63E+02
Lead	2.08E+04	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.01E+01	4.14E+02	1.50E+01	1.06E-03	4.29E+02
Manganese	1.43E+03	4.13E-01	2.50E-01	3.58E+02	2.85E+01	7.66E+01	2.43E-03	1.05E+02
Mercury	2.00E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.39E-01	3.98E-02	1.15E-01	0.00E+00	1.55E-01
Nickel	4.07E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	1.73E+00	8.11E-01	3.71E-01	0.00E+00	1.18E+00
Selenium	1.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	8.53E-01	3.19E-02	1.83E-01	0.00E+00	2.15E-01
Thallium	4.80E-01	0.00E+00	4.00E-03	1.92E-03	9.56E-03	4.11E-04	0.00E+00	9.97E-03
Vanadium	7.92E+01	2.91E-02	5.50E-03	4.36E-01	1.58E+00	9.33E-02	1.71E-04	1.67E+00
Zinc	1.38E+04	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	9.59E+02	2.75E+02	2.05E+02	2.17E-04	4.80E+02
PAHs								
Total LMW PAHs	1.88E+02	0.00E+00	1.04E-01	1.96E+01	3.74E+00	4.20E+00	0.00E+00	7.94E+00
Total HMW PAHs	2.63E+02	3.70E-05	1.04E-01	2.75E+01	5.24E+00	5.88E+00	2.18E-07	1.11E+01
Pesticides								
4,4'-DDD	1.10E-01	0.00E+00	1.57E-02	1.72E-03	2.19E-03	3.69E-04	0.00E+00	2.56E-03
4,4'-DDT	4.00E-02	0.00E+00	4.61E-03	1.84E-04	7.97E-04	3.95E-05	0.00E+00	8.36E-04
gamma-Chlordane	5.00E-02	0.00E+00	3.48E-03	1.74E-04	9.96E-04	3.73E-05	0.00E+00	1.03E-03

Table A-13
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
1,1-Biphenyl	9.70E-01	0.00E+00	2.60E-01	2.52E-01	1.93E-02	5.40E-02	0.00E+00	7.33E-02
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	3.74E-01	2.99E-03	8.02E-02	0.00E+00	8.32E-02
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	1.79E-03	8.09E-02	0.00E+00	8.26E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	9.96E-03	5.86E-05	0.00E+00	1.00E-02
Carbazole	4.00E+01	0.00E+00	5.26E-01	2.10E+01	7.97E-01	4.51E+00	0.00E+00	5.30E+00
Dibenzofuran	1.10E+00	0.00E+00	2.78E-01	3.06E-01	2.19E-02	6.54E-02	0.00E+00	8.73E-02
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	1.10E-03	9.87E-04	0.00E+00	2.08E-03
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	8.96E-05	5.71E-02	0.00E+00	5.72E-02
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	1.25E-04	3.95E-03	5.88E-06	4.08E-03
Cyclohexane	1.30E+01	0.00E+00	5.62E-01	7.31E+00	2.59E-01	1.57E+00	0.00E+00	1.82E+00
Isopropylbenzene (Cumene)	1.70E+00	0.00E+00	3.93E-01	6.67E-01	3.39E-02	1.43E-01	0.00E+00	1.77E-01
Toluene	6.40E-01	0.00E+00	1.32E+00	8.43E-01	1.27E-02	1.81E-01	0.00E+00	1.93E-01
Xylenes (m & p)	2.40E+00	0.00E+00	6.34E-01	1.52E+00	4.78E-02	3.26E-01	0.00E+00	3.74E-01
Xylenes (o)	5.40E-01	0.00E+00	6.34E-01	3.42E-01	1.08E-02	7.33E-02	0.00E+00	8.40E-02

Table A-14
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	5.41E-01	0.00E+00	2.00E-01	1.08E-01	1.08E-02	2.32E-02	0.00E+00	3.39E-02
Arsenic	2.67E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.37E-01	5.31E-02	5.08E-02	2.00E-05	1.04E-01
Cadmium	7.20E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	5.19E-01	1.43E-02	1.11E-01	1.47E-04	1.26E-01
Chromium	8.90E+00	1.80E-02	7.50E-03	6.68E-02	1.77E-01	1.43E-02	1.06E-04	1.92E-01
Chromium, hexavalent	1.10E+00	0.00E+00	7.50E-03	8.25E-03	2.19E-02	1.77E-03	0.00E+00	2.37E-02
Cobalt	3.20E+00	0.00E+00	2.00E-02	6.40E-02	6.37E-02	1.37E-02	0.00E+00	7.74E-02
Copper	2.25E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.65E+01	4.48E+00	3.53E+00	1.58E-04	8.01E+00
Lead	3.46E+02	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	7.04E+00	6.89E+00	1.51E+00	4.12E-04	8.40E+00
Manganese	2.63E+02	2.45E-01	2.50E-01	6.58E+01	5.24E+00	1.41E+01	1.44E-03	1.93E+01
Mercury	2.06E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.56E-01	4.10E-03	3.35E-02	0.00E+00	3.76E-02
Nickel	7.17E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.72E-01	1.43E-01	1.01E-01	0.00E+00	2.44E-01
Selenium	3.89E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	1.79E-01	7.75E-03	3.83E-02	0.00E+00	4.61E-02
Thallium	4.50E-02	0.00E+00	4.00E-03	1.80E-04	8.96E-04	3.85E-05	0.00E+00	9.35E-04
Vanadium	1.42E+01	2.91E-02	5.50E-03	7.81E-02	2.83E-01	1.67E-02	1.71E-04	3.00E-01
Zinc	4.70E+02	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	1.47E+02	9.36E+00	3.15E+01	2.17E-04	4.08E+01
PAHs								
Total LMW PAHs	1.15E+01	0.00E+00	1.04E-01	1.20E+00	2.30E-01	2.58E-01	0.00E+00	4.87E-01
Total HMW PAHs	1.40E+01	3.70E-05	1.04E-01	1.46E+00	2.78E-01	3.13E-01	2.18E-07	5.91E-01

Table A-14
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors in the Wilcox Process Area and Lorraine Process Area

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
4,4'-DDD	3.17E-02	0.00E+00	1.57E-02	4.97E-04	6.31E-04	1.06E-04	0.00E+00	7.38E-04
4,4'-DDT	1.63E-02	0.00E+00	4.61E-03	7.51E-05	3.25E-04	1.61E-05	0.00E+00	3.41E-04
gamma-Chlordane	1.33E-02	0.00E+00	3.48E-03	4.63E-05	2.65E-04	9.92E-06	0.00E+00	2.75E-04
SVOCs								
1,1-Biphenyl	2.27E-01	0.00E+00	2.60E-01	5.90E-02	4.52E-03	1.26E-02	0.00E+00	1.72E-02
4-methylphenol	1.50E-01	0.00E+00	2.50E+00	3.74E-01	2.99E-03	8.02E-02	0.00E+00	8.32E-02
Acetophenone	9.00E-02	0.00E+00	4.20E+00	3.78E-01	1.79E-03	8.09E-02	0.00E+00	8.26E-02
Bis(2-ethylhexyl)phthalate	5.00E-01	0.00E+00	5.48E-04	2.74E-04	9.96E-03	5.86E-05	0.00E+00	1.00E-02
Carbazole	1.40E-01	0.00E+00	5.26E-01	7.37E-02	2.79E-03	1.58E-02	0.00E+00	1.86E-02
Dibenzofuran	1.33E-02	0.00E+00	2.78E-01	3.69E-03	2.65E-04	7.91E-04	0.00E+00	1.06E-03
Di-n-butyl phthalate	5.50E-02	0.00E+00	8.38E-02	4.61E-03	1.10E-03	9.87E-04	0.00E+00	2.08E-03
VOCs								
1,4-dioxane	4.50E-03	0.00E+00	5.93E+01	2.67E-01	8.96E-05	5.71E-02	0.00E+00	5.72E-02
Carbon disulfide	6.30E-03	1.00E-03	2.93E+00	1.85E-02	1.25E-04	3.95E-03	5.88E-06	4.08E-03
Cyclohexane	2.44E-03	0.00E+00	5.62E-01	1.37E-03	4.86E-05	2.94E-04	0.00E+00	3.42E-04
Isopropylbenzene (Cumene)	1.41E-01	0.00E+00	3.93E-01	5.54E-02	2.81E-03	1.19E-02	0.00E+00	1.47E-02
Toluene	1.09E-02	0.00E+00	1.32E+00	1.44E-02	2.17E-04	3.08E-03	0.00E+00	3.29E-03
Xylenes (m & p)	3.16E-01	0.00E+00	6.34E-01	2.00E-01	6.29E-03	4.29E-02	0.00E+00	4.92E-02
Xylenes (o)	6.49E-02	0.00E+00	6.34E-01	4.11E-02	1.29E-03	8.81E-03	0.00E+00	1.01E-02

Table A-15
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	6.90E+00	0.00E+00	2.00E-01	1.38E+00	5.33E-03	5.33E-02	0.00E+00	5.87E-02
Arsenic	2.21E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.82E-01	1.71E-02	3.02E-02	1.02E-03	4.83E-02
Barium	6.07E+02	2.36E-01	1.50E-01	9.11E+01	4.69E-01	3.52E+00	7.08E-02	4.06E+00
Beryllium	4.30E+00	0.00E+00	1.00E-02	4.30E-02	3.32E-03	1.66E-03	0.00E+00	4.98E-03
Cadmium	6.20E+00	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	1.68E+00	4.79E-03	6.50E-02	7.50E-03	7.73E-02
Chromium	9.50E+01	1.80E-02	7.50E-03	7.13E-01	7.34E-02	2.75E-02	5.40E-03	1.06E-01
Cobalt	6.12E+01	0.00E+00	2.00E-02	1.22E+00	4.73E-02	4.73E-02	0.00E+00	9.46E-02
Copper	1.08E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.24E+01	8.35E-02	4.77E-01	8.07E-03	5.69E-01
Lead	2.73E+03	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.24E+01	2.11E+00	8.67E-01	5.43E-02	3.03E+00
Manganese	7.40E+03	4.13E-01	2.50E-01	1.85E+03	5.72E+00	7.15E+01	1.24E-01	7.73E+01
Mercury	2.70E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.81E-01	2.09E-04	7.00E-03	0.00E+00	7.21E-03
Nickel	6.15E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	2.36E+00	4.75E-02	9.10E-02	0.00E+00	1.39E-01
Selenium	8.90E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	5.67E+00	6.88E-03	2.19E-01	0.00E+00	2.26E-01
Silver	4.70E+00	0.00E+00	4.00E-01	1.88E+00	3.63E-03	7.26E-02	0.00E+00	7.63E-02
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	2.94E-03	5.87E-04	0.00E+00	3.52E-03
Vanadium	5.22E+01	2.91E-02	5.50E-03	2.87E-01	4.03E-02	1.11E-02	8.73E-03	6.02E-02
Zinc	1.11E+03	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	2.37E+02	8.58E-01	9.14E+00	1.11E-02	1.00E+01
PAHs								
Total HMW PAHs	4.50E+01	3.70E-05	1.04E-01	4.70E+00	3.48E-02	1.82E-01	1.11E-05	2.16E-01
Pesticides								
alpha-Chlordane	9.50E-03	0.00E+00	9.33E-03	8.86E-05	7.34E-06	3.42E-06	0.00E+00	1.08E-05
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	4.71E-05	9.89E-03	0.00E+00	9.93E-03

Table A-15
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	7.57E-04	2.07E-05	0.00E+00	7.78E-04
Carbazole	4.38E-01	0.00E+00	5.26E-01	2.30E-01	3.38E-04	8.90E-03	0.00E+00	9.24E-03
Dibenzofuran	1.80E-01	0.00E+00	2.78E-01	5.00E-02	1.39E-04	1.93E-03	0.00E+00	2.07E-03
Dimethyl phthalate	4.80E-01	0.00E+00	4.25E+00	2.04E+00	3.71E-04	7.88E-02	0.00E+00	7.92E-02
Di-n-butyl phthalate	1.40E+00	0.00E+00	8.38E-02	1.17E-01	1.08E-03	4.53E-03	0.00E+00	5.62E-03
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	2.16E-03	2.96E-01	0.00E+00	2.99E-01
Cyclohexane	4.10E+01	0.00E+00	5.62E-01	2.31E+01	3.17E-02	8.91E-01	0.00E+00	9.22E-01
Ethylbenzene	6.70E+00	0.00E+00	6.87E-01	4.60E+00	5.18E-03	1.78E-01	0.00E+00	1.83E-01
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	2.47E-03	4.85E-02	0.00E+00	5.10E-02
Toluene	3.20E-01	0.00E+00	1.32E+00	4.22E-01	2.47E-04	1.63E-02	0.00E+00	1.65E-02
Xylenes (m & p)	5.90E-01	0.00E+00	6.34E-01	3.74E-01	4.56E-04	1.44E-02	0.00E+00	1.49E-02
Xylenes (o)	2.80E-01	0.00E+00	6.34E-01	1.77E-01	2.16E-04	6.86E-03	0.00E+00	7.07E-03
Xylenes (Total)	5.90E-01	0.00E+00	5.85E-01	3.45E-01	4.56E-04	1.33E-02	0.00E+00	1.38E-02

Table A-16
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	3.58E-01	0.00E+00	2.00E-01	7.16E-02	2.77E-04	2.77E-03	0.00E+00	3.04E-03
Arsenic	3.08E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.57E-01	2.38E-03	9.94E-03	1.02E-03	1.33E-02
Barium	5.21E+01	1.19E-01	1.50E-01	7.82E+00	4.03E-02	3.02E-01	3.57E-02	3.78E-01
Beryllium	3.51E-01	0.00E+00	1.00E-02	3.51E-03	2.71E-04	1.36E-04	0.00E+00	4.07E-04
Cadmium	3.63E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	3.57E-01	2.81E-04	1.38E-02	7.50E-03	2.16E-02
Chromium	7.63E+00	1.80E-02	7.50E-03	5.72E-02	5.90E-03	2.21E-03	5.40E-03	1.35E-02
Cobalt	4.93E+00	0.00E+00	2.00E-02	9.86E-02	3.81E-03	3.81E-03	0.00E+00	7.62E-03
Copper	1.23E+01	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	5.24E+00	9.47E-03	2.02E-01	8.07E-03	2.20E-01
Lead	7.89E+01	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.07E+00	6.09E-02	1.19E-01	2.10E-02	2.01E-01
Manganese	4.03E+02	2.45E-01	2.50E-01	1.01E+02	3.11E-01	3.89E+00	7.35E-02	4.27E+00
Mercury	2.96E-02	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.44E-02	2.29E-05	2.10E-03	0.00E+00	2.13E-03
Nickel	6.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.44E-01	5.10E-03	1.72E-02	0.00E+00	2.23E-02
Selenium	4.71E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	2.21E-01	3.64E-04	8.54E-03	0.00E+00	8.91E-03
Silver	1.09E-01	0.00E+00	4.00E-01	4.36E-02	8.42E-05	1.68E-03	0.00E+00	1.77E-03
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	2.94E-03	5.87E-04	0.00E+00	3.52E-03
Vanadium	1.17E+01	2.91E-02	5.50E-03	6.44E-02	9.05E-03	2.49E-03	8.73E-03	2.03E-02
Zinc	5.40E+01	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	4.42E+01	4.18E-02	1.71E+00	1.11E-02	1.76E+00
PAHs								
Total HMW PAHs	1.16E+00	3.70E-05	1.04E-01	1.21E-01	8.96E-04	4.68E-03	1.11E-05	5.59E-03
Pesticides								
alpha-Chlordane	6.36E-05	0.00E+00	9.33E-03	5.93E-07	4.91E-08	2.29E-08	0.00E+00	7.21E-08
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	4.71E-05	9.89E-03	0.00E+00	9.93E-03

Table A-16
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (White-Footed Mouse) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.73E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	3.86E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	7.57E-04	2.07E-05	0.00E+00	7.78E-04
Carbazole	6.37E-02	0.00E+00	5.26E-01	3.35E-02	4.92E-05	1.29E-03	0.00E+00	1.34E-03
Dibenzofuran	3.99E-02	0.00E+00	2.78E-01	1.11E-02	3.08E-05	4.28E-04	0.00E+00	4.59E-04
Dimethyl phthalate	1.44E-01	0.00E+00	4.25E+00	6.12E-01	1.11E-04	2.37E-02	0.00E+00	2.38E-02
Di-n-butyl phthalate	6.42E-02	0.00E+00	8.38E-02	5.38E-03	4.96E-05	2.08E-04	0.00E+00	2.58E-04
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	2.16E-03	2.96E-01	0.00E+00	2.99E-01
Cyclohexane	7.00E-01	0.00E+00	5.62E-01	3.94E-01	5.41E-04	1.52E-02	0.00E+00	1.57E-02
Ethylbenzene	4.15E-01	0.00E+00	6.87E-01	2.85E-01	3.21E-04	1.10E-02	0.00E+00	1.13E-02
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	2.47E-03	4.85E-02	0.00E+00	5.10E-02
Toluene	3.79E-03	0.00E+00	1.32E+00	4.99E-03	2.93E-06	1.93E-04	0.00E+00	1.96E-04
Xylenes (m & p)	1.74E-02	0.00E+00	6.34E-01	1.10E-02	1.34E-05	4.26E-04	0.00E+00	4.40E-04
Xylenes (o)	8.77E-03	0.00E+00	6.34E-01	5.56E-03	6.78E-06	2.15E-04	0.00E+00	2.22E-04
Xylenes (Total)	1.74E-02	0.00E+00	5.85E-01	1.02E-02	1.34E-05	3.93E-04	0.00E+00	4.07E-04

Table A-17
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	6.90E+00	0.00E+00	2.00E-01	1.38E+00	3.67E-03	3.45E-02	0.00E+00	3.82E-02
Arsenic	2.21E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.82E-01	1.18E-02	1.95E-02	6.44E-04	3.20E-02
Barium	6.07E+02	2.36E-01	1.50E-01	9.11E+01	3.23E-01	2.28E+00	4.47E-02	2.64E+00
Beryllium	4.30E+00	0.00E+00	1.00E-02	4.30E-02	2.29E-03	1.08E-03	0.00E+00	3.36E-03
Cadmium	6.20E+00	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	1.68E+00	3.30E-03	4.21E-02	4.74E-03	5.01E-02
Chromium	9.50E+01	1.80E-02	7.50E-03	7.13E-01	5.06E-02	1.78E-02	3.41E-03	7.18E-02
Cobalt	6.12E+01	0.00E+00	2.00E-02	1.22E+00	3.26E-02	3.06E-02	0.00E+00	6.32E-02
Copper	1.08E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.24E+01	5.75E-02	3.09E-01	5.10E-03	3.71E-01
Lead	2.73E+03	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.24E+01	1.45E+00	5.61E-01	3.43E-02	2.05E+00
Manganese	7.40E+03	4.13E-01	2.50E-01	1.85E+03	3.94E+00	4.63E+01	7.82E-02	5.03E+01
Mercury	2.70E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.81E-01	1.44E-04	4.53E-03	0.00E+00	4.67E-03
Nickel	6.15E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	2.36E+00	3.27E-02	5.89E-02	0.00E+00	9.17E-02
Selenium	8.90E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	5.67E+00	4.74E-03	1.42E-01	0.00E+00	1.47E-01
Silver	4.70E+00	0.00E+00	4.00E-01	1.88E+00	2.50E-03	4.70E-02	0.00E+00	4.95E-02
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	2.02E-03	3.80E-04	0.00E+00	2.40E-03
Vanadium	5.22E+01	2.91E-02	5.50E-03	2.87E-01	2.78E-02	7.18E-03	5.51E-03	4.05E-02
Zinc	1.11E+03	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	2.37E+02	5.91E-01	5.92E+00	6.99E-03	6.52E+00
PAHs								
Total HMW PAHs	4.50E+01	3.70E-05	1.04E-01	4.70E+00	2.40E-02	1.17E-01	7.01E-06	1.41E-01
Pesticides								
alpha-Chlordane	9.50E-03	0.00E+00	9.33E-03	8.86E-05	5.06E-06	2.22E-06	0.00E+00	7.27E-06
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	3.25E-05	6.40E-03	0.00E+00	6.43E-03

Table A-17
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	5.22E-04	1.34E-05	0.00E+00	5.35E-04
Carbazole	4.38E-01	0.00E+00	5.26E-01	2.30E-01	2.33E-04	5.76E-03	0.00E+00	5.99E-03
Dibenzofuran	1.80E-01	0.00E+00	2.78E-01	5.00E-02	9.59E-05	1.25E-03	0.00E+00	1.35E-03
Dimethyl phthalate	4.80E-01	0.00E+00	4.25E+00	2.04E+00	2.56E-04	5.10E-02	0.00E+00	5.13E-02
Di-n-butyl phthalate	1.40E+00	0.00E+00	8.38E-02	1.17E-01	7.46E-04	2.93E-03	0.00E+00	3.68E-03
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	1.49E-03	1.92E-01	0.00E+00	1.93E-01
Cyclohexane	4.10E+01	0.00E+00	5.62E-01	2.31E+01	2.18E-02	5.76E-01	0.00E+00	5.98E-01
Ethylbenzene	6.70E+00	0.00E+00	6.87E-01	4.60E+00	3.57E-03	1.15E-01	0.00E+00	1.19E-01
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	1.70E-03	3.14E-02	0.00E+00	3.31E-02
Toluene	3.20E-01	0.00E+00	1.32E+00	4.22E-01	1.70E-04	1.05E-02	0.00E+00	1.07E-02
Xylenes (m & p)	5.90E-01	0.00E+00	6.34E-01	3.74E-01	3.14E-04	9.35E-03	0.00E+00	9.66E-03
Xylenes (o)	2.80E-01	0.00E+00	6.34E-01	1.77E-01	1.49E-04	4.44E-03	0.00E+00	4.59E-03
Xylenes (Total)	5.90E-01	0.00E+00	5.85E-01	3.45E-01	3.14E-04	8.63E-03	0.00E+00	8.95E-03

Table A-18
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (Cattle) from Media
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	3.58E-01	0.00E+00	2.00E-01	7.16E-02	1.91E-04	1.79E-03	0.00E+00	1.98E-03
Arsenic	3.08E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.57E-01	1.64E-03	6.43E-03	6.44E-04	8.71E-03
Barium	5.21E+01	1.19E-01	1.50E-01	7.82E+00	2.77E-02	1.95E-01	2.25E-02	2.46E-01
Beryllium	3.51E-01	0.00E+00	1.00E-02	3.51E-03	1.87E-04	8.78E-05	0.00E+00	2.75E-04
Cadmium	3.63E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	3.57E-01	1.93E-04	8.93E-03	4.74E-03	1.39E-02
Chromium	7.63E+00	1.80E-02	7.50E-03	5.72E-02	4.06E-03	1.43E-03	3.41E-03	8.90E-03
Cobalt	4.93E+00	0.00E+00	2.00E-02	9.86E-02	2.63E-03	2.47E-03	0.00E+00	5.09E-03
Copper	1.23E+01	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	5.24E+00	6.53E-03	1.31E-01	5.10E-03	1.43E-01
Lead	7.89E+01	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.07E+00	4.20E-02	7.68E-02	1.33E-02	1.32E-01
Manganese	4.03E+02	2.45E-01	2.50E-01	1.01E+02	2.14E-01	2.52E+00	4.64E-02	2.78E+00
Mercury	2.96E-02	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.44E-02	1.58E-05	1.36E-03	0.00E+00	1.38E-03
Nickel	6.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.44E-01	3.52E-03	1.11E-02	0.00E+00	1.46E-02
Selenium	4.71E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	2.21E-01	2.51E-04	5.53E-03	0.00E+00	5.78E-03
Silver	1.09E-01	0.00E+00	4.00E-01	4.36E-02	5.80E-05	1.09E-03	0.00E+00	1.15E-03
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	2.02E-03	3.80E-04	0.00E+00	2.40E-03
Vanadium	1.17E+01	2.91E-02	5.50E-03	6.44E-02	6.24E-03	1.61E-03	5.51E-03	1.34E-02
Zinc	5.40E+01	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	4.42E+01	2.88E-02	1.11E+00	6.99E-03	1.14E+00
PAHs								
Total HMW PAHs	1.16E+00	3.70E-05	1.04E-01	1.21E-01	6.18E-04	3.03E-03	7.01E-06	3.65E-03
Pesticides								
alpha-Chlordane	6.36E-05	0.00E+00	9.33E-03	5.93E-07	3.39E-08	1.48E-08	0.00E+00	4.87E-08

Table A-18
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Mammals (Cattle) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	5.33E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.89E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	3.25E-05	6.40E-03	0.00E+00	6.43E-03
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	5.22E-04	1.34E-05	0.00E+00	5.35E-04
Carbazole	6.37E-02	0.00E+00	5.26E-01	3.35E-02	3.39E-05	8.38E-04	0.00E+00	8.72E-04
Dibenzofuran	3.99E-02	0.00E+00	2.78E-01	8.08E-01	2.12E-05	2.02E-02	0.00E+00	2.02E-02
Dimethyl phthalate	1.44E-01	0.00E+00	4.25E+00	1.65E+00	7.67E-05	4.12E-02	0.00E+00	4.13E-02
Di-n-butyl phthalate	6.42E-02	0.00E+00	8.38E-02	5.38E-03	3.42E-05	1.35E-04	0.00E+00	1.69E-04
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	1.49E-03	1.92E-01	0.00E+00	1.93E-01
Cyclohexane	7.00E-01	0.00E+00	5.62E-01	3.94E-01	3.73E-04	9.84E-03	0.00E+00	1.02E-02
Ethylbenzene	4.15E-01	0.00E+00	6.87E-01	2.85E-01	2.21E-04	7.12E-03	0.00E+00	7.34E-03
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	1.70E-03	3.14E-02	0.00E+00	3.31E-02
Toluene	3.79E-03	0.00E+00	1.32E+00	4.99E-03	2.02E-06	1.25E-04	0.00E+00	1.27E-04
Xylenes (m & p)	1.74E-02	0.00E+00	6.34E-01	1.10E-02	9.27E-06	2.76E-04	0.00E+00	2.85E-04
Xylenes (o)	8.77E-03	0.00E+00	6.34E-01	5.56E-03	4.67E-06	1.39E-04	0.00E+00	1.44E-04
Xylenes (Total)	1.74E-02	0.00E+00	5.85E-01	1.02E-02	9.27E-06	2.55E-04	0.00E+00	2.64E-04

