Final
Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex
Lewis and Clark County, Montana

Montana Department of Environmental Quality
Remediation Division

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ACRONYMS AND ABBREVIATIONS

µg/dL	Microgram per deciliter
UCL	Upper confidence limit
ABS	Dermal absorption factor
ALM	Adult lead methodology
AOC	Administrative Order on Consent
ARCO	Atlantic Richfield Company
ARM	Administrative Rules of Montana
ASARCO	American Smelting and Refining Company
ATV	All-terrain vehicle
BCF	Bioconcentration factor
BER	Board of Environmental Review
BERA	Baseline ecological risk assessment
bgs	Below ground surface
BTV	Background threshold value
cm^2	Square centimeter
Cal/EPA	California Environmental Protection Agency
CDC	Centers for Disease Control and Prevention
CDM	Camp, Dresser, and McKee
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
COC	Chemical of concern
COPC	Chemical of potential concern
CSEM	Conceptual site exposure model
DAF	Dilution-attenuation factor
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resource Conservation
DSL	Department of State Lands
DSR	Data Summary Report
DT	Dispersed tailings
EE/CA	Engineering evaluation/cost analysis
EOT	Edge of tailings
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
EU	Exposure unit
ft^3	Cubic feet

ACRONYMS AND ABBREVIATIONS (Continued)

gpm	Gallon per minute
GWIC	Groundwater Information Center
HEAST	Health Effects Assessment Summary Tables
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
hr/day	Hour per day
IEUBK	Integrated exposure uptake biokinetic
IP	Implementation plan
IRIS	Integrated Risk Information System
IUR	Inhalation unit risk
kg/day	Kilogram per day
LC	Leachate Criterion
LOAEL	Lowest observed adverse effect level
m^3/kg	Cubic meter per kilogram
MDHES	Montana Department of Health and Environmental Services
mg/cm^2	Milligram per square centimeter
mg/day	Milligram per day
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/L	Milligram per liter
mg/m^3	Milligram per cubic meter
MPDES	Montana Pollutant Discharge Elimination System
NCEA	National Center for Environmental Assessment
NOAEL	No observed adverse effects level
OEHHA	Office of Environmental and Health Hazard Assessment
O&M	Operation and maintenance
PEF	Particulate emission factor
PHHRG	Preliminary human health remediation goal
PLP	Potentially liable person
PPRTV	Provisional peer-reviewed toxicity value
RAGS	Risk Assessment Guidance for Superfund
RBA	Relative bioavailability
RBC	Risk-based concentration

ACRONYMS AND ABBREVIATIONS (Continued)

RfC	Reference concentration
RfD	Reference dose
RI/FS	Remedial investigation/feasibility study
RME	Reasonable maximum exposure
RSL	Regional screening level
SF	Slope factor
SPLP	Synthetic Precipitation Leaching Procedure
SRS	Site Response Section
SSCL	Site-Specific Cleanup Level
SSL	Soil screening level
TMDL	Total maximum daily load
UBMC	Upper Blackfoot Mining Complex
USFS	U.S. Forest Service
VCP	Voluntary cleanup plan
VCRA	Voluntary Cleanup and Redevelopment Act
WBZ	Water-bearing zone
XRF	X-ray fluorescence
yd^3	Cubic yards

EXECUTIVE SUMMARY

This report presents the findings of the baseline human health risk assessment (HHRA) conducted for the Upper Blackfoot Mining Complex (UBMC), located in the headwaters of the Blackfoot River in Lewis and Clark County, Montana.

BACKGROUND

The UBMC is a 6-square-mile mining district that was mined intermittently from 1889 to the 1950s and includes a mixture of National Forest and private lands. Tailings, waste rock dumps, and acid mine drainage from old adits have contaminated surface water, sediments, soils, and groundwater, and have been taken up by plants and wildlife. The main workings in the area are the Mike Horse Mine, which is a major contributor to surface water contamination; and lesser workings that include the Anaconda, Carbonate, Edith, Mary P. Pine, Consolation, Capitol, Number 3 Tunnel, and Paymaster Mines; and a surface impoundment on Beartrap Creek. In 1975, the impoundment failed during a heavy rain-on-snow event and washed metal-laden tailings into the upper Blackfoot River.

Nearby National Forest land is used by hunters and other recreational users, but the area is remote from large population centers. The town of Lincoln, Montana, is 15 miles west (downstream). One residence with a domestic well is located on Beartrap Creek above the impoundment. In addition, three residences are located within 2 miles downstream (west) of the confluence of the Blackfoot River and Pass Creek.

ENVIRONMENTAL INVESTIGATIONS

The Montana Department of State Lands (DSL) completed an environmental assessment of the area in 1991. A 1991 state legislative action then transferred regulatory authority for the mining area from DSL to the Montana Department of Health and Environmental Services (MDHES) Comprehensive Environmental Cleanup and Responsibility Act (CECRA) program. MDHES became the Montana Department of Environmental Quality (DEQ) in 1995. Many other investigations have occurred since then (DEQ 2007).

A remedial investigation (RI) completed for the UBMC in 2007 and 2008 identified nine chemicals (aluminum, arsenic, cadmium, copper, iron, lead, manganese, mercury, and zinc) of potential concern (COPC) that warrant further evaluation in an HHRA and baseline ecological risk assessment (BERA) (Tetra Tech 2013a). This HHRA is based on data collected during the RI and is limited to an evaluation of the COPCs identified in the RI. A detailed discussion regarding use of data, including why historical data were omitted, is part of Section 5.1. Mercury was excluded as a COPC from the HHRA because it was not detected in any RI samples collected at exposure units (EUs) evaluated in the HHRA. However, mercury was detected at a single stream sediment sample (SHSE-101) from Shave Gulch (part of the Abandoned Mine Feature inventory) at a concentration of 380 milligrams per kilogram (mg/kg), which exceeds the U.S. Environmental Protection Agency (EPA) Regional Screening Level (RSL) for residential soil of 23 mg/kg (EPA 2013b). Additional sampling of stream sediments in November 2011 by DEQ did not detect mercury beyond this single sample (Tetra Tech 2013a). The BERA for the UBMC was prepared under separate cover.

HHRA OBJECTIVES AND SCOPE

The primary objective of the HHRA is to evaluate site-specific risk to human health and to develop site-specific cleanup levels (SSCLs) that are protective of human health and the environment. The HHRA supports one of two possible determinations: (1) the Facility does not pose an unacceptable human health risk, and no further action is needed; or, (2) the Facility poses an unacceptable human health risk, and further action may be needed.

The HHRA estimated health risks from exposure to COPCs in soil and sediment for the following 13 separate EUs, identified by physical location, habitat type, and waste sources.

- EU 1 – Upper Anaconda Mine Waste Removal Areas and Waste Piles
- EU 2 – Blackfoot River Dispersed Tailings Associated with Engineering Evaluation and Cost Analysis (EE/CA) Removal Action Area and Overbank Deposits
- EU 3 – Capital Mine Waste Area
- EU 4 – Carbonate Mine Waste Area
- EU 5 – Edith Mine Waste Areas
- EU 6 – Consolation Mine Waste Area
- EU 7 – Mary P. Mine Waste Pile
- EU 8 – Mike Horse Mine Waste Piles
- EU 9 – Paymaster Mine Waste Areas
- EU 10 – Number 3 Tunnel Waste Area
- EU 11 – Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles
- EU 12 –Marsh
- EU 13 – Stream Sediments

In addition, the HHRA compared concentrations in groundwater and surface water with DEQ-7 numeric water quality standards (DEQ 2012) for protection of human health. Health risks were not quantified for groundwater and surface water.

HHRA METHODOLOGY

The HHRA evaluated health risks for four recreational scenarios (all-terrain vehicle [ATV]/motorcycle rider, fisherman, rock hound, and hunter), two worker scenarios (industrial and construction), and a residential scenario. Health risks were estimated for exposure COPCs in surface soil (0 to 2 feet below ground surface [bgs]) at EUs 1 through 11 and in subsurface soil (2 to 10 feet bgs) at EUs 2, 9, and 11. Health risks were also estimated in surface sediment

(0 to 2 feet bgs) at EUs 12 and 13 (Note: at EU 13, the majority of sediment samples were collected from 0 to 2 inches bgs) and subsurface sediment (2 to 10 feet bgs) at EU 12.

Before the health risks were estimated, the HHRA compared maximum concentrations of COPCs with background and risk-based screening levels to refine the list of COPCs. Comparison to risk-based screening levels indicated most COPCs exceeded screening levels for all EUs; cadmium and zinc were the COPCs most frequently detected below risk-based screening levels. Similarly, comparison to background levels indicated most COPCs exceeded background for all or most EUs. Aluminum in soil did not exceed background for any EU, and copper and iron in soil exceeded background at all EUs. EU 9 had the fewest results that exceeded background in soil. All COPCs exceeded background in marsh sediments (EU 12) and streambed sediments (EU 13).

Potentially complete exposure pathways for soil and sediment at the UBMC are incidental ingestion, dermal contact, and inhalation of COPCs released to outdoor air. The HHRA evaluated these pathways for all receptors. In addition, the HHRA evaluated exposure to COPCs from ingestion of fish for the recreational fisherman.

The appropriate (95 percent or higher) upper confidence limit (UCL) was used as the exposure point concentration (EPC) for direct exposure (ingestion and dermal contact) to COPCs in soil and sediment, except when the UCL exceeded the maximum concentration or when the data set or number of detected results was not sufficiently large to calculate a UCL. In both of these cases, the EPC was set equal to the maximum detected concentration for a particular data set. EPCs for indirect exposure (inhalation) to COPCs in soil and sediment were estimated using particulate emission models. Since there were no fish collected for tissue sampling, EPCs for fish tissue were estimated using measured concentrations of COPCs in surface water and chemical-specific bioaccumulation factors. Pathway-specific chemical exposure (intake) for each COPC was estimated for each receptor using the calculated EPCs and EPA and DEQ default exposure assumptions.

The HHRA used chemical-specific cancer slope factors and unit risks to evaluate cancer risks and the chemical-specific noncancer reference doses and reference concentrations used to evaluate noncancer health effects. The sources used to obtain these toxicity criteria for the HHRA were based on the source hierarchy outlined by EPA (EPA 2003).

HHRA RESULTS

Results of the HHRA are shown in Tables ES-1 through ES-5 and are briefly summarized below. The HHRA compared cancer risk results with the DEQ allowable cumulative risk level of 1E-05 and cumulative noncancer hazard index (HI) results with the threshold HI of 1 for each receptor and EU. If the total HI exceeded 1, the HHRA further evaluated potential synergistic effects by calculating HIs segregated by target organ. Risks and HIs that do not exceed these levels generally do not require further action. Risks and HIs that exceed these levels indicate that an unacceptable health risk is associated with exposure to COPCs at the EU and that further action may be needed. The HHRA identified a COPC as a chemical of concern (COC) for all COPCs except lead if the COPC-specific risk exceeds 1E-05 or the COPC-specific HI exceeds 1. However, the Centers for Disease Control and Prevention (CDC) have recently indicated that adverse health effects are documented at blood lead levels of 5 µg/dL. Therefore, the HHRA includes blood lead modeling to evaluate lead using two different blood lead endpoints; lead is identified as a COC if the predicted 95th percentile blood lead level exceeds either 10 micrograms per deciliter (µg/dL) or 5 µg/dL. This provides two separate risk-based levels for media based on both

The range of estimated cancer risks and noncancer HIs for each EU is provided in the summary below. Unless otherwise indicated, the lowest estimated cancer risk and noncancer HI are associated with the low frequency exposure scenario for the recreational hunter. The highest estimated risk and HI are associated with the residential receptor.

- **EU 1, Upper Anaconda Mine Waste Removal Areas and Waste Piles** – Health risks are based on exposure to surface soil. Cancer risks range from 1E-06 to 7E-05. Noncancer HIs range from 0.01 to 2; the highest segregated HI is 1. Predicted blood lead levels range from 11.7 to 93.2 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 2, Blackfoot River Dispersed Tailings Associated with EE/CA Removal Area and Overbank Deposits** – Health risks are based on exposure to surface and subsurface soil. Cancer risks for exposure to surface soil range from 1E-06 to 9E-05, and noncancer HIs range from 0.02 to 4; the highest segregated HI is 2. Predicted blood lead levels range from 5.3 to 47.7 µg/dL for the industrial worker, construction worker, and resident. Arsenic and lead are COCs for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 7E-07 and the total HI is 0.4. The predicted blood lead level is 12.1 µg/dL. Lead is the only COC identified for subsurface soil.

  Arsenic, cadmium, lead, manganese, and zinc are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 3, Capital Mine Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 1E-05 to 6E-04. Noncancer HIs range from 0.09 to 15; the highest segregated HI is 13. The predicted blood lead level for the resident is 22 µg/dL; the predicted blood lead level for all other receptors is below10 µg/dL with predicted blood lead levels of 7.2 and 9.6 µg/dL, for the industrial and construction worker, respectively. Arsenic and lead are COCs.

  Arsenic is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 4, Carbonate Mine Waste Area –** Health risks are based on exposure to surface soil. Cancer risks range from 2E-11 to 2E-08. Noncancer HIs range from 0.004 to 1. The predicted blood lead level for the resident is 10 µg/dL with 5.1 µg/dL the predicted blood lead level for the construction worker. Lead is the only COC.

  Arsenic, iron, and manganese are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 5, Edith Mine Waste Areas** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-07 to 2E-05. Noncancer HIs range from 0.004 to 0.9. Predicted blood lead levels are all less than 5 µg/dL except for a predicted blood lead level for residents of 6.8 µg/dL. Arsenic and lead are the only COCs.

  No COC concentrations exceeded the leaching-to-groundwater SSCLs.

- **EU 6, Consolation Mine Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 4E-06 to 3E-04. Noncancer HIs range from 0.04 to 6; the highest segregated HI is 6. Predicted blood lead levels range from 10.3 to 31.3 µg/dL for the industrial worker, construction worker, and resident; predicted blood lead levels are 5.0 and 5.2 µg/dL for the ATV/motorcycle rider and child rock hound, respectively. Arsenic and lead are COCs.

  Arsenic and lead are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 7, Mary P. Mine Waste Pile** – Health risks are based on exposure to surface soil. Cancer risks range from 2E-06 to 1E-04. Noncancer HIs range from 0.02 to 3; the highest segregated HI is 2. Predicted blood lead levels range from 5.2 to 46.2 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on its leaching-to-groundwater SSCL.

- **EU 8, Mike Horse Mine Waste Piles** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-06 to 2E-04. Noncancer HIs range from 0.03 to 6; the highest segregated HI is 4. Predicted blood lead levels range from 6.6 to 58.9 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 9, Paymaster Mine Waste Areas (does not include the Paymaster Repository area)** – Health risks are based on exposure to surface and subsurface soil. Carcinogenic COPCs were not identified for surface soil. Noncancer HIs range from 0.003 to 0.8. Lead was not evaluated for surface soil at EU 9 because the exposure point concentration was below the background threshold value. No COCs were identified for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 1E-05 and the total HI is 3. (The highest segregated HI is 2.) Lead was not evaluated for subsurface soil at EU 9 because the exposure point concentration was below the background threshold value. Arsenic is the only COC for subsurface soil.

  Arsenic and iron are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 10, Number 3 Tunnel Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-07 to 2E-05. Noncancer HIs range from 0.006 to 1. Lead was not evaluated for surface soil at EU 10 because the exposure point concentration was below the background threshold value. Arsenic is the only COC.

Iron and manganese are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 11, Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles** – Health risks are based on exposure to surface soil. Cancer risks range from 2E-06 to 1E-04. Noncancer HIs range from 0.02 to 5; the highest segregated HI is 3. Predicted blood lead levels range from 10.7 to 32.5 µg/dL for the industrial worker, construction worker, and resident; predicted blood lead levels are 5.1 and 5.3 µg/dL for the ATV/motorcycle rider and the child rock hound, respectively. Arsenic and lead are COCs for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 2E-06 and the total HI is 0.8. The predicted blood lead level is 30.2 µg/dL. Lead is the only COC for subsurface soil.

  Cadmium, copper, lead, manganese, and zinc are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 12, Marsh** – Health risks are based on exposure to surface and subsurface sediment. Cancer risks range from 1E-06 to 4E-05. Noncancer HIs range from 0.03 to 2; the highest segregated HI is 0.5. Predicted blood lead levels range from 5.6 to 16 µg/dL. Lead is the only COC for surface sediment.

  Evaluation of exposure to subsurface sediment was limited to the construction worker. The cancer risk is 6E-07 and the total HI is 0.3. The predicted blood lead level is 6.4 µg/dL. Only lead was identified as a COC for subsurface sediment.

  Aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc are COCs for sediment based on leaching-to-groundwater SSCLs.

- **EU 13, Stream Sediments** – Halth risks are based on exposure to surface sediment. Cancer risks range from 4E-7 to 1E-05. Noncancer HIs range from 0.01 to 0.6. Predicted blood lead levels were below 5 µg/dL for all receptors. No COCs were identified for surface sediment.

The HHRA also evaluated health risks from exposure to COPCs from ingestion of fish for the recreational fisherman. Risks were evaluated UBMC-wide, rather than on an EU-specific, basis using surface water data to estimate COPC concentrations in fish tissue. There is no elevated cancer risk for fish ingestion because no carcinogenic COPCs were detected in surface water. Noncancer HIs for ingestion of fish range from 0.1 to 0.7. No COCs were identified for the fish ingestion exposure pathway.

Based on the HHRA results, arsenic and lead are COCs in soil or sediment for almost all EUs (arsenic is not a COC at EUs 4, 12, and 13 and lead is not a COC at EUs 9, 10, and 13).

UNCERTAINTIES ASSOCIATED WITH THE HHRA

Varying degrees of uncertainty at each stage of the HHRA arise from assumptions made in the HHRA. Uncertainty and variability are inherent in the exposure assessment, toxicity values, and risk characterization. Site-specific sources of uncertainty associated with the HHRA for the UBMC include the following:

- Limited soil sampling data for aluminum and cadmium, compared with data for other COPCs.
- Exclusion of some known recreational uses, such as hiking and camping, from the quantitative risk evaluation. However, the HHRA compared expected exposures from hiking and camping activities with exposures evaluated for rock hunting. This comparison indicates that health risks associated with hiking and camping are likely to be similar to, or potentially less than, health risks estimated for the rock hound scenario.
- The assumption that all EUs can be readily accessed by all receptors, regardless of physical characteristics such as steep slopes and heavy vegetation.

In general, the risk assessment process is based on use of conservative (health-protective) assumptions to address these and other uncertainties that, when combined, may overestimate the actual risk. However, a small possibility exists that risks were underestimated.

SITE-SPECIFIC CLEANUP LEVELS

The HHRA also developed SSCLs, which are concentrations in environmental media that correspond to a specific, acceptable target risk or hazard level when a receptor contacts the contaminated medium according to a defined exposure scenario. Table ES-6 presents the soil and sediment SSCLs for the UBMC.

Mercury was excluded as a COPC from the HHRA because it was not detected in any RI samples collected at EUs evaluated in the HHRA. However, mercury was detected at a single stream sediment sample (SHSE-101) from Shave Gulch (part of the Abandoned Mine Feature inventory) at a concentration of 380 mg/kg, which exceeds the EPA RSL for residential soil of 23 mg/kg (EPA 2013b). Additional sampling of stream sediments in November 2011 by DEQ did not detect mercury beyond this single sample (Tetra Tech 2013a).

1.0 INTRODUCTION

This document presents the baseline human health risk assessment (HHRA) for the Upper Blackfoot Mining Complex (UBMC). The UBMC, also known as the Heddleston District, is an inactive mining district located 15 miles east of Lincoln in Lewis and Clark County, Montana, in the headwaters of the Blackfoot River (Figure 1-1). This approximately 6-square-mile Facility was mined intermittently from 1889 to the 1950s and includes a mixture of National Forest and private lands. Tailings, waste rock dumps, and acid mine drainage from old adits have contaminated surface water, sediments, soils, and groundwater and have been taken up by plants and wildlife. The main workings in the district are the Mike Horse Mine, which is a major contributor to surface water contamination (Tetra Tech 2013a); the Anaconda, Carbonate, Edith, Mary P, Consolation, Capitol, Number 3 Tunnel, and Paymaster Mines; and the Mike Horse Tailings surface impoundment on Beartrap Creek (Figure 1-2). In 1975, the impoundment failed during a heavy rain-on-snow event and washed metal-laden tailings down the drainage into the upper Blackfoot River.

Nearby National Forest land is used by hunters and other recreational users, but the area is remote from large population centers. One residence with a domestic well is located along Beartrap Creek, approximately 0.6 mile upstream of the Mike Horse Tailings impoundment. In addition, three residences are located within 2 miles downstream (west) of the confluence of the Blackfoot River and Pass Creek.

A remedial investigation (RI) completed in 2007 and 2008 identified nine chemicals (aluminum, arsenic, cadmium, copper, iron, lead, manganese, mercury, and zinc) of potential concern (COPC) that warrant further evaluation in a baseline HHRA and baseline ecological risk assessment (BERA) (Tetra Tech 2013b). This HHRA is based on data collected during the RI and other recent investigations and is limited to an evaluation of the COPCs identified in the RI (see Section 5.1 for further discussion). Mercury was excluded as a COPC from the HHRA because it was not detected in any RI samples collected at exposure units (EU) evaluated in the HHRA. However, it mercury was detected at a single stream sediment sample (SHSE-101) from Shave Gulch (part of the Abandoned Mine Feature inventory) at a concentration of 380 milligrams per kilogram (mg/kg), which exceeds the U.S. Environmental Protection Agency (EPA) Regional Screening Level (RSL) for residential soil of 23 mg/kg (EPA 2013b). Additional sampling of stream sediments in November 2011 by DEQ did not detect mercury beyond this single sample (Tetra Tech 2013a). The BERA for the UBMC was prepared under separate cover.

1.1 REGULATORY HISTORY

DEQ, formerly the Montana Department of Health and Environmental Services (MDHES), Site Response Section (SRS) is the lead agency for the UBMC and has ranked it as a high-priority Comprehensive Environmental Cleanup and Responsibility Act (CECRA) facility. A brief summary of the regulatory history of this Facility, based on information in the RI report for the UBMC (Tetra Tech 2013a), is presented below.

In June 1991, American Smelting and Refining Company (ASARCO) and Atlantic Richfield Company (ARCO) were identified by DEQ, under CECRA, as potentially liable persons (PLP) for hazardous or deleterious substance contamination at the UBMC. Required actions identified included development of a remedial investigation and feasibility study (RI/FS), and implementation of a remedy to be determined by DEQ.

Between February 1992 and 1993, ASARCO and ARCO met with DEQ regarding implementation of a reclamation program at the UBMC in lieu of the RI at that time. The terms of that reclamation program are outlined in a May 26, 1993, letter from DEQ, including preparation and submittal of annual work plans and other documents. Under this agreement, DEQ reviewed plans and work, but did not officially or unofficially approve any of the work. Reclamation activities proceeded under this agreement until 1998.

In 1996 and 1997, work was also conducted under the newly established Voluntary Cleanup and Redevelopment Act (VCRA) program. Under a DEQ-approved voluntary cleanup plan (VCP), mine waste was removed from several areas in and near Paymaster Creek and taken to the Paymaster Repository.

In 1999, ASARCO petitioned the Montana Board of Environmental Review (BER) for adoption of temporary modification of water quality standards in portions of three streams at the UBMC (Hydrometrics 1999). Temporary standards were requested in portions of Mike Horse Creek, Beartrap Creek, and the upper Blackfoot River. The temporary standards were approved by the BER in June 2000. The temporary standards temporarily modified the surface water quality standards for a number of metals, including cadmium, copper, iron, lead, manganese, and zinc, as well as pH, until 2008. As part of the temporary standards, ASARCO was required to develop a conceptual plan for mitigation of all "water quality limiting factors" identified in the temporary standards support document, referred to as the Temporary Standards Implementation Plan (IP) (Hydrometrics 2000).

In November 2002, ASARCO entered into an Administrative Order on Consent (AOC) with the U.S. Forest Service (USFS) for performance of an engineering evaluation/cost analysis (EE/CA) for certain public lands within the UBMC. The AOC covers the National Forest System lands along portions of Mike Horse Creek, Beartrap Creek (including the Mike Horse tailings impoundment), and the Blackfoot River upstream of the confluence with Pass Creek that may have been affected by operation of the Mike Horse Mine and tailings impoundment. The objective of the AOC was for ASARCO to develop removal action alternatives, for USFS evaluation through development of an EE/CA.

In 2003, DEQ brought legal action in State District Court against ASARCO and ARCO for recovery of DEQ's past and future remedial action costs associated with contamination and threats of contamination at the UBMC and to require the companies to implement required remedial actions. As part of this action, DEQ also sought a declaratory judgment to establish liability for all future remedial action costs, including clean-up.

In June 2003, DEQ also finalized the Water Quality Restoration Plan for Metals in the Blackfoot Headwaters TMDL (Total Maximum Daily Load) Planning Area. The restoration plan identified the UBMC as the primary source of metals contamination in the Blackfoot headwaters area.

In August 2005, ASARCO filed for Chapter 11 bankruptcy. DEQ and the Montana Department of Justice filed claims in the bankruptcy that have since been settled. This settlement also included settlement with ARCO and the USFS. As part of the settlement, DEQ dismissed the state court action.

In December of 2006, the BER revoked the temporary water quality standards based on failures and delays on the part of ASARCO in implementing the IP. As part of the settlement of the bankruptcy action, ASARCO was responsible for constructing a water treatment plant. Construction of the plant was completed in January 2009 and is designed to treat more than half a million gallons of contaminated mine adit water per week. Long-term operation and maintenance (O&M) of the plant will occur and be funded by a separate settlement agreement. As part of that agreement, ASARCO transferred its ownership at the UBMC to the Montana Environmental Custodial Trust, which is responsible for operating the plant to treat water from the Mike Horse and Anaconda mine adit discharges. A revised Montana Pollutant Discharge Elimination System (MPDES) discharge permit was issued, which as of May 2011 is administered by DEQ's Site Response Section.

In July 2007, the USFS - Region 1 and ASARCO released the EE/CA concerning cleanup of contaminants on USFS land at the UBMC titled *Engineering Evaluation Cost Analysis for the Mike Horse Dam and Impounded Tailings, Lower Mike Horse Creek, Beartrap Creek and the Upper Blackfoot River Floodplain Removal Areas Upper Blackfoot Mining Complex, Lewis and Clark County, MT* (Hydrometrics 2007). Also during July 2007, the Helena National Forest, Lincoln Ranger District, released an action memorandum based on the EE/CA (Helena National Forest 2007) selecting a preferred alternative for cleanup of the designated sub-areas. In brief, the action memorandum selected:

(1) Total removal of the Mike Horse Dam and impounded tailings to a within-drainage repository;

(2) Complete removal of mine waste from Lower Mike Horse Creek and placing the waste into a within-drainage repository;

(3) Removal of all concentrated and intermixed tailings within the active stream channel migration corridor of Beartrap Creek and placing the waste into a within-drainage repository; and

(4) Complete mine waste removal from the Upper Blackfoot River Sub-area and placement of the waste into a within-drainage repository.

In August 2007, DEQ initiated an RI for all areas at the UBMC that were not covered in the EE/CA. The RI was funded by $2 million from the Montana Legislature. The main text of the RI for the UMBC was completed in January 2013 (Tetra Tech 2013a). The RI also includes the BERA, completed in May 2013 (Tetra Tech 2013b), and the HHRA.

1.2 OVERVIEW OF THE HUMAN HEALTH RISK ASSESSMENT PROCESS

The primary objectives of the HHRA are to evaluate site-specific risk to human receptors to support the RI of the UBMC and to develop site-specific cleanup levels (SSCLs) protective of human health and the environment. The HHRA is based on RI data collected at the UBMC in 2007 and 2008 and additional data collected in 2006 and 2011 (see Section 5.1 for detailed discussion). The results of this HHRA will be used to support decisions on necessary remedial action at the UBMC.

The EPA has developed a risk assessment framework for conducting HHRAs (EPA 1989). The six basic steps of the HHRA process are:

- Step 1: Creation of a conceptual site exposure model (CSEM)
- Step 2: Data evaluation and selection of chemicals of potential concern
- Step 3: Exposure assessment
- Step 4: Toxicity assessment
- Step 5: Risk characterization
- Step 6: Uncertainty analysis

The information provided in this HHRA supports one of two possible determinations:

A. The Facility does not pose an unacceptable human health risk. No further action is needed.

B. The Facility poses an unacceptable human health risk. Further action may be needed.

The need for further action will also be based on findings of the BERA, which is presented separately from this HHRA.

1.3 REPORT ORGANIZATION

This HHRA is organized as follows:

- **Section 1.0, Introduction**. This section provides an overview of the human health risk assessment process and an organizational overview of the report.
- **Section 2.0, Site Description and Background**. This section describes the exposure units (EU) and land uses at UBMC.
- **Section 3.0, Risk Assessment Guidelines.** This section describes the process for evaluating human health risk at UBMC.
- **Section 4.0, Conceptual Site Exposure Model.** This section summarizes the sources of site chemicals, affected environmental media, chemical release and transport mechanisms, potentially exposed human receptors, and potentially complete exposure pathways at UBMC.
- **Section 5.0, Data Evaluation, Data Grouping, and Chemicals of Potential Concern.** This section addresses data evaluation, data grouping, and the identification of COPCs.

- **Section 6.0, Exposure Assessment.** This section describes the exposure points to be evaluated, the calculation of exposure point concentrations (EPC), and estimates of chemical intake for receptors.

- **Section 7.0**, **Toxicity Assessment**. This section describes the methods for obtaining reference doses and concentrations, slope factors, and unit risks for COPCs.

- **Section 8.0**, **Risk Characterization**. This section describes the methods for calculating cancer risks and noncancer hazards, and for characterizing risks from exposure to lead.

- **Section 9.0**, **Results of the Human Health Risk Assessment**. This section summarizes the results of the HHRA for each receptor and exposure medium by EU.

- **Section 10.0, Comparison of Groundwater, Surface Water, Soil, and Sediment Results to Medium-specific Standards, and Screening Levels.** This section compares groundwater and surface water results to Montana water quality standards (DEQ 2012) or EPA RSLs for the protection of human health and soil and sediment results to default and site-specific soil screening levels for the protection of groundwater.

- **Section 11.0**, **Uncertainty Evaluation**. This section discusses sources of uncertainty in this HHRA, including the sampling data, identification of COPCs, selection of exposure scenarios and pathways, estimation of EPCs, selection of exposure variables used to estimate chemical intake, toxicity values for COPCs, and risk characterization methodology.

- **Section 12.0**, **Site-Specific Cleanup Levels (SSCLs)**. This section describes the process for developing the SSCLs for the UBMC.

- **Section 13.0**, **Conclusions of the HHRA**. This section summarizes the conclusions of the HHRA.

- **Section 14.0, References.** This section lists the documents used to prepare this HHRA.

Figures and tables are presented after the sections where they are first mentioned. In addition, the following appendices are included:

- **Appendix A,** Methods for Calculating Exposure Point Concentrations for Metals in Soil, Sediment, and Surface Water

- **Appendix B,** Background Screening Approach for Metals in Soil and Sediment

- **Appendix C,** EPA RAGS Part D Tables 1 through 10

- **Appendix D**, Toxicity Profiles

- **Appendix E,** Risk Evaluation for Lead

- **Appendix F,** Data Used in the Human Health Risk Assessment

- **Appendix G**, Development of Site-Specific Soil Screening Levels

2.0 SITE DESCRIPTION AND BACKGROUND

The UBMC Facility contains both federally owned lands (National Forest System and private lands) (historical ASARCO patented mining claims, ASARCO fee lands, and other private property) located within the boundaries of the Lewis and Clark National Forest and within Lewis and Clark County, Montana (Figure 1-1). ASARCO transferred its patented mining claims and fee lands to the Montana Environmental Trust Group, LLC (Custodial Trust), on December 9, 2009, as part of the settlement of Montana's claims in the ASARCO bankruptcy. The Facility lies predominantly south of U.S. Highway 200, about 15 miles east of the community of Lincoln, Montana (population 1,100) and about 5 miles northeast of Highway 279 (Flesher Pass Road).

The Heddleston District portion of the Facility covers an area of about 6 square miles and is characterized by heavily forested, steep mountainous terrain, with elevations ranging from 5,200 feet at the confluence of Pass Creek and the Blackfoot River (near the head of a major marsh system, Figure 1-1), to as much as 7,200 feet on the ridge that makes up Anaconda Hill along the northeastern edge.

The Heddleston District portion of the Facility is situated at the headwaters of the Blackfoot River. Major tributary streams within the Facility include Mike Horse Creek, Beartrap Creek, Anaconda Creek, Stevens Gulch, Shave Creek, Paymaster Creek, Pass Creek, Swamp Gulch, and Meadow Creek (Figure 1-1). The Blackfoot River proper is formed at the confluence of Beartrap and Anaconda Creeks. This area includes the drainage area from upgradient of the Mike Horse Mine and tailings impoundment, downstream to the Upper Marsh where Swamp Gulch (site of the reclaimed Carbonate Mine) enters the Blackfoot River.

Nearby National Forest land is used by hunters and other recreational users, but the area is remote from large population centers. One residence with a domestic well is located along Beartrap Creek, approximately 0.6 mile upstream of the Mike Horse tailings impoundment. In addition, three residences are located within 2 miles downstream (west) of the confluence of the Blackfoot River and Pass Creek. The closest of these three residences is located along U.S. Highway 200, approximately 0.75 mile from the confluence of Blackfoot River and Pass Creek.

Section 1.0 of the final RI discusses historical mining operations within the UBMC (Tetra Tech 2013a), as well as previous studies and waste removal efforts. Metals released as a result of historical mining have contaminated soils, surface water, groundwater, and sediments at UBMC. Metals have been transported by soil erosion, groundwater leaching, and a 1975 breach of a tailings impoundment.

Human health risks were estimated for the following 13 EUs. The EUs are identified by physical location, habitat type, and waste sources (Figure 1-2).

- EU 1 – Upper Anaconda Mine Waste Removal Areas and Waste Piles
- EU 2 – Blackfoot River Dispersed Tailings Associated with EE/CA Removal Action Area and Overbank Deposits
- EU 3 – Capital Mine Waste Area

- EU 4 – Carbonate Mine Waste Area
- EU 5 – Edith Mine Waste Areas
- EU 6 – Consolation Mine Waste Area
- EU 7 – Mary P. Mine Waste Pile
- EU 8 – Mike Horse Mine Waste Piles
- EU 9 – Paymaster Mine Waste Areas
- EU 10 – Number 3 Tunnel Waste Area
- EU 11 – Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles
- EU 12 – Marsh
- EU 13 – Stream Sediments

The remainder of this section describes EUs 1 through 13, based on information provided in the RI (Tetra Tech 2013a). In addition, descriptions are provided for groundwater and surface water, which are present throughout the UBMC. Surface water is treated as part of EU 13 to be consistent with the BERA.

2.1 EU 1 – Upper Anaconda Mine Waste Removal Areas and Waste Piles

The Anaconda Mine was discovered and developed during the early 1900s. The Anaconda Mine is located at the headwaters of the Blackfoot River adjacent to the confluence of Anaconda Creek and Beartrap Creek. Approximately 39,000 cubic yards (yd^3) of mine waste was removed from the Anaconda Mine in 1994 and 1995 and placed in the Mike Horse Repository (Hydrometrics 1995a, 1996b). Most of the mine waste removed was originally located on the floodplain of the Blackfoot River, resulting in potential leaching of metals and erosion and subsequent transport of mine waste to the river (Hydrometrics 1995a).

Two additional mine waste dumps located on a hillside adjacent to the Anaconda Mine were also reclaimed in 1995. The largest of the dumps was removed and placed in the Mike Horse repository. Because of its distance from any surface water drainage, the other dump was reclaimed in place, by amending with cement kiln dust, re-grading, covering with growth medium, and applying a seed/mulch mixture (Hydrometrics 1996b).

In addition, the following remediation features were constructed: a concrete/bentonite plug was placed in the collar of the Anaconda shaft and a permanent vehicle stream crossing was constructed at the site, as were surface water run-on control ditches with riprap, and fencing (Hydrometrics 1996b).

In 1995 and 1996, a passive wetlands-based water treatment system was built at the former location of the Anaconda mine waste adjacent to the Blackfoot River and just downstream from the confluence of Anaconda Creek and Beartrap Creek. A portal-plug with piping and controls was installed in the Anaconda adit, with the water discharge directed to the water treatment system (Hydrometrics 1996b; 1997a). This system was replaced in 2009 by a new microfiltration water treatment plant. The new plant's location is where the old system's Cell 6 was once located. The new system integrated the old system's Cell 4 and Cell 5 to serve as emergency retention basins for the new plant (Camp, Dresser, and McKee [CDM] 2008).

There are two reclaimed waste pile areas (UAW2 and UAW5) and three un-reclaimed mine waste piles (UAW1, UAW3, and UAW4) within EU 1. Sampling locations are depicted in Figure 2-1. The three unreclaimed waste piles (UAW1, UAW3, and UAW4) are located northeast and upslope of the two larger reclaimed areas. Mine waste in the three waste piles is primarily tan to yellow, shows signs of staining or oxidation, and smells of sulfur. Very little to no vegetation grows on the waste piles.

Based on results from the 2007 and 2008 investigations, the estimated area of affected soil associated with the two reclaimed waste areas and three unreclaimed waste piles of EU 1 is 7.3 acres (Figure 2-1).

2.2 EU 2 – Blackfoot River Dispersed Tailings Associated with EE/CA Removal Action Area and Overbank Deposits

The Mike Horse Tailings Impoundment was constructed on the Beartrap Creek drainage in 1941 for disposal of tailings from the Mike Horse Mine floatation mill. Before 1941, jig tailings were likely deposited directly on the ground and discharged to Mike Horse Creek. Surface water flow and subsequent precipitation and high flow events likely mobilized the tailings to the lower portion of Beartrap Creek and the upper Blackfoot River. In June 1975, heavy precipitation, along with blockage of a surface water diversion ditch by mudslide debris, resulted in a breach of the Mike Horse tailings impoundment. As a result, tailings were washed downstream and persist along Beartrap Creek and the upper Blackfoot River floodplains. Tailings continue to be transported along the floodplain during heavy rains and high flow events. Physical evidence of floodplain deposition and features indicating former channels indicate the stream channel has moved over the years.

Results of the 2007 and 2008 investigations indicate the overbank deposits and dispersed tailings extend over the entire floodplain of the Blackfoot River. They reach from the toe of the eastern hillside to the toe of the western hillside (Figure 2-2), extending approximately 550 feet in the widest portion of the river. Approximately 45.5 acres have been affected. Migration of the tailings is visually evident as far downstream as the edge of the Upper Marsh (part of EU 12). The lateral extent of impacts also appears to widen as the floodplain also widens toward the southeast side of the Upper Marsh area.

Tailings within the floodplain include dispersed tailings and overbank deposits left during high flow events. Dispersed tailings consist of areas of concentrated tailings deposited within the floodplain; they include areas of concentrated tailings such as the Shave Creek Tailings and depositional bars where tailings are intermixed with coarser-grained sand and gravel sediments. Overbank deposits are primarily fine-grained tailings and tailings mixed with soil; they are generally tan to orange-brown as a result of iron oxide staining. Tailings also extend out of Stevens Gulch to the Blackfoot River floodplain. Figure 2-2 shows the location and approximate size of each of the dispersed tailings features. Vegetation on overbank and dispersed tailings deposits is either absent or sparse. Vegetative ground cover ranges from zero to moderate within forested areas along the riverbank that contain tailings.

EU 2 was divided into three sub-areas, based on where soil samples were collected: (1) within the tailings-contaminated floodplain area (that is, between the river and the outer edge of the tailings); (2) at the edge of tailings; and (3) outside the tailings-contaminated area.

2.3 EU 3 – Capital Mine Waste Area

The relatively small Capital Mine is located in upper Stevens Gulch on patented mining claims that were reclaimed by ASARCO in 1997 (Hydrometrics 1998b). Previous historical investigations (DEQ 2007) indicated that two discrete waste removal areas are immediately adjacent to the Capital Mine. During reclamation at Capital Mine, 725 yd^3 of mine waste was removed from the Stevens Gulch drainage bottom and placed in the Paymaster Repository. The Capital Mine adit was sealed with grout to eliminate seasonal discharge of water. The excavation area was amended with cement kiln dust, then regraded and re-vegetated. Approximately 2,000 feet of the Stevens Creek channel, which flows through the removal area, were reconstructed.

During the 2007 and 2008 investigations, the two mine waste removal areas were combined into one sampling area (designated as CMWA). The extent of contaminated soil is approximately 0.32 acre (Figure 2-3).

2.4 EU 4 – Carbonate Mine Waste Area

The claims on the Carbonate Mine property were staked in 1889 and the mine was developed in the early 1900s. Various mining companies operated the mine until ASARCO acquired it in 1981. The property consists of four patented claims with one adit. A mill associated with the mine processed ore for gold, silver, copper, and lead. Reclamation at the Carbonate Mine began in the summer of 1993 and was completed in 1994. Cleanup work included pouring concrete into and onto an open mine shaft, diverting a surface water ditch, and removing waste rock and tailings from Swamp Gulch. Quicklime was added to mine waste deposited at the upper Carbonate repository, and then the mine waste was covered with a 6-inch layer of drainage gravel and 12 to 18 inches of cover soil. The level portion of the repository was covered with gravel, a geosynthetic clay liner, and clean soil. The remediation also included pumping contaminated water from the repository. Fill material was placed in the excavated hole, and the former tailings impoundment area was backfilled with borrow gravel and cover soil. The area was then graded to establish a wetland and meadow within Swamp Gulch. The repository, wetland, and other disturbed areas were revegetated. Groundwater monitoring wells were installed, final grading was completed, and storm water control ditches and structures were built. In 1995, the Carbonate Mine repository cap was compromised by erosion, and the soil was subsequently replaced and an erosion mat placed over the eroded surface; the area was then re-seeded and mulched. After the removal and reclamation effort, surface water quality in Swamp Gulch improved significantly (Hydrometrics 1995b, 1996a, 1997b, 1998a).

The Carbonate Mine waste area is about 2.7 acres (Figure 2-4). Soil from beneath the cover soil at the Carbonate Mine waste area (designated CARM) was sampled during the 2007 and 2008 RI (Figure 2-4). No soil samples were collected from the 1.9-acre Carbonate Mine Repository; however, groundwater wells were sampled to monitor water quality in this area.

2.5 EU 5 – Edith Mine Waste Areas

The Edith Mine is located along the Blackfoot River near its confluence with Shave Gulch. Original discovery work for the mine began prior to 1904; the mine was re-opened by the Anaconda Company in 1967. The Edith Mine is associated with the Paymaster and Black Diamond ore veins that were rich in molybdenum. In 1995, approximately 5,000 cubic yards of mine waste were removed from several waste piles and waste areas near Edith Mine and placed in the Mike Horse Repository. Removal of the waste piles resulted in three disturbed areas, referred to as the east (EEA), west (WEA) and central (CEA) Edith Mine waste areas during the 2007 and 2008 RI (Figure 2-5). Mine waste removal areas were amended with lime-bearing material to neutralize soil acidity, and the area was seeded to promote vegetative cover.

Field personnel collected soil samples from the center and perimeters of the three disturbed areas (EEA, WEA, and CEA) associated with the Edith Mine during the 2007 RI (Figure 2-5). The three combined disturbed areas include about 3.2 acres (0.55 acre in WEA, 2.0 acres in CEA, and 0.67 acre in EEA).

2.6 EU 6 – Consolation Mine Waste Area

Development of the Consolation Mine before 1933 consisted of several pits, three caved adits, and a shaft (Pardee and Schrader 1933). The relatively small Consolation Mine is located in lower Shave Gulch on patented mining claims that ASARCO reclaimed in 1997 (Figure 2-6). During reclamation, the Consolation Mine reportedly consisted of two collapsed adits (upper and lower) and associated mine waste piles (Hydrometrics 1998). Waste from the mine was dispersed as a relatively thin pile covering about 2.5 acres of hillside below each adit. Reclamation involved consolidation of the mine waste into the lower adit area by pushing the upper mine waste downhill into the adit and hauling the lower mine waste pile uphill to the adit. Approximately 2,200 cubic yards of mine waste was placed into the prepared adit area. The upper 12 inches of waste was amended with cement kiln dust and then covered with at least 12 inches of clean soil; the entire removal area was regraded to match the surrounding topography, and then revegetated (Hydrometrics 1998).

2.7 EU 7 – Mary P. Mine Waste Pile

The Mary P. Mine was in operation until 1911. The mine was located a few hundred yards southeast of the Anaconda Mine on the opposite (southwestern) side of the Blackfoot River (Figure 2-7). The operation consisted of a discovery cut with a tunnel and a second tunnel with a short drift. There is no evidence of production from the Mary P. Mine; the mine was apparently operational for only a year or two.

A small waste pile (MPWA1) associated with the Mary P. Mine is located on the western side of Mike Horse Road, southwest of the former Anaconda constructed wetlands. The 0.26-acre waste pile and affected area is on a narrow strip of land between Mike Horse Creek Road and the steep hillside.

The Mary P. Mine waste pile has not been reclaimed, and mine waste is still present. The estimated in-place volume of mine waste and contaminated soil at the Mary P. Mine is 2,800 cubic feet (ft^3) (Tetra Tech, 2013a).

2.8 EU 8 – MIKE HORSE MINE WASTE PILES

The Mike Horse Mine is located in the upper portion of the Mike Horse drainage (Figure 2-8). The Mike Horse claim was first located in 1898; production at the mine began approximately 15 years later and continued until the 1920s. A mill was constructed at the mine to process lead-silver concentrate from the Mike Horse mine and ore from the Anaconda and Paymaster mines. The mine had a number of adits. Operation resumed in 1938, when the Mike Horse Mining and Milling Company leased the property and built a 150-tons-per-day flotation mill. In 1941, the Mike Horse Tailings Impoundment was constructed on Beartrap Creek, and the mill tailings were deposited there. Before the impoundment was constructed, tailings were likely deposited in Mike Horse Creek. ASARCO purchased the mine in 1945 and operated it until 1955. The mine was operated by a different mining company from 1958 through 1964. Peak production at the mine was from 1941 to 1952, when 200 tons of ore per day were processed in the flotation mill to produce a lead-zinc concentrate (GCM 1993).

Reclamation at the Mike Horse Mine included excavation of mine waste and construction of a repository at the lower Mike Horse Mine in 1995 and 1996, and in-place reclamation of approximately 5 acres of disturbed land at the upper Mike Horse Mine in 1998. The 0.42-acre Mike Horse Repository was built to accommodate mine waste mainly from the Anaconda and Edith Mines, in addition to a relatively small volume of waste from the lower Mike Horse Mine. The repository includes a subsurface shallow groundwater collection and drainage system to maintain groundwater levels below the repository base and a limestone-gravel drainage layer beneath the repository. The upper 18 inches of mine waste in the repository was amended to limit long-term acid generation. The slopes of the repository were covered with a 12-inch layer of growth medium to support the vegetative cover; a geosynthetic clay liner was placed on the upper crest of the repository. Approximately 45,000 yd^3 of mine waste from the Mike Horse, Anaconda, and Edith mines were placed in the Mike Horse Repository. A sludge drying bed, part of the Mike Horse Mine water treatment system, was constructed on the top of the repository. Approximately 14,000 yd^3 of additional waste was removed from the same upper Mike Horse mine area during 2004, 2005, and 2006. The waste was placed in the Paymaster Repository (Helena National Forest 2007).