Table A-19
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	6.90E+00	0.00E+00	1.00E+00	6.90E+00	1.39E-01	1.07E+00	0.00E+00	1.21E+00
Arsenic	2.21E+01	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	2.15E+00	4.45E-01	3.33E-01	7.58E-04	7.79E-01
Barium	6.07E+02	2.36E-01	1.60E-01	9.71E+01	1.22E+01	1.51E+01	5.26E-02	2.73E+01
Beryllium	4.30E+00	0.00E+00	1.18E+00	5.07E+00	8.66E-02	7.86E-01	0.00E+00	8.73E-01
Cadmium	6.20E+00	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	3.53E+01	1.25E-01	5.47E+00	5.58E-03	5.61E+00
Chromium	9.50E+01	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	8.81E+00	1.91E+00	1.37E+00	4.01E-03	3.28E+00
Cobalt	6.12E+01	0.00E+00	2.91E-01	1.78E+01	1.23E+00	2.76E+00	0.00E+00	3.99E+00
Copper	1.08E+02	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	1.84E+01	2.18E+00	2.85E+00	6.00E-03	5.03E+00
Lead	2.73E+03	1.81E-01	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	4.77E+02	5.50E+01	7.39E+01	4.04E-02	1.29E+02
Manganese	7.40E+03	4.13E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	1.94E+02	1.49E+02	3.00E+01	9.21E-02	1.79E+02
Mercury	2.70E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	4.32E-01	5.44E-03	6.70E-02	0.00E+00	7.25E-02
Nickel	6.15E+01	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	1.35E+01	1.24E+00	2.10E+00	0.00E+00	3.34E+00
Selenium	8.90E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	4.61E+00	1.79E-01	7.14E-01	0.00E+00	8.93E-01
Silver	4.70E+00	0.00E+00	1.53E+01	7.19E+01	9.47E-02	1.11E+01	0.00E+00	1.12E+01
Thallium	3.80E+00	0.00E+00	1.00E+00	3.80E+00	7.66E-02	5.89E-01	0.00E+00	6.66E-01
Vanadium	5.22E+01	2.91E-02	8.80E-01	4.59E+01	1.05E+00	7.12E+00	6.49E-03	8.18E+00
Zinc	1.11E+03	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	8.53E+02	2.24E+01	1.32E+02	8.23E-03	1.55E+02
PAHs								
Total HMW PAHs	4.50E+01	3.70E-05	3.00E-01	1.35E+01	9.07E-01	2.09E+00	8.25E-06	3.00E+00
Pesticides								
alpha-Chlordane	9.50E-03	0.00E+00	1.00E+00	9.50E-03	1.91E-04	1.47E-03	0.00E+00	1.66E-03

Table A-19
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
Acetophenone	6.10E-02	0.00E+00	1.00E+00	6.10E-02	1.23E-03	9.46E-03	0.00E+00	1.07E-02
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	1.00E+00	9.80E-01	1.97E-02	1.52E-01	0.00E+00	1.72E-01
Carbazole	4.38E-01	0.00E+00	1.00E+00	4.38E-01	8.83E-03	6.79E-02	0.00E+00	7.67E-02
Dibenzofuran	1.80E-01	0.00E+00	1.00E+00	1.80E-01	3.63E-03	2.79E-02	0.00E+00	3.15E-02
Dimethyl phthalate	4.80E-01	0.00E+00	1.00E+00	4.80E-01	9.67E-03	7.44E-02	0.00E+00	8.41E-02
Di-n-butyl phthalate	1.40E+00	0.00E+00	1.00E+00	1.40E+00	2.82E-02	2.17E-01	0.00E+00	2.45E-01
VOCs								
Benzene	2.80E+00	0.00E+00	1.00E+00	2.80E+00	5.64E-02	4.34E-01	0.00E+00	4.90E-01
Cyclohexane	4.10E+01	0.00E+00	1.00E+00	4.10E+01	8.26E-01	6.36E+00	0.00E+00	7.18E+00
Ethylbenzene	6.70E+00	0.00E+00	1.00E+00	6.70E+00	1.35E-01	1.04E+00	0.00E+00	1.17E+00
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	1.00E+00	3.20E+00	6.45E-02	4.96E-01	0.00E+00	5.60E-01
Toluene	3.20E-01	0.00E+00	1.00E+00	3.20E-01	6.45E-03	4.96E-02	0.00E+00	5.60E-02
Xylenes (m & p)	5.90E-01	0.00E+00	1.00E+00	5.90E-01	1.19E-02	9.15E-02	0.00E+00	1.03E-01
Xylenes (o)	2.80E-01	0.00E+00	1.00E+00	2.80E-01	5.64E-03	4.34E-02	0.00E+00	4.90E-02
Xylenes (Total)	5.90E-01	0.00E+00	1.00E+00	5.90E-01	1.19E-02	9.15E-02	0.00E+00	1.03E-01

Table A-20
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	3.58E-01	0.00E+00	1.00E+00	3.58E-01	7.21E-03	5.55E-02	0.00E+00	6.27E-02
Arsenic	3.08E+00	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	5.34E-01	6.20E-02	8.28E-02	7.58E-04	1.46E-01
Barium	5.21E+01	1.19E-01	1.60E-01	8.34E+00	1.05E+00	1.29E+00	2.65E-02	2.37E+00
Beryllium	3.51E-01	0.00E+00	1.18E+00	4.14E-01	7.07E-03	6.42E-02	0.00E+00	7.13E-02
Cadmium	3.63E-01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	3.70E+00	7.31E-03	5.74E-01	5.58E-03	5.86E-01
Chromium	7.63E+00	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.04E+01	1.54E-01	1.62E+00	4.01E-03	1.77E+00
Cobalt	4.93E+00	0.00E+00	2.91E-01	1.43E+00	9.93E-02	2.22E-01	0.00E+00	3.22E-01
Copper	1.23E+01	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	1.03E+01	2.47E-01	1.60E+00	6.00E-03	1.86E+00
Lead	7.89E+01	7.00E-02	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	2.73E+01	1.59E+00	4.23E+00	1.56E-02	5.83E+00
Manganese	4.03E+02	2.45E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	2.66E+01	8.11E+00	4.13E+00	5.46E-02	1.23E+01
Mercury	2.96E-02	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	3.33E-01	5.96E-04	5.16E-02	0.00E+00	5.22E-02
Nickel	6.60E+00	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	2.42E+01	1.33E-01	3.75E+00	0.00E+00	3.88E+00
Selenium	4.71E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	5.34E-01	9.49E-03	8.28E-02	0.00E+00	9.23E-02
Silver	1.09E-01	0.00E+00	1.53E+01	1.67E+00	2.20E-03	2.58E-01	0.00E+00	2.61E-01
Thallium	3.80E+00	0.00E+00	1.00E+00	3.80E+00	7.66E-02	5.89E-01	0.00E+00	6.66E-01
Vanadium	1.17E+01	2.91E-02	8.80E-01	1.03E+01	2.36E-01	1.60E+00	6.49E-03	1.84E+00
Zinc	5.40E+01	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	3.17E+02	1.09E+00	4.91E+01	8.23E-03	5.02E+01
PAHs								
Total HMW PAHs	1.16E+00	3.70E-05	3.00E-01	3.48E-01	2.34E-02	5.39E-02	8.25E-06	7.73E-02

Table A-20
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Mammals (Southern Short-Tailed Shrew) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.02E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	1.55E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	2.23E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
alpha-Chlordane	6.36E-05	0.00E+00	1.00E+00	6.36E-05	1.28E-06	9.86E-06	0.00E+00	1.11E-05
SVOCs								
Acetophenone	6.10E-02	0.00E+00	1.00E+00	6.10E-02	1.23E-03	9.46E-03	0.00E+00	1.07E-02
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	1.00E+00	9.80E-01	1.97E-02	1.52E-01	0.00E+00	1.72E-01
Carbazole	6.37E-02	0.00E+00	1.00E+00	6.37E-02	1.28E-03	9.87E-03	0.00E+00	1.12E-02
Dibenzofuran	3.99E-02	0.00E+00	1.00E+00	3.99E-02	8.04E-04	6.18E-03	0.00E+00	6.99E-03
Dimethyl phthalate	1.44E-01	0.00E+00	1.00E+00	1.44E-01	2.90E-03	2.23E-02	0.00E+00	2.52E-02
Di-n-butyl phthalate	6.42E-02	0.00E+00	1.00E+00	6.42E-02	1.29E-03	9.95E-03	0.00E+00	1.12E-02
VOCs								
Benzene	2.80E+00	0.00E+00	1.00E+00	2.80E+00	5.64E-02	4.34E-01	0.00E+00	4.90E-01
Cyclohexane	7.00E-01	0.00E+00	1.00E+00	7.00E-01	1.41E-02	1.09E-01	0.00E+00	1.23E-01
Ethylbenzene	4.15E-01	0.00E+00	1.00E+00	4.15E-01	8.36E-03	6.43E-02	0.00E+00	7.27E-02
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	1.00E+00	3.20E+00	6.45E-02	4.96E-01	0.00E+00	5.60E-01
Toluene	3.79E-03	0.00E+00	1.00E+00	3.79E-03	7.64E-05	5.87E-04	0.00E+00	6.64E-04
Xylenes (m & p)	1.74E-02	0.00E+00	1.00E+00	1.74E-02	3.51E-04	2.70E-03	0.00E+00	3.05E-03
Xylenes (o)	8.77E-03	0.00E+00	1.00E+00	8.77E-03	1.77E-04	1.36E-03	0.00E+00	1.54E-03
Xylenes (Total)	1.74E-02	0.00E+00	1.00E+00	1.74E-02	3.51E-04	2.70E-03	0.00E+00	3.05E-03

Table A-21
Wildlife Exposure Modeling of Maximum Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Antimony	6.90E+00	0.00E+00	5.87E-02	1.00E+00	5.87E-02	4.83E-03	1.47E-03	0.00E+00	6.30E-03
Arsenic	2.21E+01	3.40E-03	4.83E-02	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	9.90E-02	1.55E-02	2.48E-03	2.89E-04	1.82E-02
Barium	6.07E+02	2.36E-01	4.06E+00	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	2.16E+01	4.25E-01	5.41E-01	2.01E-02	9.86E-01
Beryllium	4.30E+00	0.00E+00	4.98E-03	1.00E+00	4.30E+00	3.01E-03	1.08E-01	0.00E+00	1.11E-01
Cadmium	6.20E+00	2.50E-02	7.73E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	1.58E+00	4.34E-03	3.95E-02	2.13E-03	4.59E-02
Chromium	9.50E+01	1.80E-02	1.06E-01	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	0.00E+00	6.65E-02	0.00E+00	1.53E-03	6.80E-02
Cobalt	6.12E+01	0.00E+00	9.46E-02	1.00E-01	6.12E+00	4.28E-02	1.53E-01	0.00E+00	1.96E-01
Copper	1.08E+02	2.69E-02	5.69E-01	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.52E+01	7.56E-02	3.79E-01	2.29E-03	4.57E-01
Lead	2.73E+03	1.81E-01	3.03E+00	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	3.57E+01	1.91E+00	8.92E-01	1.54E-02	2.82E+00
Manganese	7.40E+03	4.13E-01	7.73E+01	5.87E-02	4.34E+02	5.18E+00	1.09E+01	3.51E-02	1.61E+01
Mercury	2.70E-01	0.00E+00	7.21E-03	1.92E-01	5.18E-02	1.89E-04	1.30E-03	0.00E+00	1.49E-03
Nickel	6.15E+01	0.00E+00	1.39E-01	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	5.33E+00	4.31E-02	1.33E-01	0.00E+00	1.76E-01
Selenium	8.90E+00	0.00E+00	2.26E-01	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	1.50E+00	6.23E-03	3.76E-02	0.00E+00	4.38E-02
Silver	4.70E+00	0.00E+00	7.63E-02	5.01E-01	2.35E+00	3.29E-03	5.89E-02	0.00E+00	6.22E-02
Thallium	3.80E+00	0.00E+00	3.52E-03	1.23E-01	4.67E-01	2.66E-03	1.17E-02	0.00E+00	1.43E-02

Table A-21
Wildlife Exposure Modeling of Maximum Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Vanadium	5.22E+01	2.91E-02	6.02E-02	1.79E-01	9.34E+00	3.65E-02	2.34E-01	2.47E-03	2.73E-01
Zinc	1.11E+03	3.69E-02	1.00E+01	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.47E+02	7.77E-01	3.67E+00	3.14E-03	4.45E+00
PAHs									
Total HMW PAHs	4.50E+01	3.70E-05	2.16E-01	1.26E-01	2.73E-02	3.15E-02	6.83E-04	3.15E-06	3.22E-02
Pesticides									
alpha-Chlordane	9.50E-03	0.00E+00	1.08E-05	1.83E-01	1.74E-03	6.65E-06	4.34E-05	0.00E+00	5.01E-05
SVOCs									
Acetophenone	6.10E-02	0.00E+00	9.93E-03	4.70E-06	2.87E-07	4.27E-05	7.17E-09	0.00E+00	4.27E-05
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	7.78E-04	2.47E+01	2.42E+01	6.86E-04	6.04E-01	0.00E+00	6.05E-01
Carbazole	4.38E-01	0.00E+00	9.24E-03	1.71E-04	7.47E-05	3.07E-04	1.87E-06	0.00E+00	3.08E-04
Dibenzofuran	1.80E-01	0.00E+00	2.07E-03	5.15E-04	9.28E-05	1.26E-04	2.32E-06	0.00E+00	1.28E-04
Dimethyl phthalate	4.80E-01	0.00E+00	7.92E-02	4.59E-06	2.20E-06	3.36E-04	5.51E-08	0.00E+00	3.36E-04
Di-n-butyl phthalate	1.40E+00	0.00E+00	5.62E-03	4.09E-03	5.73E-03	9.80E-04	1.43E-04	0.00E+00	1.12E-03
VOCs									
Benzene	2.80E+00	0.00E+00	2.99E-01	9.89E-06	2.77E-05	1.96E-03	6.92E-07	0.00E+00	1.96E-03
Cyclohexane	4.10E+01	0.00E+00	9.22E-01	1.52E-04	6.24E-03	2.87E-02	1.56E-04	0.00E+00	2.89E-02
Ethylbenzene	6.70E+00	0.00E+00	1.83E-01	1.08E-04	7.21E-04	4.69E-03	1.80E-05	0.00E+00	4.71E-03
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	5.10E-02	2.83E-04	9.06E-04	2.24E-03	2.27E-05	0.00E+00	2.26E-03
Toluene	3.20E-01	0.00E+00	1.65E-02	3.48E-05	1.11E-05	2.24E-04	2.79E-07	0.00E+00	2.24E-04
Xylenes (m & p)	5.90E-01	0.00E+00	1.49E-02	1.24E-04	7.29E-05	4.13E-04	1.82E-06	0.00E+00	4.15E-04
Xylenes (o)	2.80E-01	0.00E+00	7.07E-03	1.24E-04	3.46E-05	1.96E-04	8.65E-07	0.00E+00	1.97E-04
Xylenes (Total)	5.90E-01	0.00E+00	1.38E-02	1.42E-04	8.37E-05	4.13E-04	2.09E-06	0.00E+00	4.15E-04

Table A-22
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Mammals (Red Fox) from Media
for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Antimony	3.58E-01	0.00E+00	3.04E-03	1.00E+00	3.04E-03	2.51E-04	7.61E-05	0.00E+00	3.27E-04
Arsenic	3.08E+00	3.40E-03	1.33E-02	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	1.97E-02	2.15E-03	4.93E-04	2.89E-04	2.94E-03
Barium	5.21E+01	1.19E-01	3.78E-01	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	3.88E+00	3.65E-02	9.69E-02	1.01E-02	1.44E-01
Beryllium	3.51E-01	0.00E+00	4.07E-04	1.00E+00	3.51E-01	2.46E-04	8.78E-03	0.00E+00	9.02E-03
Cadmium	3.63E-01	2.50E-02	2.16E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	3.97E-01	2.54E-04	9.93E-03	2.13E-03	1.23E-02
Chromium	7.63E+00	1.80E-02	1.35E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	0.00E+00	5.34E-03	0.00E+00	1.53E-03	6.87E-03
Cobalt	4.93E+00	0.00E+00	7.62E-03	1.00E-01	4.93E-01	3.45E-03	1.23E-02	0.00E+00	1.58E-02
Copper	1.23E+01	2.69E-02	2.20E-01	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.11E+01	8.58E-03	2.77E-01	2.29E-03	2.88E-01
Lead	7.89E+01	7.00E-02	2.01E-01	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	7.44E+00	5.52E-02	1.86E-01	5.95E-03	2.47E-01
Manganese	4.03E+02	2.45E-01	4.27E+00	5.87E-02	2.36E+01	2.82E-01	5.91E-01	2.08E-02	8.93E-01
Mercury	2.96E-02	0.00E+00	2.13E-03	1.92E-01	5.68E-03	2.07E-05	1.42E-04	0.00E+00	1.63E-04
Nickel	6.60E+00	0.00E+00	2.23E-02	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	1.88E+00	4.62E-03	4.71E-02	0.00E+00	5.17E-02
Selenium	4.71E-01	0.00E+00	8.91E-03	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	4.97E-01	3.30E-04	1.24E-02	0.00E+00	1.28E-02
Silver	1.09E-01	0.00E+00	1.77E-03	5.01E-01	5.46E-02	7.63E-05	1.37E-03	0.00E+00	1.44E-03
Thallium	3.80E+00	0.00E+00	3.52E-03	1.23E-01	4.67E-01	2.66E-03	1.17E-02	0.00E+00	1.43E-02
Vanadium	1.17E+01	2.91E-02	2.03E-02	1.79E-01	2.10E+00	8.20E-03	5.24E-02	2.47E-03	6.31E-02
Zinc	5.40E+01	3.69E-02	1.76E+00	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.17E+02	3.78E-02	2.94E+00	3.14E-03	2.98E+00

Table A-22
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Mammals (Red Fox) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	7.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.50E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
PAHs									
Total HMW PAHs	1.16E+00	3.70E-05	5.59E-03	1.26E-01	7.06E-04	8.12E-04	1.76E-05	3.15E-06	8.33E-04
Pesticides									
alpha-Chlordane	6.36E-05	0.00E+00	7.21E-08	1.83E-01	1.16E-05	4.45E-08	2.91E-07	0.00E+00	3.35E-07
SVOCs									
Acetophenone	6.10E-02	0.00E+00	9.93E-03	4.70E-06	2.87E-07	4.27E-05	7.17E-09	0.00E+00	4.27E-05
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	7.78E-04	2.47E+01	2.42E+01	6.86E-04	6.04E-01	0.00E+00	6.05E-01
Carbazole	6.37E-02	0.00E+00	1.34E-03	1.71E-04	1.09E-05	4.46E-05	2.72E-07	0.00E+00	4.49E-05
Dibenzofuran	3.99E-02	0.00E+00	4.59E-04	5.15E-04	2.06E-05	2.79E-05	5.14E-07	0.00E+00	2.84E-05
Dimethyl phthalate	1.44E-01	0.00E+00	2.38E-02	4.59E-06	6.61E-07	1.01E-04	1.65E-08	0.00E+00	1.01E-04
Di-n-butyl phthalate	6.42E-02	0.00E+00	2.58E-04	4.09E-03	2.63E-04	4.49E-05	6.57E-06	0.00E+00	5.15E-05
VOCs									
Benzene	2.80E+00	0.00E+00	2.99E-01	9.89E-06	2.77E-05	1.96E-03	6.92E-07	0.00E+00	1.96E-03
Cyclohexane	7.00E-01	0.00E+00	1.57E-02	1.52E-04	1.06E-04	4.90E-04	2.66E-06	0.00E+00	4.93E-04
Ethylbenzene	4.15E-01	0.00E+00	1.13E-02	1.08E-04	4.47E-05	2.91E-04	1.12E-06	0.00E+00	2.92E-04
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	5.10E-02	2.83E-04	9.06E-04	2.24E-03	2.27E-05	0.00E+00	2.26E-03
Toluene	3.79E-03	0.00E+00	1.96E-04	3.48E-05	1.32E-07	2.65E-06	3.30E-09	0.00E+00	2.66E-06
Xylenes (m & p)	1.74E-02	0.00E+00	4.40E-04	1.24E-04	2.15E-06	1.22E-05	5.38E-08	0.00E+00	1.22E-05
Xylenes (o)	8.77E-03	0.00E+00	2.22E-04	1.24E-04	1.08E-06	6.14E-06	2.71E-08	0.00E+00	6.17E-06
Xylenes (Total)	1.74E-02	0.00E+00	4.07E-04	1.42E-04	2.47E-06	1.22E-05	6.17E-08	0.00E+00	1.22E-05

Table A-23
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	6.90E+00	0.00E+00	1.00E+00	6.90E+00	1.61E-01	1.54E+00	0.00E+00	1.70E+00
Arsenic	2.21E+01	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	2.15E+00	5.16E-01	4.78E-01	4.76E-04	9.95E-01
Barium	6.07E+02	2.36E-01	1.60E-01	9.71E+01	1.42E+01	2.16E+01	3.30E-02	3.58E+01
Beryllium	4.30E+00	0.00E+00	1.18E+00	5.07E+00	1.00E-01	1.13E+00	0.00E+00	1.23E+00
Cadmium	6.20E+00	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	3.53E+01	1.45E-01	7.86E+00	3.50E-03	8.01E+00
Chromium	9.50E+01	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	8.81E+00	2.22E+00	1.96E+00	2.52E-03	4.18E+00
Cobalt	6.12E+01	0.00E+00	2.91E-01	1.78E+01	1.43E+00	3.96E+00	0.00E+00	5.39E+00
Copper	1.08E+02	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	1.84E+01	2.52E+00	4.09E+00	3.77E-03	6.62E+00
Lead	2.73E+03	1.81E-01	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	4.77E+02	6.38E+01	1.06E+02	2.53E-02	1.70E+02
Manganese	7.40E+03	4.13E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	1.94E+02	1.73E+02	4.31E+01	5.78E-02	2.16E+02
Mercury	2.70E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	4.32E-01	6.31E-03	9.62E-02	0.00E+00	1.03E-01
Nickel	6.15E+01	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	1.35E+01	1.44E+00	3.01E+00	0.00E+00	4.45E+00
Selenium	8.90E+00	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	4.61E+00	2.08E-01	1.02E+00	0.00E+00	1.23E+00
Silver	4.70E+00	0.00E+00	1.53E+01	7.19E+01	1.10E-01	1.60E+01	0.00E+00	1.61E+01
Thallium	3.80E+00	0.00E+00	1.00E+00	3.80E+00	8.88E-02	8.46E-01	0.00E+00	9.34E-01
Vanadium	5.22E+01	2.91E-02	8.80E-01	4.59E+01	1.22E+00	1.02E+01	4.07E-03	1.14E+01
Zinc	1.11E+03	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	8.53E+02	2.59E+01	1.90E+02	5.17E-03	2.16E+02
PAHs								
Total HMW PAHs	4.50E+01	3.70E-05	3.00E-01	1.35E+01	1.05E+00	3.00E+00	5.18E-06	4.06E+00
Pesticides								
alpha-Chlordane	9.50E-03	0.00E+00	1.00E+00	9.50E-03	2.22E-04	2.11E-03	0.00E+00	2.34E-03

Table A-23
Wildlife Exposure Modeling of Maximum Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
Acetophenone	6.10E-02	0.00E+00	1.00E+00	6.10E-02	1.43E-03	1.36E-02	0.00E+00	1.50E-02
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	1.00E+00	9.80E-01	2.29E-02	2.18E-01	0.00E+00	2.41E-01
Carbazole	4.38E-01	0.00E+00	1.00E+00	4.38E-01	1.02E-02	9.75E-02	0.00E+00	1.08E-01
Dibenzofuran	1.80E-01	0.00E+00	1.00E+00	1.80E-01	4.21E-03	4.01E-02	0.00E+00	4.43E-02
Dimethyl phthalate	4.80E-01	0.00E+00	1.00E+00	4.80E-01	1.12E-02	1.07E-01	0.00E+00	1.18E-01
Di-n-butyl phthalate	1.40E+00	0.00E+00	1.00E+00	1.40E+00	3.27E-02	3.12E-01	0.00E+00	3.44E-01
VOCs								
Benzene	2.80E+00	0.00E+00	1.00E+00	2.80E+00	6.54E-02	6.23E-01	0.00E+00	6.88E-01
Cyclohexane	4.10E+01	0.00E+00	1.00E+00	4.10E+01	9.58E-01	9.12E+00	0.00E+00	1.01E+01
Ethylbenzene	6.70E+00	0.00E+00	1.00E+00	6.70E+00	1.57E-01	1.49E+00	0.00E+00	1.65E+00
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	1.00E+00	3.20E+00	7.48E-02	7.12E-01	0.00E+00	7.87E-01
Toluene	3.20E-01	0.00E+00	1.00E+00	3.20E-01	7.48E-03	7.12E-02	0.00E+00	7.87E-02
Xylenes (m & p)	5.90E-01	0.00E+00	1.00E+00	5.90E-01	1.38E-02	1.31E-01	0.00E+00	1.45E-01
Xylenes (o)	2.80E-01	0.00E+00	1.00E+00	2.80E-01	6.54E-03	6.23E-02	0.00E+00	6.88E-02
Xylenes (Total)	5.90E-01	0.00E+00	1.00E+00	5.90E-01	1.38E-02	1.31E-01	0.00E+00	1.45E-01

Table A-24
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	3.58E-01	0.00E+00	1.00E+00	3.58E-01	8.36E-03	7.97E-02	0.00E+00	8.80E-02
Arsenic	3.08E+00	3.40E-03	ln(dry worm conc, mg/kg) = (-1.421+0.706*ln(soil conc))	5.34E-01	7.19E-02	1.19E-01	4.76E-04	1.91E-01
Barium	5.21E+01	1.19E-01	1.60E-01	8.34E+00	1.22E+00	1.85E+00	1.67E-02	3.09E+00
Beryllium	3.51E-01	0.00E+00	1.18E+00	4.14E-01	8.20E-03	9.22E-02	0.00E+00	1.00E-01
Cadmium	3.63E-01	2.50E-02	ln(dry worm conc, mg/kg) = (2.114+0.795*ln(soil conc))	3.70E+00	8.48E-03	8.23E-01	3.50E-03	8.35E-01
Chromium	7.63E+00	1.80E-02	ln(dry worm conc, mg/kg) = (2.481+-0.067*ln(soil conc))	1.04E+01	1.78E-01	2.32E+00	2.52E-03	2.50E+00
Cobalt	4.93E+00	0.00E+00	2.91E-01	1.43E+00	1.15E-01	3.19E-01	0.00E+00	4.34E-01
Copper	1.23E+01	2.69E-02	ln(dry worm conc, mg/kg) = (1.675+0.264*ln(soil conc))	1.03E+01	2.86E-01	2.30E+00	3.77E-03	2.59E+00
Lead	7.89E+01	7.00E-02	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	2.73E+01	1.84E+00	6.07E+00	9.80E-03	7.92E+00
Manganese	4.03E+02	2.45E-01	ln(dry worm conc, mg/kg) = (-0.809+0.682*ln(soil conc))	2.66E+01	9.41E+00	5.92E+00	3.43E-02	1.54E+01
Mercury	2.96E-02	0.00E+00	ln(dry worm conc, mg/kg) = (-0.684+0.118*ln(soil conc))	3.33E-01	6.92E-04	7.41E-02	0.00E+00	7.48E-02
Nickel	6.60E+00	0.00E+00	ln(dry worm conc, mg/kg) = (3.677-0.26*ln(soil conc))	2.42E+01	1.54E-01	5.38E+00	0.00E+00	5.54E+00
Selenium	4.71E-01	0.00E+00	ln(dry worm conc, mg/kg) = (-0.075+0.733*ln(soil conc))	5.34E-01	1.10E-02	1.19E-01	0.00E+00	1.30E-01
Silver	1.09E-01	0.00E+00	1.53E+01	1.67E+00	2.55E-03	3.71E-01	0.00E+00	3.74E-01
Thallium	3.80E+00	0.00E+00	1.00E+00	3.80E+00	8.88E-02	8.46E-01	0.00E+00	9.34E-01
Vanadium	1.17E+01	2.91E-02	8.80E-01	1.03E+01	2.74E-01	2.29E+00	4.07E-03	2.57E+00
Zinc	5.40E+01	3.69E-02	ln(dry worm conc, mg/kg) = (4.449+0.328*ln(soil conc))	3.17E+02	1.26E+00	7.04E+01	5.17E-03	7.17E+01
PAHs								
Total HMW PAHs	1.16E+00	3.70E-05	3.00E-01	3.48E-01	2.71E-02	7.74E-02	5.18E-06	1.05E-01

Table A-24
Wildlife Exposure Modeling of 95UCLM Doses to Insectivorous Birds (American Robin) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	2.34E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.23E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	1.40E-01	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Insect/Worm) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides								
alpha-Chlordane	6.36E-05	0.00E+00	1.00E+00	6.36E-05	1.49E-06	1.42E-05	0.00E+00	1.56E-05
SVOCs								
Acetophenone	6.10E-02	0.00E+00	1.00E+00	6.10E-02	1.43E-03	1.36E-02	0.00E+00	1.50E-02
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	1.00E+00	9.80E-01	2.29E-02	2.18E-01	0.00E+00	2.41E-01
Carbazole	6.37E-02	0.00E+00	1.00E+00	6.37E-02	1.49E-03	1.42E-02	0.00E+00	1.57E-02
Dibenzofuran	3.99E-02	0.00E+00	1.00E+00	3.99E-02	9.32E-04	8.88E-03	0.00E+00	9.81E-03
Dimethyl phthalate	1.44E-01	0.00E+00	1.00E+00	1.44E-01	3.36E-03	3.20E-02	0.00E+00	3.54E-02
Di-n-butyl phthalate	6.42E-02	0.00E+00	1.00E+00	6.42E-02	1.50E-03	1.43E-02	0.00E+00	1.58E-02
VOCs								
Benzene	2.80E+00	0.00E+00	1.00E+00	2.80E+00	6.54E-02	6.23E-01	0.00E+00	6.88E-01
Cyclohexane	7.00E-01	0.00E+00	1.00E+00	7.00E-01	1.64E-02	1.56E-01	0.00E+00	1.72E-01
Ethylbenzene	4.15E-01	0.00E+00	1.00E+00	4.15E-01	9.70E-03	9.23E-02	0.00E+00	1.02E-01
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	1.00E+00	3.20E+00	7.48E-02	7.12E-01	0.00E+00	7.87E-01
Toluene	3.79E-03	0.00E+00	1.00E+00	3.79E-03	8.85E-05	8.43E-04	0.00E+00	9.32E-04
Xylenes (m & p)	1.74E-02	0.00E+00	1.00E+00	1.74E-02	4.07E-04	3.87E-03	0.00E+00	4.28E-03
Xylenes (o)	8.77E-03	0.00E+00	1.00E+00	8.77E-03	2.05E-04	1.95E-03	0.00E+00	2.16E-03
Xylenes (Total)	1.74E-02	0.00E+00	1.00E+00	1.74E-02	4.07E-04	3.87E-03	0.00E+00	4.28E-03

Table A-25
Wildlife Exposure Modeling of Maximum Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Antimony	6.90E+00	0.00E+00	5.87E-02	1.00E+00	5.87E-02	0.00E+00	3.28E-03	0.00E+00	3.28E-03
Arsenic	2.21E+01	3.40E-03	4.83E-02	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	9.90E-02	0.00E+00	5.55E-03	1.94E-04	5.74E-03
Barium	6.07E+02	2.36E-01	4.06E+00	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	2.16E+01	0.00E+00	1.21E+00	1.35E-02	1.22E+00
Beryllium	4.30E+00	0.00E+00	4.98E-03	1.00E+00	4.30E+00	0.00E+00	2.41E-01	0.00E+00	2.41E-01
Cadmium	6.20E+00	2.50E-02	7.73E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	1.58E+00	0.00E+00	8.84E-02	1.43E-03	8.99E-02
Chromium	9.50E+01	1.80E-02	1.06E-01	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	1.03E-03	1.03E-03
Cobalt	6.12E+01	0.00E+00	9.46E-02	1.00E-01	6.12E+00	0.00E+00	3.43E-01	0.00E+00	3.43E-01
Copper	1.08E+02	2.69E-02	5.69E-01	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.52E+01	0.00E+00	8.48E-01	1.53E-03	8.50E-01
Lead	2.73E+03	1.81E-01	3.03E+00	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	3.57E+01	0.00E+00	2.00E+00	1.03E-02	2.01E+00
Manganese	7.40E+03	4.13E-01	7.73E+01	5.87E-02	4.34E+02	0.00E+00	2.43E+01	2.35E-02	2.43E+01
Mercury	2.70E-01	0.00E+00	7.21E-03	1.92E-01	5.18E-02	0.00E+00	2.90E-03	0.00E+00	2.90E-03
Nickel	6.15E+01	0.00E+00	1.39E-01	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	5.33E+00	0.00E+00	2.98E-01	0.00E+00	2.98E-01
Selenium	8.90E+00	0.00E+00	2.26E-01	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	1.50E+00	0.00E+00	8.41E-02	0.00E+00	8.41E-02
Silver	4.70E+00	0.00E+00	7.63E-02	5.01E-01	2.35E+00	0.00E+00	1.32E-01	0.00E+00	1.32E-01
Thallium	3.80E+00	0.00E+00	3.52E-03	1.23E-01	4.67E-01	0.00E+00	2.62E-02	0.00E+00	2.62E-02
Vanadium	5.22E+01	2.91E-02	6.02E-02	1.79E-01	9.34E+00	0.00E+00	5.23E-01	1.66E-03	5.25E-01
Zinc	1.11E+03	3.69E-02	1.00E+01	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.47E+02	0.00E+00	8.22E+00	2.10E-03	8.22E+00
PAHs									
Total HMW PAHs	4.50E+01	3.70E-05	2.16E-01	1.26E-01	2.73E-02	0.00E+00	1.53E-03	2.11E-06	1.53E-03

Table A-25
Wildlife Exposure Modeling of Maximum Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		Maximum Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides									
alpha-Chlordane	9.50E-03	0.00E+00	1.08E-05	1.83E-01	1.74E-03	0.00E+00	9.73E-05	0.00E+00	9.73E-05
SVOCs									
Acetophenone	6.10E-02	0.00E+00	9.93E-03	4.70E-06	2.87E-07	0.00E+00	1.61E-08	0.00E+00	1.61E-08
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	7.78E-04	2.47E+01	2.42E+01	0.00E+00	1.35E+00	0.00E+00	1.35E+00
Carbazole	4.38E-01	0.00E+00	9.24E-03	1.71E-04	7.47E-05	0.00E+00	4.19E-06	0.00E+00	4.19E-06
Dibenzofuran	1.80E-01	0.00E+00	2.07E-03	5.15E-04	9.28E-05	0.00E+00	5.19E-06	0.00E+00	5.19E-06
Dimethyl phthalate	4.80E-01	0.00E+00	7.92E-02	4.59E-06	2.20E-06	0.00E+00	1.23E-07	0.00E+00	1.23E-07
Di-n-butyl phthalate	1.40E+00	0.00E+00	5.62E-03	4.09E-03	5.73E-03	0.00E+00	3.21E-04	0.00E+00	3.21E-04
VOCs									
Benzene	2.80E+00	0.00E+00	2.99E-01	9.89E-06	2.77E-05	0.00E+00	1.55E-06	0.00E+00	1.55E-06
Cyclohexane	4.10E+01	0.00E+00	9.22E-01	1.52E-04	6.24E-03	0.00E+00	3.49E-04	0.00E+00	3.49E-04
Ethylbenzene	6.70E+00	0.00E+00	1.83E-01	1.08E-04	7.21E-04	0.00E+00	4.04E-05	0.00E+00	4.04E-05
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	5.10E-02	2.83E-04	9.06E-04	0.00E+00	5.07E-05	0.00E+00	5.07E-05
Toluene	3.20E-01	0.00E+00	1.65E-02	3.48E-05	1.11E-05	0.00E+00	6.24E-07	0.00E+00	6.24E-07
Xylenes (m & p)	5.90E-01	0.00E+00	1.49E-02	1.24E-04	7.29E-05	0.00E+00	4.08E-06	0.00E+00	4.08E-06
Xylenes (o)	2.80E-01	0.00E+00	7.07E-03	1.24E-04	3.46E-05	0.00E+00	1.94E-06	0.00E+00	1.94E-06
Xylenes (Total)	5.90E-01	0.00E+00	1.38E-02	1.42E-04	8.37E-05	0.00E+00	4.69E-06	0.00E+00	4.69E-06

Table A-26
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Antimony	3.58E-01	0.00E+00	3.04E-03	1.00E+00	3.04E-03	0.00E+00	1.70E-04	0.00E+00	1.70E-04
Arsenic	3.08E+00	3.40E-03	1.33E-02	ln(dry mammal conc, mg/kg) = (-4.8471+0.8188*ln(soil conc))	1.97E-02	0.00E+00	1.10E-03	1.94E-04	1.30E-03
Barium	5.21E+01	1.19E-01	3.78E-01	ln(dry mammal conc, mg/kg) = (-1.412+0.7*ln(soil conc))	3.88E+00	0.00E+00	2.17E-01	6.78E-03	2.24E-01
Beryllium	3.51E-01	0.00E+00	4.07E-04	1.00E+00	3.51E-01	0.00E+00	1.97E-02	0.00E+00	1.97E-02
Cadmium	3.63E-01	2.50E-02	2.16E-02	ln(dry mammal conc, mg/kg) = (-0.4306+0.4865*ln(soil conc))	3.97E-01	0.00E+00	2.22E-02	1.43E-03	2.37E-02
Chromium	7.63E+00	1.80E-02	1.35E-02	ln(dry mammal conc, mg/kg) = (-1.4599+0.7338*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	1.03E-03	1.03E-03
Cobalt	4.93E+00	0.00E+00	7.62E-03	1.00E-01	4.93E-01	0.00E+00	2.76E-02	0.00E+00	2.76E-02
Copper	1.23E+01	2.69E-02	2.20E-01	ln(dry mammal conc, mg/kg) = (2.042+0.1444*ln(soil conc))	1.11E+01	0.00E+00	6.20E-01	1.53E-03	6.21E-01
Lead	7.89E+01	7.00E-02	2.01E-01	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	7.44E+00	0.00E+00	4.17E-01	3.99E-03	4.21E-01
Manganese	4.03E+02	2.45E-01	4.27E+00	5.87E-02	2.36E+01	0.00E+00	1.32E+00	1.40E-02	1.34E+00
Mercury	2.96E-02	0.00E+00	2.13E-03	1.92E-01	5.68E-03	0.00E+00	3.18E-04	0.00E+00	3.18E-04
Nickel	6.60E+00	0.00E+00	2.23E-02	ln(dry mammal conc, mg/kg) = (-0.2462+0.4658*ln(soil conc))	1.88E+00	0.00E+00	1.05E-01	0.00E+00	1.05E-01
Selenium	4.71E-01	0.00E+00	8.91E-03	ln(dry mammal conc, mg/kg) = (-0.4158+0.3764*ln(soil conc))	4.97E-01	0.00E+00	2.78E-02	0.00E+00	2.78E-02
Silver	1.09E-01	0.00E+00	1.77E-03	5.01E-01	5.46E-02	0.00E+00	3.06E-03	0.00E+00	3.06E-03
Thallium	3.80E+00	0.00E+00	3.52E-03	1.23E-01	4.67E-01	0.00E+00	2.62E-02	0.00E+00	2.62E-02
Vanadium	1.17E+01	2.91E-02	2.03E-02	1.79E-01	2.10E+00	0.00E+00	1.17E-01	1.66E-03	1.19E-01
Zinc	5.40E+01	3.69E-02	1.76E+00	ln(dry mammal conc, mg/kg) = (4.4713+0.0738*ln(soil conc))	1.17E+02	0.00E+00	6.58E+00	2.10E-03	6.58E+00
PAHs									
Total HMW PAHs	1.16E+00	3.70E-05	5.59E-03	1.26E-01	7.06E-04	0.00E+00	3.95E-05	2.11E-06	4.16E-05

Table A-26
Wildlife Exposure Modeling of 95UCLM Doses to Predatory Birds (Red-Tailed Hawk) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	5.60E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.70E-02	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L dry wt.)	Maximum Dose to Small Mammal (mg/kg bw-day)	Food Item (Small Mammal) Uptake		95UCLM Case Scenario Doses			
				Uptake Factor (mg/kg dry wt./mg/kg dry wt.) or Small Mammal Biotransfer Factor (mg/kg bw-day to mg/kg)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Pesticides									
alpha-Chlordane	6.36E-05	0.00E+00	7.21E-08	1.83E-01	1.16E-05	0.00E+00	6.51E-07	0.00E+00	6.51E-07
SVOCs									
Acetophenone	6.10E-02	0.00E+00	9.93E-03	4.70E-06	2.87E-07	0.00E+00	1.61E-08	0.00E+00	1.61E-08
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	7.78E-04	2.47E+01	2.42E+01	0.00E+00	1.35E+00	0.00E+00	1.35E+00
Carbazole	6.37E-02	0.00E+00	1.34E-03	1.71E-04	1.09E-05	0.00E+00	6.09E-07	0.00E+00	6.09E-07
Dibenzofuran	3.99E-02	0.00E+00	4.59E-04	5.15E-04	2.06E-05	0.00E+00	1.15E-06	0.00E+00	1.15E-06
Dimethyl phthalate	1.44E-01	0.00E+00	2.38E-02	4.59E-06	6.61E-07	0.00E+00	3.70E-08	0.00E+00	3.70E-08
Di-n-butyl phthalate	6.42E-02	0.00E+00	2.58E-04	4.09E-03	2.63E-04	0.00E+00	1.47E-05	0.00E+00	1.47E-05
VOCs									
Benzene	2.80E+00	0.00E+00	2.99E-01	9.89E-06	2.77E-05	0.00E+00	1.55E-06	0.00E+00	1.55E-06
Cyclohexane	7.00E-01	0.00E+00	1.57E-02	1.52E-04	1.06E-04	0.00E+00	5.96E-06	0.00E+00	5.96E-06
Ethylbenzene	4.15E-01	0.00E+00	1.13E-02	1.08E-04	4.47E-05	0.00E+00	2.50E-06	0.00E+00	2.50E-06
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	5.10E-02	2.83E-04	9.06E-04	0.00E+00	5.07E-05	0.00E+00	5.07E-05
Toluene	3.79E-03	0.00E+00	1.96E-04	3.48E-05	1.32E-07	0.00E+00	7.39E-09	0.00E+00	7.39E-09
Xylenes (m & p)	1.74E-02	0.00E+00	4.40E-04	1.24E-04	2.15E-06	0.00E+00	1.20E-07	0.00E+00	1.20E-07
Xylenes (o)	8.77E-03	0.00E+00	2.22E-04	1.24E-04	1.08E-06	0.00E+00	6.07E-08	0.00E+00	6.07E-08
Xylenes (Total)	1.74E-02	0.00E+00	4.07E-04	1.42E-04	2.47E-06	0.00E+00	1.38E-07	0.00E+00	1.38E-07

Table A-27
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	6.90E+00	0.00E+00	2.00E-01	1.38E+00	1.37E-01	2.96E-01	0.00E+00	4.33E-01
Arsenic	2.21E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	7.82E-01	4.40E-01	1.67E-01	2.00E-05	6.08E-01
Barium	6.07E+02	2.36E-01	1.50E-01	9.11E+01	1.21E+01	1.95E+01	1.39E-03	3.16E+01
Beryllium	4.30E+00	0.00E+00	1.00E-02	4.30E-02	8.56E-02	9.21E-03	0.00E+00	9.48E-02
Cadmium	6.20E+00	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	1.68E+00	1.23E-01	3.60E-01	1.47E-04	4.84E-01
Chromium	9.50E+01	1.80E-02	7.50E-03	7.13E-01	1.89E+00	1.53E-01	1.06E-04	2.04E+00
Cobalt	6.12E+01	0.00E+00	2.00E-02	1.22E+00	1.22E+00	2.62E-01	0.00E+00	1.48E+00
Copper	1.08E+02	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	1.24E+01	2.15E+00	2.64E+00	1.58E-04	4.80E+00
Lead	2.73E+03	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.24E+01	5.44E+01	4.80E+00	1.06E-03	5.92E+01
Manganese	7.40E+03	4.13E-01	2.50E-01	1.85E+03	1.47E+02	3.96E+02	2.43E-03	5.44E+02
Mercury	2.70E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	1.81E-01	5.38E-03	3.88E-02	0.00E+00	4.42E-02
Nickel	6.15E+01	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	2.36E+00	1.22E+00	5.05E-01	0.00E+00	1.73E+00
Selenium	8.90E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	5.67E+00	1.77E-01	1.21E+00	0.00E+00	1.39E+00
Silver	4.70E+00	0.00E+00	4.00E-01	1.88E+00	9.36E-02	4.03E-01	0.00E+00	4.96E-01
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	7.57E-02	3.25E-03	0.00E+00	7.89E-02
Vanadium	5.22E+01	2.91E-02	5.50E-03	2.87E-01	1.04E+00	6.15E-02	1.71E-04	1.10E+00
Zinc	1.11E+03	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	2.37E+02	2.21E+01	5.07E+01	2.17E-04	7.28E+01
PAHs								
Total HMW PAHs	4.50E+01	3.70E-05	1.04E-01	4.70E+00	8.96E-01	1.01E+00	2.18E-07	1.90E+00
Pesticides								
alpha-Chlordane	9.50E-03	0.00E+00	9.33E-03	8.86E-05	1.89E-04	1.90E-05	0.00E+00	2.08E-04
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	1.21E-03	5.48E-02	0.00E+00	5.60E-02

Table A-27
Wildlife Exposure Modeling of Maximum Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	Maximum Soil Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	1.95E-02	1.15E-04	0.00E+00	1.96E-02
Carbazole	4.38E-01	0.00E+00	5.26E-01	2.30E-01	8.72E-03	4.93E-02	0.00E+00	5.81E-02
Dibenzofuran	1.80E-01	0.00E+00	2.78E-01	5.00E-02	3.58E-03	1.07E-02	0.00E+00	1.43E-02
Dimethyl phthalate	4.80E-01	0.00E+00	4.25E+00	2.04E+00	9.56E-03	4.37E-01	0.00E+00	4.47E-01
Di-n-butyl phthalate	1.40E+00	0.00E+00	8.38E-02	1.17E-01	2.79E-02	2.51E-02	0.00E+00	5.30E-02
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	5.58E-02	1.64E+00	0.00E+00	1.70E+00
Cyclohexane	4.10E+01	0.00E+00	5.62E-01	2.31E+01	8.17E-01	4.94E+00	0.00E+00	5.75E+00
Ethylbenzene	6.70E+00	0.00E+00	6.87E-01	4.60E+00	1.33E-01	9.85E-01	0.00E+00	1.12E+00
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	6.37E-02	2.69E-01	0.00E+00	3.33E-01
Toluene	3.20E-01	0.00E+00	1.32E+00	4.22E-01	6.37E-03	9.03E-02	0.00E+00	9.67E-02
Xylenes (m & p)	5.90E-01	0.00E+00	6.34E-01	3.74E-01	1.17E-02	8.01E-02	0.00E+00	9.18E-02
Xylenes (o)	2.80E-01	0.00E+00	6.34E-01	1.77E-01	5.58E-03	3.80E-02	0.00E+00	4.36E-02
Xylenes (Total)	5.90E-01	0.00E+00	5.85E-01	3.45E-01	1.17E-02	7.39E-02	0.00E+00	8.57E-02

Table A-28
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Antimony	3.58E-01	0.00E+00	2.00E-01	7.16E-02	7.13E-03	1.53E-02	0.00E+00	2.25E-02
Arsenic	3.08E+00	3.40E-03	ln(dry plant conc, mg/kg) = (-1.992+0.564*ln(soil conc))	2.57E-01	6.13E-02	5.51E-02	2.00E-05	1.16E-01
Barium	5.21E+01	1.19E-01	1.50E-01	7.82E+00	1.04E+00	1.67E+00	7.00E-04	2.71E+00
Beryllium	3.51E-01	0.00E+00	1.00E-02	3.51E-03	6.99E-03	7.52E-04	0.00E+00	7.74E-03
Cadmium	3.63E-01	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	3.57E-01	7.23E-03	7.65E-02	1.47E-04	8.39E-02
Chromium	7.63E+00	1.80E-02	7.50E-03	5.72E-02	1.52E-01	1.23E-02	1.06E-04	1.64E-01
Cobalt	4.93E+00	0.00E+00	2.00E-02	9.86E-02	9.82E-02	2.11E-02	0.00E+00	1.19E-01
Copper	1.23E+01	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	5.24E+00	2.44E-01	1.12E+00	1.58E-04	1.37E+00
Lead	7.89E+01	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.07E+00	1.57E+00	6.58E-01	4.12E-04	2.23E+00
Manganese	4.03E+02	2.45E-01	2.50E-01	1.01E+02	8.02E+00	2.16E+01	1.44E-03	2.96E+01
Mercury	2.96E-02	0.00E+00	ln(dry plant conc, mg/kg) = (-0.996+0.544*ln(soil conc))	5.44E-02	5.89E-04	1.17E-02	0.00E+00	1.22E-02
Nickel	6.60E+00	0.00E+00	ln(dry plant conc, mg/kg) = (-2.224+0.748*ln(soil conc))	4.44E-01	1.31E-01	9.51E-02	0.00E+00	2.27E-01
Selenium	4.71E-01	0.00E+00	ln(dry plant conc, mg/kg) = (-0.678+1.104*ln(soil conc))	2.21E-01	9.38E-03	4.73E-02	0.00E+00	5.67E-02
Silver	1.09E-01	0.00E+00	4.00E-01	4.36E-02	2.17E-03	9.34E-03	0.00E+00	1.15E-02
Thallium	3.80E+00	0.00E+00	4.00E-03	1.52E-02	7.57E-02	3.25E-03	0.00E+00	7.89E-02
Vanadium	1.17E+01	2.91E-02	5.50E-03	6.44E-02	2.33E-01	1.38E-02	1.71E-04	2.47E-01
Zinc	5.40E+01	3.69E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	4.42E+01	1.08E+00	9.47E+00	2.17E-04	1.05E+01
PAHs								
Total HMW PAHs	1.16E+00	3.70E-05	1.04E-01	1.21E-01	2.31E-02	2.59E-02	2.18E-07	4.90E-02
Pesticides								
alpha-Chlordane	6.36E-05	0.00E+00	9.33E-03	5.93E-07	1.27E-06	1.27E-07	0.00E+00	1.39E-06

Table A-28
Wildlife Exposure Modeling of 95UCLM Doses to Herbivorous Birds (Song Sparrow) from Media for Terrestrial Receptors at the North Tank Farm, Loading Dock Area, and East Tank Farm

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.99E-02	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	2.14E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	5.88E-03	L/kg-day

Chemical	95UCLM Soil Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
SVOCs								
Acetophenone	6.10E-02	0.00E+00	4.20E+00	2.56E-01	1.21E-03	5.48E-02	0.00E+00	5.60E-02
Bis(2-ethylhexyl)phthalate	9.80E-01	0.00E+00	5.48E-04	5.37E-04	1.95E-02	1.15E-04	0.00E+00	1.96E-02
Carbazole	6.37E-02	0.00E+00	5.26E-01	3.35E-02	1.27E-03	7.18E-03	0.00E+00	8.44E-03
Dibenzofuran	3.99E-02	0.00E+00	2.78E-01	1.11E-02	7.95E-04	2.37E-03	0.00E+00	3.17E-03
Dimethyl phthalate	1.44E-01	0.00E+00	4.25E+00	6.12E-01	2.87E-03	1.31E-01	0.00E+00	1.34E-01
Di-n-butyl phthalate	6.42E-02	0.00E+00	8.38E-02	5.38E-03	1.28E-03	1.15E-03	0.00E+00	2.43E-03
VOCs								
Benzene	2.80E+00	0.00E+00	2.74E+00	7.67E+00	5.58E-02	1.64E+00	0.00E+00	1.70E+00
Cyclohexane	7.00E-01	0.00E+00	5.62E-01	3.94E-01	1.39E-02	8.43E-02	0.00E+00	9.82E-02
Ethylbenzene	4.15E-01	0.00E+00	6.87E-01	2.85E-01	8.26E-03	6.10E-02	0.00E+00	6.93E-02
Isopropylbenzene (Cumene)	3.20E+00	0.00E+00	3.93E-01	1.26E+00	6.37E-02	2.69E-01	0.00E+00	3.33E-01
Toluene	3.79E-03	0.00E+00	1.32E+00	4.99E-03	7.55E-05	1.07E-03	0.00E+00	1.15E-03
Xylenes (m & p)	1.74E-02	0.00E+00	6.34E-01	1.10E-02	3.47E-04	2.36E-03	0.00E+00	2.71E-03
Xylenes (o)	8.77E-03	0.00E+00	6.34E-01	5.56E-03	1.75E-04	1.19E-03	0.00E+00	1.37E-03
Xylenes (Total)	1.74E-02	0.00E+00	5.85E-01	1.02E-02	3.47E-04	2.18E-03	0.00E+00	2.53E-03

Table A-29
Wildlife Exposure Modeling of Maximum Doses to Aquatic Herbivorous Mammals (Muskrat) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.50E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.69E+04	1.91E+01	4.00E-03	6.76E+01	2.54E+01	5.07E+00	5.73E+00	3.62E+01
Barium	1.12E+02	2.36E-01	1.50E-01	1.68E+01	1.68E-01	1.26E+00	7.08E-02	1.50E+00
Beryllium	5.60E-01	0.00E+00	1.00E-02	5.60E-03	8.40E-04	4.20E-04	0.00E+00	1.26E-03
Cadmium	NO COPC	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	7.50E-03	7.50E-03
Chromium, hexavalent	4.80E+00	0.00E+00	7.50E-03	3.60E-02	7.20E-03	2.70E-03	0.00E+00	9.90E-03
Copper	1.25E+01	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	5.28E+00	1.88E-02	3.96E-01	8.07E-03	4.23E-01
Lead	2.24E+02	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	5.52E+00	3.36E-01	4.14E-01	5.43E-02	8.04E-01
Manganese	5.00E+02	4.13E-01	2.50E-01	1.25E+02	7.50E-01	9.38E+00	1.24E-01	1.02E+01
Vanadium	2.34E+01	2.91E-02	5.50E-03	1.29E-01	3.51E-02	9.65E-03	8.73E-03	5.35E-02
PAHs								
Benzo(a)Pyrene	2.00E-01	6.00E-05	1.14E-02	2.28E-03	3.00E-04	1.71E-04	1.80E-05	4.89E-04
Total LMW PAHs	8.60E-01	0.00E+00	1.04E-01	8.98E-02	1.29E-03	6.73E-03	0.00E+00	8.02E-03
Total HMW PAHs	1.64E+00	3.70E-05	1.04E-01	1.71E-01	2.46E-03	1.28E-02	1.11E-05	1.53E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	2.50E+00	3.50E-01	2.10E-04	2.62E-02	0.00E+00	2.64E-02
VOCs								
Acetone	8.60E-01	9.30E-03	5.33E+01	4.58E+01	1.29E-03	3.44E+00	2.79E-03	3.44E+00
Toluene	1.00E-02	0.00E+00	1.32E+00	1.32E-02	1.50E-05	9.88E-04	0.00E+00	1.00E-03