Land disturbance at the upper Mike Horse Mine consisted of waste rock piles spread over steep hillsides. Reclamation included consolidating and regrading mine waste to minimize the surface area and limit infiltration, incorporating amendments into the mine waste to raise pH and limit the solubility of metals, covering the mine waste with local borrow soil, constructing ditches and berms to divert storm water runoff, and seeding all disturbed areas. Water quality in the adjacent

Mike Horse Creek improved after regrading and revegetating were completed. The reclaimed Mike Horse waste rock-pile sites have not been successfully revegetated (Tetra Tech 2013a).

The field team investigated three reclaimed mine waste areas (UMH1, UMH2, and UMH3) in the Upper Mike Horse area during the 2007 and 2008 RI work (Figure 2-8), totaling about 4.3 acres (0.55 acre at UMH1, 1.7 acres at UMH2, and 2.1 acres at UMH3).

2.9 EU 9 – Paymaster Mine Waste Areas

The first work on the Paymaster Mine occurred in February 1920 with construction of a tunnel. The mine operated until sometime before 1927 from three adits in the lower Paymaster Creek drainage (Figure 2-9). The Paymaster Mine was re-opened in the 1960s through the established lower adit, but no production was reported. The molybdenum-rich ore body in this area was also accessed by the Midnight and, later, the Edith mines.

Waste rock was removed at the Paymaster Mine area in 1996. Three distinct waste rock piles, totaling approximately 8,065 cubic yards, were removed from the Paymaster Creek drainage bottom and placed in an engineered repository (Paymaster Repository) located near the Paymaster Mine. The Paymaster Repository, which covers 1.44 acres, is not included in the risk assessment. The repository also accepted 4,955 cubic yards of mine waste from the Number 3 Tunnel waste area and 8,412 cubic yards of mine tailings from the Big Blackfoot mine, a DEQ abandoned mine reclamation project not related to the UBMC. The Big Blackfoot mine tailings were transported from their original location 25 miles west of the UBMC and placed in the Paymaster Repository with permission from ASARCO and ARCO. All material held in the repository was fully amended with cement kiln dust to neutralize acidity and decrease metal solubility. Approximately 14,000 yd^3 of additional waste from the upper Mike Horse mine were placed in the Paymaster Repository in 2007 (Helena National Forest 2007).

The field team sampled two mine waste areas associated with the Paymaster Mine on the east side of the Paymaster gulch access road (PMWA1 and PMWA2) (Figure 2-9). Results of the 2007 and 2008 investigations indicated that about 0.14-acre of soil at PMWA1 and about 0.17-acre at PMWA2 are affected by the mine waste.

2.10 EU 10 – Number 3 Tunnel Waste Area

Number 3 Tunnel was first opened by the Anaconda Company in the late 1960s. An adit was driven south of the road approximately 1,700 feet into the southern limit of a copper-molybdenum ore body to obtain bulk samples for exploration. Most of the ore excavated from the mine was transported to the Edith area, with a smaller amount of mine waste remaining at the Number 3 Tunnel waste area. Approximately 4,955 cubic yards of mine waste were removed from this waste area in 1996 and placed in the Paymaster Repository. After the upper 6 inches of soil in the removal area were amended, 12 inches of growth medium were spread over the area, then graded, hydroseeded, and mulched (Figure 2-10). The Number 3 Tunnel waste area covers 2.7 acres (Tetra Tech 2013a).

2.11 EU 11 – Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles

The Mike Horse Creek Tailings Impoundment was constructed on the Beartrap Creek drainage in 1941 for disposal of tailings from the Mike Horse Mine flotation mill (Figure 2-11). Before 1941, jig tailings were likely deposited directly on the ground surface and discharged to Mike Horse Creek. Surface water flow and subsequent heavy rains and high flow events likely mobilized the tailings to the lower portion of Beartrap Creek and then to the Blackfoot River.

In June 1975, a heavy rain-on-snow event, along with blockage of a surface water diversion ditch by mudslide debris, caused a breach of the Mike Horse Tailings Impoundment. As a result, tailings were washed downstream to Beartrap Creek and the upper Blackfoot River floodplains. Thick and laterally continuous sedimentary deposits of tailings from the release remain along Beartrap Creek and Blackfoot River. Tailings continue to be remobilized along the floodplain during heavy rains and high flow events (Tetra Tech 2013a).

Beartrap Creek Canyon below the impoundment is steep and narrow. Flood waters associated with the breach appear to have been driven up onto the sidewalls of the canyon. The turbulent flow left behind a debris line of downed trees and other vegetation that became entangled in the rooted treeline when the waters receded (Tetra Tech 2013a).

Results from the 2007 and 2008 investigation indicate the overbank deposits and dispersed tailings extend over the entire floodplain of Beartrap Creek, from the tailings impoundment to the confluence with Anaconda Creek (Figure 2-11). The entire width of the floodplain (300 feet at its widest) is affected, from the toe of the slope on the southern side of the canyon to the toe of the slope on the northern side of the canyon. The floodplain impacts cover approximately 12.2 acres.

Overbank deposits primarily include areas of fine-grained tailings and tailings mixed with soil and are generally tan to orange-brown caused by iron oxide staining. Dispersed tailings consist of areas of concentrated tailings deposited within the floodplain, including depositional bars.

EU 11 was divided into three sub-areas for this HHRA, based on where soil samples were collected, including: (1) within the tailings-contaminated floodplain area (that is, between the river and the edge of the tailings); (2) at the edge of the tailings; and (3) outside the tailings-contaminated area. In addition, one soil sample was collected in roughly the center of the Flossie Louise Mine Waste Pile east of Beartrap Creek (Figure 2-11). The total estimated volume of floodplain sediments contaminated by mine wastes is 362,545 yd^3 (Tetra Tech 2013a).

2.12 EU 12 – Marsh

The Marsh is composed of three freshwater marsh sections: (1) the Upper Marsh, a 71.5-acre wetland at the confluence of Pass Creek with the Blackfoot River, (2) the Middle Marsh, a 40.6-acre wetland at the confluence of the Blackfoot River and a small tributary entering the marsh from the north, west of Surveyors Gulch, and (3) the Lower Marsh, a 181.4-acre wetland approximately 20 feet downstream of the westernmost portion of the Middle Marsh (Figure 2-12). The Upper Marsh receives surface water from Pass Creek, the Blackfoot River, Paymaster Gulch, Swamp Gulch, and possibly Meadow Creek (at the extreme western edge of the wetland). The Lower Marsh receives surface water from all sources listed for the Upper Marsh, in addition to Porcupine Gulch, Surveyors Gulch, and an unnamed tributary, while the Lower Marsh also receives surface water from Cadotte Creek, Third Gulch, and an unnamed tributary from the south. The marshes also likely receive water from the surrounding bedrock and alluvium. Surface water-groundwater interaction in the marsh system appears to be complex. Based on piezometer data from 2008, some areas of the Upper Marsh receive water from shallow groundwater, and some areas lose water to groundwater (Tetra Tech 2013a).

The sediments of the marsh are a mixture of sediment from tributaries of the Blackfoot River intermixed with tailings from upstream mining in the headwaters. The 1975 tailings impoundment breach, and subsequent heavy rain and high flow events, dispersed the tailings far downstream. Sediments and tailings continue to be redistributed during high flow events.

Sediment was collected in the Upper Marsh during the 2007 and 2008 RI to evaluate deposition of mine wastes and impacts on the Marsh. These sediment samples were collected from the 0- to 2-inch, 2- to 6-inch, and 6- to 12-inch intervals. In 2012, additional samples were collected at the inlets of the Middle and Lower Marshes to evaluate deposition of mine wastes and impacts on these downstream marshes. These sediment samples were collected over a range of depths from 0 to 9 feet bgs.

2.13 EU 13 – STREAM SEDIMENTS

Downstream of the Upper Marsh, the Blackfoot River continues to flow through a mixture of wooded and meadow areas, marshy or wetland areas, and small canyons for several miles (Tetra Tech 2013a). Stream sediment was sampled in this area as well as upstream of the Marsh to assess risks to human health. The HHRA grouped and evaluated streambed sediment samples as one group defined by sample location – within the active channel of the river or tributary. Streambed sediment samples were collocated with surface water samples from the active river or stream channel.

Sediment samples from the areas of the Blackfoot River downstream of the Marsh were collected during 2007, 2008, and 2011 to evaluate transport of mine wastes and impacts to this part of the river (see Figure 2-13). About 31 acres of stream sediments are contaminated by mine wastes. Sediment samples were collected from 0- to 2-inch, 2- to 6-inch, and 6- to 12-inch depth intervals.

2.14 GROUNDWATER

Groundwater in the UBMC has been studied in areas of known mining impacts, predominantly along the stream valley bottoms. A combination of narrow valleys limiting well placement for triangulation and the completion of wells in both bedrock and alluvium greatly limits the ability to produce a potentiometric surface map for the UBMC. However, a potentiometric surface map was prepared for the Marsh area and is discussed in Section 4.6 of the RI (Tetra Tech 2013a). The general pattern of groundwater flow is from higher elevation areas, where bedrock groundwater is recharged by snowmelt and spring storm events, toward the local drainage bottoms then along the axis of the drainage. Hydrogeology and groundwater quality are variable and appear to be site specific or locally controlled in many areas of the UBMC. Groundwater occurs within fractured metasediments, igneous bedrock units, and within unconsolidated alluvium in drainage bottoms. Bedrock groundwater discharges to local stream drainages, recharging the alluvial groundwater system and ultimately sustaining base flow in local streams during periods of low precipitation. The recharge area of the UBMC watershed is relatively small, because of topography and proximity to the Continental Divide and, therefore, annual precipitation amounts and timing significantly influence base flows in area streams (Tetra Tech 2013a).

Based on invariably low yields (a few gallons per minute [gpm] or less) from bedrock monitoring wells at the UBMC, bedrock permeability is considered low, with groundwater flow occurring predominantly through secondary fractures, joints, and fault zones. This conclusion is supported by relatively low base flow discharge (typically 22 to 50 gpm [CDM 2008]) from the Mike Horse Mine adit despite workings that include more than 30,000 lineal feet of tunnels, drifts, raises, and winzes (MSE 1997). Alluvium has a much higher permeability than bedrock based on the predominance of gravel and cobbles in the larger UBMC drainages (Beartrap Creek, Anaconda Creek, and the upper Blackfoot River).

Fifteen groundwater rights are on record within the UBMC study area (RI Table 7 [Tetra Tech 2013a] and Montana DNRC 2011). All are located downstream of the Upper Marsh. Given their physical location along tributaries to the Blackfoot River, it is unlikely that four of the 15 groundwater rights (WR#'s 91569-00, 127775, 52005-00, and 116746-00) receive water from the Blackfoot River valley fill deposits. It is unclear whether the remaining 11 groundwater rights have the potential to receive water from Blackfoot River valley fill deposits. The nearest groundwater right listing to the UBMC is within Porcupine Gulch on the southern side of the Blackfoot River and downstream of Swamp Gulch. The location is hydraulically upgradient of the Porcupine Gulch and Blackfoot River confluence. The Porcupine Gulch groundwater right is owned by the USFS and designated for institutional use. The two nearest groundwater rights potentially hydraulically connected to the Blackfoot River and downgradient of the Upper Marsh are located near the mouth of Surveyors Gulch (WR #76F42722-00) and (WR# 76F30044741). Both are designated for domestic use.

A total of 55 wells are on record with the State of Montana in the UBMC study area (MBMG 2011 and Montana DNRC 2011). Thirty-two of them are monitoring wells on record within the Facility, and the remaining 23 wells (RI Table 7 [Tetra Tech 2013a]) are all within a half-mile radius of the UBMC downstream of the Upper Marsh area. These wells are listed with a variety of purposes, including domestic, institutional, commercial, mining, irrigation, and stock use. Figure 2-14 shows the locations of groundwater wells at the UMBC.

The groundwater was not classified until the 2008 RI field investigation because there is limited historical groundwater data at the UBMC. Data necessary to classify the groundwater were obtained during the RI by drilling a number of additional groundwater monitoring wells and periodic sampling of these wells. In accordance with Administrative Rules of Montana (ARM) 17.30.1005, groundwater is classified I through IV based on its beneficial uses, and groundwater is to be classified according to actual quality or use, whichever places the groundwater in a higher class. ARM 17.30.1006 sets the standards for groundwater based on its specific conductance. A review of both field and laboratory specific conductance data for the period of 2007 and 2008 indicates all sampled groundwater within the project area is classified as Class I groundwater, with the exception of two specific areas. The upper Mike Horse waste pile area and the Carbonate mine area both exhibited Class II groundwater characteristics based on specific conductance (Tetra Tech 2013a).

2.15 SURFACE WATER

The drainage network in the UBMC is characterized by the dendritic pattern typical of mountain streams (Figure 2-15). Stream flow originates as snowmelt and as periodic rain events along steep upland slopes. Infiltration from these events provides base flow to streams throughout the remainder of the year. Major tributary streams in the UBMC include, from upstream to downstream, Beartrap Creek, Mike Horse Creek, Anaconda Creek, Blackfoot River, Stevens Gulch, Shave (or Shaue) Creek, Paymaster Creek, Pass Creek, and Swamp Gulch. The surface of the Blackfoot River covers 15.0 acres within the UBMC. The Blackfoot River is formed by the confluence of Beartrap Creek and Anaconda Creek. Numerous smaller tributaries join the Blackfoot River downstream of Swamp Gulch (RI Table 5 [Tetra Tech 2013a]). Other significant surface water features include the Mike Horse Tailings Impoundment on Beartrap Creek and a large marsh system, which begins near the confluence of the Blackfoot River and Pass Creek and extends several miles downstream.

Groundwater in the alluvial aquifer and surface water in the Blackfoot River valley and larger tributaries are intimately related, with the streams losing surface water to the alluvial aquifer system in some reaches and gaining water from it in other reaches (RI Appendix D [Tetra Tech 2013a]).

A floodplain analysis of the UBMC was completed as part of ASARCO's and ARCO's early site characterization program. The study included stream cross-section surveys and bankfull (the stream stage above which flooding begins) width and elevation measurements at various locations on the Blackfoot River and tributaries (Table 5 of the RI [Tetra Tech 2013a]). Peak flows at each point resulting from the 100-year storm event were also calculated using TR20 hydrologic modeling software. All surface waters within the UBMC are classified as B-1 waters with the following beneficial uses (DEQ 2003):

- Growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers
- Contact recreation
- Agriculture water supply
- Industry water supply
- Drinking, culinary, and food purposes after conventional treatment

The Blackfoot River (above Landers Fork), Beartrap Creek, and Mike Horse Creek are listed on DEQ's Clean Water Act Section 303(d) list as having impaired beneficial uses for aquatic life, cold water fish, and drinking water supply. Beneficial uses are identified as impaired based on elevated concentrations of cadmium, copper, iron, lead, manganese, and zinc in the Blackfoot River and Beartrap Creek; these metals plus aluminum are elevated in Mike Horse Creek.

Within the UBMC, 13 surface water right diversions with priority dates ranging from 1892 to 1963 are on file (Table 6 in RI [Tetra Tech 2013a]). The purpose listed for all 13 rights is "mining." Eleven of the water rights were owned by ASARCO (after bankruptcy, these water rights were transferred to the Montana Environmental Trust Group), one by a private individual, and one by USFS (for Mike Horse Dam).

3.0 RISK ASSESSMENT GUIDELINES

The methods used to conduct the HHRA are based on the risk assessment framework developed by EPA. The framework is documented in "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (also known as "RAGS") (EPA 1989). The EPA HHRA framework consists of the following six basic steps:

- **Conceptual Site Exposure Model:** This step involves evaluating potential exposure pathways to the COPCs and human populations that might be exposed to them under current or future site conditions.
- **Data Evaluation and Selection of COPCs:** This step consists of evaluating the analytical data for usability in the HHRA, grouping analytical data by site and by medium, and selecting COPCs in site media.
- **Exposure Assessment:** This step quantifies exposure to the COPCs identified for exposure pathways that are potentially complete. EPCs are estimated from measured or modeled concentrations, and pathway-specific intakes (doses) are estimated using current and potential future human receptors for evaluation in the subsequent risk calculations.
- **Toxicity Assessment:** This step consists of compiling toxicity values that characterize potential adverse health effects from exposure to COPCs.
- **Risk Characterization:** This step combines the results of the previous steps to quantitatively characterize potential risks to human health associated with exposure to COPCs at the area evaluated. Both potential cancer risks and noncancer hazard indices (HI), a measure of the potential for adverse health effects other than cancer, are evaluated.
- **Uncertainty Analysis:** This step analyzes the major uncertainties associated with the risks calculated.

The remainder of this report presents the methods for and results of each of these steps of the HHRA. The data, assumptions, and calculations associated with each of these steps are provided in Appendix C of this HHRA in RAGS Part D tabular format (EPA 2001).

4.0 CONCEPTUAL SITE EXPOSURE MODEL

This section presents the CSEM for human health for the UBMC. The CSEM summarizes information on sources of chemicals at the Facility and affected environmental media, chemical release and transport mechanisms that may occur at each location, potentially exposed human receptors, and potential exposure pathways for each receptor. Figure 4-1 presents the CSEM for the UBMC. The components of the CSEM are discussed below.

4.1 SOURCES OF SITE CHEMICALS AND AFFECTED ENVIRONMENTAL MEDIA

Sources of chemicals at the UBMC and affected environmental media are detailed in the RI report (Tetra Tech 2013a). Primary sources of chemicals at the UBMC are mine wastes and include mine waste rock piles, mine tailings, vein and porphyry exposed by mining activities, and acidic, untreated metal-laden mine adit discharge. Contaminated media include soil (combined with mine waste in some locations), sediment, surface water, and groundwater.

4.2 CHEMICAL RELEASE AND TRANSPORT MECHANISMS

Chemical release and transport mechanisms for the UBMC chemicals are shown in Figure 4-1. Release and transport mechanisms include storm water runoff and erosion, infiltration and leaching, infiltration and mixing, wind suspension, surface and groundwater interactions, and biotic transport.

The specific chemical transport pathways identified for the UBMC and the potential for migration of chemicals are discussed further in the following sections.

4.2.1 Surface Runoff and Erosion from Mine Wastes

Surface water runoff and erosion of mine waste represent a common release mechanism for contaminants to surface water throughout the UBMC. Erosion of mine waste by precipitation, storm water, and snowmelt, and its subsequent release to surface waters, is evidenced by the failed tailings dam, erosional gullies, and alluvial sedimentary aprons present on the surface of, or near, mine waste deposits. Waste deposits located near surface water are susceptible to erosion through mechanisms such as scouring and undercutting of the mine waste deposits located in stream banks adjacent to active channels. Erosion of surficial soil and waste piles has also resulted in transport of contaminants to the streams.

4.2.2 Infiltration and Leaching

Metals are made available for mobilization as products of sulfide mineral oxidation. The oxidation of metal-bearing sulfide phases generates acidity and releases metals. Once freed from the mineral structure, metals and acidity can be leached from sources (mine wastes, tailings, sediment, and exposed ore deposits) and then transported via acidic water to receiving streams and to the groundwater system. Infiltration of storm water (including snowmelt) and leaching of contaminants may also contribute to contaminant transport from primary sources into subsurface soils. Native soils several feet beneath the mine wastes contain elevated concentrations of some metals; this vertical profile indicates that metals may have leached from the mine waste sources into the soil.

4.2.3 Wind Suspension

Wind and vehicular traffic can suspend dry mine waste, mine-contaminated soil, and tailings into the air as particulates (fugitive dust).

4.2.4 Surface and Groundwater

Shallow groundwater and surface water are in direct communication at the UBMC (RI Appendix D [Tetra Tech 2013a]). Contaminants transported in solution or suspended in surface water can contaminate groundwater through losses of surface water to groundwater. Contaminated groundwater can contaminate surface water via these same interactions. Groundwater discharges to surface water through seeps and springs, and it contributes base flow to streams.

4.2.5 Biotic Transport

Contaminants may also be transported to plant and animal tissues. COPCs that have migrated to surface water and sediment may accumulate in fish tissue. Fish may provide a route of transfer of chemicals when they are consumed by highly mobile wildlife. Transport also occurs directly when a contaminated fish moves downstream and is consumed by predators.

4.3 POTENTIALLY EXPOSED HUMAN RECEPTORS

When evaluating receptors for risk assessment purposes, a distinction is made for those areas where contamination may have originated (on-site) and those areas where contamination has migrated from sources (off-site). Current land use at the UBMC consists of dispersed recreational (on- and off-site) and dispersed residential (off-site) use. In addition, construction is under way at areas that are considered on- and off-site for risk assessment purposes only. Future land use of the UBMC is likely to remain the same as current land use, including industrial land use for the water treatment system. Although residential land use is currently limited to off-site areas, potential future on-site residential use will also be evaluated in the HHRA because there are no current restrictions at the Facility for residential use. A residential land use scenario generally represents the greatest potential for exposure to site chemicals and will provide information to support cleanup decisions for the Facility.

Each of the current and potential future land uses described above (recreational, industrial, residential, and construction) may occur in both on-site and off-site exposure areas of the UBMC. The HHRA refers to areas directly associated with UBMC chemical sources (that is, historical, active mining areas where these chemical sources originated) as on-site exposure areas (that is, EUs 1, 3, 4, 5, 6, 7, 8, 9, and 10). Affected areas located downstream from historical, active mining areas are referred to as off-site exposure areas (that is, EUs 2, 11, 12, and 13). This distinction is made only to assist DEQ in developing SSCLs for different exposure areas within the UBMC and its use is limited to this purpose because, under CECRA, the "facility" includes "any site or area where a hazardous or deleterious substance has been deposited, stored, disposed of, placed, or otherwise come to be located." For all other purposes, the term "on-site" includes all suitable areas in close proximity to the contamination necessary to implement the remedial action.

Based on this information, the following current and future receptors were evaluated in the HHRA (see table below). The selection of recreational receptors listed below is consistent with DEQ guidance for abandoned mine sites (Tetra Tech 1996).

The table below summarizes the seven receptors evaluated in the HHRA and the type of exposure (that is, on-site or off-site, current or future) evaluated for each receptor.

RECEPTORS EVALUATED IN THE HHRA

Land Use	Receptor	On-Site		Off-Site	
		Current	Future	Current	Future
Recreational	Fisherman	X	X	X	X
	Hunter	X	X	X	X
	Rock Hound	X	X	X	X
	ATV and Motorcycle Rider	X	X	X	X
Industrial	Industrial Worker	X	X		X
Residential	Resident (Adult and Child)		X	X	X
Construction	Construction Worker	X	X	X	X

Notes:

ATV All-terrain vehicle

X Receptor will be evaluated in the HHRA

4.4 POTENTIALLY COMPLETE EXPOSURE PATHWAYS

According to EPA guidance (EPA 1989), a complete exposure pathway consists of four elements:

- A source and mechanism of chemical release
- A retention or transport medium (or media in cases involving transfer of chemicals)
- A point of potential human contact with the contaminated medium (referred to as the exposure point)
- An exposure route (such as ingestion) at the contact point

If any of these elements is missing (except in a case where the source itself is the point of exposure), then the exposure pathway is considered incomplete. For example, if human contact with the source or transport medium does not occur, then the exposure pathway is incomplete and is not quantitatively evaluated for risk. Similarly, if human contact with an exposure medium is not possible, the exposure pathway is considered incomplete and is not evaluated.

The CSEM for the UBMC summarizes the information on sources of COPCs, affected environmental media, COPC release and transport mechanisms that may occur at the site, potentially exposed receptors, and potential exposure pathways for each receptor (see Figure 4-1). Potentially complete exposure pathways are designated by a closed circle in the CSEM. Incomplete exposure pathways are designated by an open circle. Unless otherwise indicated in the CSEM, quantitative risk evaluation (that is, calculation of numerical cancer and noncancer risk estimates) was conducted for exposure pathways identified in the CSEM as potentially complete. The basis for identifying each exposure pathway as complete or incomplete is summarized in Tables C-1.1 through C-1.3 of Appendix C.

Many of the exposure pathways for the future exposure scenarios (for example, industrial worker) are based on assumed future exposures; these pathways are considered potentially complete and are evaluated to provide a conservative estimate of risk. Not all of these pathways may actually be complete for all receptors in the future.