Table A-30
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Herbivorous Mammals (Muskrat) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.50E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	8.91E+03	6.89E+00	4.00E-03	3.57E+01	1.34E+01	2.67E+00	2.07E+00	1.81E+01
Barium	5.72E+01	1.19E-01	1.50E-01	8.58E+00	8.58E-02	6.44E-01	3.57E-02	7.65E-01
Beryllium	5.60E-01	0.00E+00	1.00E-02	5.60E-03	8.40E-04	4.20E-04	0.00E+00	1.26E-03
Cadmium	NO COPC	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	7.50E-03	7.50E-03
Chromium, hexavalent	4.80E+00	0.00E+00	7.50E-03	3.60E-02	7.20E-03	2.70E-03	0.00E+00	9.90E-03
Copper	6.66E+00	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	4.12E+00	9.99E-03	3.09E-01	8.07E-03	3.27E-01
Lead	1.09E+02	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.68E+00	1.63E-01	2.76E-01	2.10E-02	4.60E-01
Manganese	2.62E+02	2.45E-01	2.50E-01	6.55E+01	3.93E-01	4.91E+00	7.35E-02	5.38E+00
Vanadium	1.29E+01	2.91E-02	5.50E-03	7.10E-02	1.94E-02	5.32E-03	8.73E-03	3.34E-02
PAHs								
Benzo(a)Pyrene	5.26E-02	6.00E-05	1.14E-02	5.99E-04	7.89E-05	4.49E-05	1.80E-05	1.42E-04
Total LMW PAHs	2.88E-01	0.00E+00	1.04E-01	3.01E-02	4.32E-04	2.26E-03	0.00E+00	2.69E-03
Total HMW PAHs	2.73E-01	3.70E-05	1.04E-01	2.85E-02	4.10E-04	2.14E-03	1.11E-05	2.56E-03
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	2.50E+00	3.50E-01	2.10E-04	2.62E-02	0.00E+00	2.64E-02
VOCs								
Acetone	2.48E-01	4.56E-03	5.33E+01	1.32E+01	3.73E-04	9.93E-01	1.37E-03	9.95E-01
Toluene	2.82E-03	0.00E+00	1.32E+00	3.72E-03	4.23E-06	2.79E-04	0.00E+00	2.83E-04

Table A-31
Wildlife Exposure Modeling of Maximum Doses to Aquatic Insectivorous Mammals (Raccoon) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	4.51E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.25E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Benthos) Uptake			Maximum Case Scenario Doses			
			BSAF/Uptake Factor		Maximum Food Item Tissue Concentration (mg/kgdry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Aluminum	1.69E+04	1.91E+01	1.00E+00	Uptake Factor	1.69E+04	7.63E+01	8.11E+02	1.58E+00	8.89E+02
Barium	1.12E+02	2.36E-01	1.00E+00	Uptake Factor	1.12E+02	5.05E-01	5.38E+00	1.95E-02	5.90E+00
Beryllium	5.60E-01	0.00E+00	1.00E+00	Uptake Factor	5.60E-01	2.53E-03	2.69E-02	0.00E+00	2.94E-02
Cadmium	NO COPC	2.50E-02	3.07E+00	Uptake Factor	0.00E+00	0.00E+00	0.00E+00	2.06E-03	2.06E-03
Chromium, hexavalent	4.80E+00	0.00E+00	4.68E-01	Uptake Factor	2.25E+00	2.17E-02	1.08E-01	0.00E+00	1.29E-01
Copper	1.25E+01	2.69E-02	5.25E+00	Uptake Factor	6.56E+01	5.64E-02	3.15E+00	2.22E-03	3.21E+00
Lead	2.24E+02	1.81E-01	6.60E-02	Uptake Factor	1.48E+01	1.01E+00	7.10E-01	1.49E-02	1.74E+00
Manganese	5.00E+02	4.13E-01	1.00E+00	Uptake Factor	5.00E+02	2.26E+00	2.40E+01	3.41E-02	2.63E+01
Vanadium	2.34E+01	2.91E-02	1.00E+00	Uptake Factor	2.34E+01	1.06E-01	1.12E+00	2.40E-03	1.23E+00
PAHs									
Benzo(a)Pyrene	2.00E-01	6.00E-05	3.37E-03	BSAF	8.08E-03	9.02E-04	3.88E-04	4.95E-06	1.30E-03
Total LMW PAHs	8.60E-01	0.00E+00	6.19E-02	BSAF	6.39E-01	3.88E-03	3.07E-02	0.00E+00	3.45E-02
Total HMW PAHs	1.64E+00	3.70E-05	1.78E-02	BSAF	3.50E-01	7.40E-03	1.68E-02	3.05E-06	2.42E-02
SVOCs									
4-methylphenol	1.40E-01	0.00E+00	4.00E+00	BSAF	6.72E+00	6.32E-04	3.23E-01	0.00E+00	3.23E-01
VOCs									
Acetone	8.60E-01	9.30E-03	4.00E+00	BSAF	4.13E+01	3.88E-03	1.98E+00	7.67E-04	1.99E+00
Toluene	1.00E-02	0.00E+00	4.00E+00	BSAF	4.80E-01	4.51E-05	2.30E-02	0.00E+00	2.31E-02

Table A-32
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Insectivorous Mammals (Raccoon) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	4.51E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.25E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake			95UCLM Case Scenario Doses			
			BSAF/Uptake Factor		95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Aluminum	8.91E+03	6.89E+00	1.00E+00	Uptake Factor	8.91E+03	4.02E+01	4.28E+02	5.69E-01	4.69E+02
Barium	5.72E+01	1.19E-01	1.00E+00	Uptake Factor	5.72E+01	2.58E-01	2.75E+00	9.82E-03	3.01E+00
Beryllium	5.60E-01	0.00E+00	1.00E+00	Uptake Factor	5.60E-01	2.53E-03	2.69E-02	0.00E+00	2.94E-02
Cadmium	NO COPC	2.50E-02	3.07E+00	Uptake Factor	0.00E+00	0.00E+00	0.00E+00	2.06E-03	2.06E-03
Chromium, hexavalent	4.80E+00	0.00E+00	4.68E-01	Uptake Factor	2.25E+00	2.17E-02	1.08E-01	0.00E+00	1.29E-01
Copper	6.66E+00	2.69E-02	5.25E+00	Uptake Factor	3.50E+01	3.00E-02	1.68E+00	2.22E-03	1.71E+00
Lead	1.09E+02	7.00E-02	6.60E-02	Uptake Factor	7.18E+00	4.91E-01	3.45E-01	5.78E-03	8.42E-01
Manganese	2.62E+02	2.45E-01	1.00E+00	Uptake Factor	2.62E+02	1.18E+00	1.26E+01	2.02E-02	1.38E+01
Vanadium	1.29E+01	2.91E-02	1.00E+00	Uptake Factor	1.29E+01	5.82E-02	6.19E-01	2.40E-03	6.80E-01
PAHs									
Benzo(a)Pyrene	5.26E-02	6.00E-05	3.37E-03	BSAF	2.13E-03	2.37E-04	1.02E-04	4.95E-06	3.44E-04
Total LMW PAHs	2.88E-01	0.00E+00	6.19E-02	BSAF	2.14E-01	1.30E-03	1.03E-02	0.00E+00	1.16E-02
Total HMW PAHs	2.73E-01	3.70E-05	1.78E-02	BSAF	5.82E-02	1.23E-03	2.80E-03	3.05E-06	4.03E-03
SVOCs									
4-methylphenol	1.40E-01	0.00E+00	4.00E+00	BSAF	6.72E+00	6.32E-04	3.23E-01	0.00E+00	3.23E-01
VOCs									
Acetone	2.48E-01	4.56E-03	4.00E+00	BSAF	1.19E+01	1.12E-03	5.72E-01	3.76E-04	5.74E-01
Toluene	2.82E-03	0.00E+00	4.00E+00	BSAF	1.35E-01	1.27E-05	6.50E-03	0.00E+00	6.52E-03

Table A-33
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Mammals (River Otter) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.69E+04	1.91E+01	1.08E+01	2.06E+02	0.00E+00	9.90E+00	1.55E+00	1.14E+01
Barium	1.12E+02	2.36E-01	1.60E+01	3.78E+00	0.00E+00	1.81E-01	1.91E-02	2.00E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	2.83E-01	2.03E-03	2.85E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	1.25E+01	2.69E-02	1.86E+03	4.99E+01	0.00E+00	2.40E+00	2.18E-03	2.40E+00
Lead	2.24E+02	1.81E-01	4.50E+01	8.15E+00	0.00E+00	3.91E-01	1.47E-02	4.06E-01
Manganese	5.00E+02	4.13E-01	1.60E+03	6.61E+02	0.00E+00	3.17E+01	3.35E-02	3.18E+01
Vanadium	2.34E+01	2.91E-02	1.00E+00	2.91E-02	0.00E+00	1.40E-03	2.36E-03	3.75E-03
PAHs								
Benzo(a)Pyrene	2.00E-01	6.00E-05	2.06E+04	1.24E+00	0.00E+00	5.93E-02	4.86E-06	5.93E-02
Total LMW PAHs	8.60E-01	0.00E+00	1.43E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total HMW PAHs	1.64E+00	3.70E-05	1.43E+04	5.29E-01	0.00E+00	2.54E-02	3.00E-06	2.54E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOCs								
Acetone	8.60E-01	9.30E-03	1.26E+01	1.18E-01	0.00E+00	5.64E-03	7.53E-04	6.40E-03
Toluene	1.00E-02	0.00E+00	1.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-34
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Mammals (River Otter) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	8.91E+03	6.89E+00	1.08E+01	7.44E+01	0.00E+00	3.57E+00	5.58E-01	4.13E+00
Barium	5.72E+01	1.19E-01	1.60E+01	1.90E+00	0.00E+00	9.14E-02	9.64E-03	1.01E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	2.83E-01	2.03E-03	2.85E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	6.66E+00	2.69E-02	1.86E+03	4.99E+01	0.00E+00	2.40E+00	2.18E-03	2.40E+00
Lead	1.09E+02	7.00E-02	4.50E+01	3.15E+00	0.00E+00	1.51E-01	5.67E-03	1.57E-01
Manganese	2.62E+02	2.45E-01	1.60E+03	3.92E+02	0.00E+00	1.88E+01	1.98E-02	1.88E+01
Vanadium	1.29E+01	2.91E-02	1.00E+00	2.91E-02	0.00E+00	1.40E-03	2.36E-03	3.75E-03
PAHs								
Benzo(a)Pyrene	5.26E-02	6.00E-05	2.06E+04	1.24E+00	0.00E+00	5.93E-02	4.86E-06	5.93E-02
Total LMW PAHs	2.88E-01	0.00E+00	1.43E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total HMW PAHs	2.73E-01	3.70E-05	1.43E+04	5.29E-01	0.00E+00	2.54E-02	3.00E-06	2.54E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOCs								
Acetone	2.48E-01	4.56E-03	1.26E+01	5.76E-02	0.00E+00	2.77E-03	3.69E-04	3.14E-03
Toluene	2.82E-03	0.00E+00	1.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-35
Wildlife Exposure Modeling of Maximum Doses to Aquatic Herbivorous Birds (Canada Goose) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	6.36E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.75E-03	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.43E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.69E+04	1.91E+01	4.00E-03	6.76E+01	1.07E+01	5.24E-01	8.45E-01	1.21E+01
Barium	1.12E+02	2.36E-01	1.50E-01	1.68E+01	7.12E-02	1.30E-01	1.04E-02	2.12E-01
Beryllium	5.60E-01	0.00E+00	1.00E-02	5.60E-03	3.56E-04	4.34E-05	0.00E+00	3.99E-04
Cadmium	NO COPC	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03
Chromium, hexavalent	4.80E+00	0.00E+00	7.50E-03	3.60E-02	3.05E-03	2.79E-04	0.00E+00	3.33E-03
Copper	1.25E+01	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	5.28E+00	7.94E-03	4.09E-02	1.19E-03	5.01E-02
Lead	2.24E+02	1.81E-01	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	5.52E+00	1.42E-01	4.28E-02	8.01E-03	1.93E-01
Manganese	5.00E+02	4.13E-01	2.50E-01	1.25E+02	3.18E-01	9.69E-01	1.83E-02	1.30E+00
Vanadium	2.34E+01	2.91E-02	5.50E-03	1.29E-01	1.49E-02	9.97E-04	1.29E-03	1.72E-02
PAHs								
Total LMW PAHs	8.60E-01	0.00E+00	1.04E-01	8.98E-02	5.47E-04	6.96E-04	0.00E+00	1.24E-03
Total HMW PAHs	1.64E+00	3.70E-05	1.04E-01	1.71E-01	1.04E-03	1.33E-03	1.64E-06	2.37E-03
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	2.50E+00	3.50E-01	8.90E-05	2.71E-03	0.00E+00	2.80E-03
VOCs								
Acetone	8.60E-01	9.30E-03	5.33E+01	4.58E+01	5.47E-04	3.55E-01	4.12E-04	3.56E-01
Toluene	1.00E-02	0.00E+00	1.32E+00	1.32E-02	6.36E-06	1.02E-04	0.00E+00	1.08E-04

Table A-36
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Herbivorous Birds (Canada Goose) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	6.36E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.75E-03	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.43E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	8.91E+03	6.89E+00	4.00E-03	3.57E+01	5.66E+00	2.76E-01	3.05E-01	6.25E+00
Barium	5.72E+01	1.19E-01	1.50E-01	8.58E+00	3.64E-02	6.65E-02	5.27E-03	1.08E-01
Beryllium	5.60E-01	0.00E+00	1.00E-02	5.60E-03	3.56E-04	4.34E-05	0.00E+00	3.99E-04
Cadmium	NO COPC	2.50E-02	ln(dry plant conc, mg/kg) = (-0.476+0.546*ln(soil conc))	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03
Chromium, hexavalent	4.80E+00	0.00E+00	7.50E-03	3.60E-02	3.05E-03	2.79E-04	0.00E+00	3.33E-03
Copper	6.66E+00	2.69E-02	ln(dry plant conc, mg/kg) = (0.669+0.394*ln(soil conc))	4.12E+00	4.23E-03	3.19E-02	1.19E-03	3.74E-02
Lead	1.09E+02	7.00E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.68E+00	6.92E-02	2.85E-02	3.10E-03	1.01E-01
Manganese	2.62E+02	2.45E-01	2.50E-01	6.55E+01	1.67E-01	5.08E-01	1.08E-02	6.85E-01
Vanadium	1.29E+01	2.91E-02	5.50E-03	7.10E-02	8.20E-03	5.50E-04	1.29E-03	1.00E-02
PAHs								
Total LMW PAHs	2.88E-01	0.00E+00	1.04E-01	3.01E-02	1.83E-04	2.33E-04	0.00E+00	4.16E-04
Total HMW PAHs	2.73E-01	3.70E-05	1.04E-01	2.85E-02	1.73E-04	2.21E-04	1.64E-06	3.96E-04
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	2.50E+00	3.50E-01	8.90E-05	2.71E-03	0.00E+00	2.80E-03
VOCs								
Acetone	2.48E-01	4.56E-03	5.33E+01	1.32E+01	1.58E-04	1.03E-01	2.02E-04	1.03E-01
Toluene	2.82E-03	0.00E+00	1.32E+00	3.72E-03	1.79E-06	2.88E-05	0.00E+00	3.06E-05

Table A-37
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Birds (Great Blue Heron) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.50E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.69E+04	1.91E+01	1.08E+01	2.06E+02	1.52E+01	9.28E+00	8.60E-01	2.54E+01
Barium	1.12E+02	2.36E-01	1.60E+01	3.78E+00	1.01E-01	1.70E-01	1.06E-02	2.81E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	5.04E-04	0.00E+00	0.00E+00	5.04E-04
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	2.66E-01	1.13E-03	2.67E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	4.32E-03	0.00E+00	0.00E+00	4.32E-03
Copper	1.25E+01	2.69E-02	1.86E+03	4.99E+01	1.13E-02	2.25E+00	1.21E-03	2.26E+00
Lead	2.24E+02	1.81E-01	4.50E+01	8.15E+00	2.02E-01	3.67E-01	8.15E-03	5.76E-01
Manganese	5.00E+02	4.13E-01	1.60E+03	6.61E+02	4.50E-01	2.97E+01	1.86E-02	3.02E+01
Vanadium	2.34E+01	2.91E-02	1.00E+00	2.91E-02	2.11E-02	1.31E-03	1.31E-03	2.37E-02
PAHs								
Total LMW PAHs	8.60E-01	0.00E+00	1.43E+04	0.00E+00	7.74E-04	0.00E+00	0.00E+00	7.74E-04
Total HMW PAHs	1.64E+00	3.70E-05	1.43E+04	5.29E-01	1.48E-03	2.38E-02	1.67E-06	2.53E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	1.26E-04	0.00E+00	0.00E+00	1.26E-04
VOCs								
Acetone	8.60E-01	9.30E-03	1.26E+01	1.18E-01	7.74E-04	5.29E-03	4.19E-04	6.48E-03
Toluene	1.00E-02	0.00E+00	1.18E+02	0.00E+00	9.00E-06	0.00E+00	0.00E+00	9.00E-06

Table A-38
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Birds (Great Blue Heron) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.50E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	8.91E+03	6.89E+00	1.08E+01	7.44E+01	8.02E+00	3.35E+00	3.10E-01	1.17E+01
Barium	5.72E+01	1.19E-01	1.60E+01	1.90E+00	5.15E-02	8.57E-02	5.36E-03	1.43E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	5.04E-04	0.00E+00	0.00E+00	5.04E-04
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	2.66E-01	1.13E-03	2.67E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	4.32E-03	0.00E+00	0.00E+00	4.32E-03
Copper	6.66E+00	2.69E-02	1.86E+03	4.99E+01	5.99E-03	2.25E+00	1.21E-03	2.25E+00
Lead	1.09E+02	7.00E-02	4.50E+01	3.15E+00	9.80E-02	1.42E-01	3.15E-03	2.43E-01
Manganese	2.62E+02	2.45E-01	1.60E+03	3.92E+02	2.36E-01	1.76E+01	1.10E-02	1.79E+01
Vanadium	1.29E+01	2.91E-02	1.00E+00	2.91E-02	1.16E-02	1.31E-03	1.31E-03	1.42E-02
PAHs								
Total LMW PAHs	2.88E-01	0.00E+00	1.43E+04	0.00E+00	2.59E-04	0.00E+00	0.00E+00	2.59E-04
Total HMW PAHs	2.73E-01	3.70E-05	1.43E+04	5.29E-01	2.46E-04	2.38E-02	1.67E-06	2.41E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	1.26E-04	0.00E+00	0.00E+00	1.26E-04
VOCs								
Acetone	2.48E-01	4.56E-03	1.26E+01	5.76E-02	2.24E-04	2.59E-03	2.05E-04	3.02E-03
Toluene	2.82E-03	0.00E+00	1.18E+02	0.00E+00	2.54E-06	0.00E+00	0.00E+00	2.54E-06

Table A-39
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Birds (Green Heron) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.92E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	9.58E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	9.45E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.69E+04	1.91E+01	1.08E+01	2.06E+02	3.24E+01	1.98E+01	1.80E+00	5.39E+01
Barium	1.12E+02	2.36E-01	1.60E+01	3.78E+00	2.15E-01	3.62E-01	2.23E-02	5.98E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	1.07E-03	0.00E+00	0.00E+00	1.07E-03
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	5.65E-01	2.36E-03	5.67E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	9.19E-03	0.00E+00	0.00E+00	9.19E-03
Copper	1.25E+01	2.69E-02	1.86E+03	4.99E+01	2.39E-02	4.78E+00	2.54E-03	4.81E+00
Lead	2.24E+02	1.81E-01	4.50E+01	8.15E+00	4.29E-01	7.80E-01	1.71E-02	1.23E+00
Manganese	5.00E+02	4.13E-01	1.60E+03	6.61E+02	9.58E-01	6.33E+01	3.90E-02	6.43E+01
Vanadium	2.34E+01	2.91E-02	1.00E+00	2.91E-02	4.48E-02	2.79E-03	2.75E-03	5.04E-02
PAHs								
Total LMW PAHs	8.60E-01	0.00E+00	1.43E+04	0.00E+00	1.65E-03	0.00E+00	0.00E+00	1.65E-03
Total HMW PAHs	1.64E+00	3.70E-05	1.43E+04	5.29E-01	3.14E-03	5.07E-02	3.50E-06	5.38E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	2.68E-04	0.00E+00	0.00E+00	2.68E-04
VOCs								
Acetone	8.60E-01	9.30E-03	1.26E+01	1.18E-01	1.65E-03	1.13E-02	8.79E-04	1.38E-02
Toluene	1.00E-02	0.00E+00	1.18E+02	0.00E+00	1.92E-05	0.00E+00	0.00E+00	1.92E-05

Table A-40
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Birds (Green Heron) from Media for Aquatic Receptors in Ponds

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.92E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	9.58E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	9.45E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	8.91E+03	6.89E+00	1.08E+01	7.44E+01	1.71E+01	7.13E+00	6.51E-01	2.49E+01
Barium	5.72E+01	1.19E-01	1.60E+01	1.90E+00	1.10E-01	1.82E-01	1.12E-02	3.03E-01
Beryllium	5.60E-01	0.00E+00	2.48E+02	0.00E+00	1.07E-03	0.00E+00	0.00E+00	1.07E-03
Cadmium	NO COPC	2.50E-02	2.36E+02	5.90E+00	0.00E+00	5.65E-01	2.36E-03	5.67E-01
Chromium, hexavalent	4.80E+00	0.00E+00	8.00E+02	0.00E+00	9.19E-03	0.00E+00	0.00E+00	9.19E-03
Copper	6.66E+00	2.69E-02	1.86E+03	4.99E+01	1.28E-02	4.78E+00	2.54E-03	4.80E+00
Lead	1.09E+02	7.00E-02	4.50E+01	3.15E+00	2.09E-01	3.02E-01	6.61E-03	5.17E-01
Manganese	2.62E+02	2.45E-01	1.60E+03	3.92E+02	5.02E-01	3.75E+01	2.31E-02	3.81E+01
Vanadium	1.29E+01	2.91E-02	1.00E+00	2.91E-02	2.47E-02	2.79E-03	2.75E-03	3.02E-02
PAHs								
Total LMW PAHs	2.88E-01	0.00E+00	1.43E+04	0.00E+00	5.52E-04	0.00E+00	0.00E+00	5.52E-04
Total HMW PAHs	2.73E-01	3.70E-05	1.43E+04	5.29E-01	5.23E-04	5.07E-02	3.50E-06	5.12E-02
SVOCs								
4-methylphenol	1.40E-01	0.00E+00	3.54E+01	0.00E+00	2.68E-04	0.00E+00	0.00E+00	2.68E-04
VOCs								
Acetone	2.48E-01	4.56E-03	1.26E+01	5.76E-02	4.76E-04	5.52E-03	4.31E-04	6.43E-03
Toluene	2.82E-03	0.00E+00	1.18E+02	0.00E+00	5.41E-06	0.00E+00	0.00E+00	5.41E-06

Table A-41
Wildlife Exposure Modeling of Maximum Doses to Aquatic Herbivorous Mammals (Muskrat) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.50E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.41E+04	9.48E-01	4.00E-03	5.64E+01	2.12E+01	4.23E+00	2.84E-01	2.57E+01
Barium	1.47E+02	2.24E-01	1.50E-01	2.21E+01	2.21E-01	1.65E+00	6.72E-02	1.94E+00
Beryllium	2.60E-01	0.00E+00	1.00E-02	2.60E-03	3.90E-04	1.95E-04	0.00E+00	5.85E-04
Chromium, hexavalent	3.80E+00	3.42E-04	7.50E-03	2.85E-02	5.70E-03	2.14E-03	1.03E-04	7.94E-03
Lead	9.17E+01	1.91E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.34E+00	1.38E-01	2.51E-01	5.73E-03	3.94E-01
Manganese	1.02E+03	1.08E+00	2.50E-01	2.55E+02	1.53E+00	1.91E+01	3.24E-01	2.10E+01
Vanadium	3.08E+01	2.40E-03	5.50E-03	1.69E-01	4.62E-02	1.27E-02	7.20E-04	5.96E-02
Zinc	1.34E+02	8.59E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	7.32E+01	2.01E-01	5.49E+00	2.58E-02	5.72E+00
PAHs								
Benzo(a)Pyrene	1.20E+00	0.00E+00	1.14E-02	1.37E-02	1.80E-03	1.02E-03	0.00E+00	2.82E-03
Total LMW PAHs	9.75E+00	2.10E-03	1.04E-01	1.02E+00	1.46E-02	7.63E-02	6.30E-04	9.16E-02
Total HMW PAHs	8.93E+00	1.10E-03	1.04E-01	9.32E-01	1.34E-02	6.99E-02	3.30E-04	8.36E-02
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	2.50E+00	6.99E-01	4.20E-04	5.24E-02	0.00E+00	5.28E-02
Acetophenone	3.70E-02	0.00E+00	4.20E+00	1.55E-01	5.55E-05	1.16E-02	0.00E+00	1.17E-02
Carbazole	2.10E-01	0.00E+00	5.26E-01	1.10E-01	3.15E-04	8.29E-03	0.00E+00	8.60E-03
VOCs								
Cyclohexane	8.00E-01	0.00E+00	5.62E-01	4.50E-01	1.20E-03	3.37E-02	0.00E+00	3.49E-02
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	3.93E-01	2.55E-01	9.75E-04	1.91E-02	0.00E+00	2.01E-02
Methylcyclohexane	4.40E+00	0.00E+00	3.26E-01	1.43E+00	6.60E-03	1.08E-01	0.00E+00	1.14E-01
Trichlorofluoromethane	9.50E-04	0.00E+00	2.27E+00	2.16E-03	1.43E-06	1.62E-04	0.00E+00	1.63E-04
Xylenes (m & p)	7.70E-01	0.00E+00	6.34E-01	4.88E-01	1.16E-03	3.66E-02	0.00E+00	3.78E-02
Xylenes (o)	7.00E-01	0.00E+00	6.34E-01	4.44E-01	1.05E-03	3.33E-02	0.00E+00	3.43E-02
Xylenes (Total)	7.70E-01	0.00E+00	5.85E-01	4.51E-01	1.16E-03	3.38E-02	0.00E+00	3.49E-02