Three potentially complete exposure pathways for mine waste-contaminated surface soil were identified for each of the seven receptors selected for evaluation in the HHRA:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals released to outdoor air from wind erosion (and vehicular traffic for the all-terrain vehicle (ATV) and motorcycle rider)

Exposure to surface soil (0 to 2 feet bgs), which assumes current site conditions or minimal development of the site during future land use, was evaluated for all receptors except the fisherman at EU 3 and EU 9. Exposure to surface soil was not evaluated for the fisherman at these EUs because current acidic conditions in soil and surface water at these EUs do not support fish habitat. Therefore, it assumed that exposure by fisherman to soils at these EUs will be negligible to none. Exposure to mine waste-contaminated subsurface soil (2 to 10 feet bgs) from the three exposure pathways listed above was also evaluated for the construction worker at EUs 2, 9, and 11. (Subsurface soil samples were not collected at other EUs.) Exposure to subsurface soil assumes that future use of the site involves intrusive development and excavation of site soil, thereby mixing soils throughout the soil column and making deeper soils available at the surface for contact. While subsurface soil samples were collected only at EUs 2, 9, and 11, construction activities are assumed to occur at EUs 1 through 11.

Exposure to surface sediment (0 to 2 feet bgs) was also evaluated for the fisherman, rock hound, industrial worker, construction worker, and resident at EUs 12 and 13; exposure to subsurface sediment (2 to 10 feet bgs; sediment beneath wetlands vegetation) was also evaluated for these same receptors at EU 12 but not at EU 13. (Sediment samples were not collected at other EUs.) It is highly unlikely that industrial worker, construction workers, or residents would be exposed to sediments with the same frequency as soils. However, rather than develop separate industrial and construction worker exposure scenarios for these EUs, DEQ evaluated the sediment exposure conservatively by applying the same assumptions as for soil. However, a reasonable residential exposure to sediments in these EUs would be approximately twice the frequency of the rock hound. Potentially complete exposure pathways for sediment include incidental ingestion and dermal contact. In addition, inhalation of chemicals released from sediment to outdoor air is assumed to be a potentially complete exposure pathway for the rock hound and resident because out-of-stream sediment may be piled and dried and may be dispersed by wind erosion (Tetra Tech 1996). Inhalation of sediment particulates is assumed to be an incomplete exposure pathway for the fisherman on the basis that in-stream sediments will be submerged in or saturated with surface water (Tetra Tech 1996). Since the pathway is likely to be incomplete, the inclusion of this exposure pathway adds an extra level of conservatism to the risks calculated for sediments.

Potentially complete pathways associated with groundwater and surface water include ingestion and dermal contact. The HHRA evaluates the potential for health effects from exposure to groundwater and surface water by comparing COPC concentrations measured at the UBMC with DEQ-7 standards (DEQ 2012) (see Sections 10.1 and 10.2).

Exposure to COPCs in surface water may also occur as a result of accumulation in fish tissue and subsequent fish consumption. The HHRA quantitatively evaluates risks from fish consumption for the recreational fisherman. COPCs may also accumulate in wildlife tissue from biotic transport through plants and animals. Results of the BERA indicate that accumulation of the COPCs identified for the UBMC is not significant in larger mammals (Tetra Tech 2013b); therefore, evaluation of health risks for the recreational hunter is limited to risks from exposure to mine waste-contaminated surface soil and does not include wildlife consumption.

5.0 DATA EVALUATION, DATA GROUPING, AND CHEMICALS OF POTENTIAL CONCERN

This section discusses the process used to evaluate and group the analytical data for quantitative evaluation in the HHRA. In addition, this section discusses the process used to refine the list of COPCs for quantitative risk evaluation.

5.1 DATA EVALUATION AND REDUCTION

The analytical data for surface soil, subsurface soil, and sediment collected during the 2007 and 2008 RI for the UBMC (Tetra Tech 2013a) were used in this HHRA. The analytical data for groundwater collected in 2007 and 2008 was used to evaluate Facility-wide groundwater and for surface water collected in 2007, 2008, and 2011 was used to evaluate surface water conditions in EU 13. Analytical data for soil and sediment collected for EUs 2, 11, and 12 in 2011 by Pioneer (Pioneer 2012) were also used. Unpublished analytical data for soil collected for EU 8 in 2006 by Hydrometrics were also used (DEQ 2013c). Previously collected data were not evaluated in the HHRA because the historical data are unlikely to represent current conditions. Since the historical data were collected, sediment was hydrologically reworked by the flow regime of the streams and rivers. Surface water quality changed as a result of actions taken in the 1990s. Soil data also changed because of removal actions, and soil data outside of historical removal areas do not exist.

The table below summarizes the soil and sediment sample matrices evaluated for each EU and the rationale for including or excluding the matrix. Groundwater was evaluated as a whole and was not included in any specific exposure unit. Surface water was evaluated as a whole and was included in EU 13.

Exposure Unit	Soil	Surface Sediment
1	Surface soil only [a]	Not evaluated [b]
2	Surface and subsurface soil	Not evaluated [b]
3	Surface soil only [a]	Not evaluated [b]
4	Surface soil only [a]	Not evaluated [b]
5	Surface soil only [a]	Not evaluated [b]
6	Surface soil only [a]	Not evaluated [b]
7	Surface soil only [a]	Not evaluated [b]
8	Surface soil only [a]	Not evaluated [b]
9	Surface and subsurface soil	Not evaluated [b]
10	Surface soil only [a]	Not evaluated [b]
11	Surface and subsurface soil	Not evaluated [b]
12	Not evaluated, no soil in this EU	Evaluated [c]
13	Not evaluated [d]	Evaluated

Notes:

a Subsurface soils were not collected in any investigation – bedrock occurs at shallow depths at this EU and subsurface soil is expected to be minimal.

b Sediment is included in EUs 12 and 13 depending on location.

c Both surface and subsurface sediments were evaluated.

d EU is defined as sediments along the Blackfoot River and does not include any soil locations.

Air samples were not collected during characterization of the UBMC. However, as discussed in Section 4.4, chemicals in surface soil, subsurface soil, and sediment may be released to outdoor and indoor air as a result of wind suspension and vehicular traffic. With the exception of lead, concentrations of COPCs in outdoor air released from site soils and sediment were modeled on the basis of measured concentrations in soil and sediment (see Section 6.1.2). Concentrations of lead released from site soil and sediment to outdoor air were not modeled because lead was evaluated using blood lead modeling, and exposure from site-related dust (particulate) inhalation is insignificant compared with oral exposure (see Section E2.0 of Appendix E).

5.1.1 Description of Data Used in the HHRA, by Exposure Unit

Soil samples were collected for EUs 1 through 11. Soil concentrations of all COPCs except aluminum were measured using X-ray fluorescence (XRF), in which samples were dried and sieved through a #10-mesh screen before they were analyzed. (These data are designated in the RI as "XRF 10.") Ten percent of the samples collected using XRF 10 were also analyzed using standard laboratory methods. The laboratory analysis was used to evaluate the relative percent difference between the XRF 10 and laboratory data, and to perform linear regression correlation between the XRF 10 and laboratory data sets (see Appendix F). The evaluation showed that XRF 10 data for all COPCs except cadmium were acceptable for use in the HHRA (RI Section 4.2 [Tetra Tech 2013a]). The XRF instrument did not provide reliable cadmium concentrations because the radiation source for the XRF instrument is cadmium and, the XRF instrument was not set up by the supplier to measure cadmium for analysis of the 2008 RI samples. No XRF 10 results were available for aluminum in soils because XRF instruments do not record aluminum.

Laboratory results were used for soil samples for which they were available; XRF 10 results converted to laboratory-equivalent concentrations using linear regression correlations (see Appendix F) were used for soil samples with only XRF 10 data.

All sediment, groundwater, and surface water samples collected by Tetra Tech were analyzed using standard laboratory methods. Sediment samples collected by other companies were analyzed by XRF and laboratory methods. As noted in the above paragraph for soil samples, laboratory results were used for sediment samples for which they were available; XRF results converted to laboratory-equivalent concentrations using linear regression correlations (see Appendix F) were used for sediment samples with only XRF data.

In addition, some soil and sediment samples were also analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) and for Acid-Base Accounting (ABA). These results and their use in developing site-specific soil screening levels are described in Section 10.3.

Mercury was not detected in any medium at any EU evaluated in the HHRA and so was not evaluated in this HHRA. However, mercury was detected at a single stream sediment sample (SHSE-101) from Shave Gulch (part of the Abandoned Mine Feature inventory) at a concentration of 380 mg/kg which exceeds the EPA RSL for residential soil of 23 mg/kg (EPA 2013b). Additional sampling of stream sediments in November 2011 by DEQ did not detect mercury beyond this single sample (Tetra Tech 2013a).

The following sections describe the specific data used in the HHRA. Sample-specific analytical results for site soil, sediment, groundwater, and surface water are provided in Tables F-1 through F-5 of Appendix F.

5.1.1.1 EU 1 – Upper Anaconda Mine Waste Removal Areas and Waste Piles

Two mine waste removal areas and three smaller unreclaimed mine waste areas associated with the Anaconda Mine were sampled during the RI. The two reclaimed areas are UAW2 and UAW5; the three un-reclaimed waste areas (UAW1, UAW3, and UAW4) are located northeast and upslope of the two reclaimed areas (Figure 2-1). Discrete samples were collected from the perimeter of areas UAW1, UAW2, and UAW5. In addition, composite samples were collected from the interior of areas UAW1, UAW2, and UAW5. Only composite samples were collected from the interior of UAW3 and UAW4; however, field XRF readings from the ground surface were taken around the perimeter of these piles to delineate the extent of impacts from mine waste. Discrete samples were not collected for XRF 10 or laboratory analysis from the interior or perimeter of UAW3 and UAW4.

Table C-2.1 of Appendix C summarizes the analytical results for surface soil samples collected from EU 1. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 46 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (nine) and cadmium (13) because only laboratory results were available for these analytes.

5.1.1.2 EU 2 – Blackfoot River Dispersed Tailings Associated with EE/CA Removal Action Area and Overbank Deposits

Mine waste deposition adjacent to and along the Beartrap Creek and Blackfoot River floodplains are a result of the 1975 Mike Horse Tailings Impoundment breach and other subsequent flood and high water events after this event. Mine wastes along Mike Horse Creek are the result of deposition of mine wastes directly to the stream and erosion from adjoining mine waste piles.

Previous sampling performed in and along Beartrap Creek and the Blackfoot River floodplains focused on distinct depositional features comprised of concentrated tailings and dispersed tailings. However, no previous sampling was completed to evaluate the maximum lateral extent of mine waste deposition adjacent to Beartrap Creek and Blackfoot River and mine wastes along the upper portion of Mike Horse Creek.

The purpose of soil sampling activities during the RI was to evaluate the lateral extent of mine waste impacts within the floodplains of these drainage systems. The floodplain sediments investigation involved analysis of floodplain materials via XRF-field screening and XRF 10 methods as well as select samples by the analytical laboratory.

Overbank Deposit Samples

The tailings and other eroded mine waste released or remobilized as a result of the impoundment breach are designated as "overbank deposits." The lateral extent of mine waste deposition at the edges of the floodplains from the breach and other potential flood and high water events was delineated during the RI (Tetra Tech 2013a).

Sample identification for Blackfoot River samples consisted of the area designation (BREOT) followed by the lateral distance from the edge-of-tailings (EOT) stake. For example, an XRF 10 reading at BREOT-N24 at a point 75 lateral feet from the EOT stake was labeled BREOT-N24+75 (0-6").

Dispersed Tailings Samples

Dispersed tailings (DT) areas along the Blackfoot River were also included in EU 2. Soil samples were collected from six test pits excavated in distinct dispersed tailings features that had not been previously analyzed for metals concentrations (Figure 2-2). Dispersed tailings were grouped with the "within tailings" samples described above. The dispersed tailings samples were designated as UBDT. UBDT samples were collected at six depth intervals; 0 to 2, 2 to 12, 12 to 24, 24 to 36, 36 to 48, and 48 to 60 inches bgs.

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 2. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 440 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (17) and cadmium (69) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.) A lower number of sample results was also used for iron (437) because laboratory results for iron were not available for a few samples that were not analyzed by XRF 10.

Table C-2.1 in Appendix C also summarizes the analytical results for subsurface soil samples collected from EU 2. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 153 subsurface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (10) and cadmium (22) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

5.1.1.3 EU 3 – Capital Mine Waste Area

Historical investigations indicated that the Capital Mine is associated with two discrete mine waste removal areas (DEQ 2007), which were combined into one soil sampling area for this HHRA. Samples from this waste area, which is located adjacent to the Capital Mine, are designated CMWA (Figure 2-3).

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 3. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 18 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (six) and cadmium (seven) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.) A lower number of sample results were also used for arsenic (17) because no XRF 10 result was available for one sample.

5.1.1.4 EU 4 – Carbonate Mine Waste Area

The Carbonate Mine Waste Area is located north of U.S. Highway 200 (Figure 2-4) in an area that formerly contained waste rock piles and a small tailings impoundment. Soil samples were collected from beneath the cover soil (which is approximately 13 to 17 inches thick). Almost the entire eastern half of the EU contains a low-lying wetland area (Figure 2-4). Samples collected in EU 4 were designated CARM.

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 4. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 29 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (three) and cadmium (six) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

5.1.1.5 EU 5 – Edith Mine Waste Areas

Eleven mine waste piles associated with the Edith Mine have been removed, regraded, and revegetated (Tetra Tech 2013a). These reclaimed mine waste areas were combined into three investigation groups during the RI because many of the individual removal areas were not visually distinguishable from one another. The three areas are referred to as the West Edith (WEA1), Central Edith (CEA1), and East Edith (EEA1) area waste piles (Figure 2-5).

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 5. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 58 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (two) and cadmium (nine) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

5.1.1.6 EU 6 – Consolation Mine Waste Area

The Consolation Mine is a relatively small mine located in lower Shave Gulch (Figure 2-6) on patented mining claims that were reclaimed by ASARCO in 1997 (Hydrometrics 1998b). The Consolation Mine waste area (CONM) was sampled in 2007 and 2008. The waste area extends west across the access road to the base of the hillside and east to the upper switchback of the road (Figure 2-6). During the summer 2008 sampling event, the waste at the base of the hillside was partially within a side channel of Shave Gulch. Based on results from the 2007 and 2008 investigations, the area of contaminated soil for the Consolation Mine waste area is 1.73 acres. One sample of what appeared to be mine waste was collected from an area east of and outside the EU boundary; this sample was not included in the HHRA because it is not within the Facility boundary.

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 6. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 36 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (eight) and cadmium (11) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

5.1.1.7 EU 7 – Mary P. Mine Waste Pile

One mine waste pile (MPWA) associated with the Mary P. Mine is located on the south side of the site access road to the west of the Anaconda Constructed Wetlands (Figure 2-7). Samples were collected to delineate the lateral extent of the waste pile. Samples collected from these areas were designated as MPWA.

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 7. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of eight surface soil samples were used in the HHRA, although a lower number of sample results (three) were used for aluminum and cadmium because only laboratory results were available for these analytes.

5.1.1.8 EU 8 – Mike Horse Mine Waste Piles

Perimeter and composite soil samples were collected at three of the five reclaimed waste rock piles at EU 8 (UMH1, UMH2, and UMH3) during the fall 2007 investigation and subsequent perimeter sampling in 2008 (Figure 2-8). The two remaining piles were removed in 2004 and 2005 and the removal areas were once again reclaimed during the fall of 2007. Confirmation samples were collected from these removal areas in 2006.

Samples were also collected in areas of dispersed tailings along Mike Horse Creek between the coffer dam, near mine waste areas, and the Mike Horse Mine waste repository; these samples were designated MHCS (Figure 2-8). Four samples were collected in 2007 to evaluate potential impacts to soil above the Mike Horse Repository caused by construction of the repository (contamination as a result of airborne deposition or tracking); these samples were designated AMHR (Figure 2-8).

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 8. All samples were collected at a depth of 0 to 2 inches or 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 180 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (14) and cadmium (28) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.) A lower number of sample results was also used for iron (106) because no XRF 10 result was available for the 2006 confirmation sampling, and for lead (179) because an XRF 10 result was not available for one sample.

5.1.1.9 EU 9 – Paymaster Mine Waste Areas

Two mine waste removal areas were historically located south of the Paymaster Mine and one adjacent to the main mine adit. Each of these waste areas was located adjacent to the access road. A wetland was constructed on top of the northernmost waste removal area, so the northernmost waste area was not sampled during the RI. Perimeter soil samples were collected from the two remaining areas, PMWA1 and PMWA2 (Figure 2-9).

Before the wetland was constructed, native soil was sampled to evaluate the underlying substrate and the effectiveness of a 1996 removal of the mine waste pile at this location. Soil samples were collected from native soil beneath the wetland at the 0- to 6-inch, 6- to 12-inch, and 12- to 24-inch depth intervals. The sample name designation for sampling beneath the constructed wetland was PAYCW or PAYRD (Figure 2-9). The thickness of the wetland substrate ranges from 2 to 4 feet; therefore, samples of the native soil beneath the wetland are all subsurface soil samples.

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 9. All surface soil samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 14 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (seven) and cadmium (nine) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

Table C-2.1 in Appendix C also summarizes analytical results for the subsurface soil samples collected from EU 9. Although the sample depths listed in Table F-1 are lower than 2 feet for these samples, the samples are all under the constructed wetland and are considered subsurface samples, as described above. Laboratory samples were used to analyze aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc. A total of 13 subsurface soil samples were used in the HHRA.

5.1.1.10 EU 10 – Number 3 Tunnel Waste Area

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 10. All samples were collected at a depth of 0 to 6 inches. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 30 surface soil samples were used in the HHRA, although a lower number of sample results were used for cadmium (three) because only laboratory results were available for cadmium. Surface soil samples were not available for aluminum at EU 10 because aluminum was not part of the analyte list for the fall 2007 sampling event.

5.1.1.11 EU 11 – Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Areas, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles

The Mike Horse Tailing Impoundment dam located on Beartrap Creek was breached during a heavy rain event in 1975, as described in Section 2.11 (Figure 2-11).

As described in Section 2.11 and Section 5.1.1.2, the tailings and other eroded mine waste released or remobilized as a result of the impoundment breach are designated as "overbank deposits." Sampling transects were established at 100-foot intervals in the same way described for EU 2 in Section 2.2. All soil samples were collected from the top 6 inches of soil once duff and vegetation were removed (Figure 2-2).

Sample identification for Beartrap Creek consisted of the area designation (BCEOT) followed by the lateral distance from the EOT stake (Figure 2-11). One soil sample was collected at Flossie Louise Mine Waste Pile (FLWA-101).

Table C-2.1 in Appendix C summarizes the analytical results for surface soil samples collected from EU 11. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 200 surface soil samples were used in the HHRA, although a lower number of sample results were used for aluminum (five) and cadmium (20) because only laboratory results were available for these analytes. (The number of aluminum sample results was lower than the number for cadmium because aluminum was not part of the analyte list for the fall 2007 sampling event.)

Table C-2.1 in Appendix C also summarizes the analytical results for subsurface soil samples collected from EU 11. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 114 subsurface soil samples were used in the HHRA, although a lower number of sample results (11) were used for aluminum and cadmium because only laboratory results were available for these analytes.

5.1.1.12 EU 12 – Marsh

Sediment samples were collected during the RI to evaluate the extent of tailings deposition in the Upper Marsh and to support the HHRA and BERA. Figure 2-12 shows the marsh sediment sample locations. Additional sediment samples were collected in 2012 to evaluate tailings deposition further downstream in the middle and lower marshes.

During the RI, marsh sediment samples were collected from three horizons (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs) at multiple locations on a sampling grid in the Marsh of EU 12 (Figure 2-12). Sample locations were not randomly selected, but were purposefully biased toward areas where deposition was thought to have been significant. In the 2012 sampling event, sediment samples were collected over a range of depths from 0 to 9 feet bgs.

Table C-2.2 in Appendix C summarizes the analytical results for surface sediment samples collected from EU 12. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from soil samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 293 surface sediment samples were used in the HHRA, although a lower number of samples were used for aluminum (56) and cadmium (129) because only laboratory results were available for these analytes, and iron (220) because results for iron were not available for all samples analyzed by XRF 10.

Table C-2.2 in Appendix C also summarizes the analytical results for subsurface sediment samples collected from EU 12. XRF 10 was used to analyze for arsenic, copper, iron, lead, manganese, and zinc. Laboratory methods were used to analyze a subset of samples for all analytes; the laboratory results were used whenever available, and were always used for aluminum and cadmium. XRF 10 results were converted to laboratory-equivalent concentrations using conversion factors developed from sediment samples analyzed by both XRF 10 and laboratory methods (see Appendix F for correlation plots). A total of 61 subsurface sediment samples were used in the HHRA, although a lower number of samples were used for aluminum and cadmium (seven) because only laboratory results were available for these analytes.

5.1.1.13 EU 13 – Stream Sediments

Streambed sediment samples were collected at 21 of the surface water stations sampled on the Blackfoot River (see Section 5.1.1.14) and its tributaries during the 2007 sampling event; and three reference/background locations in Anaconda Creek, Pass Creek, and Paymaster Gulch (Figure 2-13). Samples were collected from the 0- to 2-inch depth interval using a stainless steel trowel to scrape the surface of the streambed. Where possible, samples were also collected from deeper depth intervals (2 to 6 inches and 6 to 12 inches) by excavating a pit in the stream bed with a shovel. All sediment samples were sieved through a 2-millimeter (10-mesh) screen before they were placed in sample jars for shipment to the analytical laboratory for analysis of total metal concentrations. Sediment samples were designated as BRSW, the same as surface water samples.

Streambed sediment samples were also collected in 2008 at nine of the surface water locations sampled during the 2008 investigation and at the reference/background location on Anaconda Creek (BRSW-6) (Figure 2-13). Surface samples (0 to 2 inches bgs) were collected at all locations; an additional sample was collected from the 2- to 6-inch depth interval at four of the locations. Sampling methods and analytical parameters were consistent with the 2007 investigation.

Pioneer (2012) collected six streambed sediment samples in 2011. The sediment sample locations corresponded with six surface water sample locations located on the Blackfoot River downstream of Highway 279 and upstream of the confluence of the river with Hogum Creek (Figure 2-13). The 2007 and 2008 sediment data indicated several metals exceeded ecological screening levels at sample location BRSW-101, the farthest downstream sampling location in 2007 and 2008. Sediment samples were collected from the 0- to 2-inch depth interval. The purpose of sampling was to further evaluate mine-related impacts to sediment downstream of BRSW-101. Sampling methods and analytical parameters were consistent with the 2007 and 2008 investigations (Pioneer 2012). The streambed sediment sample locations correspond with the 2011 surface water sampling locations.

The HHRA grouped and evaluated streambed sediment samples as one group defined by sample location – within the active channel of the river or tributary. Streambed sediment samples were collocated with surface water samples from the active river or stream channel. The HHRA refers to EU 13 as Stream Sediments.

Table C-2.2 in Appendix C summarizes the analytical results for sediment samples collected from EU 13. Arsenic, cadmium, copper, iron, lead, manganese, and zinc were analyzed by laboratory methods for 47 sediment samples, although a lower number of samples were used for aluminum and iron (19) because laboratory results were not available for these samples in 2007.

5.1.1.14 Groundwater

The RI sampling included collection of groundwater samples in 2007 and 2008. In 2007, groundwater samples were collected from 40 monitoring wells located in areas where the data summary report (DSR) (DEQ 2007) indicated potential sources of metals (Figure 2-14). Two locations sampled were considered to represent unaffected reference/background areas (PMPZ-4 and SWGW-103). Four monitoring wells were either dry or did not contain sufficient water to permit sampling (Tetra Tech 2013a).