Table A-42
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Herbivorous Mammals (Muskrat) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.50E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	3.00E-01	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	6.41E+03	3.76E-01	4.00E-03	2.56E+01	9.61E+00	1.92E+00	1.13E-01	1.16E+01
Barium	6.43E+01	1.53E-01	1.50E-01	9.65E+00	9.65E-02	7.23E-01	4.59E-02	8.66E-01
Beryllium	2.60E-01	0.00E+00	1.00E-02	2.60E-03	3.90E-04	1.95E-04	0.00E+00	5.85E-04
Chromium, hexavalent	3.80E+00	3.42E-04	7.50E-03	2.85E-02	5.70E-03	2.14E-03	1.03E-04	7.94E-03
Lead	4.27E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.18E+00	6.41E-02	1.63E-01	1.02E-03	2.29E-01
Manganese	3.89E+02	4.09E-01	2.50E-01	9.73E+01	5.84E-01	7.30E+00	1.23E-01	8.01E+00
Vanadium	1.57E+01	2.40E-03	5.50E-03	8.66E-02	2.36E-02	6.49E-03	7.20E-04	3.08E-02
Zinc	5.51E+01	1.64E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	4.47E+01	8.27E-02	3.35E+00	4.91E-03	3.44E+00
PAHs								
Benzo(a)Pyrene	3.91E-01	0.00E+00	1.14E-02	4.45E-03	5.87E-04	3.34E-04	0.00E+00	9.21E-04
Total LMW PAHs	4.12E+00	2.10E-03	1.04E-01	4.30E-01	6.18E-03	3.23E-02	6.30E-04	3.91E-02
Total HMW PAHs	3.09E+00	1.10E-03	1.04E-01	3.23E-01	4.64E-03	2.42E-02	3.30E-04	2.92E-02
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	2.50E+00	6.99E-01	4.20E-04	5.24E-02	0.00E+00	5.28E-02
Acetophenone	3.70E-02	0.00E+00	4.20E+00	1.55E-01	5.55E-05	1.16E-02	0.00E+00	1.17E-02
Carbazole	2.10E-01	0.00E+00	5.26E-01	1.10E-01	3.15E-04	8.29E-03	0.00E+00	8.60E-03
VOCs								
Cyclohexane	8.00E-01	0.00E+00	5.62E-01	4.50E-01	1.20E-03	3.37E-02	0.00E+00	3.49E-02
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	3.93E-01	2.55E-01	9.75E-04	1.91E-02	0.00E+00	2.01E-02
Methylcyclohexane	4.40E+00	0.00E+00	3.26E-01	1.43E+00	6.60E-03	1.08E-01	0.00E+00	1.14E-01
Trichlorofluoromethane	9.50E-03	0.00E+00	2.27E+00	2.16E-02	1.43E-05	1.62E-03	0.00E+00	1.63E-03
Xylenes (m & p)	7.70E-01	0.00E+00	6.34E-01	4.88E-01	1.16E-03	3.66E-02	0.00E+00	3.78E-02
Xylenes (o)	7.00E-01	0.00E+00	6.34E-01	4.44E-01	1.05E-03	3.33E-02	0.00E+00	3.43E-02
Xylenes (Total)	7.70E-01	0.00E+00	5.85E-01	4.51E-01	1.16E-03	3.38E-02	0.00E+00	3.49E-02

Table A-43
Wildlife Exposure Modeling of Maximum Doses to Aquatic Insectivorous Mammals (Raccoon) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	4.51E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.25E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Benthos) Uptake			Maximum Case Scenario Doses			
			BSAF/Uptake Factor		Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Aluminum	1.41E+04	9.48E-01	1.00E+00	Uptake Factor	1.41E+04	6.36E+01	6.77E+02	7.82E-02	7.40E+02
Barium	1.47E+02	2.24E-01	1.00E+00	Uptake Factor	1.47E+02	6.63E-01	7.06E+00	1.85E-02	7.74E+00
Beryllium	2.60E-01	0.00E+00	1.00E+00	Uptake Factor	2.60E-01	1.17E-03	1.25E-02	0.00E+00	1.37E-02
Chromium, hexavalent	3.80E+00	3.42E-04	4.68E-01	Uptake Factor	1.78E+00	1.71E-02	8.54E-02	2.82E-05	1.03E-01
Lead	9.17E+01	1.91E-02	6.60E-02	Uptake Factor	6.05E+00	4.14E-01	2.91E-01	1.58E-03	7.06E-01
Manganese	1.02E+03	1.08E+00	1.00E+00	Uptake Factor	1.02E+03	4.60E+00	4.90E+01	8.91E-02	5.37E+01
Vanadium	3.08E+01	2.40E-03	1.00E+00	Uptake Factor	3.08E+01	1.39E-01	1.48E+00	1.98E-04	1.62E+00
Zinc	1.34E+02	8.59E-02	4.76E+00	Uptake Factor	6.38E+02	6.05E-01	3.06E+01	7.09E-03	3.12E+01
PAHs									
Benzo(a)Pyrene	1.20E+00	0.00E+00	3.37E-03	BSAF	4.85E-02	5.41E-03	2.33E-03	0.00E+00	7.74E-03
Total LMW PAHs	9.75E+00	2.10E-03	6.19E-02	BSAF	7.24E+00	4.40E-02	3.47E-01	1.73E-04	3.92E-01
Total HMW PAHs	8.93E+00	1.10E-03	1.78E-02	BSAF	1.90E+00	4.03E-02	9.14E-02	9.08E-05	1.32E-01
SVOCs									
4-methylphenol	2.80E-01	0.00E+00	4.00E+00	BSAF	1.34E+01	1.26E-03	6.45E-01	0.00E+00	6.46E-01
Acetophenone	3.70E-02	0.00E+00	4.00E+00	BSAF	1.78E+00	1.67E-04	8.52E-02	0.00E+00	8.54E-02
Carbazole	2.10E-01	0.00E+00	4.00E+00	BSAF	1.01E+01	9.48E-04	4.84E-01	0.00E+00	4.85E-01
VOCs									
Cyclohexane	8.00E-01	0.00E+00	4.00E+00	BSAF	3.84E+01	3.61E-03	1.84E+00	0.00E+00	1.85E+00
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.00E+00	BSAF	3.12E+01	2.93E-03	1.50E+00	0.00E+00	1.50E+00
Methyl acetate	NO COPC	NO COPC	4.00E+00	BSAF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	4.40E+00	0.00E+00	4.00E+00	BSAF	2.11E+02	1.99E-02	1.01E+01	0.00E+00	1.02E+01
Trichlorofluoromethane	9.50E-04	0.00E+00	4.00E+00	BSAF	4.56E-02	4.29E-06	2.19E-03	0.00E+00	2.19E-03
Xylenes (m & p)	7.70E-01	0.00E+00	4.00E+00	BSAF	3.70E+01	3.47E-03	1.77E+00	0.00E+00	1.78E+00
Xylenes (o)	7.00E-01	0.00E+00	4.00E+00	BSAF	3.36E+01	3.16E-03	1.61E+00	0.00E+00	1.62E+00
Xylenes (Total)	7.70E-01	0.00E+00	4.00E+00	BSAF	3.70E+01	3.47E-03	1.77E+00	0.00E+00	1.78E+00

Table A-44
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Insectivorous Mammals (Raccoon) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	4.51E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.25E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake			95UCLM Case Scenario Doses			
			BSAF/Uptake Factor		95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals									
Aluminum	6.41E+03	3.76E-01	1.00E+00	Uptake Factor	6.41E+03	2.89E+01	3.08E+02	3.10E-02	3.37E+02
Barium	6.43E+01	1.53E-01	1.00E+00	Uptake Factor	6.43E+01	2.90E-01	3.09E+00	1.26E-02	3.39E+00
Beryllium	2.60E-01	0.00E+00	1.00E+00	Uptake Factor	2.60E-01	1.17E-03	1.25E-02	0.00E+00	1.37E-02
Chromium, hexavalent	3.80E+00	3.42E-04	4.68E-01	Uptake Factor	1.78E+00	1.71E-02	8.54E-02	2.82E-05	1.03E-01
Lead	4.27E+01	3.40E-03	6.60E-02	Uptake Factor	2.82E+00	1.93E-01	1.35E-01	2.81E-04	3.29E-01
Manganese	3.89E+02	4.09E-01	1.00E+00	Uptake Factor	3.89E+02	1.76E+00	1.87E+01	3.37E-02	2.05E+01
Vanadium	1.57E+01	2.40E-03	1.00E+00	Uptake Factor	1.57E+01	7.10E-02	7.56E-01	1.98E-04	8.27E-01
Zinc	5.51E+01	1.64E-02	4.76E+00	Uptake Factor	2.62E+02	2.49E-01	1.26E+01	1.35E-03	1.28E+01
PAHs									
Benzo(a)Pyrene	3.91E-01	0.00E+00	3.37E-03	BSAF	1.58E-02	1.76E-03	7.58E-04	0.00E+00	2.52E-03
Total LMW PAHs	4.12E+00	2.10E-03	6.19E-02	BSAF	3.06E+00	1.86E-02	1.47E-01	1.73E-04	1.66E-01
Total HMW PAHs	3.09E+00	1.10E-03	1.78E-02	BSAF	6.59E-01	1.39E-02	3.16E-02	9.08E-05	4.57E-02
SVOCs									
4-methylphenol	2.80E-01	0.00E+00	4.00E+00	BSAF	1.34E+01	1.26E-03	6.45E-01	0.00E+00	6.46E-01
Acetophenone	3.70E-02	0.00E+00	4.00E+00	BSAF	1.78E+00	1.67E-04	8.52E-02	0.00E+00	8.54E-02
Carbazole	2.10E-01	0.00E+00	4.00E+00	BSAF	1.01E+01	9.48E-04	4.84E-01	0.00E+00	4.85E-01
VOCs									
Cyclohexane	8.00E-01	0.00E+00	4.00E+00	BSAF	3.84E+01	3.61E-03	1.84E+00	0.00E+00	1.85E+00
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.00E+00	BSAF	3.12E+01	2.93E-03	1.50E+00	0.00E+00	1.50E+00
Methyl acetate	NO COPC	NO COPC	4.00E+00	BSAF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	4.40E+00	0.00E+00	4.00E+00	BSAF	2.11E+02	1.99E-02	1.01E+01	0.00E+00	1.02E+01
Trichlorofluoromethane	9.50E-03	0.00E+00	4.00E+00	BSAF	4.56E-01	4.29E-05	2.19E-02	0.00E+00	2.19E-02
Xylenes (m & p)	7.70E-01	0.00E+00	4.00E+00	BSAF	3.70E+01	3.47E-03	1.77E+00	0.00E+00	1.78E+00
Xylenes (o)	7.00E-01	0.00E+00	4.00E+00	BSAF	3.36E+01	3.16E-03	1.61E+00	0.00E+00	1.62E+00
Xylenes (Total)	7.70E-01	0.00E+00	4.00E+00	BSAF	3.70E+01	3.47E-03	1.77E+00	0.00E+00	1.78E+00

Table A-45
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Mammals (River Otter) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.41E+04	9.48E-01	1.08E+01	1.02E+01	0.00E+00	4.91E-01	7.68E-02	5.68E-01
Barium	1.47E+02	2.24E-01	1.60E+01	3.58E+00	0.00E+00	1.72E-01	1.81E-02	1.90E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	0.00E+00	1.31E-02	2.77E-05	1.32E-02
Lead	9.17E+01	1.91E-02	4.50E+01	8.60E-01	0.00E+00	4.13E-02	1.55E-03	4.28E-02
Manganese	1.02E+03	1.08E+00	1.60E+03	1.73E+03	0.00E+00	8.29E+01	8.75E-02	8.30E+01
Vanadium	3.08E+01	2.40E-03	1.00E+00	2.40E-03	0.00E+00	1.15E-04	1.94E-04	3.10E-04
Zinc	1.34E+02	8.59E-02	2.52E+02	2.16E+01	0.00E+00	1.04E+00	6.96E-03	1.05E+00
PAHs								
Benzo(a)Pyrene	1.20E+00	0.00E+00	2.06E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total LMW PAHs	9.75E+00	2.10E-03	1.43E+04	3.00E+01	0.00E+00	1.44E+00	1.70E-04	1.44E+00
Total HMW PAHs	8.93E+00	1.10E-03	1.43E+04	1.57E+01	0.00E+00	7.55E-01	8.91E-05	7.55E-01
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichlorofluoromethane	9.50E-04	0.00E+00	8.68E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-46
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Mammals (River Otter) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	0.00E+00	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.80E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/kg dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	6.41E+03	3.76E-01	1.08E+01	4.06E+00	0.00E+00	1.95E-01	3.05E-02	2.25E-01
Barium	6.43E+01	1.53E-01	1.60E+01	2.45E+00	0.00E+00	1.18E-01	1.24E-02	1.30E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	0.00E+00	1.31E-02	2.77E-05	1.32E-02
Lead	4.27E+01	3.40E-03	4.50E+01	1.53E-01	0.00E+00	7.34E-03	2.75E-04	7.62E-03
Manganese	3.89E+02	4.09E-01	1.60E+03	6.54E+02	0.00E+00	3.14E+01	3.31E-02	3.14E+01
Vanadium	1.57E+01	2.40E-03	1.00E+00	2.40E-03	0.00E+00	1.15E-04	1.94E-04	3.10E-04
Zinc	5.51E+01	1.64E-02	2.52E+02	4.12E+00	0.00E+00	1.98E-01	1.32E-03	1.99E-01
PAHs								
Benzo(a)Pyrene	3.91E-01	0.00E+00	2.06E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total LMW PAHs	4.12E+00	2.10E-03	1.43E+04	3.00E+01	0.00E+00	1.44E+00	1.70E-04	1.44E+00
Total HMW PAHs	3.09E+00	1.10E-03	1.43E+04	1.57E+01	0.00E+00	7.55E-01	8.91E-05	7.55E-01
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichlorofluoromethane	9.50E-03	0.00E+00	8.68E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-47
Wildlife Exposure Modeling of Maximum Doses to Aquatic Herbivorous Birds (Canada Goose) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	6.36E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.75E-03	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.43E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Plant) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.41E+04	9.48E-01	4.00E-03	5.64E+01	8.96E+00	4.37E-01	4.19E-02	9.44E+00
Barium	1.47E+02	2.24E-01	1.50E-01	2.21E+01	9.34E-02	1.71E-01	9.91E-03	2.74E-01
Beryllium	2.60E-01	0.00E+00	1.00E-02	2.60E-03	1.65E-04	2.02E-05	0.00E+00	1.85E-04
Chromium, hexavalent	3.80E+00	3.42E-04	7.50E-03	2.85E-02	2.41E-03	2.21E-04	1.51E-05	2.65E-03
Lead	9.17E+01	1.91E-02	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	3.34E+00	5.83E-02	2.59E-02	8.45E-04	8.50E-02
Manganese	1.02E+03	1.08E+00	2.50E-01	2.55E+02	6.48E-01	1.98E+00	4.78E-02	2.67E+00
Vanadium	3.08E+01	2.40E-03	5.50E-03	1.69E-01	1.96E-02	1.31E-03	1.06E-04	2.10E-02
Zinc	1.34E+02	8.59E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	7.32E+01	8.52E-02	5.67E-01	3.80E-03	6.56E-01
PAHs								
Total LMW PAHs	9.75E+00	2.10E-03	1.04E-01	1.02E+00	6.19E-03	7.89E-03	9.29E-05	1.42E-02
Total HMW PAHs	8.93E+00	1.10E-03	1.04E-01	9.32E-01	5.68E-03	7.23E-03	4.87E-05	1.29E-02
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	2.50E+00	6.99E-01	1.78E-04	5.42E-03	0.00E+00	5.60E-03
Acetophenone	3.70E-02	0.00E+00	4.20E+00	1.55E-01	2.35E-05	1.20E-03	0.00E+00	1.23E-03
Carbazole	2.10E-01	0.00E+00	5.26E-01	1.10E-01	1.33E-04	8.56E-04	0.00E+00	9.90E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	5.62E-01	4.50E-01	5.08E-04	3.49E-03	0.00E+00	3.99E-03
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	3.93E-01	2.55E-01	4.13E-04	1.98E-03	0.00E+00	2.39E-03
Methylcyclohexane	4.40E+00	0.00E+00	3.26E-01	1.43E+00	2.80E-03	1.11E-02	0.00E+00	1.39E-02
Trichlorofluoromethane	9.50E-04	0.00E+00	2.27E+00	2.16E-03	6.04E-07	1.67E-05	0.00E+00	1.73E-05
Xylenes (m & p)	7.70E-01	0.00E+00	6.34E-01	4.88E-01	4.89E-04	3.78E-03	0.00E+00	4.27E-03
Xylenes (o)	7.00E-01	0.00E+00	6.34E-01	4.44E-01	4.45E-04	3.44E-03	0.00E+00	3.88E-03
Xylenes (Total)	7.70E-01	0.00E+00	5.85E-01	4.51E-01	4.89E-04	3.49E-03	0.00E+00	3.98E-03

Table A-48
Wildlife Exposure Modeling of 95UCLM Doses to Aquatic Herbivorous Birds (Canada Goose) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	6.36E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	7.75E-03	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.43E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Plant) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	6.41E+03	3.76E-01	4.00E-03	2.56E+01	4.07E+00	1.99E-01	1.66E-02	4.29E+00
Barium	6.43E+01	1.53E-01	1.50E-01	9.65E+00	4.09E-02	7.47E-02	6.77E-03	1.22E-01
Beryllium	2.60E-01	0.00E+00	1.00E-02	2.60E-03	1.65E-04	2.02E-05	0.00E+00	1.85E-04
Chromium, hexavalent	3.80E+00	3.42E-04	7.50E-03	2.85E-02	2.41E-03	2.21E-04	1.51E-05	2.65E-03
Lead	4.27E+01	3.40E-03	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.18E+00	2.72E-02	1.69E-02	1.50E-04	4.42E-02
Manganese	3.89E+02	4.09E-01	2.50E-01	9.73E+01	2.47E-01	7.54E-01	1.81E-02	1.02E+00
Vanadium	1.57E+01	2.40E-03	5.50E-03	8.66E-02	1.00E-02	6.71E-04	1.06E-04	1.08E-02
Zinc	5.51E+01	1.64E-02	ln(dry plant conc, mg/kg) = (1.575+0.555*ln(soil conc))	4.47E+01	3.50E-02	3.47E-01	7.23E-04	3.82E-01
PAHs								
Total LMW PAHs	4.12E+00	2.10E-03	1.04E-01	4.30E-01	2.62E-03	3.34E-03	9.29E-05	6.05E-03
Total HMW PAHs	3.09E+00	1.10E-03	1.04E-01	3.23E-01	1.96E-03	2.50E-03	4.87E-05	4.51E-03
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	2.50E+00	6.99E-01	1.78E-04	5.42E-03	0.00E+00	5.60E-03
Acetophenone	3.70E-02	0.00E+00	4.20E+00	1.55E-01	2.35E-05	1.20E-03	0.00E+00	1.23E-03
Carbazole	2.10E-01	0.00E+00	5.26E-01	1.10E-01	1.33E-04	8.56E-04	0.00E+00	9.90E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	5.62E-01	4.50E-01	5.08E-04	3.49E-03	0.00E+00	3.99E-03
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	3.93E-01	2.55E-01	4.13E-04	1.98E-03	0.00E+00	2.39E-03
Methylcyclohexane	4.40E+00	0.00E+00	3.26E-01	1.43E+00	2.80E-03	1.11E-02	0.00E+00	1.39E-02
Trichlorofluoromethane	9.50E-03	0.00E+00	2.27E+00	2.16E-02	6.04E-06	1.67E-04	0.00E+00	1.73E-04
Xylenes (m & p)	7.70E-01	0.00E+00	6.34E-01	4.88E-01	4.89E-04	3.78E-03	0.00E+00	4.27E-03
Xylenes (o)	7.00E-01	0.00E+00	6.34E-01	4.44E-01	4.45E-04	3.44E-03	0.00E+00	3.88E-03
Xylenes (Total)	7.70E-01	0.00E+00	5.85E-01	4.51E-01	4.89E-04	3.49E-03	0.00E+00	3.98E-03

Table A-49
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Birds (Great Blue Heron) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.50E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.41E+04	9.48E-01	1.08E+01	1.02E+01	1.27E+01	4.61E-01	4.27E-02	1.32E+01
Barium	1.47E+02	2.24E-01	1.60E+01	3.58E+00	1.32E-01	1.61E-01	1.01E-02	3.04E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	2.34E-04	0.00E+00	0.00E+00	2.34E-04
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	3.42E-03	1.23E-02	1.54E-05	1.57E-02
Lead	9.17E+01	1.91E-02	4.50E+01	8.60E-01	8.25E-02	3.87E-02	8.60E-04	1.22E-01
Manganese	1.02E+03	1.08E+00	1.60E+03	1.73E+03	9.18E-01	7.78E+01	4.86E-02	7.87E+01
Vanadium	3.08E+01	2.40E-03	1.00E+00	2.40E-03	2.77E-02	1.08E-04	1.08E-04	2.79E-02
Zinc	1.34E+02	8.59E-02	2.52E+02	2.16E+01	1.21E-01	9.74E-01	3.87E-03	1.10E+00
PAHs								
Total LMW PAHs	9.75E+00	2.10E-03	1.43E+04	3.00E+01	8.77E-03	1.35E+00	9.45E-05	1.36E+00
Total HMW PAHs	8.93E+00	1.10E-03	1.43E+04	1.57E+01	8.04E-03	7.08E-01	4.95E-05	7.16E-01
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	2.52E-04	0.00E+00	0.00E+00	2.52E-04
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	3.33E-05	0.00E+00	0.00E+00	3.33E-05
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	1.89E-04	0.00E+00	0.00E+00	1.89E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	7.20E-04	0.00E+00	0.00E+00	7.20E-04
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	5.85E-04	0.00E+00	0.00E+00	5.85E-04
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	3.96E-03	0.00E+00	0.00E+00	3.96E-03
Trichlorofluoromethane	9.50E-04	0.00E+00	8.68E+01	0.00E+00	8.55E-07	0.00E+00	0.00E+00	8.55E-07
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	6.93E-04	0.00E+00	0.00E+00	6.93E-04
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	6.30E-04	0.00E+00	0.00E+00	6.30E-04
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	6.93E-04	0.00E+00	0.00E+00	6.93E-04

Table A-50
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Birds (Great Blue Heron) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	4.50E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	4.50E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	6.41E+03	3.76E-01	1.08E+01	4.06E+00	5.77E+00	1.83E-01	1.69E-02	5.97E+00
Barium	6.43E+01	1.53E-01	1.60E+01	2.45E+00	5.79E-02	1.10E-01	6.89E-03	1.75E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	2.34E-04	0.00E+00	0.00E+00	2.34E-04
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	3.42E-03	1.23E-02	1.54E-05	1.57E-02
Lead	4.27E+01	3.40E-03	4.50E+01	1.53E-01	3.85E-02	6.89E-03	1.53E-04	4.55E-02
Manganese	3.89E+02	4.09E-01	1.60E+03	6.54E+02	3.50E-01	2.94E+01	1.84E-02	2.98E+01
Vanadium	1.57E+01	2.40E-03	1.00E+00	2.40E-03	1.42E-02	1.08E-04	1.08E-04	1.44E-02
Zinc	5.51E+01	1.64E-02	2.52E+02	4.12E+00	4.96E-02	1.85E-01	7.36E-04	2.36E-01
PAHs								
Total LMW PAHs	4.12E+00	2.10E-03	1.43E+04	3.00E+01	3.71E-03	1.35E+00	9.45E-05	1.36E+00
Total HMW PAHs	3.09E+00	1.10E-03	1.43E+04	1.57E+01	2.78E-03	7.08E-01	4.95E-05	7.11E-01
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	2.52E-04	0.00E+00	0.00E+00	2.52E-04
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	3.33E-05	0.00E+00	0.00E+00	3.33E-05
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	1.89E-04	0.00E+00	0.00E+00	1.89E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	7.20E-04	0.00E+00	0.00E+00	7.20E-04
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	5.85E-04	0.00E+00	0.00E+00	5.85E-04
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	3.96E-03	0.00E+00	0.00E+00	3.96E-03
Trichlorofluoromethane	9.50E-03	0.00E+00	8.68E+01	0.00E+00	8.55E-06	0.00E+00	0.00E+00	8.55E-06
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	6.93E-04	0.00E+00	0.00E+00	6.93E-04
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	6.30E-04	0.00E+00	0.00E+00	6.30E-04
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	6.93E-04	0.00E+00	0.00E+00	6.93E-04

Table A-51
Wildlife Exposure Modeling of Maximum Doses to Piscivorous Birds (Green Heron) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.92E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	9.58E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	9.45E-02	L/kg-day

Chemical	Maximum Sediment Concentration (mg/kg dry wt.)	Maximum Water Concentration (mg/L)	Food Item (Fish) Uptake		Maximum Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	Maximum Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	1.41E+04	9.48E-01	1.08E+01	1.02E+01	2.70E+01	9.81E-01	8.96E-02	2.81E+01
Barium	1.47E+02	2.24E-01	1.60E+01	3.58E+00	2.82E-01	3.43E-01	2.12E-02	6.46E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	4.98E-04	0.00E+00	0.00E+00	4.98E-04
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	7.28E-03	2.62E-02	3.23E-05	3.35E-02
Lead	9.17E+01	1.91E-02	4.50E+01	8.60E-01	1.76E-01	8.23E-02	1.80E-03	2.60E-01
Manganese	1.02E+03	1.08E+00	1.60E+03	1.73E+03	1.95E+00	1.65E+02	1.02E-01	1.68E+02
Vanadium	3.08E+01	2.40E-03	1.00E+00	2.40E-03	5.90E-02	2.30E-04	2.27E-04	5.95E-02
Zinc	1.34E+02	8.59E-02	2.52E+02	2.16E+01	2.57E-01	2.07E+00	8.12E-03	2.34E+00
PAHs								
Total LMW PAHs	9.75E+00	2.10E-03	1.43E+04	3.00E+01	1.87E-02	2.88E+00	1.98E-04	2.90E+00
Total HMW PAHs	8.93E+00	1.10E-03	1.43E+04	1.57E+01	1.71E-02	1.51E+00	1.04E-04	1.52E+00
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	5.36E-04	0.00E+00	0.00E+00	5.36E-04
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	7.09E-05	0.00E+00	0.00E+00	7.09E-05
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	4.02E-04	0.00E+00	0.00E+00	4.02E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	1.53E-03	0.00E+00	0.00E+00	1.53E-03
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	1.25E-03	0.00E+00	0.00E+00	1.25E-03
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	8.43E-03	0.00E+00	0.00E+00	8.43E-03
Trichlorofluoromethane	9.50E-04	0.00E+00	8.68E+01	0.00E+00	1.82E-06	0.00E+00	0.00E+00	1.82E-06
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	1.47E-03	0.00E+00	0.00E+00	1.47E-03
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	1.34E-03	0.00E+00	0.00E+00	1.34E-03
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	1.47E-03	0.00E+00	0.00E+00	1.47E-03

Table A-52
Wildlife Exposure Modeling of 95UCLM Doses to Piscivorous Birds (Green Heron) from Media for Aquatic Receptors in Streams

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	1.92E-03	kg/kg-day
Food Ingestion Rate (kg dry wt./kg bw-day):	9.58E-02	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	9.45E-02	L/kg-day

Chemical	95UCLM Sediment Concentration (mg/kg dry wt.)	95UCLM Water Concentration (mg/L)	Food Item (Fish) Uptake		95UCLM Case Scenario Doses			
			BAF/Equation (mg/L dry wt. to mg/kg dry wt.)	95UCLM Food Item Tissue Concentration (mg/kg dry wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Metals								
Aluminum	6.41E+03	3.76E-01	1.08E+01	4.06E+00	1.23E+01	3.89E-01	3.55E-02	1.27E+01
Barium	6.43E+01	1.53E-01	1.60E+01	2.45E+00	1.23E-01	2.34E-01	1.45E-02	3.72E-01
Beryllium	2.60E-01	0.00E+00	2.48E+02	0.00E+00	4.98E-04	0.00E+00	0.00E+00	4.98E-04
Chromium, hexavalent	3.80E+00	3.42E-04	8.00E+02	2.74E-01	7.28E-03	2.62E-02	3.23E-05	3.35E-02
Lead	4.27E+01	3.40E-03	4.50E+01	1.53E-01	8.19E-02	1.47E-02	3.21E-04	9.69E-02
Manganese	3.89E+02	4.09E-01	1.60E+03	6.54E+02	7.46E-01	6.27E+01	3.86E-02	6.35E+01
Vanadium	1.57E+01	2.40E-03	1.00E+00	2.40E-03	3.01E-02	2.30E-04	2.27E-04	3.06E-02
Zinc	5.51E+01	1.64E-02	2.52E+02	4.12E+00	1.06E-01	3.95E-01	1.54E-03	5.02E-01
PAHs								
Total LMW PAHs	4.12E+00	2.10E-03	1.43E+04	3.00E+01	7.90E-03	2.88E+00	1.98E-04	2.88E+00
Total HMW PAHs	3.09E+00	1.10E-03	1.43E+04	1.57E+01	5.92E-03	1.51E+00	1.04E-04	1.51E+00
SVOCs								
4-methylphenol	2.80E-01	0.00E+00	3.54E+01	0.00E+00	5.36E-04	0.00E+00	0.00E+00	5.36E-04
Acetophenone	3.70E-02	0.00E+00	5.32E+00	0.00E+00	7.09E-05	0.00E+00	0.00E+00	7.09E-05
Carbazole	2.10E-01	0.00E+00	5.28E+02	0.00E+00	4.02E-04	0.00E+00	0.00E+00	4.02E-04
VOCs								
Cyclohexane	8.00E-01	0.00E+00	3.46E+02	0.00E+00	1.53E-03	0.00E+00	0.00E+00	1.53E-03
Isopropylbenzene (Cumene)	6.50E-01	0.00E+00	4.84E+02	0.00E+00	1.25E-03	0.00E+00	0.00E+00	1.25E-03
Methylcyclohexane	4.40E+00	0.00E+00	4.48E+02	0.00E+00	8.43E-03	0.00E+00	0.00E+00	8.43E-03
Trichlorofluoromethane	9.50E-03	0.00E+00	8.68E+01	0.00E+00	1.82E-05	0.00E+00	0.00E+00	1.82E-05
Xylenes (m & p)	7.70E-01	0.00E+00	2.31E+02	0.00E+00	1.47E-03	0.00E+00	0.00E+00	1.47E-03
Xylenes (o)	7.00E-01	0.00E+00	2.26E+02	0.00E+00	1.34E-03	0.00E+00	0.00E+00	1.34E-03
Xylenes (Total)	7.70E-01	0.00E+00	2.26E+02	0.00E+00	1.47E-03	0.00E+00	0.00E+00	1.47E-03

APPENDIX B

Background Results

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TABLE B-1
BACKGROUND SURFACE SOIL
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	UPL	Distribution	Note
METALS										
Aluminum	1890	J	4170	J	mg/kg	BKG-09-0.5	10/10	5013	Normal	95% UTL (t)
Arsenic	0.64	/	2.1		mg/kg	BKG-04-0.5	10/10	2.3	Normal	95% UTL (t)
Barium	15.5		58.6		mg/kg	BKG-08-0.5	10/10	51.5	Gamma	95% Hawkins Wixley (HW) Approx. Gamma UTL
Beryllium	0.17	LJ/J	0.21	LJ	mg/kg	BKG-08-0.5	4/10	0.21	Maximum	No. detects <10; Maximum detected concentration used
Cadmium	0.53	LJ	0.53	LJ	mg/kg	BKG-08-0.5	1/10	0.53	Maximum	No. detects <10; Maximum detected concentration used
Calcium	366	J	366	J	mg/kg	BKG-05-0.5	1/10	366	Maximum	No. detects <10; Maximum detected concentration used
Chromium	5.9		7.1	J	mg/kg	BKG-05-0.5	3/10	7.1	Maximum	No. detects <10; Maximum detected concentration used
Cobalt	1.1	J/J	10.8	J	mg/kg	BKG-04-0.5	10/10	11.12	Gamma	95% Hawkins Wixley (HW) Approx. Gamma UTL
Copper	1.8	J	3	J	mg/kg	BKG-04-0.5	10/10	3.24	Normal	95% UTL (t)
Iron	2710	J	14700	J	mg/kg	BKG-03-0.5	10/10	14700	Nonparametric	95% UTL with 95% coverage
Lead	2.8	J	7.8	J	mg/kg	BKG-04-0.5	10/10	9.19	Normal	95% UTL (t)
Magnesium	180	LJ	369	LJ	mg/kg	BKG-09-0.5	10/10	401.8	Normal	95% UTL (t)
Manganese	137		545		mg/kg	BKG-04-0.5	10/10	505.5	Gamma	95% Hawkins Wixley (HW) Approx. Gamma UTL
Mercury	0.038	J	0.038	J	mg/kg	BKG-05-0.5	1/10	0.038	Maximum	No. detects <10; Maximum detected concentration used
Nickel	1.8	/	5.6		mg/kg	BKG-04-0.5	10/10	5.6	Nonparametric	95% UTL with 95% coverage
Potassium	294	LJ	526	LJ	mg/kg	BKG-09-0.5	10/10	641.9	Normal	95% UTL (t)
Sodium	10.7	LJ	11.6	LJ	mg/kg	BKG-08-0.5	2/10	11.6	Maximum	No. detects <10; Maximum detected concentration used
Vanadium	3.9		9.7		mg/kg	BKG-04-0.5	10/10	11.17	Normal	95% UTL (t)
Zinc	3.6		12.3		mg/kg	BKG-07-0.5	10/10	14.2	Normal	95% UTL (t)
PAHs										
Benzo(a)anthracene	0.0033	LJ	0.0033	LJ	mg/kg	BKG-03-0.5	1/10	0.0033	Maximum	No. detects <10; Maximum detected concentration used
Benzo(a)pyrene	0.0025	LJ	0.0025	LJ	mg/kg	BKG-03-0.5	1/10	0.0025	Maximum	No. detects <10; Maximum detected concentration used
Benzo(b)fluoranthene	0.0011	LJ	0.0032	LJ	mg/kg	BKG-03-0.5	2/10	0.0032	Maximum	No. detects <10; Maximum detected concentration used
Benzo(g,h,i)perylene	0.0016	LJ	0.0016	LJ	mg/kg	BKG-03-0.5	1/10	0.0016	Maximum	No. detects <10; Maximum detected concentration used
Chrysene	0.0011	LJ	0.004		mg/kg	BKG-03-0.5	5/10	0.004	Maximum	No. detects <10; Maximum detected concentration used
Fluoranthene	0.0012	LJ	0.0046		mg/kg	BKG-03-0.5	2/10	0.0046	Maximum	No. detects <10; Maximum detected concentration used
Indeno(1,2,3-cd)pyrene	0.0017	LJ	0.0017	LJ	mg/kg	BKG-03-0.5	1/10	0.0017	Maximum	No. detects <10; Maximum detected concentration used
Phenanthrene	0.0015	LJ	0.0015	LJ	mg/kg	BKG-03-0.5	1/10	0.0015	Maximum	No. detects <10; Maximum detected concentration used
Pyrene	0.0012	LJ	0.0064		mg/kg	BKG-03-0.5	2/10	0.0064	Maximum	No. detects <10; Maximum detected concentration used

[1] Minimum/maximum detected concentration.

TABLE B-2
BACKGROUND SEDIMENT
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency
METALS							
Aluminum	1050		5790		mg/kg	SCUC1a-SD-0.5	4/4
Arsenic	0.25	J	1.9		mg/kg	SCUC1a-SD-0.5	4/4
Barium	9.2		43.1	J	mg/kg	ETUC-SD-0.5	3/4
Beryllium	0.24	LJ	0.24	LJ	mg/kg	SCUC1a-SD-0.5	1/4
Calcium	178	J	1540		mg/kg	SCUC1a-SD-0.5	4/4
Chromium	2.2	J	6.7	J	mg/kg	ETUC-SD-0.5	4/4
Chromium, Hexavalent	0.46	J	0.53	J	mg/kg	SCUC1a-SD-0.5	2/2
Cobalt	1.8		4.3		mg/kg	SCUC1a-SD-0.5	3/4
Copper	1.1		5	J	mg/kg	ETUC-SD-0.5	4/4
Iron	1540		8010		mg/kg	SCUC1a-SD-0.5	4/4
Lead	3.6		12.8	J	mg/kg	WTUC-SD-0.5	4/4
Magnesium	104	J	972		mg/kg	SCUC1a-SD-0.5	4/4
Manganese	17		261		mg/kg	SCUC1a-SD-0.5	4/4
Mercury	0.016	J	0.016	J	mg/kg	WTUC-SD-0.5	1/4
Nickel	0.86	J	6.2	J	mg/kg	ETUC-SD-0.5	4/4
Potassium	138	LJ	987		mg/kg	SCUC1a-SD-0.5	4/4
Sodium	11.6	J	125	LJ	mg/kg	SCUC1a-SD-0.5	3/4
Vanadium	2.1	J	10.8		mg/kg	ETUC-SD-0.5	4/4
Zinc	5		36		mg/kg	SCUC1a-SD-0.5	4/4

TABLE B-2
BACKGROUND SEDIMENT
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency
PAHs							
2-Methylnaphthalene	0.0014	J	0.0014	J	mg/kg	WTUC-SD-0.5	1/4
Acenaphthylene	0.0018	J	0.0018	J	mg/kg	ETUC-SD-0.5	1/4
Anthracene	0.0013	J	0.0021	LJ	mg/kg	SCUC1a-SD-0.5	2/4
Benzo(a)anthracene	0.0043		0.0083		mg/kg	SCUC1a-SD-0.5	3/4
Benzo(a)pyrene	0.0038	J	0.009		mg/kg	SCUC1a-SD-0.5	3/4
Benzo(b)fluoranthene	0.0051		0.015		mg/kg	SCUC1a-SD-0.5	3/4
Benzo(g,h,i)perylene	0.0036	J	0.0093		mg/kg	SCUC1a-SD-0.5	3/4
Benzo(k)fluoranthene	0.0033	J	0.0046	LJ	mg/kg	SCUC1a-SD-0.5	2/4
Chrysene	0.0058		0.012		mg/kg	WTUC-SD-0.5	3/4
Dibenz (a,h) anthracene	0.0013	J/J	0.0015	LJ	mg/kg	SCUC1a-SD-0.5	3/4
Fluoranthene	0.0029	J	0.018		mg/kg	SCUC1a-SD-0.5	3/4
Indeno(1,2,3-cd)pyrene	0.0021	J	0.0092		mg/kg	SCUC1a-SD-0.5	3/4
Phenanthrene	0.0015	J	0.0076		mg/kg	SCUC1a-SD-0.5	3/4
Pyrene	0.0059		0.016		mg/kg	SCUC1a-SD-0.5	3/4
TOTAL HPAH	0.0163		0.044		mg/kg	SCUC1a-SD-0.5	3/3
TOTAL LPAH	0.0046		0.0097		mg/kg	SCUC1a-SD-0.5	3/3
TOTAL PAH	0.0535		0.1106		mg/kg	SCUC1a-SD-0.5	3/3
SVOCs							
m, p-Xylene	0.00059	J+	0.00059	J+	mg/kg	ETUC-SD-0.5	1/4
Methylcyclohexane	0.0041	J+	0.0041	J+	mg/kg	ETUC-SD-0.5	1/4
VOCs							
2-Butanone	0.018	J+	0.018	J+	mg/kg	ETUC-SD-0.5	1/4
Acetone	0.0052	LJ	0.039	J+	mg/kg	ETUC-SD-0.5	2/4
Ethylbenzene	0.00028	J+	0.00028	J+	mg/kg	ETUC-SD-0.5	1/4

TABLE B-2
BACKGROUND SEDIMENT
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency
Isopropylbenzene	0.00037	J+	0.00037	J+	mg/kg	ETUC-SD-0.5	1/4
Methylene chloride	0.00028	J+	0.00028	J+	mg/kg	ETUC-SD-0.5	1/4
Toluene	0.00029	LJ	0.00033	J+	mg/kg	ETUC-SD-0.5	2/4

[(1)] Minimum/maximum detected concentration.

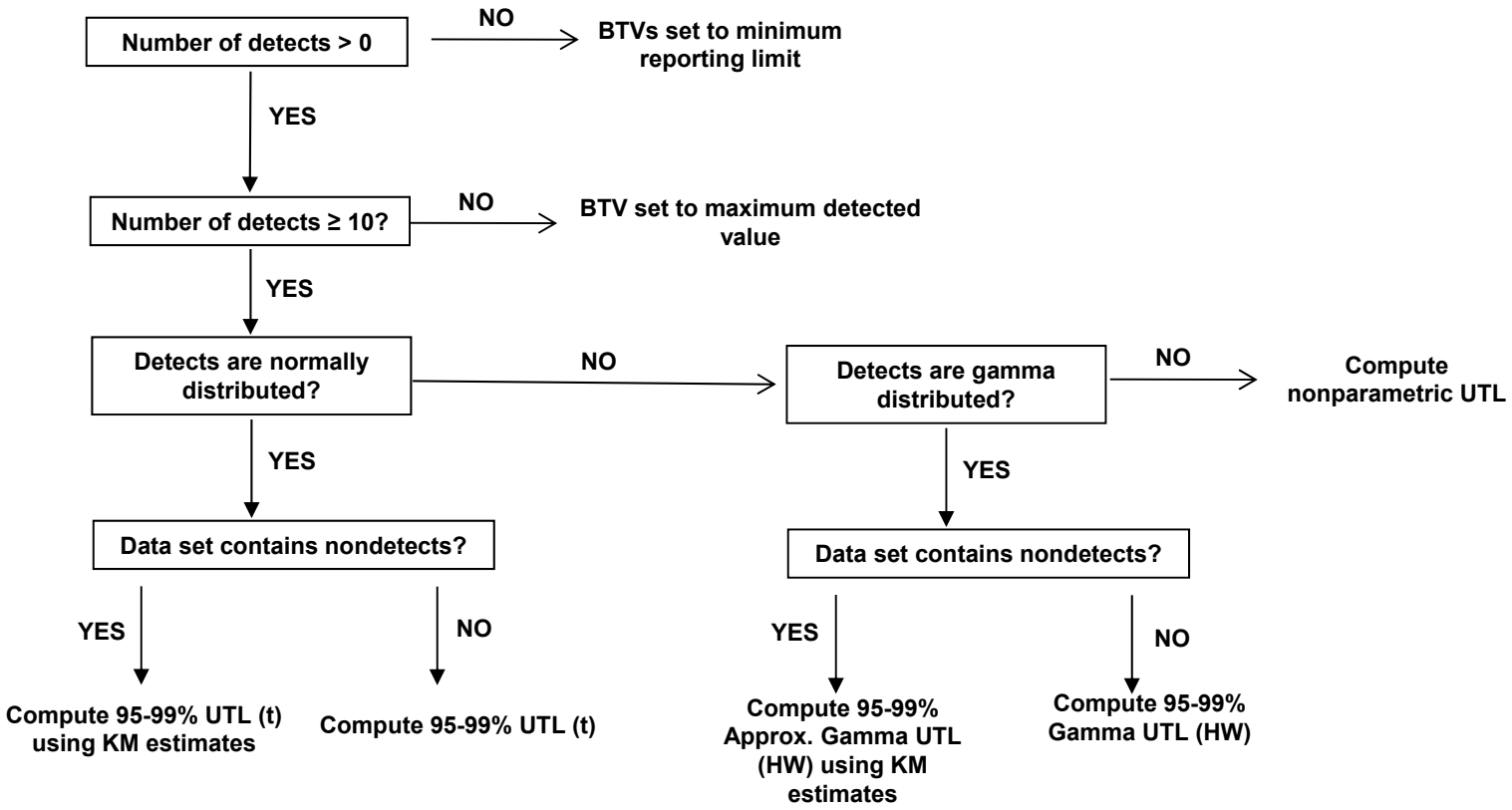
TABLE B-3
BACKGROUND SURFACE WATER
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency
METALS - DISSOLVED							
Aluminum	182		182		ug/L	SCUC1c-SW-F	1/3
Barium	40.9		71.6		ug/L	ETUC-SW-F	3/3
Cadmium	24.9		24.9		ug/L	ETUC-SW-F	1/3
Calcium	15300		24500		ug/L	ETUC-SW-F	3/3
Iron	557		612		ug/L	SCUC1c-SW-F	3/3
Magnesium	5500		9090		ug/L	ETUC-SW-F	3/3
Manganese	55.6		691		ug/L	ETUC-SW-F	3/3
Potassium	4050		5070		ug/L	ETUC-SW-F	3/3
Sodium	10200		19600		ug/L	ETUC-SW-F	3/3
Zinc	25.9		25.9		ug/L	ETUC-SW-F	1/3
METALS - TOTAL							
Aluminum	342		757		ug/L	SCUC1a-SW	3/3
Barium	51		73.6		ug/L	ETUC-SW	3/3
Calcium	16200		24200		ug/L	ETUC-SW	3/3
Iron	2010		2710		ug/L	ETUC-SW	3/3
Magnesium	5940		8680		ug/L	ETUC-SW	3/3
Manganese	95.2		690		ug/L	ETUC-SW	3/3
Potassium	4380		4560		ug/L	ETUC-SW	3/3
Sodium	10700		18200		ug/L	ETUC-SW	3/3

TABLE B-3
BACKGROUND SURFACE WATER
WILCOX OIL COMPANY
BRISTOW, CREEK COUNTY, OKLAHOMA

Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency
VOCs							
4-Bromofluorobenzene	9.19		9.52		ug/L	SCUC1c-SW	2/2
Acetone	4	J	4.6	J	ug/L	WTUC-SW	2/4
m,p-Xylene	60400		105000		ug/L	ETUC-SW	3/3

[(1)] Minimum/maximum detected concentration.



Decision Tree for Determining the 95-99% Upper Tolerance Limit (UTL)

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.16/17/2019 6:12:12 PM
From File	ProUCL Inputs BKG SS.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

1234678-HpCDF

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	1.7000E-7	First Quartile	3.4875E-7
Second Largest	5.3000E-6	Median	5.6700E-7
Maximum	8.6700E-6	Third Quartile	3.8750E-6
Mean	2.2906E-6	SD	2.9109E-6
Coefficient of Variation	N/A	Skewness	1.437
Mean of logged Data	-13.82	SD of logged Data	1.399

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	1.0764E-5	90% Percentile (z)	6.0211E-6
95% UPL (t)	7.8870E-6	95% Percentile (z)	7.0786E-6
95% USL	8.6249E-6	99% Percentile (z)	9.0624E-6

Gamma GOF Test

A-D Test Statistic	0.697	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.264	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.277	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.721	k star (bias corrected MLE)	0.571
Theta hat (MLE)	3.1776E-6	Theta star (bias corrected MLE)	4.0097E-6
nu hat (MLE)	14.42	nu star (bias corrected)	11.43
MLE Mean (bias corrected)	2.2906E-6	MLE Sd (bias corrected)	3.0306E-6

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.7405E-6	90% Percentile	6.0229E-6
95% Hawkins Wixley (HW) Approx. Gamma UPL	1.0400E-5	95% Percentile	8.3893E-6
95% WH Approx. Gamma UTL with 95% Coverage	1.8951E-5	99% Percentile	1.4138E-5
95% HW Approx. Gamma UTL with 95% Coverage	2.2413E-5		
95% WH USL	1.1723E-5	95% HW USL	1.2848E-5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	5.8378E-5	90% Percentile (z)	5.9715E-6
95% UPL (t)	1.4643E-5	95% Percentile (z)	9.9278E-6
95% USL	2.0876E-5	99% Percentile (z)	2.5762E-5

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	8.6700E-6
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	8.6700E-6	95% BCA Bootstrap UTL with 95% Coverage	8.6700E-6
95% UPL	8.6700E-6	90% Percentile	5.6370E-6
90% Chebyshev UPL	1.1450E-5	95% Percentile	7.1535E-6
95% Chebyshev UPL	1.5598E-5	99% Percentile	8.3667E-6
95% USL	8.6700E-6		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

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General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	10		
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	5.1400E-8	Minimum Non-Detect	5.3100E-6
Maximum Detect	1.7700E-7	Maximum Non-Detect	5.4800E-6

Variance Detected	2.678E-15	Percent Non-Detects	50%
Mean Detected	8.7080E-8	SD Detected	5.1746E-8
Mean of Detected Logged Data	-16.37	SD of Detected Logged Data	0.494

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.754	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	8.7080E-8	KM SD	4.6283E-8
95% UTL95% Coverage	2.2181E-7	95% KM UPL (t)	1.7606E-7
90% KM Percentile (z)	1.4639E-7	95% KM Percentile (z)	1.6321E-7
99% KM Percentile (z)	1.9475E-7	95% KM USL	1.8779E-7

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	1.3910E-6	SD	1.3751E-6
95% UTL95% Coverage	5.3940E-6	95% UPL (t)	4.0348E-6
90% Percentile (z)	3.1533E-6	95% Percentile (z)	3.6529E-6
99% Percentile (z)	4.5901E-6	95% USL	4.3834E-6

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.544	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.681	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.269	**Kolmogorov-Smirnov 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)	4.674	k star (bias corrected MLE)	2.003
Theta hat (MLE)	1.8632E-8	Theta star (bias corrected MLE)	4.3480E-8
nu hat (MLE)	46.74	nu star (bias corrected)	20.03
MLE Mean (bias corrected)	8.7080E-8		
MLE Sd (bias corrected)	6.1532E-8	95% Percentile of Chisquare (2kstar)	9.497

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	5.1400E-8	Mean	0.005

Maximum	0.01	Median	0.005
SD	0.00527	CV	1.054
k hat (MLE)	0.148	k star (bias corrected MLE)	0.171
Theta hat (MLE)	0.0337	Theta star (bias corrected MLE)	0.0293
nu hat (MLE)	2.968	nu star (bias corrected)	3.411
MLE Mean (bias corrected)	0.005	MLE Sd (bias corrected)	0.0121
95% Percentile of Chisquare (2kstar)	1.827	90% Percentile	0.015
95% Percentile	0.0268	99% Percentile	0.0601

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.0816	0.153	95% Approx. Gamma UPL	0.034	0.0488
95% Gamma USL	0.0436	0.0676			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	8.7080E-8	SD (KM)	4.6283E-8
Variance (KM)	2.142E-15	SE of Mean (KM)	2.3141E-8
k hat (KM)	3.54	k star (KM)	2.545
nu hat (KM)	70.8	nu star (KM)	50.89
theta hat (KM)	2.4599E-8	theta star (KM)	3.4221E-8
80% gamma percentile (KM)	1.2668E-7	90% gamma percentile (KM)	1.6022E-7
95% gamma percentile (KM)	1.9178E-7	99% gamma percentile (KM)	2.6082E-7

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.5139E-7	2.5745E-7	95% Approx. Gamma UPL	1.7896E-7	1.7961E-7
95% KM Gamma Percentile	1.6147E-7	1.6134E-7	95% Gamma USL	1.9599E-7	1.9760E-7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	8.2514E-8	Mean in Log Scale	-16.37
SD in Original Scale	3.4831E-8	SD in Log Scale	0.329
95% UTL95% Coverage	2.0319E-7	95% BCA UTL95% Coverage	1.7700E-7
95% Bootstrap (%) UTL95% Coverage	1.7700E-7	95% UPL (t)	1.4676E-7
90% Percentile (z)	1.1885E-7	95% Percentile (z)	1.3394E-7
99% Percentile (z)	1.6762E-7	95% USL	1.5953E-7

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-16.37	95% KM UTL (Lognormal)95% Coverage	2.8188E-7
KM SD of Logged Data	0.442	95% KM UPL (Lognormal)	1.8218E-7
95% KM Percentile Lognormal (z)	1.6116E-7	95% KM USL (Lognormal)	2.0376E-7

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	1.3910E-6	Mean in Log Scale	-14.6
SD in Original Scale	1.3751E-6	SD in Log Scale	1.896
95% UTL95% Coverage	1.1438E-4	95% UPL (t)	1.7555E-5
90% Percentile (z)	5.2061E-6	95% Percentile (z)	1.0368E-5
99% Percentile (z)	3.7747E-5	95% USL	2.8388E-5

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	5.4800E-6
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	5.4800E-6
95% USL	5.4800E-6	95% KM Chebyshev UPL	2.9867E-7

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

123789-HxCDF

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Minimum Detect	1.2400E-7	Minimum Non-Detect	5.2300E-6
Maximum Detect	1.2400E-7	Maximum Non-Detect	5.4800E-6
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	1.2400E-7	SD Detected	N/A
Mean of Detected Logged Data	-15.9	SD of Detected Logged Data	N/A

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 123789-HxCDF was not processed!