2008 Groundwater Samples

In 2008, groundwater samples were collected from 46 monitoring wells and seven piezometers. Five locations sampled were considered to represent unaffected reference/background areas (ANSW-9, PMPZ-4, SWGW-103, PDGW-101, and PDGW-102). Two monitoring wells did not contain sufficient water to permit sampling (Tetra Tech 2013a).

Table C-2.3 in Appendix C summarizes analytical results for the groundwater samples collected. Aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc were analyzed by laboratory methods for 82 groundwater samples; 53 of the samples were collected from alluvial groundwater, and 29 of the samples were collected from bedrock groundwater. Metals in groundwater were analyzed as dissolved metals.

5.1.1.15 Surface Water

Surface water samples were collected in 2007 to measure metals concentrations associated with low-flow conditions and in 2008 to measure metals concentrations associated with high-flow, spring runoff conditions. In October 2007, surface water samples were collected from 24 locations along Beartrap Creek, Blackfoot River, Stevens Gulch, and Paymaster Gulch and three reference/background locations in Anaconda Creek, Pass Creek, and Paymaster Gulch, which were considered to represent unaffected reference/background areas (Figure 2-15). Surface water samples were collected in biased locations from stream reaches where previous evaluations indicated potential impacts from metals.

In June 2008, an additional 13 surface water samples were collected along Beartrap Creek, Blackfoot River, and Stevens Gulch and from one reference/background location along Anaconda Creek in June 2008 (Figure 2-15). The 2008 surface water sampling locations corresponded with select stations sampled during the 2007 investigation, with the exception of location BRSW-4A, which was added in 2008. Surface water samples from the 2007 and 2008 events were designated as BRSW.

Table C-2.4 in Appendix C summarizes the analytical results for surface water samples collected. Aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc were analyzed by laboratory methods for 34 surface water samples; 22 in 2007, and 12 in 2008. Total metals were analyzed for surface water, with the exception of aluminum. Per DEQ-7 (DEQ 2012), aluminum was filtered and analyzed as dissolved aluminum; only results for samples with a pH of between 6.5 and 9.0 were retained and considered in the HHRA (Tetra Tech 2013a).

5.1.2 Reference/Background Site Samples

The following sections provide a summary of the soil, sediment, groundwater, and surface water reference/background samples collected during the RI for the UBMC. Analytical results for the reference/background samples are provided in Tables F-6 through F-9 of Appendix F.

5.1.2.1 Soil

Eleven reference/background site soil samples were collected from the UBMC in 2007, and another 19 in 2011 to evaluate baseline concentrations of metals in several unaffected drainages for comparison with site-related concentrations.

Six soil samples were collected from highly mineralized areas (Paymaster, Stevens, Shave, and Swamp gulches) and five from lesser- to non-mineralized areas (Anaconda Creek, Beartrap Creek, and Meadow Gulch) (Figure 1-2). Reference site soil samples were analyzed using the same methods described for soil samples in terrestrial EUs. Analytical results for the reference/background soil samples are provided in Table F-6 of Appendix F.

5.1.2.2 Sediment

Reference/background marsh sediment samples were collected from two locations in Pass Creek to represent unaffected areas comparable to the Marsh (Figure 2-12). Sediment samples were collected at three depths (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs) from two locations in Pass Creek Marsh (PGBG-1 and PGBG-2).

Reference/background streambed sediment samples collected from sites upstream from historical mining areas were considered to represent reference/background site conditions. Reference/background sites include Anaconda Creek (BRSW-6), Pass Creek (BRSW-11), and Paymaster Gulch (BRSW-21) (Figure 2-13). All samples were collected from 0 to 2 inches; an additional sample was collected from 2 to 6 inches at reference site BRSW-21. Analytical results for the reference/background sediment samples are provided in Table F-7 of Appendix F.

5.1.2.3 Groundwater

Groundwater samples collected from locations upgradient from historical mining areas were considered to represent reference/background site conditions. Reference/background sites include monitoring wells near Anaconda Creek (ANMW-9), Swamp Creek (SWGW-103), Pass Creek (PDGW-101 and PDGW-102) and Paymaster Gulch (PMPZ-4) (Figure 2-14). Analytical results for the reference/background groundwater samples are provided in Table F-8 of Appendix F.

5.1.2.4 Surface Water

Reference/background surface water samples collected from sites upstream from historical mining areas were considered to represent reference/background site conditions. Reference/background sites include Anaconda Creek (BRSW-6), Pass Creek (BRSW-11), and Paymaster Gulch (BRSW-21) (Figure 2-15). Analytical results for the reference/background surface water samples are provided in Table F-9 of Appendix F.

5.2 DATA GROUPING

Validated data for soil were grouped by each EU (for example, EU 1 data were grouped separately from EU 2 data) and sample medium (for example, soil data were grouped separately from sediment data). Data for soil were also grouped by the two depth intervals described in Section 4.5 for each EU: 0 to 2 feet bgs (surface soil) and 2 to 5 feet bgs (subsurface soil).

5.3 IDENTIFYING CHEMICALS OF POTENTIAL CONCERN

As discussed in Section 1.0, the RI for the UBMC identified nine COPCs that warrant further evaluation in an HHRA: aluminum, arsenic, cadmium, copper, iron, lead, manganese, mercury, and zinc (Tetra Tech 2013a). COPCs are chemicals that are carried through the quantitative exposure assessment and risk characterization portions of the HHRA. COPCs represent the chemicals assumed to account for most of any estimated health effects at a site.

Typically, the COPCs for an HHRA are refined by the following two screening steps:

1. Comparing site-specific concentrations with naturally occurring background levels (that is, concentrations measured at reference locations).
2. Comparing site-specific concentrations with nonsite-specific, risk-based screening concentrations.

Chemicals at site concentrations that do not exceed background levels and risk-based screening concentrations are typically eliminated as COPCs and excluded from further evaluation. The remainder of this section discusses the two screening steps used to refine the list of UBMC COPCs. The COPC screening is shown in Tables C-2.1 through C-2.4 of Appendix C. The chemicals shown on the "COPC Flag" as "Y" (Yes) were retained for quantitative risk evaluation. The chemicals shown on the COPC Flag as "N" (No) were excluded from further risk evaluation. Mercury was excluded as a COPC for all EUs because it was not detected in any samples for any of the EUs evaluated in the HHRA. However, as noted earlier, mercury was detected at a single stream sediment sample (SHSE-101) from Shave Gulch (part of the Abandoned Mine Feature inventory) at a concentration of 380 mg/kg, which exceeds the EPA RSL for residential soil of 23 mg/kg (EPA 2013b). Additional sampling of stream sediments in November 2011 by DEQ did not detect mercury beyond this single sample (Tetra Tech 2013a).

5.3.1 Comparison to Background Levels

The preferred approach for comparison of site data to naturally occurring background levels is to use one or more two-population statistical tests. Typically, these are tests for (1) central tendency, and (2) the upper quantiles of the site and background distributions. An evaluation of the background data for the UBMC indicates that most COPCs have sufficient detected results to meet the minimum requirements for two-population testing; however, the number of detected results for aluminum and cadmium in particular does not meet the minimum requirements. To remain consistent with the approach presented in the final RI (Tetra Tech 2013a), background sampling was conducted separately for soil, marsh sediments (EU 12), and streambed sediments (EU 13) by comparing the maximum detected concentration of each COPC with the EU- and medium-specific background threshold value (BTV) calculated for that COPC. COPCs detected at concentrations less than their respective medium-specific BTVs were excluded as COPCs for the HHRA for the relevant EU. Appendix B presents the methodology used to develop the medium-specific BTVs and the results of the comparisons of maximum detected concentrations to the BTVs.

5.3.2 Comparison to Risk-Based Screening Levels

The COPCs for the UBMC were further refined for the HHRA by comparing maximum detected concentrations with risk-based screening levels for each EU and medium sampled. The EPA regional screening levels (RSLs) for residential soil were used as screening levels for soil and sediment (EPA 2013b). RSLs for noncarcinogenic COPCs were reduced by a factor of 10 to account for potential cumulative synergistic effects. Tables C-2.1 and C-2.2 of Appendix C show the RSL screening results for each EU.

6.0 EXPOSURE ASSESSMENT

An exposure assessment identifies potential human receptors that could be exposed to site-related chemicals, as well as the routes, magnitude, frequency, and duration of the potential exposures. The principal objective of this evaluation is to identify reasonable maximum exposures (RME). The RME is the maximum exposure that is reasonably expected to occur at a site (EPA 1989). The potential human receptors and complete exposure pathways for the identified receptors were presented in Section 4.0, Conceptual Site Exposure Model. The remainder of this section describes the process used to estimate EPCs and quantify chemical intake for pathway-specific exposures for each receptor.

6.1 EXPOSURE POINTS AND EXPOSURE POINT CONCENTRATIONS

Potential exposure points are identified on the basis of present and anticipated future population activity patterns and the relationship of the activities to the presence of contaminated media. A location is identified as an exposure point if a human might contact (for example, ingest) a contaminated medium (for example, surface soil) at that location. The 13 EUs identified in Section 2.0 are considered separate exposure points for this HHRA. Potential exposure to COPCs is assumed to occur uniformly throughout each of the EUs (exposure points).

The concentration in the medium (for example, surface soil) that a receptor may be exposed to is called the EPC (exposure point concentration). The methods used to calculate EPCs for sampled media for each EU (surface soil, subsurface soil, sediment, and surface water) are described in Appendix A. The EPCs calculated for sampled media are summarized in Tables C-3.1 and C-3.2 of Appendix C. In addition, EPCs were developed for surface water to estimate EPCs for fish tissue. EPCs for surface water are summarized in Table C-3.3 of Appendix C.

As discussed in Section 4.0, COPCs in soil may be transferred to outdoor air by erosion of particulate chemicals from soil and sediment to outdoor air by wind or vehicular traffic. Samples were not collected for outdoor air at any of the EUs. Particulate emission models were used to estimate EPCs in outdoor air as a result of transfer mechanisms from soil and sediment in the absence of direct measurements of chemical concentrations in outdoor air. These models are discussed below.

COPCs in surface water may also concentrate in fish tissue and be subsequently ingested by fishermen. EPCs of COPCs in fish tissue were estimated using surface water data and fish tissue bioconcentration factors, as discussed below.

6.1.1 Particulate Emission Models

EPCs of COPCs released from surface, subsurface soil, and sediment to outdoor air as particulates were estimated using soil EPCs as the source term and the methodology provided by EPA in its memorandum describing the derivation of RSLs (EPA 2012a). The soil EPC was multiplied by the reciprocal of the particulate emission factor (PEF) — which is a nonchemical-specific value that relates chemical concentrations in soil to airborne concentrations that may be inhaled — to derive the EPCs for particulates released to outdoor air. A PEF of 1.36E+09 cubic meters per kilogram (m^3/kg) was used to evaluate particulate inhalation exposures for all receptors (EPA, 2012a), with the exception of the ATV/motorcycle rider receptor. The default PEF is based on emissions associated with wind erosion. The PEF was not adjusted to account for regional-specific contaminant dispersion because the particulate inhalation pathway from wind erosion is relatively insignificant compared with the oral and dermal pathways when evaluating exposure from soil (EPA 2013b).

The PEF for the ATV/motorcycle rider was calculated using the methodology described for this receptor in the Montana State Abandoned Mines Guidance (Tetra Tech 1996). A separate PEF was used to evaluate this ATV/motorcycle rider because this receptor is anticipated to be engaged in mechanical soil disturbance that is associated with higher rates of particulate emissions compared with rates associated with ambient wind erosion of soil. The PEF for the ATV/motorcycle rider is 1.31E+06 m^3/kg.

EPCs for particulate chemicals released from surface soil, subsurface soil, and sediment to outdoor air are calculated as part of the intake equation shown in the RAGS Part D standard Table 4 for soil and sediment (see Table C-4.1 of Appendix C). Therefore, no separate set of RAGS Part D standard Table 3 is presented for the inhalation EPC. The HHRA assumed that particulate releases from dried overbank sediment are similar to particulate releases from soil.

6.1.2 Bioconcentration Factors for Fish Tissue

Bioconcentration factors (BCF) were used to estimate the concentration of COPCs that may accumulate in fish tissue, based on the concentration of COPCs in surface water. BCFs used in the HHRA are from DEQ-7 (DEQ 2012) and are listed in the table below.

Chemical	Bioconcentration Factor (liter per kilogram)	Reference
Aluminum	--	DEQ 2012
Arsenic	44	DEQ 2012
Cadmium	64	DEQ 2012
Copper	36	DEQ 2012
Iron	--	DEQ 2012
Lead	49	DEQ 2012
Manganese	--	DEQ 2012
Zinc	47	DEQ 2012

Note:

-- Not applicable; chemical does not bioconcentrate

Surface water EPCs were multiplied by the bioconcentration factors to derive EPCs for fish tissue (see Table C18-1.1 of Appendix C).

6.2 CHEMICAL INTAKE ESTIMATES

Estimates of exposure are based on the EPCs (as described in Section 6.1) and scenario-specific assumptions and intake parameters. Exposure estimates (intakes) were calculated for an RME scenario for each receptor and exposure pathway and are expressed in terms of milligrams of chemical per kilogram body weight per day (mg/kg-day) (EPA 1995). The RME represents the highest exposure reasonably expected to occur and is calculated using the EPC and the RME exposure parameters.

EPA-derived exposure algorithms were used to estimate the chemical intakes for each route of exposure (that is, oral, dermal, and inhalation). The generic equations for calculating chemical intake are provided below (EPA 1989, 2009b):

$$I\,(oral) = \frac{C \times CR \times RBA \times EF \times ED}{BW \times AT} \tag{6-1}$$

$$I\,(dermal) = \frac{C \times CR \times EF \times ED}{BW \times AT} \tag{6-2}$$

$$I\,(inhalation) = \frac{C \times ET \times EF \times ED}{AT} \tag{6-3}$$

where:

I	=	Intake: the amount of chemical at the exchange boundary from oral or dermal exposure (mg/kg-day for oral and dermal exposure; milligram per cubic meter [mg/m^3] for inhalation exposure)
C	=	Chemical concentration for the exposure medium: the EPC (for example, mg/kg for soil)
CR	=	Contact rate: the amount of contaminated medium contacted orally or dermally per unit of time or event; may be the ingestion rate or dermal contact rate (for example, milligram per day [mg/day] for the ingestion rate of soil). The contact rate is not applicable for inhalation exposures.
RBA	=	Relative bioavailability: the fraction of the chemical that is absorbed into the bloodstream from the digestive tract. The RBA is 0.6 for arsenic; the RBA for all other metals was assumed to be 1.
ET	=	Exposure time: number of hours the exposure occurs (hours per day [hr/day]); the exposure time is applicable only for inhalation exposures.
EF	=	Exposure frequency: how often the exposure occurs (days per year)
ED	=	Exposure duration: the number of years a receptor comes in contact with the contaminated medium (years)
BW	=	Body weight: the average body weight of the receptor over the exposure period (kilograms); applicable only for oral and dermal exposures

AT = Averaging time: the period over which exposure is averaged (days for oral and dermal exposures; hours for inhalation exposures).

For carcinogens, the averaging time is 27,375 days (oral and dermal exposures) and 657,000 hours (inhalation exposures) on the basis of a lifetime exposure of 75 years, which represents the average life expectancy.

For noncarcinogens, the averaging time is equal to the exposure duration expressed in days (ED x 365 days/year) for oral and dermal exposures and in hours (ED x 365 days/year x 24 hr/day) for inhalation exposures.

Pathway-specific variations of the generic equations above were used to calculate intakes of COPCs. The exposure parameters common to all equations are discussed in Section 6.2.1, and pathway-specific equations and exposure parameters are discussed in Section 6.2.2.

6.2.1 General Exposure Assumptions

The exposure parameter values used in the intake equations are based on a series of reported and assumed factors related to current and potential land use patterns. Exposure parameters also account for a number of physiological factors, such as surface area of exposed skin. Exposure parameters common to all intake equations are the exposure time, exposure frequency, exposure duration, body weight, and averaging time. Each of these parameters is discussed in detail in the following text. Exposure assumptions for these parameters are consistent with DEQ recommendations (Tetra Tech1996; DEQ 2013a) and EPA recommendations (EPA 1989, 1991, 2002, 2004, 2009a, 2012a), and are summarized in Tables C-4.1 and C-4.2 of Appendix C.

6.2.1.1 Exposure Time, Frequency, and Duration

Three parameters (exposure time, exposure frequency, and exposure duration) together define the total extent of exposure of a receptor. The exposure time is the number of hours per day (or hours per event) when a receptor is present at a specific exposure point; it is used only to describe the inhalation pathway. An exposure time of 8 hours per day was assumed for the industrial worker and construction worker receptors (EPA 1991, 2002, 2009b) for evaluation of exposure to COPCs in soils released to outdoor air from wind erosion. The exposure times for the child and adult resident were assumed to be 24 hours per day (EPA 1991, 2002, 2009b). These exposure times are extremely conservative with regard to exposure to sediment. The exposure times for the recreational fisherman, hunter, and ATV/motorcycle rider receptors were assumed to be 4 hours per day, and the exposure time for the recreational rock hound was assumed to be 8 hours per day (EPA 1989, 1991; Tetra Tech 1996).

The exposure frequency is the number of days per year (or events per year) when exposure occurs. An exposure frequency of 165 days per year was assumed for the industrial worker receptor, corresponding to the number workdays in a year excluding a 2-week vacation and 4 months of snow cover or frozen ground (DEQ 2013b). An exposure frequency of 124 days per year was assumed for the construction worker receptor, corresponding to 4 months of open excavation (DEQ 2013b). Rather than develop separate industrial and construction worker exposure scenarios for these EUs, DEQ evaluated the sediment exposure conservatively by applying the same assumptions as for soil. An exposure frequency of 230 days per year was assumed for both the child and adult resident exposure to soil, based on the assumption of year-round exposure excluding a 2-week vacation and 4 months of snow cover or frozen ground (DEQ 2013b). However, a reasonable residential exposure to sediments would be approximately twice the frequency of the rock hound or 50 days per year. Exposure frequencies for recreational receptors were based on the length of recreational seasons and the percentage of sites with recreation. An exposure frequency of 24 days per year was assumed for the recreational rock hound receptor (DEQ 2013b). An exposure frequency of 24 days per year was assumed for the recreational fisherman (DEQ 2013b). An exposure frequency of 16 days per year was assumed for the recreational hunter (DEQ 2013b). An exposure frequency of 12 days per year was assumed for the recreational ATV/motorcycle rider (DEQ 2013b).

The exposure duration is the total number of years when exposure occurs. The exposure duration was 25 years for the industrial worker; 1 year for the construction worker; and 26 years for the resident (combined child and adult exposure) and for the rock hound recreational receptor (combined adult and child exposure). The 26-year exposure duration for the resident and recreational rock hound was based on child exposure for an initial six years followed by adult exposure for 20 years (EPA 2014). The remaining recreational receptors (ATV/motorcycle rider, fisherman, and hunter) do not include child exposure; instead, these scenarios were evaluated using a 20-year exposure duration (EPA 2014).

6.2.1.2 Body Weight

A default body weight of 80 kilograms was used for all adults, and 15 kilograms was used for children (EPA 2014).

6.2.1.3 Averaging Time

The averaging time for addressing noncancer health effects is equal to the exposure duration (in years) times 365 days per year (EPA 1989). The averaging time for cancer risk estimation is the number of days in a 78-year lifetime or 28,470 days (DEQ 2013a). The averaging time is expressed in days for evaluation of oral and dermal exposures. The averaging time for evaluation of inhalation exposures is expressed in hours (EPA 2009a).

6.2.2 Pathway-Specific Exposure Factors

This section summarizes the exposure factors unique to each of the exposure pathways quantified in this HHRA and that are summarized in RAGS Part D standard "Values Used for Daily Intake" tables (see Tables C-4.1 and C-4.2 of Appendix C). Neither EPA nor DEQ provides specific exposure assumptions to evaluate chemical intake of COPCs in sediment. This HHRA assumed that chemical intake from contact with sediment is similar to contact with soil. That is, the same exposure assumptions used to evaluate contact with soil were used to evaluate contact with sediment.

6.2.2.1 Exposure Parameters for Inhalation of Particulate Chemicals

Individuals may be exposed to COPCs in air by inhaling chemicals sorbed to particulates. Exposure time, exposure frequency, and exposure duration are used to estimate chemical intake from the inhalation exposure route. The assumptions for these parameters are discussed above in Section 6.2.1.1. PEFs, described in Section 6.1, were used to estimate EPCs in air.

6.2.2.2 Exposure Parameters for Incidental Ingestion of Soil and Sediment

Individuals may be exposed to COPCs in soil and sediment by inadvertently ingesting contaminated soil and sediment. The intake (applied dose) is estimated as the amount of chemical at the exchange boundary (gastrointestinal tract). The exposure parameters specific to the ingestion of soil pathway are the soil ingestion rate and the fraction of the ingested soil assumed to be contaminated. The following soil ingestion rates were used for industrial and construction workers: 100 mg/day for the current and future industrial worker, and 330 mg/day for the construction worker (EPA 2014). The following soil ingestion rates were also used for residential receptors: 200 mg/day for the child and 100 mg/day for the adult resident (EPA 2014). Different ingestion rates were needed to evaluate child and adult residents because of children's mouthing habits, which are assumed to result in greater incidental soil intakes during the preschool years of 0 to 6 (EPA 2014). A soil ingestion rate of 50 mg/day was assumed for the recreational fisherman and hunter receptors, based on one-half the intake for adult residential exposure (EPA 2014; Tetra Tech 1996). A soil ingestion rate of 165 mg/day was assumed for the recreational ATV/motorcycle rider and the adult recreational rock hound based on one-half the intake for the construction worker (EPA 2002; Tetra Tech 1996). A soil ingestion rate of 100 mg/day was assumed for the child recreational rock hound receptor based on one-half the intake for the child residential exposure because the child only receives a portion of his total daily exposure while at the Facility (EPA 1991; Tetra Tech 1996). The exposure assumptions for evaluating incidental soil ingestion are summarized in Table C-4.1 of Appendix C. These assumptions were also used to evaluate incidental sediment ingestion.

The term "fraction ingested" is used to account for the fraction of soil or sediment contacted that is assumed contaminated. All soil and sediment contacted is conservatively assumed to be contaminated for this HHRA (that is, the fraction ingested was set equal to 1).

The bioavailability of metals in soil and sediment may differ from the bioavailability of these metals in the medium where they were presented in laboratory studies used to develop metal-specific toxicity factors (EPA 2012). The ratio between the bioavailability of a metal in the medium of interest (such as soil and sediment) versus the medium considered in the laboratory study or studies used to develop a toxicity factor is referred to as the relative bioavailability (RBA). The default RBA for metals is 1 (except for arsenic and lead), unless site-specific studies have been completed (EPA 2012). No such studies have been performed at the UBMC. Therefore, the HHRA assumed a default RBA of 1 for all metals except arsenic and lead. An RBA value of 0.6 was used for evaluating incidental ingestion of arsenic in soil and sediment (EPA 2012). As discussed in Sections 7.4 and 8.3, exposure and risks from lead is addressed using EPA-recommended models, rather than the standard exposure/risk methodology used for other contaminants. These models incorporate a default RBA for lead in soil of 0.6 (EPA 2009b, 2009c).

6.2.2.3 Exposure Parameters for Dermal Contact with Soil and Sediment

Individuals may be exposed to COPCs in soil by direct contact with the skin. The intake for the dermal pathway is estimated as an absorbed dose, which is the amount of chemical that crosses the skin, enters the body, and passes into the bloodstream. (The absorbed dose is in contrast to an applied dose, which is used to estimate intake for all other exposure routes.) The exposure parameters specific to the assessment of the dermal pathway are the skin surface area (the amount of skin in contact with soil), the amount of soil that adheres to the skin (adherence factor), and the chemical-specific dermal absorption factor (ABS) (that is, the fraction of chemical in contact with the skin that actually crosses the skin barrier). ABS factors (EPA 2013b) are summarized in the table below. Intake of COPCs with an ABS of zero from dermal contact is negligible, and is therefore not quantified in the HHRA.