12378-PeCDD

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	9		

Number of Detects	7	Number of Non-Detects	3
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	1.8700E-8	Minimum Non-Detect	5.3300E-6
Maximum Detect	2.0200E-7	Maximum Non-Detect	5.4200E-6
Variance Detected	4.251E-15	Percent Non-Detects	30%
Mean Detected	7.7871E-8	SD Detected	6.5199E-8
Mean of Detected Logged Data	-16.69	SD of Detected Logged Data	0.906

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.876	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	7.7871E-8	KM SD	6.0362E-8
95% UTL95% Coverage	2.5359E-7	95% KM UPL (t)	1.9392E-7
90% KM Percentile (z)	1.5523E-7	95% KM Percentile (z)	1.7716E-7
99% KM Percentile (z)	2.1830E-7	95% KM USL	2.0922E-7

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	8.6301E-7	SD	1.2654E-6
95% UTL95% Coverage	4.5465E-6	95% UPL (t)	3.2958E-6
90% Percentile (z)	2.4847E-6	95% Percentile (z)	2.9444E-6
99% Percentile (z)	3.8067E-6	95% USL	3.6165E-6

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.273	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.316	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)	1.681	k star (bias corrected MLE)	1.056
Theta hat (MLE)	4.6335E-8	Theta star (bias corrected MLE)	7.3770E-8
nu hat (MLE)	23.53	nu star (bias corrected)	14.78
MLE Mean (bias corrected)	7.7871E-8		
MLE Sd (bias corrected)	7.5793E-8	95% Percentile of Chisquare (2kstar)	6.205

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.8700E-8	Mean	0.003
Maximum	0.01	Median	1.0245E-7
SD	0.00483	CV	1.61
k hat (MLE)	0.11	k star (bias corrected MLE)	0.144
Theta hat (MLE)	0.0272	Theta star (bias corrected MLE)	0.0208
nu hat (MLE)	2.209	nu star (bias corrected)	2.88
MLE Mean (bias corrected)	0.003	MLE Sd (bias corrected)	0.00791
95% Percentile of Chisquare (2kstar)	1.597	90% Percentile	0.00884
95% Percentile	0.0166	99% Percentile	0.0395

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.0485	0.078	95% Approx. Gamma UPL	0.0184	0.022
95% Gamma USL	0.0243	0.0317			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	7.7871E-8	SD (KM)	6.0362E-8
Variance (KM)	3.644E-15	SE of Mean (KM)	2.4643E-8
k hat (KM)	1.664	k star (KM)	1.232
nu hat (KM)	33.29	nu star (KM)	24.63
theta hat (KM)	4.6790E-8	theta star (KM)	6.3225E-8
80% gamma percentile (KM)	1.2299E-7	90% gamma percentile (KM)	1.7031E-7
95% gamma percentile (KM)	2.1690E-7	99% gamma percentile (KM)	3.2349E-7

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	3.6969E-7	4.0707E-7	95% Approx. Gamma UPL	2.2609E-7	2.3536E-7
95% KM Gamma Percentile	1.9381E-7	1.9886E-7	95% Gamma USL	2.5851E-7	2.7285E-7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	7.2704E-8	Mean in Log Scale	-16.69
SD in Original Scale	5.5523E-8	SD in Log Scale	0.774
95% UTL95% Coverage	5.3456E-7	95% BCA UTL95% Coverage	2.0200E-7
95% Bootstrap (%) UTL95% Coverage	2.0200E-7	95% UPL (t)	2.4879E-7
90% Percentile (z)	1.5150E-7	95% Percentile (z)	2.0068E-7
99% Percentile (z)	3.4003E-7	95% USL	3.0271E-7

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-16.69	95% KM UTL (Lognormal)95% Coverage	6.4567E-7
KM SD of Logged Data	0.839	95% KM UPL (Lognormal)	2.8184E-7
95% KM Percentile Lognormal (z)	2.2328E-7	95% KM USL (Lognormal)	3.4860E-7

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	8.6301E-7	Mean in Log Scale	-15.53
SD in Original Scale	1.2654E-6	SD in Log Scale	2.01
95% UTL95% Coverage	6.2472E-5	95% UPL (t)	8.5638E-6
90% Percentile (z)	2.3602E-6	95% Percentile (z)	4.8997E-6
99% Percentile (z)	1.9284E-5	95% USL	1.4256E-5

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	5.4200E-6
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	5.4200E-6
95% USL	5.4200E-6	95% KM Chebyshev UPL	3.5383E-7

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	1890	First Quartile	2170
Second Largest	3550	Median	2635
Maximum	4170	Third Quartile	3415
Mean	2804	SD	758.9
Coefficient of Variation	0.271	Skewness	0.564
Mean of logged Data	7.907	SD of logged Data	0.266

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	5013	90% Percentile (z)		3777
	95% UPL (t)	4263	95% Percentile (z)		4052
	95% USL	4455	99% Percentile (z)		4569

Gamma GOF Test

A-D Test Statistic	0.363	**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	0.199	**Kolmogorov-Smirnov 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)	15.73	k star (bias corrected MLE)	11.08
Theta hat (MLE)	178.2	Theta star (bias corrected MLE)	253.1
nu hat (MLE)	314.6	nu star (bias corrected)	221.6
MLE Mean (bias corrected)	2804	MLE Sd (bias corrected)	842.4

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL		4414	90% Percentile		3923
95% Hawkins Wixley (HW) Approx. Gamma UPL		4439	95% Percentile		4318
95% WH Approx. Gamma UTL with	95% Coverage	5489	99% Percentile		5125
95% HW Approx. Gamma UTL with	95% Coverage	5574			
	95% WH USL	4675	95% HW USL		4712

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.186	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	5884	90% Percentile (z)		3817
	95% UPL (t)	4525	95% Percentile (z)		4203
	95% USL	4841	99% Percentile (z)		5038

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		10	95% UTL with	95% Coverage	4170
Approx, f used to compute achieved CC		0.526	Approximate Actual Confidence Coefficient achieved by UTL		0.401
			Approximate Sample Size needed to achieve specified CC		59
95% Percentile Bootstrap UTL with	95% Coverage	4170	95% BCA Bootstrap UTL with	95% Coverage	4170
	95% UPL	4170		90% Percentile	3612
	90% Chebyshev UPL	5192		95% Percentile	3891

95% Chebyshev UPL	6273	99% Percentile	4114
95% USL	4170		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Arsenic

General Statistics

Total Number of Observations	10	Number of Distinct Observations	7
Minimum	0.64	First Quartile	0.805
Second Largest	1.3	Median	1
Maximum	2.1	Third Quartile	1.275
Mean	1.08	SD	0.434
Coefficient of Variation	0.402	Skewness	1.481
Mean of logged Data	0.0135	SD of logged Data	0.366

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	2.344	90% Percentile (z)	1.637
	95% UPL (t)	1.915	95% Percentile (z)	1.794
	95% USL	2.025	99% Percentile (z)	2.09

Gamma GOF Test

A-D Test Statistic	0.331	**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	0.155	**Kolmogorov-Smirnov 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)	8.04	k star (bias corrected MLE)	5.694
Theta hat (MLE)	0.134	Theta star (bias corrected MLE)	0.19
nu hat (MLE)	160.8	nu star (bias corrected)	113.9
MLE Mean (bias corrected)	1.08	MLE Sd (bias corrected)	0.453

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	1.981	90% Percentile	1.685
95% Hawkins Wixley (HW) Approx. Gamma UPL	1.995	95% Percentile	1.916
95% WH Approx. Gamma UTL with 95% Coverage	2.637	99% Percentile	2.4
95% HW Approx. Gamma UTL with 95% Coverage	2.698		
95% WH USL	2.137	95% HW USL	2.16

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	2.943	90% Percentile (z)	1.621
95% UPL (t)	2.049	95% Percentile (z)	1.851
95% USL	2.249	99% Percentile (z)	2.376

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	2.1
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	2.1	95% BCA Bootstrap UTL with 95% Coverage	2.1
95% UPL	2.1	90% Percentile	1.38
90% Chebyshev UPL	2.447	95% Percentile	1.74
95% Chebyshev UPL	3.065	99% Percentile	2.028
95% USL	2.1		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.

The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Barium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	15.5	First Quartile	18.73
Second Largest	37.3	Median	21.55
Maximum	58.6	Third Quartile	26.15
Mean	25.98	SD	13.08
Coefficient of Variation	0.503	Skewness	2.058
Mean of logged Data	3.172	SD of logged Data	0.407

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.755	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	64.06	90% Percentile (z)	42.74
	95% UPL (t)	51.13	95% Percentile (z)	47.5
	95% USL	54.44	99% Percentile (z)	56.41

Gamma GOF Test

A-D Test Statistic	0.657	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.226	**Kolmogorov-Smirnov 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)	6.027	k star (bias corrected MLE)	4.285
Theta hat (MLE)	4.311	Theta star (bias corrected MLE)	6.063
nu hat (MLE)	120.5	nu star (bias corrected)	85.71
MLE Mean (bias corrected)	25.98	MLE Sd (bias corrected)	12.55

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL		51.4	90% Percentile	42.8
95% Hawkins Wixley (HW) Approx. Gamma UPL		51.54	95% Percentile	49.46
95% WH Approx. Gamma UTL with	95% Coverage	70.8	99% Percentile	63.64
95% HW Approx. Gamma UTL with	95% Coverage	72.22		
	95% WH USL	55.99	95% HW USL	56.35

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.198	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	77.98	90% Percentile (z)	40.19
	95% UPL (t)	52.16	95% Percentile (z)	46.59
	95% USL	57.83	99% Percentile (z)	61.47

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	58.6
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	58.6	95% BCA Bootstrap UTL with 95% Coverage	58.6
95% UPL	58.6	90% Percentile	39.43
90% Chebyshev UPL	67.14	95% Percentile	49.02
95% Chebyshev UPL	85.78	99% Percentile	56.68
95% USL	58.6		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Benzo (a) anthracene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Minimum Detect	0.0033	Minimum Non-Detect	0.0035
Maximum Detect	0.0033	Maximum Non-Detect	0.0038
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	0.0033	SD Detected	N/A
Mean of Detected Logged Data	-5.714	SD of Detected Logged Data	N/A

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 Benzo (a) anthracene was not processed!

Benzo (a) pyrene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Minimum Detect	0.0025	Minimum Non-Detect	0.0035
Maximum Detect	0.0025	Maximum Non-Detect	0.0038
Variance Detected	N/A	Percent Non-Detects	90%

Mean Detected	0.0025	SD Detected	N/A
Mean of Detected Logged Data	-5.991	SD of Detected Logged Data	N/A

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 Benzo (a) pyrene was not processed!

Benzo (b) fluoranthene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	5		
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.0011	Minimum Non-Detect	0.0035
Maximum Detect	0.0032	Maximum Non-Detect	0.0038
Variance Detected	2.2050E-6	Percent Non-Detects	80%
Mean Detected	0.00215	SD Detected	0.00148
Mean of Detected Logged Data	-6.279	SD of Detected Logged Data	0.755

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.00215	KM SD	0.00105
95% UTL95% Coverage	0.00521	95% KM UPL (t)	0.00417
90% KM Percentile (z)	0.0035	95% KM Percentile (z)	0.00388
99% KM Percentile (z)	0.00459	95% KM USL	0.00443

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.00188	SD	5.1707E-4
95% UTL95% Coverage	0.00338	95% UPL (t)	0.00287
90% Percentile (z)	0.00254	95% Percentile (z)	0.00273
99% Percentile (z)	0.00308	95% USL	0.003

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	3.829	k star (bias corrected MLE)	N/A
Theta hat (MLE)	5.6154E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	15.32	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00215	SD (KM)	0.00105
Variance (KM)	1.1025E-6	SE of Mean (KM)	0.00105
k hat (KM)	4.193	k star (KM)	3.002
nu hat (KM)	83.85	nu star (KM)	60.03
theta hat (KM)	5.1279E-4	theta star (KM)	7.1629E-4
80% gamma percentile (KM)	0.00307	90% gamma percentile (KM)	0.00381
95% gamma percentile (KM)	0.00451	99% gamma percentile (KM)	0.00602

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.00681	0.00718	95% Approx. Gamma UPL	0.00472	0.00482
95% KM Gamma Percentile	0.00422	0.00428	95% Gamma USL	0.00521	0.00536

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.00242	Mean in Log Scale	-6.279
SD in Original Scale	0.00191	SD in Log Scale	0.757
95% UTL95% Coverage	0.017	95% BCA UTL95% Coverage	0.00705
95% Bootstrap (%) UTL95% Coverage	0.00705	95% UPL (t)	0.00804
90% Percentile (z)	0.00495	95% Percentile (z)	0.00652
99% Percentile (z)	0.0109	95% USL	0.00974

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-6.279	95% KM UTL (Lognormal)95% Coverage	0.00888
KM SD of Logged Data	0.534	95% KM UPL (Lognormal)	0.00524
95% KM Percentile Lognormal (z)	0.00452	95% KM USL (Lognormal)	0.006

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.00188	Mean in Log Scale	-6.309
SD in Original Scale	5.1707E-4	SD in Log Scale	0.253
95% UTL95% Coverage	0.0038	95% UPL (t)	0.00296
90% Percentile (z)	0.00252	95% Percentile (z)	0.00276
99% Percentile (z)	0.00328	95% USL	0.00316

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	0.0038
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.0038
95% USL	0.0038	95% KM Chebyshev UPL	0.00695

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

Benzo (g,h,i) perylene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Minimum Detect	0.0016	Minimum Non-Detect	0.0035
Maximum Detect	0.0016	Maximum Non-Detect	0.0038
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	0.0016	SD Detected	N/A
Mean of Detected Logged Data	-6.438	SD of Detected Logged Data	N/A

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 Benzo (g,h,i) perylene was not processed!

Beryllium

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	4	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	6
Minimum Detect	0.17	Minimum Non-Detect	0.44
Maximum Detect	0.21	Maximum Non-Detect	0.55
Variance Detected	4.2500E-4	Percent Non-Detects	60%
Mean Detected	0.188	SD Detected	0.0206
Mean of Detected Logged Data	-1.678	SD of Detected Logged Data	0.11

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.302	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.188	KM SD	0.0179
95% UTL95% Coverage	0.239	95% KM UPL (t)	0.222
90% KM Percentile (z)	0.21	95% KM Percentile (z)	0.217
99% KM Percentile (z)	0.229	95% KM USL	0.226

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.225	SD	0.0378
95% UTL95% Coverage	0.335	95% UPL (t)	0.298
90% Percentile (z)	0.273	95% Percentile (z)	0.287
99% Percentile (z)	0.313	95% USL	0.307

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.524	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.337	**Kolmogorov-Smirnov 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)	110.7	k star (bias corrected MLE)	27.84
Theta hat (MLE)	0.00169	Theta star (bias corrected MLE)	0.00673
nu hat (MLE)	885.6	nu star (bias corrected)	222.7
MLE Mean (bias corrected)	0.188		
MLE Sd (bias corrected)	0.0355	95% Percentile of Chisquare (2kstar)	74.1

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.17	Mean	0.187
Maximum	0.21	Median	0.187
SD	0.0119	CV	0.0636
k hat (MLE)	276.5	k star (bias corrected MLE)	193.6
Theta hat (MLE)	6.7753E-4	Theta star (bias corrected MLE)	9.6756E-4
nu hat (MLE)	5529	nu star (bias corrected)	3872
MLE Mean (bias corrected)	0.187	MLE Sd (bias corrected)	0.0135
95% Percentile of Chisquare (2kstar)	434	90% Percentile	0.205

95% Percentile	0.21	99% Percentile	0.22

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.224	0.224	95% Approx. Gamma UPL	0.211	0.211
95% Gamma USL	0.214	0.214			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.188	SD (KM)	0.0179
Variance (KM)	3.1875E-4	SE of Mean (KM)	0.0103
k hat (KM)	110.3	k star (KM)	77.27
nu hat (KM)	2206	nu star (KM)	1545
theta hat (KM)	0.0017	theta star (KM)	0.00243
80% gamma percentile (KM)	0.205	90% gamma percentile (KM)	0.215
95% gamma percentile (KM)	0.224	99% gamma percentile (KM)	0.241

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.244	0.244	95% Approx. Gamma UPL	0.223	0.223
95% KM Gamma Percentile	0.218	0.218	95% Gamma USL	0.228	0.229

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.187	Mean in Log Scale	-1.678
SD in Original Scale	0.0119	SD in Log Scale	0.0634
95% UTL95% Coverage	0.224	95% BCA UTL95% Coverage	0.21
95% Bootstrap (%) UTL95% Coverage	0.21	95% UPL (t)	0.211
90% Percentile (z)	0.202	95% Percentile (z)	0.207
99% Percentile (z)	0.216	95% USL	0.214

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-1.678	95% KM UTL (Lognormal)95% Coverage	0.246
KM SD of Logged Data	0.095	95% KM UPL (Lognormal)	0.224
95% KM Percentile Lognormal (z)	0.218	95% KM USL (Lognormal)	0.23

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.225	Mean in Log Scale	-1.505
SD in Original Scale	0.0378	SD in Log Scale	0.174
95% UTL95% Coverage	0.369	95% UPL (t)	0.31
90% Percentile (z)	0.278	95% Percentile (z)	0.296
99% Percentile (z)	0.333	95% USL	0.324

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	0.55
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.55
95% USL	0.55	95% KM Chebyshev UPL	0.269

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Calcium

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	10		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	9
Minimum Detect	366	Minimum Non-Detect	443
Maximum Detect	366	Maximum Non-Detect	549
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	366	SD Detected	N/A
Mean of Detected Logged Data	5.903	SD of Detected Logged Data	N/A

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 Calcium was not processed!

Chromium

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	3	Number of Non-Detects	7
Number of Distinct Detects	3	Number of Distinct Non-Detects	6
Minimum Detect	5.9	Minimum Non-Detect	0.88
Maximum Detect	7.1	Maximum Non-Detect	1.1
Variance Detected	0.363	Percent Non-Detects	70%
Mean Detected	6.467	SD Detected	0.603
Mean of Detected Logged Data	1.864	SD of Detected Logged Data	0.0928

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	2.556	KM SD	2.574
95% UTL95% Coverage	10.05	95% KM UPL (t)	7.505
90% KM Percentile (z)	5.855	95% KM Percentile (z)	6.79
99% KM Percentile (z)	8.545	95% KM USL	8.158

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	2.285	SD	2.9
95% UTL95% Coverage	10.73	95% UPL (t)	7.86
90% Percentile (z)	6.001	95% Percentile (z)	7.055
99% Percentile (z)	9.031	95% USL	8.595

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	173.8	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0372	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1043	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	3.442	Mean	4.73
Maximum	7.1	Median	3.995
SD	1.256	CV	0.265
k hat (MLE)	17.63	k star (bias corrected MLE)	12.4

Theta hat (MLE)	0.268	Theta star (bias corrected MLE)	0.381
nu hat (MLE)	352.5	nu star (bias corrected)	248.1
MLE Mean (bias corrected)	4.73	MLE Sd (bias corrected)	1.343
95% Percentile of Chisquare (2kstar)	37.42	90% Percentile	6.512
95% Percentile	7.134	99% Percentile	8.401

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	8.96	9.058	95% Approx. Gamma UPL	7.28	7.301
95% Gamma USL	7.689	7.725			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	2.556	SD (KM)	2.574
Variance (KM)	6.627	SE of Mean (KM)	0.997
k hat (KM)	0.986	k star (KM)	0.757
nu hat (KM)	19.72	nu star (KM)	15.14
theta hat (KM)	2.593	theta star (KM)	3.378
80% gamma percentile (KM)	4.189	90% gamma percentile (KM)	6.299
95% gamma percentile (KM)	8.459	99% gamma percentile (KM)	13.58

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	14.47	15.73	95% Approx. Gamma UPL	8.328	8.509
95% KM Gamma Percentile	6.987	7.028	95% Gamma USL	9.693	10.05

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.995	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	4.981	Mean in Log Scale	1.587
SD in Original Scale	1.079	SD in Log Scale	0.2
95% UTL95% Coverage	8.76	95% BCA UTL95% Coverage	7.1
95% Bootstrap (%) UTL95% Coverage	7.1	95% UPL (t)	7.185
90% Percentile (z)	6.319	95% Percentile (z)	6.796
99% Percentile (z)	7.791	95% USL	7.56

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	0.47	95% KM UTL (Lognormal)95% Coverage	22.86
KM SD of Logged Data	0.914	95% KM UPL (Lognormal)	9.264
95% KM Percentile Lognormal (z)	7.188	95% KM USL (Lognormal)	11.68

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	2.285	Mean in Log Scale	0.0614

SD in Original Scale	2.9	SD in Log Scale	1.247
95% UTL95% Coverage	40.07	95% UPL (t)	11.69
90% Percentile (z)	5.255	95% Percentile (z)	8.266
99% Percentile (z)	19.33	95% USL	16.03

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	7.1
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	7.1
95% USL	7.1	95% KM Chebyshev UPL	14.32

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Chrysene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	6		
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	1
Minimum Detect	0.0011	Minimum Non-Detect	0.0036
Maximum Detect	0.004	Maximum Non-Detect	0.0036
Variance Detected	1.5250E-6	Percent Non-Detects	50%
Mean Detected	0.0018	SD Detected	0.00123
Mean of Detected Logged Data	-6.455	SD of Detected Logged Data	0.53

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.64	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.427	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.00153	KM SD	8.3179E-4
95% UTL95% Coverage	0.00395	95% KM UPL (t)	0.00312
90% KM Percentile (z)	0.00259	95% KM Percentile (z)	0.00289

99% KM Percentile (z)	0.00346	95% KM USL	0.00334

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.0018	SD	8.2327E-4
95% UTL95% Coverage	0.0042	95% UPL (t)	0.00338
90% Percentile (z)	0.00286	95% Percentile (z)	0.00315
99% Percentile (z)	0.00372	95% USL	0.00359

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.923	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.681	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.418	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.359	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.856	k star (bias corrected MLE)	1.676
Theta hat (MLE)	4.6680E-4	Theta star (bias corrected MLE)	0.00107
nu hat (MLE)	38.56	nu star (bias corrected)	16.76
MLE Mean (bias corrected)	0.0018		
MLE Sd (bias corrected)	0.00139	95% Percentile of Chisquare (2kstar)	8.416

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0011	Mean	0.0059
Maximum	0.01	Median	0.007
SD	0.0044	CV	0.746
k hat (MLE)	1.402	k star (bias corrected MLE)	1.048
Theta hat (MLE)	0.00421	Theta star (bias corrected MLE)	0.00563
nu hat (MLE)	28.03	nu star (bias corrected)	20.95
MLE Mean (bias corrected)	0.0059	MLE Sd (bias corrected)	0.00576
95% Percentile of Chisquare (2kstar)	6.175	90% Percentile	0.0134
95% Percentile	0.0174	99% Percentile	0.0265

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.0337	0.039	95% Approx. Gamma UPL	0.0197	0.0211
95% Gamma USL	0.0228	0.0249			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00153	SD (KM)	8.3179E-4
Variance (KM)	6.9188E-7	SE of Mean (KM)	2.9706E-4
k hat (KM)	3.361	k star (KM)	2.42

nu hat (KM)	67.23	nu star (KM)	48.39
theta hat (KM)	4.5369E-4	theta star (KM)	6.3027E-4
80% gamma percentile (KM)	0.00223	90% gamma percentile (KM)	0.00284
95% gamma percentile (KM)	0.00341	99% gamma percentile (KM)	0.00466

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.00396	0.00397	95% Approx. Gamma UPL	0.00291	0.00288
95% KM Gamma Percentile	0.00265	0.00262	95% Gamma USL	0.00316	0.00314

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.387	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.00159	Mean in Log Scale	-6.545
SD in Original Scale	9.0242E-4	SD in Log Scale	0.426
95% UTL95% Coverage	0.00497	95% BCA UTL95% Coverage	0.004
95% Bootstrap (%) UTL95% Coverage	0.004	95% UPL (t)	0.00326
90% Percentile (z)	0.00248	95% Percentile (z)	0.0029
99% Percentile (z)	0.00387	95% USL	0.00363

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-6.572	95% KM UTL (Lognormal)95% Coverage	0.00399
KM SD of Logged Data	0.36	95% KM UPL (Lognormal)	0.0028
95% KM Percentile Lognormal (z)	0.00253	95% KM USL (Lognormal)	0.00307

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.0018	Mean in Log Scale	-6.388
SD in Original Scale	8.2327E-4	SD in Log Scale	0.36
95% UTL95% Coverage	0.0048	95% UPL (t)	0.00336
90% Percentile (z)	0.00267	95% Percentile (z)	0.00304
99% Percentile (z)	0.00389	95% USL	0.00368

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	0.004
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.004
95% USL	0.004	95% KM Chebyshev UPL	0.00533

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

Cobalt

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Minimum	1.1	First Quartile	1.45
Second Largest	9.5	Median	2.05
Maximum	10.8	Third Quartile	2.975
Mean	3.53	SD	3.561
Coefficient of Variation	1.009	Skewness	1.672
Mean of logged Data	0.914	SD of logged Data	0.814

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.684	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.348	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	13.9	90% Percentile (z)	8.093
	95% UPL (t)	10.38	95% Percentile (z)	9.387
	95% USL	11.28	99% Percentile (z)	11.81

Gamma GOF Test

A-D Test Statistic	0.932	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.739	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.256	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.271	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.584	k star (bias corrected MLE)	1.175
Theta hat (MLE)	2.229	Theta star (bias corrected MLE)	3.003
nu hat (MLE)	31.68	nu star (bias corrected)	23.51
MLE Mean (bias corrected)	3.53	MLE Sd (bias corrected)	3.256

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	10.95	90% Percentile	7.81
95% Hawkins Wixley (HW) Approx. Gamma UPL	11.12	95% Percentile	9.993

95% WH Approx. Gamma UTL with	95% Coverage	18.39	99% Percentile	15
95% HW Approx. Gamma UTL with	95% Coverage	19.67		
	95% WH USL	12.62	95% HW USL	12.97

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.856	**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	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	26.69	90% Percentile (z)	7.08
	95% UPL (t)	11.93	95% Percentile (z)	9.518
	95% USL	14.67	99% Percentile (z)	16.58

Nonparametric Distribution Free Background Statistics

Data appear Approximate Gamma Distribution at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with	95% Coverage	10.8
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL		0.401
		Approximate Sample Size needed to achieve specified CC		59
95% Percentile Bootstrap UTL with	95% Coverage	10.8	95% BCA Bootstrap UTL with 95% Coverage	10.8
	95% UPL	10.8	90% Percentile	9.63
	90% Chebyshev UPL	14.73	95% Percentile	10.22
	95% Chebyshev UPL	19.81	99% Percentile	10.68
	95% USL	10.8		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Copper

General Statistics

Total Number of Observations	10	Number of Distinct Observations	7
Minimum	1.8	First Quartile	1.9
Second Largest	2.6	Median	2.05
Maximum	3	Third Quartile	2.175
Mean	2.15	SD	0.375
Coefficient of Variation	0.174	Skewness	1.613
Mean of logged Data	0.753	SD of logged Data	0.16

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.809	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	3.241	90% Percentile (z)	2.63
	95% UPL (t)	2.871	95% Percentile (z)	2.767
	95% USL	2.966	99% Percentile (z)	3.022

Gamma GOF Test

A-D Test Statistic	0.749	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.239	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	41.24	k star (bias corrected MLE)	28.94
Theta hat (MLE)	0.0521	Theta star (bias corrected MLE)	0.0743
nu hat (MLE)	824.8	nu star (bias corrected)	578.7
MLE Mean (bias corrected)	2.15	MLE Sd (bias corrected)	0.4

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.881	90% Percentile	2.675
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.882	95% Percentile	2.847
95% WH Approx. Gamma UTL with 95% Coverage	3.326	99% Percentile	3.187
95% HW Approx. Gamma UTL with 95% Coverage	3.339		
95% WH USL	2.991	95% HW USL	2.995

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	3.382	90% Percentile (z)	2.607
	95% UPL (t)	2.888	95% Percentile (z)	2.763
	95% USL	3.007	99% Percentile (z)	3.081

Nonparametric Distribution Free Background Statistics

Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	3
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	3	95% BCA Bootstrap UTL with 95% Coverage	3
95% UPL	3	90% Percentile	2.64
90% Chebyshev UPL	3.33	95% Percentile	2.82
95% Chebyshev UPL	3.864	99% Percentile	2.964
95% USL	3		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Cyanide

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Minimum	0.045	First Quartile	0.06
Second Largest	0.12	Median	0.0665
Maximum	0.14	Third Quartile	0.0858
Mean	0.0776	SD	0.0312
Coefficient of Variation	0.402	Skewness	1.092
Mean of logged Data	-2.622	SD of logged Data	0.376

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	0.168	90% Percentile (z)	0.118
95% UPL (t)	0.138	95% Percentile (z)	0.129
95% USL	0.145	99% Percentile (z)	0.15

Gamma GOF Test

A-D Test Statistic	0.371	**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	0.194	**Kolmogorov-Smirnov 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)	7.72	k star (bias corrected MLE)	5.47
Theta hat (MLE)	0.0101	Theta star (bias corrected MLE)	0.0142
nu hat (MLE)	154.4	nu star (bias corrected)	109.4
MLE Mean (bias corrected)	0.0776	MLE Sd (bias corrected)	0.0332

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.144	90% Percentile	0.122
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.145	95% Percentile	0.139
95% WH Approx. Gamma UTL with 95% Coverage	0.192	99% Percentile	0.175
95% HW Approx. Gamma UTL with 95% Coverage	0.197		
95% WH USL	0.155	95% HW USL	0.157

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	0.217	90% Percentile (z)	0.118
95% UPL (t)	0.15	95% Percentile (z)	0.135
95% USL	0.165	99% Percentile (z)	0.174

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	0.14
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	0.14	95% BCA Bootstrap UTL with 95% Coverage	0.14
95% UPL	0.14	90% Percentile	0.122
90% Chebyshev UPL	0.176	95% Percentile	0.131
95% Chebyshev UPL	0.22	99% Percentile	0.138
95% USL	0.14		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Fluoranthene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	5		
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.0012	Minimum Non-Detect	0.0035
Maximum Detect	0.0046	Maximum Non-Detect	0.0038
Variance Detected	5.7800E-6	Percent Non-Detects	80%
Mean Detected	0.0029	SD Detected	0.0024
Mean of Detected Logged Data	-6.054	SD of Detected Logged Data	0.95

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.00154	KM SD	0.00102
95% UTL95% Coverage	0.00451	95% KM UPL (t)	0.0035
90% KM Percentile (z)	0.00285	95% KM Percentile (z)	0.00322
99% KM Percentile (z)	0.00391	95% KM USL	0.00376

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.00203	SD	9.2534E-4
95% UTL95% Coverage	0.00472	95% UPL (t)	0.0038
90% Percentile (z)	0.00321	95% Percentile (z)	0.00355
99% Percentile (z)	0.00418	95% USL	0.00404

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	2.529	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00115	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	10.12	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00154	SD (KM)	0.00102
Variance (KM)	1.0404E-6	SE of Mean (KM)	4.5616E-4
k hat (KM)	2.28	k star (KM)	1.662
nu hat (KM)	45.59	nu star (KM)	33.25

theta hat (KM)	6.7558E-4	theta star (KM)	9.2641E-4
80% gamma percentile (KM)	0.00236	90% gamma percentile (KM)	0.00313
95% gamma percentile (KM)	0.00388	99% gamma percentile (KM)	0.00555

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.00447	0.00446	95% Approx. Gamma UPL	0.00317	0.00312
95% KM Gamma Percentile	0.00286	0.00281	95% Gamma USL	0.00348	0.00343

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.0016	Mean in Log Scale	-6.604
SD in Original Scale	0.00116	SD in Log Scale	0.578
95% UTL95% Coverage	0.00729	95% BCA UTL95% Coverage	0.0046
95% Bootstrap (%) UTL95% Coverage	0.0046	95% UPL (t)	0.00412
90% Percentile (z)	0.00284	95% Percentile (z)	0.00351
99% Percentile (z)	0.0052	95% USL	0.00477

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-6.591	95% KM UTL (Lognormal)95% Coverage	0.00444
KM SD of Logged Data	0.403	95% KM UPL (Lognormal)	0.00298
95% KM Percentile Lognormal (z)	0.00266	95% KM USL (Lognormal)	0.0033

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.00203	Mean in Log Scale	-6.264
SD in Original Scale	9.2534E-4	SD in Log Scale	0.336
95% UTL95% Coverage	0.00506	95% UPL (t)	0.00363
90% Percentile (z)	0.00293	95% Percentile (z)	0.00331
99% Percentile (z)	0.00416	95% USL	0.00396

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	0.0046
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.0046
95% USL	0.0046	95% KM Chebyshev UPL	0.0062

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Indeno (1,2,3-cd) pyrene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Minimum Detect	0.0017	Minimum Non-Detect	0.0035
Maximum Detect	0.0017	Maximum Non-Detect	0.0038
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	0.0017	SD Detected	N/A
Mean of Detected Logged Data	-6.377	SD of Detected Logged Data	N/A

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 Indeno (1,2,3-cd) pyrene was not processed!

Iron

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	2710	First Quartile	3698
Second Largest	7730	Median	4085
Maximum	14700	Third Quartile	5000
Mean	5411	SD	3540
Coefficient of Variation	0.654	Skewness	2.412
Mean of logged Data	8.468	SD of logged Data	0.486

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.683	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	15717	90% Percentile (z)	9948
	95% UPL (t)	12217	95% Percentile (z)	11234
	95% USL	13115	99% Percentile (z)	13647

Gamma GOF Test

A-D Test Statistic	0.875	**Anderson-Darling Gamma GOF Test**	

5% A-D Critical Value	0.729	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.293	**Kolmogorov-Smirnov 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)	4.051	k star (bias corrected MLE)	2.902
Theta hat (MLE)	1336	Theta star (bias corrected MLE)	1864
nu hat (MLE)	81.02	nu star (bias corrected)	58.05
MLE Mean (bias corrected)	5411	MLE Sd (bias corrected)	3176

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	12028	90% Percentile	9669
95% Hawkins Wixley (HW) Approx. Gamma UPL	12033	95% Percentile	11464
95% WH Approx. Gamma UTL with 95% Coverage	17443	99% Percentile	15363
95% HW Approx. Gamma UTL with 95% Coverage	17847		
95% WH USL	13290	95% HW USL	13363

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.256	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	19594	90% Percentile (z)	8873
95% UPL (t)	12118	95% Percentile (z)	10587
95% USL	13707	99% Percentile (z)	14746

Nonparametric Distribution Free Background Statistics

Data appear Lognormal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	14700
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	14700	95% BCA Bootstrap UTL with 95% Coverage	14700
95% UPL	14700	90% Percentile	8427
90% Chebyshev UPL	16550	95% Percentile	11564
95% Chebyshev UPL	21596	99% Percentile	14073
95% USL	14700		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Lead

General Statistics

Total Number of Observations	10	Number of Distinct Observations	8
Minimum	2.8	First Quartile	3.925
Second Largest	6.9	Median	4
Maximum	7.8	Third Quartile	4.8
Mean	4.6	SD	1.578
Coefficient of Variation	0.343	Skewness	1.252
Mean of logged Data	1.479	SD of logged Data	0.314

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

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	0.248	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	9.192	90% Percentile (z)	6.622
	95% UPL (t)	7.633	95% Percentile (z)	7.195
	95% USL	8.033	99% Percentile (z)	8.27

Gamma GOF Test

A-D Test Statistic	0.57	**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	0.236	**Kolmogorov-Smirnov 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)	10.83	k star (bias corrected MLE)	7.645
Theta hat (MLE)	0.425	Theta star (bias corrected MLE)	0.602
nu hat (MLE)	216.5	nu star (bias corrected)	152.9
MLE Mean (bias corrected)	4.6	MLE Sd (bias corrected)	1.664

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL		7.847	90% Percentile	6.819
95% Hawkins Wixley (HW) Approx. Gamma UPL		7.887	95% Percentile	7.634
95% WH Approx. Gamma UTL with	95% Coverage	10.12	99% Percentile	9.324
95% HW Approx. Gamma UTL with	95% Coverage	10.29		
	95% WH USL	8.392	95% HW USL	8.458

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.216	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	10.96	90% Percentile (z)		6.567
	95% UPL (t)	8.034	95% Percentile (z)		7.362
	95% USL	8.7	99% Percentile (z)		9.121

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		10	95% UTL with	95% Coverage	7.8
Approx, f used to compute achieved CC		0.526	Approximate Actual Confidence Coefficient achieved by UTL		0.401
			Approximate Sample Size needed to achieve specified CC		59
95% Percentile Bootstrap UTL with	95% Coverage	7.8	95% BCA Bootstrap UTL with	95% Coverage	7.8
	95% UPL	7.8		90% Percentile	6.99
	90% Chebyshev UPL	9.564		95% Percentile	7.395
	95% Chebyshev UPL	11.81		99% Percentile	7.719
	95% USL	7.8			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Magnesium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	180	First Quartile	223.3
Second Largest	289	Median	236.5
Maximum	369	Third Quartile	257
Mean	246.2	SD	53.46
Coefficient of Variation	0.217	Skewness	1.311
Mean of logged Data	5.487	SD of logged Data	0.204

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**	

5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	401.8	90% Percentile (z)	314.7
	95% UPL (t)	349	95% Percentile (z)	334.1
	95% USL	362.5	99% Percentile (z)	370.6

Gamma GOF Test

A-D Test Statistic	0.344	**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	0.172	**Kolmogorov-Smirnov 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)	25.96	k star (bias corrected MLE)	18.24
Theta hat (MLE)	9.483	Theta star (bias corrected MLE)	13.5
nu hat (MLE)	519.2	nu star (bias corrected)	364.8
MLE Mean (bias corrected)	246.2	MLE Sd (bias corrected)	57.65

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	353.6	90% Percentile	322.4
95% Hawkins Wixley (HW) Approx. Gamma UPL	354.4	95% Percentile	348.1
95% WH Approx. Gamma UTL with 95% Coverage	421.6	99% Percentile	399.7
95% HW Approx. Gamma UTL with 95% Coverage	425		
95% WH USL	370.2	95% HW USL	371.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	436.9	90% Percentile (z)	313.5
	95% UPL (t)	357.2	95% Percentile (z)	337.6
	95% USL	376.2	99% Percentile (z)	387.8

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with	95% Coverage	369
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL		0.401
		Approximate Sample Size needed to achieve specified CC		59
95% Percentile Bootstrap UTL with	95% Coverage	369	95% BCA Bootstrap UTL with 95% Coverage	369

95% UPL	369	90% Percentile	297
90% Chebyshev UPL	414.4	95% Percentile	333
95% Chebyshev UPL	490.6	99% Percentile	361.8
95% USL	369		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Manganese

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	137	First Quartile	188.5
Second Largest	384	Median	226.5
Maximum	545	Third Quartile	264
Mean	260.8	SD	120
Coefficient of Variation	0.46	Skewness	1.744
Mean of logged Data	5.487	SD of logged Data	0.396

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.819	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	610	90% Percentile (z)	414.5
	95% UPL (t)	491.4	95% Percentile (z)	458.1
	95% USL	521.8	99% Percentile (z)	539.9

Gamma GOF Test

A-D Test Statistic	0.485	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.225	**Kolmogorov-Smirnov 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)	6.645	k star (bias corrected MLE)	4.718
Theta hat (MLE)	39.25	Theta star (bias corrected MLE)	55.27
nu hat (MLE)	132.9	nu star (bias corrected)	94.37

MLE Mean (bias corrected)	260.8	MLE Sd (bias corrected)	120.1

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	502.7	90% Percentile	421.6
95% Hawkins Wixley (HW) Approx. Gamma UPL	505.5	95% Percentile	484.4
95% WH Approx. Gamma UTL with 95% Coverage	684.2	99% Percentile	617.5
95% HW Approx. Gamma UTL with 95% Coverage	700		
95% WH USL	545.7	95% HW USL	550.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	764.5	90% Percentile (z)	401
95% UPL (t)	516.9	95% Percentile (z)	463.1
95% USL	571.5	99% Percentile (z)	606.5

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	545
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	545	95% BCA Bootstrap UTL with 95% Coverage	545
95% UPL	545	90% Percentile	400.1
90% Chebyshev UPL	638.2	95% Percentile	472.6
95% Chebyshev UPL	809.2	99% Percentile	530.5
95% USL	545		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Mercury

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	3		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	2
Minimum Detect	0.038	Minimum Non-Detect	0.12

Maximum Detect	0.038	Maximum Non-Detect	0.13
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	0.038	SD Detected	N/A
Mean of Detected Logged Data	-3.27	SD of Detected Logged Data	N/A

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 Mercury was not processed!

Nickel

General Statistics

Total Number of Observations	10	Number of Distinct Observations	7
Minimum	1.8	First Quartile	1.925
Second Largest	3.2	Median	2.15
Maximum	5.6	Third Quartile	2.6
Mean	2.56	SD	1.156
Coefficient of Variation	0.452	Skewness	2.411
Mean of logged Data	0.875	SD of logged Data	0.35

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.681	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	5.925	90% Percentile (z)	4.041
	95% UPL (t)	4.782	95% Percentile (z)	4.461
	95% USL	5.075	99% Percentile (z)	5.249

Gamma GOF Test

A-D Test Statistic	0.961	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.727	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.269	**Kolmogorov-Smirnov 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)	7.839	k star (bias corrected MLE)	5.554
Theta hat (MLE)	0.327	Theta star (bias corrected MLE)	0.461
nu hat (MLE)	156.8	nu star (bias corrected)	111.1

MLE Mean (bias corrected)	2.56	MLE Sd (bias corrected)	1.086

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	4.715	90% Percentile	4.013
95% Hawkins Wixley (HW) Approx. Gamma UPL	4.711	95% Percentile	4.568
95% WH Approx. Gamma UTL with 95% Coverage	6.294	99% Percentile	5.736
95% HW Approx. Gamma UTL with 95% Coverage	6.368		
95% WH USL	5.091	95% HW USL	5.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.798	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	6.651	90% Percentile (z)	3.758
95% UPL (t)	4.704	95% Percentile (z)	4.268
95% USL	5.141	99% Percentile (z)	5.419

Nonparametric Distribution Free Background Statistics

Data appear Approximate Lognormal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	5.6
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	5.6	95% BCA Bootstrap UTL with 95% Coverage	5.6
95% UPL	5.6	90% Percentile	3.44
90% Chebyshev UPL	6.197	95% Percentile	4.52
95% Chebyshev UPL	7.844	99% Percentile	5.384
95% USL	5.6		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

OCDD

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	6	Number of Non-Detects	4
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	1.0900E-5	Minimum Non-Detect	1.0700E-5

Maximum Detect	1.9100E-5	Maximum Non-Detect	1.1000E-5
Variance Detected	8.098E-12	Percent Non-Detects	40%
Mean Detected	1.4883E-5	SD Detected	2.8456E-6
Mean of Detected Logged Data	-11.13	SD of Detected Logged Data	0.194

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	1.3215E-5	KM SD	2.8679E-6
95% UTL95% Coverage	2.1563E-5	95% KM UPL (t)	1.8729E-5
90% KM Percentile (z)	1.6890E-5	95% KM Percentile (z)	1.7932E-5
99% KM Percentile (z)	1.9887E-5	95% KM USL	1.9456E-5

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	1.1095E-5	SD	5.3310E-6
95% UTL95% Coverage	2.6613E-5	95% UPL (t)	2.1344E-5
90% Percentile (z)	1.7927E-5	95% Percentile (z)	1.9864E-5
99% Percentile (z)	2.3497E-5	95% USL	2.2696E-5

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.187	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.171	**Kolmogorov-Smirnov GOF**
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 on Detected Data Only

k hat (MLE)	32.48	k star (bias corrected MLE)	16.35
Theta hat (MLE)	4.5828E-7	Theta star (bias corrected MLE)	9.1032E-7
nu hat (MLE)	389.7	nu star (bias corrected)	196.2
MLE Mean (bias corrected)	1.4883E-5		
MLE Sd (bias corrected)	3.6808E-6	95% Percentile of Chisquare (2kstar)	47.04

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.0900E-5	Mean	0.00401
Maximum	0.01	Median	1.8000E-5
SD	0.00516	CV	1.286
k hat (MLE)	0.238	k star (bias corrected MLE)	0.234
Theta hat (MLE)	0.0168	Theta star (bias corrected MLE)	0.0172
nu hat (MLE)	4.769	nu star (bias corrected)	4.672
MLE Mean (bias corrected)	0.00401	MLE Sd (bias corrected)	0.00829
95% Percentile of Chisquare (2kstar)	2.307	90% Percentile	0.0121
95% Percentile	0.0198	99% Percentile	0.0405

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.0584	0.0889	95% Approx. Gamma UPL	0.0245	0.03
95% Gamma USL	0.0314	0.0408			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.3215E-5	SD (KM)	2.8679E-6
Variance (KM)	8.225E-12	SE of Mean (KM)	9.9352E-7
k hat (KM)	21.23	k star (KM)	14.93
nu hat (KM)	424.7	nu star (KM)	298.6
theta hat (KM)	6.2238E-7	theta star (KM)	8.8515E-7
80% gamma percentile (KM)	1.5974E-5	90% gamma percentile (KM)	1.7744E-5
95% gamma percentile (KM)	1.9297E-5	99% gamma percentile (KM)	2.2443E-5

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	2.2702E-5	2.2889E-5	95% Approx. Gamma UPL	1.9011E-5	1.9055E-5
95% KM Gamma Percentile	1.8051E-5	1.8071E-5	95% Gamma USL	1.9916E-5	1.9989E-5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	1.2498E-5	Mean in Log Scale	-11.33
SD in Original Scale	3.7607E-6	SD in Log Scale	0.299
95% UTL95% Coverage	2.8650E-5	95% BCA UTL95% Coverage	1.9100E-5
95% Bootstrap (%) UTL95% Coverage	1.9100E-5	95% UPL (t)	2.1323E-5
90% Percentile (z)	1.7605E-5	95% Percentile (z)	1.9624E-5
99% Percentile (z)	2.4057E-5	95% USL	2.3001E-5

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-11.26	95% KM UTL (Lognormal)95% Coverage	2.3537E-5
KM SD of Logged Data	0.206	95% KM UPL (Lognormal)	1.9204E-5

95% KM Percentile Lognormal (z)	1.8137E-5	95% KM USL (Lognormal)	2.0233E-5

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	1.1095E-5	Mean in Log Scale	-11.53
SD in Original Scale	5.3310E-6	SD in Log Scale	0.534
95% UTL95% Coverage	4.6608E-5	95% UPL (t)	2.7485E-5
90% Percentile (z)	1.9513E-5	95% Percentile (z)	2.3694E-5
99% Percentile (z)	3.4102E-5	95% USL	3.1471E-5

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	1.9100E-5
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	1.9100E-5
95% USL	1.9100E-5	95% KM Chebyshev UPL	2.6326E-5

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

Phenanthrene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	3
Minimum Detect	0.0015	Minimum Non-Detect	0.0035
Maximum Detect	0.0015	Maximum Non-Detect	0.0038
Variance Detected	N/A	Percent Non-Detects	90%
Mean Detected	0.0015	SD Detected	N/A
Mean of Detected Logged Data	-6.502	SD of Detected Logged Data	N/A

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 Phenanthrene was not processed!

Potassium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9

Minimum	294	First Quartile	375
Second Largest	494	Median	406.5
Maximum	526	Third Quartile	475.8
Mean	412.8	SD	78.71
Coefficient of Variation	0.191	Skewness	-0.168
Mean of logged Data	6.006	SD of logged Data	0.198

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	641.9	90% Percentile (z)	513.7
	95% UPL (t)	564.1	95% Percentile (z)	542.3
	95% USL	584.1	99% Percentile (z)	595.9

Gamma GOF Test

A-D Test Statistic	0.308	**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	**Kolmogorov-Smirnov 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)	29.27	k star (bias corrected MLE)	20.56
Theta hat (MLE)	14.1	Theta star (bias corrected MLE)	20.08
nu hat (MLE)	585.4	nu star (bias corrected)	411.1
MLE Mean (bias corrected)	412.8	MLE Sd (bias corrected)	91.05

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL		581.7	90% Percentile	532.9
95% Hawkins Wixley (HW) Approx. Gamma UPL		584.5	95% Percentile	573.1
95% WH Approx. Gamma UTL with	95% Coverage	687.5	99% Percentile	653.6
95% HW Approx. Gamma UTL with	95% Coverage	695.1		
	95% WH USL	607.7	95% HW USL	611.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	722.1	90% Percentile (z)	523
	95% UPL (t)	593.7	95% Percentile (z)	562
	95% USL	624.3	99% Percentile (z)	643.1

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

	Order of Statistic, r	10	95% UTL with	95% Coverage	526
	Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL		0.401
			Approximate Sample Size needed to achieve specified CC		59
95% Percentile Bootstrap UTL with	95% Coverage	526	95% BCA Bootstrap UTL with	95% Coverage	526
	95% UPL	526		90% Percentile	497.2
	90% Chebyshev UPL	660.5		95% Percentile	511.6
	95% Chebyshev UPL	772.6		99% Percentile	523.1
	95% USL	526			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Pyrene

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	5		
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.0012	Minimum Non-Detect	0.0035
Maximum Detect	0.0064	Maximum Non-Detect	0.0038
Variance Detected	1.3520E-5	Percent Non-Detects	80%
Mean Detected	0.0038	SD Detected	0.00368
Mean of Detected Logged Data	-5.888	SD of Detected Logged Data	1.184

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.00172	KM SD	0.00156
95% UTL95% Coverage	0.00626	95% KM UPL (t)	0.00472
90% KM Percentile (z)	0.00372	95% KM Percentile (z)	0.00429
99% KM Percentile (z)	0.00535	95% KM USL	0.00511

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.00221	SD	0.00149
95% UTL95% Coverage	0.00653	95% UPL (t)	0.00506
90% Percentile (z)	0.00411	95% Percentile (z)	0.00465
99% Percentile (z)	0.00566	95% USL	0.00544

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.732	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00219	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.927	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00172	SD (KM)	0.00156
Variance (KM)	2.4336E-6	SE of Mean (KM)	6.9765E-4
k hat (KM)	1.216	k star (KM)	0.918
nu hat (KM)	24.31	nu star (KM)	18.35
theta hat (KM)	0.00141	theta star (KM)	0.00187
80% gamma percentile (KM)	0.00279	90% gamma percentile (KM)	0.00405
95% gamma percentile (KM)	0.00531	99% gamma percentile (KM)	0.00827

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.00618	0.00617	95% Approx. Gamma UPL	0.0041	0.00401
95% KM Gamma Percentile	0.00361	0.00352	95% Gamma USL	0.00458	0.0045

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.00183	Mean in Log Scale	-6.575
SD in Original Scale	0.00173	SD in Log Scale	0.72
95% UTL95% Coverage	0.0114	95% BCA UTL95% Coverage	0.0064
95% Bootstrap (%) UTL95% Coverage	0.0064	95% UPL (t)	0.00557
90% Percentile (z)	0.00351	95% Percentile (z)	0.00456
99% Percentile (z)	0.00745	95% USL	0.00669

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-6.558	95% KM UTL (Lognormal)95% Coverage	0.00612
KM SD of Logged Data	0.502	95% KM UPL (Lognormal)	0.00373
95% KM Percentile Lognormal (z)	0.00324	95% KM USL (Lognormal)	0.00423

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.00221	Mean in Log Scale	-6.231
SD in Original Scale	0.00149	SD in Log Scale	0.434
95% UTL95% Coverage	0.00697	95% UPL (t)	0.00453
90% Percentile (z)	0.00343	95% Percentile (z)	0.00402
99% Percentile (z)	0.0054	95% USL	0.00506

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	0.0064
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.0064
95% USL	0.0064	95% KM Chebyshev UPL	0.00885

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Sodium

General Statistics

Total Number of Observations	10	Number of Missing Observations	0
Number of Distinct Observations	10		
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	10.7	Minimum Non-Detect	443
Maximum Detect	11.6	Maximum Non-Detect	549
Variance Detected	0.405	Percent Non-Detects	80%
Mean Detected	11.15	SD Detected	0.636
Mean of Detected Logged Data	2.411	SD of Detected Logged Data	0.0571

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	11.15	KM SD	0.45
95% UTL95% Coverage	12.46	95% KM UPL (t)	12.02
90% KM Percentile (z)	11.73	95% KM Percentile (z)	11.89
99% KM Percentile (z)	12.2	95% KM USL	12.13

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	201.3	SD	102.1
95% UTL95% Coverage	498.5	95% UPL (t)	397.6
90% Percentile (z)	332.2	95% Percentile (z)	369.3
99% Percentile (z)	438.8	95% USL	423.5

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	613.6	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0182	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	2454	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	11.15	SD (KM)	0.45
Variance (KM)	0.203	SE of Mean (KM)	0.45
k hat (KM)	613.9	k star (KM)	429.8
nu hat (KM)	12279	nu star (KM)	8596
theta hat (KM)	0.0182	theta star (KM)	0.0259
80% gamma percentile (KM)	11.6	90% gamma percentile (KM)	11.84
95% gamma percentile (KM)	12.05	99% gamma percentile (KM)	12.44

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	12.51	12.51	95% Approx. Gamma UPL	12.03	12.03
95% KM Gamma Percentile	11.9	11.9	95% Gamma USL	12.15	12.16

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	11.14	Mean in Log Scale	2.411
SD in Original Scale	0.212	SD in Log Scale	0.019

95% UTL95% Coverage	11.78	95% BCA UTL95% Coverage	N/A
95% Bootstrap (%) UTL95% Coverage	N/A	95% UPL (t)	11.56
90% Percentile (z)	11.42	95% Percentile (z)	11.5
99% Percentile (z)	11.65	95% USL	11.61

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	2.411	95% KM UTL (Lognormal)95% Coverage	12.53
KM SD of Logged Data	0.0404	95% KM UPL (Lognormal)	12.04
95% KM Percentile Lognormal (z)	11.91	95% KM USL (Lognormal)	12.16

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	201.3	Mean in Log Scale	4.893
SD in Original Scale	102.1	SD in Log Scale	1.311
95% UTL95% Coverage	6055	95% UPL (t)	1657
90% Percentile (z)	715.3	95% Percentile (z)	1152
99% Percentile (z)	2814	95% USL	2311

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	10	95% UTL with95% Coverage	549
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
Approximate Sample Size needed to achieve specified CC	59	95% UPL	549
95% USL	549	95% KM Chebyshev UPL	13.21

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Vanadium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Minimum	3.9	First Quartile	5.175
Second Largest	7.7	Median	6.15
Maximum	9.7	Third Quartile	7.1
Mean	6.29	SD	1.676
Coefficient of Variation	0.266	Skewness	0.702
Mean of logged Data	1.808	SD of logged Data	0.263

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	11.17	90% Percentile (z)	8.438
	95% UPL (t)	9.513	95% Percentile (z)	9.047
	95% USL	9.938	99% Percentile (z)	10.19

Gamma GOF Test

A-D Test Statistic	0.153	**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	0.12	**Kolmogorov-Smirnov 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)	16.17	k star (bias corrected MLE)	11.38
Theta hat (MLE)	0.389	Theta star (bias corrected MLE)	0.553
nu hat (MLE)	323.3	nu star (bias corrected)	227.6
MLE Mean (bias corrected)	6.29	MLE Sd (bias corrected)	1.864

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.847	90% Percentile	8.766
95% Hawkins Wixley (HW) Approx. Gamma UPL	9.906	95% Percentile	9.637
95% WH Approx. Gamma UTL with 95% Coverage	12.21	99% Percentile	11.42
95% HW Approx. Gamma UTL with 95% Coverage	12.4		
95% WH USL	10.42	95% HW USL	10.51

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	95% Coverage	13.12	90% Percentile (z)	8.543
	95% UPL (t)	10.11	95% Percentile (z)	9.401
	95% USL	10.81	99% Percentile (z)	11.25

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with	95% Coverage	9.7

Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	9.7	95% BCA Bootstrap UTL with 95% Coverage	9.7
95% UPL	9.7	90% Percentile	7.9
90% Chebyshev UPL	11.56	95% Percentile	8.8
95% Chebyshev UPL	13.95	99% Percentile	9.52
95% USL	9.7		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Zinc

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Minimum	3.6	First Quartile	5.55
Second Largest	9.6	Median	5.95
Maximum	12.3	Third Quartile	7.75
Mean	6.91	SD	2.503
Coefficient of Variation	0.362	Skewness	1.151
Mean of logged Data	1.878	SD of logged Data	0.344

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	2.911	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	14.2	90% Percentile (z)	10.12
95% UPL (t)	11.72	95% Percentile (z)	11.03
95% USL	12.36	99% Percentile (z)	12.73

Gamma GOF Test

A-D Test Statistic	0.353	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.185	**Kolmogorov-Smirnov 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)	9.342	k star (bias corrected MLE)	6.606
Theta hat (MLE)	0.74	Theta star (bias corrected MLE)	1.046
nu hat (MLE)	186.8	nu star (bias corrected)	132.1
MLE Mean (bias corrected)	6.91	MLE Sd (bias corrected)	2.688

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	12.21	90% Percentile	10.5
95% Hawkins Wixley (HW) Approx. Gamma UPL	12.31	95% Percentile	11.84
95% WH Approx. Gamma UTL with 95% Coverage	15.99	99% Percentile	14.64
95% HW Approx. Gamma UTL with 95% Coverage	16.35		
95% WH USL	13.11	95% HW USL	13.26

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	17.81	90% Percentile (z)	10.17
95% UPL (t)	12.68	95% Percentile (z)	11.52
95% USL	13.83	99% Percentile (z)	14.57

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 95% Coverage	12.3
Approx, f used to compute achieved CC	0.526	Approximate Actual Confidence Coefficient achieved by UTL	0.401
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	12.3	95% BCA Bootstrap UTL with 95% Coverage	12.3
95% UPL	12.3	90% Percentile	9.87
90% Chebyshev UPL	14.79	95% Percentile	11.09
95% Chebyshev UPL	18.35	99% Percentile	12.06
95% USL	12.3		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.

The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.