Chemical	Dermal Absorption Factor
Aluminum	0
Arsenic	0.03
Cadmium	0.001
Copper	0
Iron	0
Lead	0
Manganese	0
Zinc	0

The following receptor-specific factors for dermal adherence of soil were used (EPA 2014): 0.12 milligram per square centimeter (mg/cm^2) for the industrial worker; 0.2056 mg/cm^2 for the construction worker (DEQ, 2012); 0.2 mg/cm^2 for child residents and all recreational receptors; and 0.07 mg/cm^2 for adult residents. The following receptor-specific factors for dermal adherence of sediment were used (EPA 2011): 0.17 milligram per square centimeter (mg/cm^2) for the industrial worker; 0.2056 mg/cm^2 for the construction worker (DEQ, 2012); 4.7 mg/cm^2 for child residents and 0.2 for all recreational receptors except for the adult and child rock hound with 0.17 and 4.7 mg/cm^2, respectively; and 0.17 mg/cm^2 for adult residents. Table C-4.1 of Appendix C summarizes the assumptions used to evaluate dermal exposure to soil.

Default assumptions for exposed body surface area were used for all receptors: 3,470 square centimeters (cm^2) for industrial and construction workers (EPA 2014); 2,690 cm^2 for child residents and child recreational receptors; and 6,032 cm^2 for adult residents and adult recreational receptors (EPA 2014).

These assumptions used to evaluate dermal contact with soil were also used to evaluate dermal contact with sediment.

6.2.2.4 Exposure Parameters for Ingestion of Fish

Exposure to COPCs in surface water may also occur as a result of accumulation in fish tissue and subsequent fish consumption. The HHRA quantitatively evaluates risks from fish consumption for the recreational fisherman. The exposure parameters specific to this pathway are the fish ingestion rate and the fraction of the ingested fish from the contaminated source. The exposure assumptions for evaluating fish ingestion are summarized in Table C-4.2 of Appendix C.

The fish ingestion rates of 0.113 kilogram per day (kg/day) and 0.0956 kg/day were used for recreational adult and child fishermen, respectively (EPA 1989, 1997b). The term "fraction ingested" is used to account for the fraction of fish consumed that is from the site and is assumed contaminated. All fish consumed is conservatively assumed to be contaminated for this HHRA (that is, the fraction ingested was set equal to 1).

7.0 TOXICITY ASSESSMENT

The toxicity assessment identifies the reference doses (RfD), reference concentrations (RfC), slope factors (SF), and inhalation unit risks (IUR) used to evaluate adverse noncancer health effects and cancer risks. The hierarchy of sources used to obtain toxicity criteria are described below. The RfDs and SFs are discussed in Sections 7.1 and 7.2. Special considerations on route-to-route extrapolations and lead are discussed in Sections 7.3 and 7.4.

Sources used to obtain toxicity criteria are listed below, and follow the hierarchy outlined in EPA (2003).

1. EPA's Integrated Risk Information System (IRIS). IRIS is an on-line database that contains EPA-approved RfDs, RfC, SFs, and IURs (EPA 2013a). The toxicity criteria provided in IRIS have undergone review and are recognized as agency-wide consensus information.

2. EPA's Provisional Peer-Reviewed Toxicity Values (PPRTV) Database. EPA's PPRTVs are EPA-approved RfDs, RfCs, SFs, and IURs that have undergone review and are recognized as consensus information (EPA 2013b).

3. Other EPA toxicity values, including, but not limited to:

    a. EPA's Health Effects Assessment Summary Tables (HEAST) (EPA 1997a).

    b. EPA's National Center for Environmental Assessment (NCEA) papers (chemical-specific references) (EPA 2013b).

    c. California Environmental Protection Agency's (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) on-line database, which contains approved toxicity criteria (OEHHA 2008, 2009). The Cal/EPA toxicity criteria have undergone review and are recognized by EPA as toxicity criteria for HHRAs.

The toxicity criteria used for this HHRA are presented in standard RAGS Part D format "Toxicity Data" tables in Appendix C (see Tables C-5.1 through C-6.2) and are discussed in the following sections. Toxicity profiles for COPCs are included in Appendix D of this HHRA.

7.1 REFERENCE DOSES AND REFERENCE CONCENTRATIONS

The potential for adverse noncancer health effects from exposure to chemicals was characterized by comparing an exposure estimate (intake) with an RfD for oral and dermal exposures and with an RfC for inhalation exposures. An RfD is an estimate (with uncertainty that spans perhaps an order of magnitude or more) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of harmful effects (EPA 1989). The RfDs are expressed as mg/kg-day and are specific to the chemical, exposure route (for example, ingestion or inhalation), and exposure duration (chronic or subchronic). Oral RfDs were used to assess dermal exposure in the absence of route-specific dermal RfDs (EPA 1989), as detailed in Section 7.3. RfCs are concentrations in air expressed as in units mg/m^3 and are used to assess inhalation exposures (EPA 2009a).

Chronic RfDs and RfCs are developed for evaluating exposures that occur over periods of more than 7 years, and subchronic RfDs and RfCs are for exposures of less than 7 years. Although the potential exposures considered in this risk assessment are for periods of from 1 to 30 years, chronic RfDs and RfCs were used to evaluate both chronic and subchronic exposures. Few subchronic RfDs and RfCs were available, and the use of only one set of criteria based on chronic exposures simplifies the analysis. Using chronic RfDs and RfCs results in conservative estimates of potential hazards and does not affect the interpretation or conclusions of the assessment.

RfDs and RfCs are developed based on review of relevant human and animal studies for each chemical and selection of the study (or studies) pertinent to deriving the specific RfD or RfC. RfDs and RfCs are often derived from a measured or estimated no observed adverse effect level (NOAEL). The NOAEL corresponds to the dose, in mg/kg-day, that can be administered without inducing observable adverse effects. If a NOAEL cannot be established, the lowest observed adverse effect level (LOAEL) is used. The LOAEL corresponds to the lowest daily dose administered that induces an observable adverse effect. The toxic effect characterized by the LOAEL is referred to as the "critical effect."

NOAELs are most often based on data from experimental studies in animals. Both the experimental parameters and the extrapolation of animal data to humans are potential sources of uncertainty; therefore, the NOAEL or LOAEL is divided by uncertainty factors in deriving an RfD to ensure that the RfD will be protective of human health. The uncertainty factors usually occur in multiples of 10, and each factor represents a specific area of uncertainty inherent in the extrapolation from available data. Uncertainty factors account for the following:

- Extrapolation of data from animals to humans (interspecies extrapolation)
- Variation in human sensitivity to the toxic effects of a chemical (intraspecies differences)
- Derivation of a chronic RfD based on a subchronic rather than a chronic study
- Derivation of an RfD based on a LOAEL rather than a NOAEL

Modifying factors between 0 and 10 may also be applied to accommodate other factors or additional uncertainty associated with the data. The modifying factor is 1 for most chemicals. RfDs and RfCs are summarized in Tables C-5.1 and C-5.2 of Appendix C for the COPCs identified for this HHRA.

7.2 SLOPE FACTORS AND INHALATION UNIT RISKS

The toxicity information considered in the assessment of potential cancer risks includes a weight-of-evidence classification, an SF for evaluation of oral exposures, and an IUR for evaluation of inhalation exposures. The weight-of-evidence classification qualitatively describes the likelihood that a chemical is a human carcinogen and is based on an evaluation of the available data from human and animal studies. Chemicals evaluated by EPA since the 1996 cancer guidelines, "Proposed Guidelines for Carcinogen Risk Assessment" (EPA 1996), were published are evaluated using a weight-of-evidence narrative and one of the following descriptors for classifying potential carcinogenicity to humans: "known/likely," "cannot be determined," and "not likely." Chemicals EPA evaluated before the 1996 guidelines were published were evaluated in accordance with the 1996 guidelines (EPA 1996). These chemicals were classified using an alphanumeric system that assigned the chemical to one of five groups: Group A, a known human carcinogen; Groups B1 and B2, a probable human carcinogen; and Group C, a possible human carcinogen. Chemicals that could not be classified as human carcinogens because of lack of data were categorized in Group D, and chemicals for which there was no evidence of carcinogenicity in humans were categorized in Group E.

SFs and IURs are upper-bound estimates, approximating a 95 percent upper confidence limit (95UCL) on the increased cancer risk from lifetime exposure to a chemical (EPA 1989). The SFs and IURs used to estimate cancer risks were obtained from the sources identified in Section 7.0.

Similar to RfDs and RfCs, SFs and IURs are specific to the chemical and route of exposure. SFs are used to assess oral exposures, and IURs are used to assess inhalation exposures.

As with RfDs, oral SFs were used to estimate cancer risks for exposures via the dermal route if a dermal SF was not available, as detailed in Section 7.3. The SFs and IURs used in this assessment are presented in Appendix C (see Tables C-6.1 and C-6.2).

7.3 ROUTE-TO-ROUTE EXTRAPOLATION

Toxicity criteria are not available for the dermal exposure route; therefore, route-to-route extrapolations of oral toxicity criteria were used to evaluate dermal exposures for all COPCs. The oral absorption efficiency was assumed to be 100 percent for all COPCs; that is, oral toxicity criteria were not adjusted for absorption efficiency to evaluate dermal exposures (see Tables C-5.1 and C-6.1 of Appendix C).

7.4 LEAD

Lead was identified as a COPC in surface soil, subsurface soil, or sediment at most EUs. Risks from exposure to lead were characterized using blood lead modeling. Health effects from exposure to lead, particularly in children, may occur at such low blood lead levels that use of threshold-based toxicity criteria to evaluate potential risks from exposure to lead is not preferred. Rather, exposure to lead is evaluated by using a biomarker (blood lead levels); blood lead modeling, which accounts for multiple sources of exposure to lead (site-related and background), is used to predict blood lead levels. Using this approach, EPA (1994, 2009b) has generated blood lead modeling-based RSLs for lead based on not-to-exceed blood lead level of 10 micrograms per deciliter (µg/dL). However, the CDC have recently indicated that adverse health effects are documented at blood lead levels of 5 µg/dL. Therefore, the HHRA includes blood lead modeling to evaluate lead using two different blood lead endpoints; lead is identified as a COC if the predicted 95th percentile blood lead level exceeds either 10 µg/dL or 5 µg/dL. This provides two separate risk-based levels for media based on both current EPA and new CDC guidance on lead effects. Risks from exposure to lead are characterized in Section 8.3.

7.5 TOXICITY PROFILES

Toxicity profiles for aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc as they relate to human health are provided in Appendix D.

8.0 RISK CHARACTERIZATION

The final step in the HHRA is the characterization of the potential risks associated with exposure to detected chemicals. Cancer risks and noncancer health hazards are characterized separately. The general methodology for estimating cancer risks and HIs is presented in Sections 8.1 and 8.2. The results of risk characterization of lead are presented in Section 8.3. As discussed in Section 7.0, risks were calculated for each EU based on federal toxicity criteria. The methodology for calculating cancer risks and noncancer HIs is described below.

8.1 CHARACTERIZATION OF CANCER RISKS

Risks associated with exposure to chemicals classified as carcinogens are estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of an exposure (EPA 1989). The estimated risk is expressed as a unitless probability.

Three steps are used in estimating cancer risks for chemicals classified as carcinogens. First, the chemical intake is multiplied by the chemical-specific SF (oral and dermal exposure) or the chemical-specific IUR (inhalation exposure) to derive a cancer risk estimate for a single chemical and pathway. The calculation is based on the following relationship:

$$\text{Chemical-Specific Cancer Risk (oral or dermal)} = \text{Intake (mg/kg-day)} \times \text{SF (mg/kg-day)}^{-1} \quad (8\text{-}1)$$

$$\text{Chemical-Specific Cancer Risk (inhalation)} = \text{Intake (mg/m}^3) \times 10^{3}\ \mu\text{g/mg} \times \text{IUR } (\mu\text{g/m}^3)^{-1} \quad (8\text{-}2)$$

Note: µg/mg = Microgram per milligram; µg/m^3 = Microgram per cubic meter

Second, the individual chemical cancer risks are assumed to be additive to estimate the cancer risk associated with exposure to multiple carcinogens for a single exposure pathway, as follows:

$$\text{Pathway-Specific Cancer Risk} = \sum \text{Chemical-Specific Cancer Risk} \quad (8\text{-}3)$$

Third, pathway-specific risks are summed to estimate the total cancer risk. The estimated cancer risks are presented in Section 9.0. Both the rock hound and resident receptors were evaluated for both child and adult exposure. The total cancer risk for these two receptors is based on the summed cancer risks estimated for the child and adult receptors because cancer risks are cumulative over a lifetime of exposure. Cancer risks for the remaining receptors were estimated only for adult exposure.

DEQ guidance on exposure levels protective of human health is presented to aid in the interpretation of the results of the risk assessment. DEQ defines allowable risks as a total excess cancer risk of less than or equal to 1E-05 and a total hazard index less than or equal to 1 (DEQ 2013a). Risks and hazards that do not exceed these levels generally do not require further action.

8.2 CHARACTERIZATION OF NONCANCER HAZARDS

The potential for exposure that may result in adverse health effects other than cancer is evaluated by comparing the intake with an RfD (oral and dermal exposure) and with an RfC (inhalation exposure) for chemicals that are not classified as carcinogens and for those carcinogens known to cause adverse health effects other than cancer. When it is calculated for a single chemical, the comparison yields a ratio termed the hazard quotient (HQ):

$$HQ\ (oral\ or\ dermal) = \frac{Intake\ (mg/kg\text{-}day)}{RfD\ (mg/kg\text{-}day)} \tag{8-4}$$

$$HQ\ (inhalation) = \frac{Intake\ (mg/m^3)}{RfC\ (mg/m^3)} \tag{8-5}$$

The HQs for all chemicals are summed to evaluate the potential for adverse health effects other than cancer from simultaneous exposure to multiple chemicals, yielding an HI as follows:

$$HI = \sum HQ \tag{8-6}$$

Pathway-specific HIs are then summed to estimate a total HI for each receptor. An HI of less than 1 indicates that adverse noncancer health effects are not expected. If the total HI exceeds 1, further evaluation in the form of a segregation of the HI via a target organ analysis may be performed to assess whether the noncancer HIs are a concern (EPA 1989). Target organ-specific HIs greater than 1 may indicate a potential adverse effect for the target organ evaluated.

Estimated HIs are presented in Section 9.0. Both the rock hound and resident receptors were evaluated for both child and adult exposure. The total noncancer HI for these two receptors is based on the total HI estimated for child exposure because the intake for children of soil, sediment, and air per unit body mass is higher than for the corresponding adult-aged receptor; thus, noncancer HIs for a child receptor are always higher than noncancer HIs for the corresponding adult-aged receptor. HIs for the remaining receptors were estimated only for adult exposure.

8.3 CHARACTERIZATION OF RISKS FROM EXPOSURE TO LEAD

As discussed in Section 7.4, lead was identified as a COPC in surface soil, subsurface soil, and sediment at several EUs. The HHRA evaluated the potential for health effects from exposure to lead in soil and sediment by modeling potential blood lead levels with EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model and Adult Lead Methodology (ALM).

The IEUBK model (EPA 2009b) was used to evaluate the child receptors (resident and recreational rock hound). The ALM (EPA 2009c) was used to evaluate the adult receptors. In each case, the model was used to predict the geometric mean and the 95th percentile for the blood lead level, and the probability that the blood level exceeds 10 µg/dL or 5 µg/dL. This provides risk-based levels for media based on both current EPA and new CDC guidance on lead effects. Lead is identified as a chemical of concern (COC) if the predicted blood lead level exceeds 10 µg/dL or 5 µg/dL for more than 5 percent of the receptor population evaluated. If lead is identified as a COC at 10 µg/dL, it is also a COC at 5 µg/dL. Results of the blood lead modeling are summarized below. Detailed discussion of the blood lead modeling methodology is included in Appendix E.

8.3.1 Recreational Exposure Scenarios

Appendix E, Table E-1 summarizes the results of the blood lead modeling for the adult ATV/motorcycle rider. Lead at 10 µg/dL is a COC for surface soil at EU 1 for the ATV/motorcycle rider and also at EUs 2, 6, 7, 8, and 11 at 5 µg/dL.

Appendix E, Table E-2 summarizes the results of the blood lead modeling for the adult fisherman. Lead at 10 µg/dL is a COC for surface soil at EU 1 and also at EUs 2, 7, and 8 at 5 µg/dL. Lead is not a COC for sediment for the fisherman.

Appendix E, Table E-3 summarizes the results of the blood lead modeling for the child rock hound. Lead at 10 µg/dL is a COC for surface soil at EU 1 for the child rock hound and also at EUs 2, 6, 7, 8, 11, and 12 at 5 µg/dL.

Appendix E, Table E-4 summarizes the results of the blood lead modeling for the adult hunter. Lead at 10 µg/dL is a COC for surface soil at EU 1 for the hunter and also at EUs 2, 7, and 8 at 5 µg/dL.

8.3.2 Industrial Worker and Construction Worker Scenarios

Appendix E, Table E-5 summarizes the results of the blood lead modeling for the industrial worker. Lead at 10 µg/dL is a COC for the industrial worker for surface soil at EUs 1, 2, 6, 7, 8, and 11. Lead is also a COC at 10 µg/dL for surface sediment at EU 12 for the industrial worker. Lead at 5 µg/dL is also a COC at EU 3.

Table E-6 summarizes the results of the blood lead modeling for the construction worker. Lead at 10 µg/dL is a COC for the construction worker for surface soil at EUs 1, 2, 6, 7, 8, and 11. Lead at 10 µg/dL is a COC for the construction worker for subsurface soil at EUs 2 and 11. Lead at 10 µg/dL is also a COC for surface sediment at EU 12 for the construction worker. Lead at 5 µg/dL is also a COC for surface soil in EUs 3 and 4 and subsurface sediment in EU 12 for the construction worker.

8.3.3 Residential Scenario

Appendix E, Table E-7 summarizes the results of the blood lead modeling for the resident and modified residential exposure to sediment. If groundwater is not used as a source of drinking water, lead at 10 µg/dL is a COC for surface soil at EUs 1, 2, 3, 4, 6, 7, 8, and 11. At 5 µg/dL, lead is also a COC for surface soil in EU 5 and for surface sediment at EU 12.

9.0 RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT

The HHRA included a statistical analysis of data for soil and groundwater, an exposure assessment, a toxicity assessment, and a risk characterization. As discussed in Section 4.0, industrial workers, construction workers, residents, recreational fishermen, hunters, rock hounds, and ATV/motorcycle riders, were evaluated in the HHRA for each EU. Off-site and on-site exposures, as well as current and potential future exposures, were evaluated for each of these receptors, as shown in the table below. The HHRA refers to areas directly associated with UBMC chemical sources and to the historical mining areas where these chemical sources originated as on-site exposure areas (that is, EUs 1, 3, 4, 5, 6, 7, 8, 9, and 10). Contaminated areas located downstream from historical mining areas will be referred to in the HHRA as off-site exposure areas (that is, EUs 2, 11, 12, and 13). Risks for future exposure scenarios for all receptors except the industrial worker are assumed to be the same as risks for current exposure scenarios. For this reason, risks are not estimated for both current and future scenarios. The estimated risks for the industrial worker apply only to potential future exposures because neither on-site nor off-site areas of the UBMC are currently used for industrial purposes, with one exception. The water treatment plant currently has full-time on-site industrial workers; these workers were evaluated for potential exposure to COPCs in soil. Likewise, residences are not currently present at any of the EUs; however, dispersed residential use occurs in areas surrounding the UBMC. The estimated residential risks therefore apply to potential future exposures, but may be conservatively applied to assess risks for current residents nearby the UBMC.

RECEPTORS EVALUATED IN THE HHRA

Land Use	Receptor	On-Site		Off-Site	
		Current	Future	Current	Future
Recreational	Fisherman	X	X	X	X
	Hunter	X	X	X	X
	Rock Hound	X	X	X	X
	ATV and Motorcycle Rider	X	X	X	X
Industrial	Industrial Worker	X	X		X
Residential	Resident (Adult and Child)		X	X	X
Construction	Construction Worker	X	X	X	X

Notes:

ATV All-terrain vehicle

X Receptor will be evaluated in the HHRA

As discussed in Section 5.3, risks were calculated in the HHRA for all identified COPCs using the methodology described in Section 8.0. The EPCs, exposure assumptions, and toxicity criteria presented in the RAGS Part D Tables 3 through 6 series of Appendix C were used to calculate risks. Calculations for total cancer risks and cumulative noncancer HIs for each EU are provided in Appendix C.

In accordance with EPA guidance, risk and hazard estimates in the HHRA should be presented to only one significant figure (EPA 1989). However, tables in Appendix C show chemical-specific risk results to two significant figures for each EU to aid review of the risk calculations.

Likewise, risks are discussed in this section using two significant figures, so the discussion can be easily matched with the calculations presented in Appendix C.

A COPC is identified as a COC for this HHRA when the COPC-specific risk exceeds 1E-05 or the COPC-specific HI exceeds 1. COPCs identified as COCs are shown in boldface font in the discussion of risk results. Appendix E presents receptor-specific lead results. Only receptors with modeled blood lead concentrations greater than either the EPA-recommended target blood lead concentration of 10 µg/dL or the CDC blood lead concentration of 5 µg/dL are identified in the text; modeled blood lead results for all receptors are presented in Appendix E.

The total cancer risks and HIs on the RAGS Part D Tables 9 and 10 of Appendix C do not always match. The total cancer risk and HI on the Table 9 encompass all COPCs, while those listed on the Table 10 include only those COPCs identified as risk drivers. The segregated HI values listed in the sub-table at the bottom of the RAGS Part D Table 9s indicate the risk to specific target organs.

9.1 EXPOSURE UNIT 1

This section summarizes the HHRA results for EU 1, Upper Anaconda Mine Waste Removal Areas and Waste Piles. Health risks from exposure to COPCs in surface soil at EU 1 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 1 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 1 are provided in Table 9-1. Detailed risk calculations for EU 1 are presented in Attachment C1 to Appendix C.

EU 1 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	2E-06	0.05	(0.04)	Lead**
	Recreational Fisherman	24	2E-06	0.02	(0.01)	Lead**
	Recreational Rock Hound	24	6E-06	0.1	(0.09)	Lead**
	Recreational Hunter	16	1E-06	0.01	(0.009)	Lead**
	Industrial Worker	165	**2E-05**	0.2	(0.1)	Arsenic, Lead**
	Construction Worker	124	1E-06	0.4	(0.2)	Lead**
	Resident	230	**7E-05**	**2**	(1)	Arsenic, Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 1E-06 to 7E-05 and exceed the DEQ allowable cumulative risk level of 1E-05 only for the industrial worker and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.009 to 2; HIs segregated by target organ only exceed the threshold HI of 1 for the resident and the HI is attributable to arsenic .

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed both EPA's blood level of concern of 10 µg/dL (EPA 1994) and the CDC blood level of concern of 5 µg/dL for all receptors.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.2 Exposure Unit 2

This section summarizes the HHRA results for EU 2, Blackfoot River Dispersed Tailings Associated with EE/CA Removal Area and Overbank Deposits. Health risks from exposure to COPCs in surface soil at EU 2 were evaluated for all receptors for this EU. In addition, risks were evaluated for construction worker exposure to subsurface soil. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 2 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 2 are provided in Tables 9-2 and 9-3. Detailed risk calculations for EU 2 are presented in Attachments C2 and C3 to Appendix C.

EU 2 Human Health Risk Summary

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	3E-06	0.2	(0.2)	Lead*
	Recreational Fisherman	24	2E-06	0.03	(0.02)	Lead*
	Recreational Rock Hound	24	8E-06	0.2	(0.1)	Lead*
	Recreational Hunter	16	1E-06	0.02	(0.01)	—Lead*
	Industrial Worker	165	**2E-05**	0.3	(0.1)	Arsenic, Lead**
	Construction Worker	124	2E-06	0.7	(0.3)	Lead**
	Resident	230	**9E-05**	**4**	**(2)**	Arsenic, Lead**
Subsurface Soil (2 to 10 feet bgs)	Construction Worker	124	7E-07	0.4	(0.1)	Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 1E-06 to 9E-05, and exceed the DEQ allowable cumulative risk level of 1E-05 only for the industrial worker and the resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.01 to 4; HIs segregated by target organ exceed the threshold HI of 1 for the resident. The HI is attributable to arsenic for the resident.

The cancer risk for construction worker exposure to subsurface soil is 7E-07 and is less than the DEQ allowable cumulative risk level of 1E-05. The noncancer HI for exposure to subsurface soil is 0.4 and is less than the threshold HI of 1 for the construction worker.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed both EPA's blood level of concern of 10 µg/dL (EPA 1994) and the CDC blood level of concern of 5 µg/dL for the industrial worker, construction worker, and resident. Predicted blood levels from exposure to lead in surface soil exceeded only the CDC blood level of concern of 5 µg/dL for the recreational ATV/motorcycle rider, fisherman, rock hound, and hunter. The predicted blood lead level of concern exceeded 10 µg/dL for the construction worker for exposure to lead in subsurface soil.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.3 EXPOSURE UNIT 3

This section summarizes the HHRA results for EU 3, Capital Mine Waste Area. Health risks from exposure to COPCs in surface soil at EU 3 were evaluated for all receptors for this EU, with the exception of the fisherman. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 3 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 3 are provided in Table 9-4. Detailed risk calculations for EU 3 are presented in Attachment C4 to Appendix C.

EU 3 Human Health Risk Summary

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard	COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	**2E-05**	0.3 (0.3)	Arsenic
	Recreational Rock Hound	24	**6E-05**	0.8 (0.8)	Arsenic
	Recreational Hunter	16	1E-05	0.09 (0.08)	--
	Industrial Worker	165	**1E-04**	1 (0.9)	Arsenic, Lead*
	Construction Worker	124	1E-05	**2 (2)**	Arsenic, Lead*
	Resident	230	**6E-04**	**15 (13)**	Arsenic, Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).
The recreational fisherman receptor was not evaluated in EU 3 because no fish are present in Stevens Gulch.
-- Not applicable
* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.
** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 1E-05 to 6E-04 and exceed the DEQ allowable cumulative risk level of 1E-05 for the ATV/motorcycle rider, rock hound, industrial worker, and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.09 to 15; HIs segregated by target organ exceed the threshold HI of 1 for the construction worker and resident. The HI is attributable to arsenic for the construction worker and the resident.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for the resident and exceeded the CDC blood level of concern of 5 µg/dL for the industrial and construction workers.

Health risks for the fisherman may also result from fish consumption. However, no fish are present in Stevens Gulch, so the fisherman receptor was not evaluated for EU 3.

9.4 Exposure Unit 4

This section summarizes the HHRA results for EU 4, Carbonate Mine Waste Area. Health risks from exposure to COPCs in surface soil at EU 4 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 4 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 4 are provided in Table 9-5. Detailed risk calculations for EU 4 are presented in Attachment C5 to Appendix C.

EU 4 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard	COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	2E-08	0.01 (0.008)	--
	Recreational Fisherman	24	4E-11	0.006 (0.005)	--
	Recreational Rock Hound	24	1E-10	0.06 (0.05)	--
	Recreational Hunter	16	3E-11	0.004 (0.003)	--
	Industrial Worker	165	7E-10	0.08 (0.07)	--
	Construction Worker	124	2E-11	0.2 (0.2)	Lead*
	Resident	230	3E-09	1 (1)	Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 μg/dL blood lead level of concern, but not the 10 μg/dL blood lead level of concern.

** Lead is a COC for both the 5 μg/dL and 10 μg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 2E-11 to 2E-08 and do not exceed the DEQ allowable cumulative risk level of 1E-05 for any receptors. Noncancer HIs for exposure to surface soil range from 0.004 to 1; HIs segregated by target organ do not exceed the threshold HI of 1 for any receptors.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 μg/dL (EPA 1994) for the resident and exceed the CDC blood level of concern of 5 μg/dL for the construction worker.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.5 EXPOSURE UNIT 5

This section summarizes the HHRA results for EU 5, Edith Mine Waste Areas. Health risks from exposure to COPCs in surface soil at EU 5 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 5 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 5 are provided in Table 9-6. Detailed risk calculations for EU 5 are presented in Attachment C6 to Appendix C.

EU 5 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	5E-07	0.01	(0.009)	--
	Recreational Fisherman	24	4E-07	0.006	(0.004)	--
	Recreational Rock Hound	24	2E-06	0.05	(0.03)	--
	Recreational Hunter	16	3E-07	0.004	(0.002)	--
	Industrial Worker	165	4E-06	0.06	(0.04)	--
	Construction Worker	124	4E-07	0.2	(0.09)	--
	Resident	230	**2E-05**	0.9	(0.5)	Arsenic, Lead*

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

Cancer risks for exposure to surface soil range from 3E-07 to 2E-05 and exceed the DEQ allowable cumulative risk level of 1E-05 for the resident. All of the cancer risk for the resident is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.004 to 0.9 and do not exceed the threshold HI of 1 for any receptor.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil do not exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for any receptors. Predicted blood lead levels from exposure to lead in surface soil exceed the CDC blood level of concern of 5 µg/dL for the resident.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.6 EXPOSURE UNIT 6

This section summarizes the HHRA results for EU 6, Consolation Mine Waste Area. Health risks from exposure to COPCs in surface soil at EU 6 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 6 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 6 are provided in Table 9-7. Detailed risk calculations for EU 6 are presented in Attachment C7 to Appendix C.

EU 6 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard	COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	8E-06	0.1 (0.1)	Lead*
	Recreational Fisherman	24	6E-06	0.06 (0.06)	--
	Recreational Rock Hound	24	**2E-05**	0.4 (0.3)	Arsenic, Lead*
	Recreational Hunter	16	4E-06	0.04 (0.04)	--
	Industrial Worker	165	**6E-05**	0.5 (0.4)	Arsenic, Lead**
	Construction Worker	124	5E-06	1 (1)	Lead**
	Resident	230	**3E-04**	**6 (6)**	Arsenic, Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 4E-06 to 3E-04 and exceed the DEQ allowable cumulative risk level of 1E-05 for the rock hound, industrial workers, and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.04 to 6; HIs segregated by target organ exceed the threshold HI of 1 only for the resident. The HI is attributable to arsenic.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for the industrial worker, construction worker, and resident. Predicted blood lead levels from exposure to lead in surface soil exceed CDC blood level of concern of 5 µg/dL for the recreational ATV/motorcycle rider and rock hound.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.7 EXPOSURE UNIT 7

This section summarizes the HHRA results for EU 7, Mary P. Mine Waste Pile. Health risks from exposure to COPCs in surface soil at EU 7 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 7 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 7 are provided in Table 9-8. Detailed risk calculations for EU 7 are presented in Attachment C8 to Appendix C.

EU 7 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	3E-06	0.06	(0.05)	Lead*
	Recreational Fisherman	24	5E-06	0.03	(0.02)	Lead*
	Recreational Rock Hound	24	9E-06	0.2	(0.1)	Lead*
	Recreational Hunter	16	2E-06	0.02	(0.01)	Lead*
	Industrial Worker	165	**2E-05**	0.2	(0.2)	Arsenic, Lead**
	Construction Worker	124	2E-06	0.5	(0.4)	Lead**
	Resident	230	**1E-04**	**3**	**(2)**	Arsenic, Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.Cancer risks for exposure to surface soil range from 2E-06 to 1E-04 and exceed the DEQ allowable cumulative risk level of 1E-05 for the industrial worker and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.02 to 3; HIs segregated by target organ exceed the threshold HI of 1 for the resident. The HI is attributable to arsenic for the resident.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for the industrial worker, construction worker, and resident. Predicted blood lead levels from exposure to lead in surface soil exceed CDC blood level of concern of 5 µg/dL for all four recreational receptors.Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.8 EXPOSURE UNIT 8

This section summarizes the HHRA results for EU 8, Mike Horse Mine Waste Piles. Health risks from exposure to COPCs in surface soil at EU 8 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 8 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 8 are provided in Table 9-9. Detailed risk calculations for EU 8 are presented in Attachment C9 to Appendix C.

EU 8 Human Health Risk Summary

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	6E-06	0.3	(0.3)	Lead*
	Recreational Fisherman	24	5E-06	0.05	(0.04)	Lead*
	Recreational Rock Hound	24	**2E-05**	0.4	(0.3)	Arsenic, Lead*
	Recreational Hunter	16	3E-06	0.03	(0.03)	Lead*
	Industrial Worker	165	**5E-05**	0.4	(0.3)	Arsenic, Lead**
	Construction Worker	124	4E-06	1	(0.7)	Lead**
	Resident	230	**2E-04**	**6**	**(4)**	Arsenic, Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 3E-06 to 2E-04 and exceed the DEQ allowable cumulative risk level of 1E-05 for the rock hound, industrial worker, and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.03 to 6. HIs segregated by target organ exceed the threshold HI of 1 for the resident. The HI is attributable to arsenic for the resident.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for theindustrial worker, construction worker, and resident. Predicted blood lead levels from exposure to lead in surface soil exceed CDC blood level of concern of 5 µg/dL for all four recreational receptors.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.9 Exposure Unit 9

This section summarizes the HHRA results for EU 9, Paymaster Mine Waste Areas. Health risks from exposure to COPCs in surface soil at EU 9 were evaluated for all receptors for this EU, with the exception of the fisherman. In addition, risks were evaluated for construction worker exposure to subsurface soil. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 9 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 9 are provided in Tables 9-10 and 9-11. Detailed risk calculations for EU 9 are presented in Attachments C10 and C11 to Appendix C.

EU 9 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	--	0.006	(0.006)	--
	Recreational Rock Hound	24	--	0.04	(0.04)	--
	Recreational Hunter	16	--	0.003	(0.003)	--
	Industrial Worker	165	--	0.05	(0.05)	--
	Construction Worker	124	--	0.1	(0.1)	--
	Resident	230	--	0.8	(0.8)	--
Subsurface Soil (2 to 10 feet bgs)	Construction Worker	124	1E-05	**3**	**(2)**	Arsenic

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

Recreational fisherman receptor not evaluated in this EU because no fish are present in Paymaster Gulch.

-- Not applicable

There was no cancer risk for exposure to surface soil because arsenic and cadmium were found to be below their BTVs in surface soil. Noncancer HIs for exposure to surface soil range from 0.003 to 0.8; HIs segregated by target organ did not exceed the threshold HI of 1 for any receptor.

The cancer risk for construction worker exposure to subsurface soil is 1E-05 and is equal to the DEQ allowable cumulative risk level of 1E-05. The noncancer HI for exposure to subsurface soil is 3; the HI segregated by target organ exceeded the threshold HI of 1 for the construction worker. The HI is attributable to arsenic for the construction worker.

Exposure to lead at EU 9 was not evaluated using blood lead modeling because the lead EPCs for both surface and subsurface soil were below the BTV for soil.

Health risks for the fisherman may also result from fish consumption. However, no fish are present in Paymaster Gulch, so the fisherman receptor was not evaluated for EU 9.

9.10 EXPOSURE UNIT 10

This section summarizes the HHRA results for EU 10, Number 3 Tunnel Waste Area. Health risks from exposure to COPCs in surface soil at EU 10 were evaluated for all receptors for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 10 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 10 are provided in Table 9-12. Detailed risk calculations for EU 10 are presented in Attachment C12 to Appendix C.

EU 10 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	5E-07	0.1	(0.09)	--
	Recreational Fisherman	24	4E-07	0.008	(0.004)	--
	Recreational Rock Hound	24	2E-06	0.07	(0.03)	--
	Recreational Hunter	16	3E-07	0.006	(0.002)	--
	Industrial Worker	165	4E-06	0.09	(0.04)	--
	Construction Worker	124	4E-07	0.2	(0.09)	--
	Resident	230	**2E-05**	1	(0.6)	Arsenic

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

Cancer risks for exposure to surface soil range from 3E-07 to 2E-05 and exceed the DEQ allowable cumulative risk level of 1E-05 for the resident. All of the cancer risk for the resident is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.006 to 1; HIs segregated by target organ did not exceed the threshold HI of 1 for any receptors.

Exposure to lead at EU 10 was not evaluated using blood lead modeling because the lead EPC was below the BTV for soil.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.11 EXPOSURE UNIT 11

This section summarizes the HHRA results for EU 11, Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles. Health risks from exposure to COPCs in surface soil at EU 11 were evaluated for all receptors for this EU; exposure to subsurface soil was evaluated only for the construction worker. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from soil to outdoor air. Cancer risks and noncancer hazards for EU 11 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified in surface and subsurface soil for EU 11 are provided in Tables 9-13 and 9-14. Detailed risk calculations for EU 11 are presented in Attachment C13 and C14 to Appendix C.

EU 11 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Soil (0 to 2 feet bgs)	Recreational ATV/ Motorcycle Rider	12	4E-06	0.3	(0.2)	Lead*
	Recreational Fisherman	24	3E-06	0.04	(0.02)	--
	Recreational Rock Hound	24	1E-05	0.3	(0.2)	Lead*
	Recreational Hunter	16	2E-06	0.02	(0.02)	--
	Industrial Worker	165	**3E-05**	0.3	(0.2)	Arsenic, Lead**
	Construction Worker	124	2E-06	0.8	(0.4)	Lead**
	Resident	230	**1E-04**	**5**	**(3)**	Arsenic, Lead**
Subsurface Soil (2 to 10 feet bgs)	Construction Worker	124	2E-06	0.8	(0.3)	Lead**

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface soil range from 2E-06 to 1E-04 and exceed the DEQ allowable cumulative risk level of 1E-05 for the industrial worker and resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface soil range from 0.02 to 5; HIs segregated by target organ exceed the threshold HI of 1 for the resident. The HI is attributable to arsenic for the resident.

The cancer risk for construction worker exposure to subsurface soil is 2E-06 and is less than the DEQ allowable cumulative risk level of 1E-05. The noncancer HI for exposure to subsurface soil is 0.8 and is less than the threshold HI of 1 for the construction worker.Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface soil exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for the industrial worker, construction worker, and the resident. Predicted blood lead levels from exposure to lead in surface soil exceed the CDC blood level of concern of 5 µg/dL for the ATV/motorcycle rider and rock hound recreational receptors. The predicted blood lead level of concern exceeded 10 µg/dLfor the construction worker for exposure to lead in subsurface soil.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.12 EXPOSURE UNIT 12

This section summarizes the HHRA results for EU 12, Marsh. Health risks from exposure to COPCs in surface sediment at EU 12 were evaluated for the fisherman, rock hound, industrial worker, construction worker, and modified (50 days per year exposure) resident for this EU; exposure to subsurface sediment was evaluated only for the construction worker. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from sediment to outdoor air. Since the inhalation pathway is likely to be incomplete, the inclusion of this exposure pathway adds an extra level of conservatism to the risks calculated for sediments. Cancer risks and noncancer hazards for EU 12 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for surface and subsurface sediment for EU 12 are provided in Tables 9-15 and 9-16. Detailed risk calculations for EU 12 are presented in Attachments C15 and C16 to Appendix C.

EU 12 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Sediment	Recreational Fisherman	24	2E-06	0.03	(0.01)	--
	Recreational Rock Hound	24	**2E-05**	0.6	(0.4)	Lead*
	Industrial Worker	165	1E-05	0.3	(0.2)	Lead**
	Construction Worker	124	1E-06	0.8	(0.4)	Lead**
	Modified Resident	230	**4E-05**	**2**	(0.5)	Arsenic, Lead*
Subsurface Sediment	Construction Worker	124	6E-07	0.3	(0.1)	Lead*

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).

-- Not applicable

* Lead is a COC for the 5 µg/dL blood lead level of concern, but not the 10 µg/dL blood lead level of concern.

** Lead is a COC for both the 5 µg/dL and 10 µg/dL blood lead levels of concern.

Cancer risks for exposure to surface sediment range from 1E-06 to 4E-05 and exceed the DEQ allowable cumulative risk level of 1E-05 for the rock hound and the resident. All of the cancer risk for these receptors is attributable to arsenic. Noncancer HIs for exposure to surface sediment range from 0.03 to 2; HIs segregated by target organ did not exceed the threshold HI of 1.

Cancer risks for exposure to subsurface sediment range were 6E-07 for the construction worker and did not exceed the DEQ allowable cumulative risk level of 1E-05. Noncancer HIs for exposure to subsurface sediment were 0.3 for the construction worker.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in surface sediment exceed EPA's blood level of concern of 10 µg/dL (EPA 1994) for the industrial worker and construction worker. Predicted blood lead levels from exposure to lead in surface sediment exceed the CDC blood level of concern of 5 µg/dL for the recreational rock hound and the modified resident. Predicted blood levels from exposure to lead in subsurface sediment did not exceed 10 µg/dL for the construction worker but did exceed the 5 µg/dL blood lead level.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.13 EXPOSURE UNIT 13

This section summarizes the HHRA results for EU 13, Stream Sediments. Health risks from exposure to COPCs in sediment at EU 13 were evaluated for the fisherman, rock hound, industrial worker, construction worker, and modified (50 days per year exposure) resident for this EU. Potentially complete exposure pathways for these exposure media include incidental ingestion, dermal contact, and inhalation of particulate chemicals released from sediment to outdoor air. Since the inhalation pathway is likely to be incomplete, the inclusion of this exposure pathway adds an extra level of conservatism to the risks calculated for sediments. Cancer risks and noncancer hazards for EU 13 are summarized in the table below. Exposure pathway-specific risk results and analytical data summaries for the COCs identified for EU 13 are provided in Table 9-17. Detailed risk calculations for EU 13 are presented in Attachment C17 to Appendix C. Surface water at EU 13 is addressed in Section 10.0.

EU 13 HUMAN HEALTH RISK SUMMARY

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Sediment	Recreational Fisherman	24	6E-07	0.01	(0.005)	--
	Recreational Rock Hound	24	5E-06	0.2	(0.1)	--
	Industrial Worker	165	4E-06	0.1	(0.07)	--
	Construction Worker	124	4E-07	0.3	(0.2)	--
	Resident	230	1E-05	0.6	(0.3)	

Notes: **Boldface** indicates cancer risk greater than 1E-05 or noncancer HI greater than 1. The value shown in parenthesis is the highest segregated HI. Lead was identified as a COC based on blood lead modeling (see Appendix E).
-- Not applicable

Cancer risks for exposure to sediment range from 4E-07 to 1E-05 and did not exceed the DEQ allowable cumulative risk level of 1E-05. Noncancer HIs for exposure to sediment ranged from 0.01 to .6 and were all below the threshold HI of 1 t.

Exposure to lead was evaluated using blood lead modeling (see Appendix E). Predicted blood lead levels from exposure to lead in sediment did not exceed EPA's blood lead level of concern of 10 µg/dL (EPA 1994) or the CDC blood lead level of concern of 5 µg/dL for any receptor.

Health risks for the fisherman may also result from fish consumption; risks and hazards for the fish ingestion exposure pathway are discussed in Section 9.14.

9.14 FISH INGESTION

This section summarizes the HHRA results for fish ingestion. This exposure pathway was evaluated for the fisherman. As discussed in Section 6.1.2, EPCs of COPCs in fish tissue were estimated using surface water concentrations and bioconcentration factors for fish. EPCs for fish tissue were estimated on an UBMC-wide basis rather than on an EU-specific basis. Cancer risks and noncancer hazards for fish ingestion are summarized in the table below. Exposure pathway-specific risk results are provided in Table 9-18. Detailed risk calculations for surface water are presented in Attachment C18 to Appendix C.

Fish Ingestion Human Health Risk Summary

Matrix	Receptor	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard		COCs
Surface Water (Fish Ingestion)	Adult Recreational Fisherman	24	--	0.7	(0.5)	--
	Child Recreational Fisherman	24	--	0.1	(0.1)	--

Notes: The value shown in parenthesis is the highest segregated HI.

-- Not applicable

COC Chemicals of Concern

HI Hazard Index

There was no cancer risk for exposure to fish because arsenic was not detected in any surface water samples. Noncancer HIs for fish ingestion range from 0.1 to 0.7 and no HIs exceeded the threshold HI of 1.

Health risks from exposure to lead from fish ingestion were not evaluated because the site-specific pathway that can be assessed using the ALM model is limited to the soil ingestion pathway.

Health risks for the fisherman are also associated with exposure to COPCs from ingestion of, dermal contact with, and inhalation of particulate matter released from soil and sediment; risks and hazards for these exposure pathways are discussed in Sections 9.1 through 9.13.

10.0 COMPARISON OF GROUNDWATER, SURFACE WATER, SOIL AND SEDIMENT RESULTS TO MEDIUM-SPECIFIC STANDARDS AND SCREENING LEVELS

In accordance with the RI (Tetra Tech 2013a), groundwater and surface water results were compared with Montana water quality standards. These comparisons were made on a point-by-point basis instead of calculating EPCs for surface water and groundwater. Each sample result was compared with numeric water quality standards for Montana's surface and ground waters from Montana Numeric Water Quality Standards, Circular DEQ-7 (DEQ 2012). DEQ-7 does not have human health standards for aluminum, iron, and manganese. Therefore, the values presented in the table represent the greater of the SSCL (calculated using EPA 2014) and site-specific background concentrations.

Evaluation of the UBMC water treatment plant (WTP) area is also included in this section. The WTP sits adjacent to the Blackfoot River at the location of the former Anaconda Mine site, just downstream from the confluence of Anaconda Creek and Beartrap Creek. ASARCO initially removed mine waste in this area in 1995 to make room for a wetlands-based water treatment system. ASARCO abandoned that system in 2008 for the current WTP and performed additional mine waste removals in the area where the current WTP building was constructed. ASARCO took confirmation samples for both of these removals. In 2011, an upgrade to one of the existing storage cells required some additional soil assessment as well. Due to its adjacent location to the Blackfoot River, these WTP confirmation samples were compared to the screening levels established for EU2 – the Blackfoot River Dispersed Tailings Associated with EE/CA Removal Action Area and Overbank Deposits. The results of these three sampling events (see Appendix F) are discussed in Section 10.5.

The table below summarizes the numeric water quality standards or screening levels for human health used for the comparisons.

Chemical	DEQ-7 Numeric Groundwater Quality Standard or Screening Level (milligrams per liter)	DEQ-7 Numeric Surface Water Quality Standard or Screening Level (milligrams per liter)
Aluminum*	20	20
Arsenic	0.01	0.01
Cadmium	0.005	0.005
Copper	1.3	1.3
Iron*	14	14
Lead	0.015	0.015
Manganese**	0.94	0.43
Zinc	2	2

Note:

* The cleanup levels are site-specific (EPA 2014) calculations.

** The groundwater cleanup level is derived from the background manganese concentrations, while the surface water cleanup level is a site-specific (EPA 2014) calculation.

Sections 10.1 and 10.2 discuss the comparisons for groundwater and surface water.

Section 10.3 discusses the comparisons for soil and sediment to generic risk-based soil screening levels (SSL) (EPA 2013b) and to site-specific SSLs developed per DEQ guidance.

10.1 GROUNDWATER

This section summarizes the comparison of groundwater results to DEQ-7 (DEQ 2012) numeric water quality standards (see discussion above for aluminum, iron, and manganese) for groundwater. As discussed in Section 4.4, the HHRA evaluates the potential for health effects from exposure to groundwater by comparing COPC concentrations measured at the UBMC with Montana water quality standards, rather than by quantitative risk evaluation.

This comparison was done on a sample-result-by-sample-result basis for all groundwater samples collected during the 2007 and 2008 RI. Table 10-1 shows the results of the comparison. The groundwater data in Table 10-1 are grouped first by site or reference well locations, with site locations presented at the start of the table, and background at the end of the table. Within the site and reference groupings, the wells are grouped by water-bearing zone (WBZ), with the alluvial WBZ presented first and the bedrock WBZ second. Sample results for the alluvial and bedrock WBZs are arranged by drainage area, with locations upstream of the Blackfoot River presented at the start of the table and downstream locations presented at the end of the table. In most cases, drainage areas are generally collocated with the EUs evaluated in the HHRA. One drainage area, Pass Creek, is a tributary stream in the UBMC that drains to the Blackfoot River. This stream was identified as a reference/background reach in the RI for surface water and groundwater (Tetra Tech 2013a).

Nine groundwater samples collected from seven monitoring wells have been identified as reference/background samples. The six alluvial reference/background wells are ANMW-9, PDGW101, PMGW116, PMGW117, PMPZ-4, and SWGW-103. The two bedrock reference/background wells are PDGW102 and MW1. Samples were collected from wells PMGW116, PMGW117, PMPZ-4, SWGW-103 and MW1in both 2007 and 2008, while the other three wells were sampled only in 2008. Because of the relatively small number of samples, statistical background comparisons were not made for groundwater. The background groundwater results are presented in Table F-8 of Appendix F.

As shown in Table 10-1, each of the HHRA COPCs exceeded the standards for at least one sample, and most samples exceeded the standards for at least one analyte. Numeric water quality standards are not available from DEQ for aluminum, iron, and manganese; instead, the criterion used for comparison was the greater of the SSCL (calculated using EPA 2014) and site-specific background concentrations.. COPC-specific results of the comparison for groundwater in the alluvial WBZ are summarized below.

- Aluminum exceeded the SSCL of 20 milligrams per liter (mg/L) for three samples, with results as high as 58.52 mg/L. The wells with samples exceeding the SSCL are in the area of EU 8.
- Arsenic exceeded the DEQ-7 standard of 0.01 mg/L for two samples, with results as high as 0.04 mg/L. The wells with samples exceeding the standard are in the areas of EU 12 and the Pass Creek drainage area.
- Cadmium exceeded the DEQ-7 standard of 0.005 mg/L for 16 samples, with results as high as 1.209 mg/L. The wells with samples exceeding the standard are in the areas of EUs 4, 8, 9, 11 and 12.
- Copper exceeded the DEQ-7 standard of 1.3 mg/L for four samples, with results as high as 50.4 mg/L. The wells with samples exceeding the standard are in the areas of EUs 4 and 8.
- Iron exceeded the SSCL of 14 mg/L for 15 samples, with results as high as 46.99 mg/L. The wells with samples exceeding the SSCL are in the areas of EUs 4, 5, 9, and 12.
- Lead exceeded the DEQ-7 standard of 0.015 mg/L for eight samples, with results as high as 1.191 mg/L. These wells with samples exceeding the standard are in the areas of EUs 4, 7, 8, and 11.
- Manganese exceeded the SSCL of 0.94 mg/L for 24 samples, with results as high as 148.8 mg/L. These wells with samples exceeding the SSCL are in the areas of EUs 4, 5, 8, 9, 11, and 12.
- Zinc exceeded the DEQ-7 standard of 2 mg/L for 10 samples, with results as high as 194.8 mg/L. These wells with samples exceeding the standard are in the areas of EUs 4, 8, 11, and 12.

COPC-specific results of the comparison for groundwater in the bedrock WBZ are summarized below.

- Aluminum exceeded the SSCL of 20 mg/L for 1 sample, with a result of 21.06 mg/L. The well with the sample exceeding the SSCL is in the area of EU 4.
- Arsenic did not exceed the DEQ-7 standard of 0.01 mg/L for any samples.
- Cadmium exceeded the DEQ-7 standard of 0.005 mg/L for seven samples, with results as high as 0.2491 mg/L. The wells with samples exceeding the standard are in the areas of EUs 4 and 8.
- Copper exceeded the DEQ-7 standard of 1.3 mg/L for two samples, with results as high as 2.866 mg/L. The wells with samples exceeding the standard are in the areas of EU 9.
- Iron exceeded the SSCL of 14 mg/L for 3 samples, with results as high as 21.25 mg/L. The wells with samples exceeding the SSCL are in the areas of EUs 4 and 9.

- Lead exceeded the DEQ-7 standard of 0.015 mg/L for two samples, with results as high as 0.0296 mg/L. These wells with samples exceeding the standard are in the area of EU 8.
- Manganese exceeded the SSCL of 0.94 mg/L for 10 samples, with results as high as 62.9 mg/L. These wells with samples exceeding the SSCL are in the areas of EUs 4, 6, 8, and 9.
- Zinc exceeded the DEQ-7 standard of 2 mg/L for seven samples, with results as high as 62.14 mg/L. These wells with samples exceeding the standard are in the areas of EUs 4 and 8.

10.2 SURFACE WATER

This section summarizes the comparison of surface water results to DEQ-7 (DEQ 2012) numeric water quality standards for surface water. As discussed in Section 4.4, the HHRA evaluates the potential for health effects from exposure to surface water by comparing COPC concentrations measured at the UBMC with Montana water quality standards, rather than by quantitative risk evaluation. Numeric water quality standards are not available from DEQ for aluminum, iron, and manganese; instead, DEQ calculated SSCLs using EPA 2014.

This comparison was done on a sample result-by-sample result basis for all surface water samples collected during the 2007 and 2008 RI and in 2011. Table 10-2 shows the results of the comparison. The surface water data in Table 10-2 are organized from upstream locations (listed at the beginning of the table) to downstream locations (listed at the end of the table).

Three surface water samples from two different sampling locations have been identified as reference/background locations. The two locations were BRSW-6 and BRSW-11. Samples were collected from BRSW-6 in both 2007 and 2008, while BRSW-11 was sampled only in 2007. Because of the relatively small number of samples, statistical background comparisons were not made for surface water. The background surface water results are presented in Table F-9 of Appendix F.

As shown in Table 10-2, cadmium, lead, and zinc exceeded the DEQ-7 standards, while manganese exceeded its SSCL.. No elevated results downstream of the Upper Marsh (EU 12) were observed.

- Cadmium exceeded the DEQ-7 standard of 0.005 mg/L for 10 samples, with results as high as 0.0872 mg/L.
- Lead exceeded the DEQ-7 standard of 0.015 mg/L for six samples, with results as high as 0.0798 mg/L.
- Manganese exceeded the SSCL of 0.43 micrograms per liter for 10 samples, with results as high as2.12 mg/L.
- Zinc exceeded the DEQ-7 standard of 2 mg/L for six samples, with results as high as 4.01 mg/L.

Aluminum, arsenic, copper, and iron were either not detected or did not exceed cleanup levels (DEQ-7 standards or SSCLs) for any surface water sample.

10.3 Soil and Sediment

The maximum soil or sediment sample results for the COPC metals for EUs 1-12 were screened against the default risk-based SSL for protection of groundwater from the 2013 RSL table (EPA 2013b). Because lead does not have a risk-based SSL, the MCL-based SSL was used. The dilution-attenuation factor (DAF) used in the default SSL calculation is 1. However, DEQ specifies that a Montana-specific DAF of 10 be applied to the default risk-based SSLs from the 2013 RSL table. A DAF of 10 was applied to the default risk-based SSLs to obtain the SSLs used in the screening analysis for all EUs except 2, 11, and 12. A site-specific DAF of 8 was applied to EUs 2 and 11 because they are located in the flood plain and are closer to the groundwater table. A DAF of 1 was applied to EU 12 because it contains wetlands sediments, beneath the root bearing zone, which are saturated most of the time. Most metals exceeded the SSL at EUs 1-12 (see Table 10-3). Based on this result, site-specific SSLs for leaching to groundwater (groundwater SSCLs) were calculated for each EU.

The streambed sediments that comprise EU 13 were not screened for protection to groundwater for the following reasons:

- Generally speaking, screening levels for protection to groundwater are not applied to surface water sediments. DEQ is not aware of guidance describing methods and assumptions that could be employed for modeling in-stream sediment leaching to groundwater, or in-stream sediment leaching to surface water. The chemical partitioning equations employed in soil leaching to groundwater modeling assume equilibrium partitioning. This assumption is most likely inappropriate for the streambed environment, given the potential for significantly high rates of water movement compared to groundwater systems. Furthermore, the DAF calculated for the soil leaching to groundwater assumes steady-state water movement, and estimates a mixing zone thickness (as defined by EPA Guidance; EPA 1996a) assuming laminar (non-turbulent) flow – assumptions that are not appropriate in a streambed environment.

- The overall shallow depth of the streambed sediments creates a limited sediment horizon for potential leaching to groundwater. The sediments in the entire reach of EU 13 are characterized by shallow depths. Sediment samples were mostly collected from the 0- to 2-inch depth interval. Where possible, samples were also collected from deeper depth intervals (2- to 6-inches and 6- to 12-inches) per the RI sampling and analysis plan (SAP; Tetra Tech 2013a). A review of the sediment sampling field notes revealed that the sediment sampling deviated from the SAP because bedrock or large cobbles were encountered that prevented the deeper sampling (Tetra Tech 2013a).

- The entire upper reach – above the Upper Marsh – of EU 13 will be removed during remediation and restoration efforts covered by the USFS EE/CA (Hydrometrics 2007). Therefore, even if it were appropriate to screen sediments for potential leaching to groundwater, these sediments are already earmarked for removal.

10.4 EU-Site Specific Cleanup Levels for Leaching to Groundwater

Leaching-to-groundwater SSCLs for each EU were derived using site-specific DAFs or the DEQ default DAF of 10 and Synthetic Precipitation Leaching Procedure (SPLP) results from each EU. The DAFs for each EU were obtained from the RI report (Tetra Tech 2013a) and are as follows: 1 (EU 12), 8 (EUs 2 and 11), and 10 for all other EUs.

As a result of the complexity of the behavior of metals, leaching tests are used to quantify the partitioning and mobility of metals in site soils. The EPA SPLP (EPA SW-846 Method 1312) was developed to model an acid rain leaching environment and is generally appropriate for a contaminated soil scenario (EPA 1996). The SPLP results were used to develop groundwater SSCLs.

The DAFs were used with the SPLP results from each EU to formulate the leaching-to-groundwater SSCLs. However, after reviewing the leaching-to-groundwater SSCLs, EU soil metals concentrations, and EU groundwater data, it was noted that while the metals concentrations in the groundwater were often below DEQ-7 groundwater standards, the soil metals concentrations often exceeded the leaching-to-groundwater SSCLs. This review suggested that some of the leaching-to-groundwater SSCLs may be too conservative. Therefore, DEQ developed site-specific DAFs for EUs 1, 3, 4, 5, 6, 7, 8, 9, and 10.

The site-specific DAF can be applied to several potential methods, based on guidance provided by DEQ, for developing a groundwater SSCL (DEQ 2013d). A decision key was developed to select the appropriate approach to identify the leaching-to-groundwater SSCL based on the availability and characteristics of the SPLP results for each EU. The key uses a four-step progression that moves from the simplest to the most complex process for identifying a leaching-to-groundwater SSCL. The primary objective for this progression is to establish a simple way to navigate the decision process for selecting a leaching-to-groundwater SSCL.

The decision key process is:

Step 1: Compare EU soil metals concentrations to background.

> *Step 1.1: If all EU soil metal concentrations are less than background, then no further evaluation is needed – Background is the groundwater SSCL (see table 10.3).*
>
> *Step 1.2: If one or more soil metal concentrations exceed background, then go to Step 2.*

Step 2: For each EU, determine if SPLP results are available for each metal to develop leaching-to-groundwater SSCLs.

Step 2.1: If there are no SPLP results, then use Step 1.1 – Background is the groundwater SSCL.

Step 2.2: If at least one SPLP result exists, then go to Step 3.

Step 3: Determine a groundwater SSCL from SPLP data arranged in tabular format (NJDEP 2008).

Step 3.1: If all EU soil metal concentrations are less than or equal to the highest qualifying soil concentration (QSC), then the QSC becomes the groundwater SSCL.

Step 3.2: If one or more soil metal concentrations exceed the QSC, then go to Step 4.

Step 4: Determine a groundwater SSCL using a site-specific K_d value (NJDEP 2008).

Step 4.1: If this groundwater SSCL is greater than background and greater than the QSC, then it becomes the groundwater SSCL.

Step 4.2: If this groundwater SSCL is less than background, then use the greater of the two previous groundwater SSCLs (Step 1 or Step 3) as the groundwater SSCL.

Documentation of the development of leaching-togroundwater SSCLs is provided in Appendix G. Table 10-3 provides the results of the leaching-to-groundwater SSCL process.

10.5 SOIL SCREENING RESULTS

The soil and sediment screening results for each metal at each EU are presented in Table 10-3. As shown in Table 10-3, each of the HHRA COPCs exceeded the standards for at least one EU. Results for the comparison of soil and sediment concentrations to leaching-to-groundwater SSCLs are summarized below.

- Aluminum exceeded the leaching-to-groundwater SSCL at EU 12.
- Arsenic exceeded the leaching-to-groundwater SSCL at EUs 2, 3, 4, 6, 9, 12 and the WTP area. Of these, the leaching-to-groundwater SSCL for arsenic was exceeded in more than one sample at EUs 2, 6, 9, and 12.. The one WTP area sample that exceeded the leaching-to-groundwater SSCL also had a collocated SPLP sample and the arsenic leachate concentration did not exceed the DEQ-7 standard (see Appendix F).
- Cadmium exceeded the leaching-to-groundwater SSCL at EUs 2, 11, and 12. Of these, the leaching-to-groundwater SSCL for cadmium were exceeded in more than one sample at EUs 2, 11, and 12.

- Copper exceeded the leaching-to-groundwater SSCL at EUs and 12. The leaching-to-groundwater SSCL for copper was exceeded in more than one sample at EU 12.
- Iron exceeded the leaching-to-groundwater SSCL at EUs 4, 8, 9, 10, and 12. Of these, the leaching-to-groundwater SSCL for iron were exceeded in more than one sample at EUs 4, 9, 10, and 12.
- Lead exceeded the leaching-to-groundwater SSCL at EUs 1, 2, 6, 7, 8, 11, and 12. Of these, the leaching-to-groundwater SSCL for lead were exceeded in more than one sample at EUs 1, 2, 6, 8, 11 and 12.
- Manganese exceeded the leaching-to-groundwater SSCL at EUs 2, 4, 10, 11, and 12. Of these, the leaching-to-groundwater SSCL for manganese were exceeded in more than one sample at EUs 2, 4, 10, 11, and 12.
- Zinc exceeded the leaching-to- groundwater SSCL at EUs 2, 11, and 12. Of these, the leaching-to-groundwater SSCL for zinc were exceeded in more than one sample at EUs 2, 8, 11, and 12.

EU-specific results of the comparisons of soil and sediment concentrations to leaching-to-groundwater SSCLs are summarized below. With the exception of single locations where the leaching-to-groundwater SSCLs were exceeded, no particular clustering was noted.

- EU 1 – Only four soil concentrations (4/46) of lead exceeded its leaching-to-groundwater SSCL.
- EU 2 – The soil concentrations of five COPCs (arsenic, cadmium, lead, manganese, and zinc) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for each of these COPCs is as follows: arsenic (62/593); cadmium (19/91); lead (225/593); manganese (43/593); and zinc (73/593).
- EU 3 – Only one soil concentration (1/17) of arsenic exceeded its g leaching-to-groundwater SSCL. EU 4 – The soil concentrations of three COPCs (arsenic, iron, and manganese exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for each of these COPCs is as follows: arsenic (1/29), iron (18/29); and manganese (2/29).
- EU 5 – There were no COPC soil concentrations that exceeded the leaching-to-groundwater SSCLs at EU5.
- EU 6 – The soil concentrations of two COPCs (arsenic and lead) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for these two COPCs is as follows: arsenic (3/36) and lead (5/36).
- EU 7 – Only one soil concentration (1/8) of lead exceeded its leaching-to-groundwater SSCL.
- EU 8 – The lead soil concentrations (97/179) exceeded the leaching-to-groundwater SSCL.

- EU 9 – The soil concentrations of two COPCs (arsenic and iron) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for these two COPCs is as follows: arsenic (12/27) and iron (13/27).

- EU 10 – The concentrations of two COPCs (iron and manganese) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for these two COPCs is as follows: iron (2/30) and manganese (1/30).

- EU 11 – The concentrations of five COPCs (cadmium, copper, lead, manganese, and zinc) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedances for each of these COPCs is as follows: cadmium (8/31); copper (1/310); lead (9/310); manganese (34/310); and zinc (2/310).

- EU 12 – The concentrations of eight COPCs (aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc) exceeded their leaching-to-groundwater SSCLs. The frequency of exceedance for each of these COPCs is as follows: aluminum (41/63); arsenic (149/354); cadmium (76/136); copper (33/354); iron (268/281); lead (239/354); manganese (160/354); and zinc (258/354).

- WTP Area – One arsenic concentration exceeded its leaching-to-groundwater SSCL. The frequency of exceedance was 1/26 samples. The one WTP area sample that exceeded the leaching-to-groundwater SSCL also had a collocated SPLP sample and the arsenic leachate concentration did not exceed the DEQ-7 standard (see Appendix F).

11.0 UNCERTAINTY EVALUATION

Varying degrees of uncertainty at each stage of the HHRA arise from assumptions made in the risk assessment and the limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the exposure assessment, toxicity values, and risk characterization (EPA 1989).

EPA defines uncertainty as a "lack of knowledge about specific factors, parameters or models," including "parameter uncertainty (measurement errors, sampling errors, and systematic errors), model uncertainty (uncertainty that results from necessary simplification of real-world processes, mis-specification of the model structure, model misuse, or use of inappropriate surrogate variables), and scenario uncertainty (descriptive errors, aggregation errors, errors in professional judgment, or incomplete analysis)." Variability is defined as "observed differences attributable to true heterogeneity or diversity in a population or exposure parameter." Variability is the result of natural random processes, such as variations in body weight, breathing rate, or drinking water consumption. Variability cannot be reduced by further study, but may be better characterized through further measurements.

The sections below describe the key sources of uncertainty in the HHRA process. The effect of these uncertainties is to overestimate or underestimate the actual cancer risk or HI, depending on the specific factor. In general, the risk assessment process is based on use of conservative (health-protective) assumptions that, when combined, may overestimate the actual risk. However, a small possibility exists that risks were underestimated.

11.1 SAMPLING DATA AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Key uncertainties regarding identification of COPCs are associated with the sampling data. These uncertainties involve possible errors in chemical analysis, sample size sufficiency, and sufficiency of background data. Systematic or random errors in the chemical analysis may yield erroneous data. These errors can result in an underestimate of risk because data may be viewed as nondetected or estimated as a result of laboratory errors or assumptions in the chemical analysis. This error could also result in fewer detected results or estimated results for specific samples or analyses.

Lack of sufficient samples to characterize soil or groundwater can result in an under- or overestimate of risk because calculated risks for an exposure area may be based on very few samples, which may or may not be representative of the area at large. As discussed in Section 5.1.1, XRF 10 data were used to estimate health risks for all COPCs except aluminum and cadmium. Laboratory data were used for aluminum and cadmium because these chemicals could not be analyzed reliably using XRF 10. The amount of samples analyzed by the laboratory was limited to 10 percent of the number of samples analyzed by XRF 10; hence, the sample sizes for aluminum and cadmium are significantly smaller than the samples sizes for the remaining COPCs. It is therefore possible that data for aluminum and cadmium may not adequately characterize site concentrations of these chemicals because of the limited number of samples analyzed by the laboratory.

11.2 EXPOSURE ASSESSMENT

Uncertainties were identified in association with three areas of the exposure assessment process: (1) the selection of exposure scenarios and pathways, (2) the estimation of EPCs, and (3) the selection of exposure assumptions used to estimate chemical intake. Uncertainties in each of these areas are discussed in the following sections.

11.2.1 Exposure Scenarios and Pathways

Exposure scenarios were identified based on observed and assumed land use and activity that may occur. Uncertainties are introduced to the degree that actual land use and activity patterns are not represented by those assumed. Exposure estimates developed under the future land use scenarios (for example, industrial) may overestimate risks if the areas are not used for the scenarios evaluated. Likewise, exposure estimates developed for current land use scenarios may underestimate risks if the areas are used for other purposes than the scenarios evaluated. For example, four recreational scenarios were evaluated in the HHRA: ATV/motorcycle rider, fisherman, rock hound, and hunter. Current recreational land use at the UMBC also includes hiking and camping, and it is likely these activities will also occur at the UBMC in the future. Hiking and camping scenarios were not evaluated in the HHRA because the anticipated complete exposure pathways associated with these activities (that is, incidental ingestion of, dermal contact with, and inhalation of particulates released from mine waste and soil and sediment) are the same as the exposure pathways assessed for the recreational receptors evaluated in the HHRA. In addition, the exposure assumptions used to estimate chemical intake for the recreational uses evaluated in the HHRA are likely to be similar to those for a hiking or camping scenario. For example, the recreational rock hound was evaluated for combined child and adult exposure, using assumptions of 8 hours per day, 50 days per year, for 30 years. These exposure assumptions are likely to be protective of recreational users who are hiking and camping. Therefore, health risks associated with hiking and camping are likely to be similar to, or potentially less than, health risks estimated for the rock hound.

11.2.2 Estimating Exposure Point Concentrations

The sample collection strategy was designed as a biased investigation, so that samples were collected in areas of suspected or known contamination. The primary objective of this sampling effort was to define the nature and extent of contamination. The EPCs based on the data for these nonrandom samples may overestimate the concentrations at the exposure point, as well as the actual dose to the receptor. In addition, the area of many of the EUs is relatively small compared with the actual likely area that will be contacted by a receptor for the entire exposure time, frequency, and duration evaluated in the HHRA.

Recommendations in EPA (2010) were followed for calculating 95 UCLs for all chemicals with one or more censored results for each EU. Although these recommendations include stochastic methods with some associated uncertainty, the use of these methods is a standard, widely recognized practice in HHRAs and is not expected to have a significant effect on the HHRA results.

11.2.3 Selecting Exposure Assumptions

The exposure assumptions used to estimate chemical intake are standard upper-bound estimates. In reality, however, there may be considerable variation in the activity patterns and physiological response of individuals. It is possible that the exposure assumptions used in this evaluation do not represent actual current or future exposure conditions.

The exposure assumptions used in the HHRA were standard default assumptions for workers and residents. This HHRA is expected to be comparable with other risk assessments conducted following EPA HHRA guidance because the default, non-site-specific assumptions were used to evaluate exposure. All defaults are intended to provide a conservative estimate of risks, rather than to underestimate risks.

Furthermore, it is possible that the assumptions for contact rate and exposure time, frequency, and duration used in the HHRA may result in an overestimate of risks for some EUs because physical characteristics of the UBMC (steep slopes and heavy vegetation) limit access at some of the EUs (for example, EU 1 - Upper Anaconda Mine Waste Removal Areas and Waste Piles, EU 3 – Capital Mine Waste Area, and EU 9 – Paymaster Mine Waste Areas).

11.3 TOXICITY ASSESSMENT

The primary uncertainties associated with the toxicity assessment are related to derivation of toxicity values for COPCs. Standard RfDs, RfCs, SFs, and IURs developed by EPA were used to estimate potential cancer and noncancer health effects from exposure to COPCs. These values are derived by applying conservative (health-protective) assumptions and are intended to protect the most sensitive potentially exposed individuals.

EPA makes several assumptions to derive the toxicity values that may overestimate the actual hazard or risk to human health. RfDs and RfCs are typically derived from animal studies adjusted with uncertainty factors and modifying factors to ensure adequate protection of human health because data from human studies are generally unavailable. This approach may result in an overestimated potential for noncancer adverse health effects for many compounds.

SFs and IURs used to estimate cancer risk are also typically derived based on data from animal studies. These data are taken from studies that administered high doses of a test chemical to laboratory animals; the reported response is extrapolated to the much lower doses that are likely for human exposure. Very little experimental data are available on the nature of the dose-response relationship at low doses. Because of this uncertainty, EPA has selected a conservative model to estimate the low-dose relationship, and EPA uses an upper-bound estimate (typically a 95UCL of the slope predicted by the extrapolation model) as the SF or IUR. Therefore, cancer risks calculated using SFs and IURs are upper-bound estimates.

A second uncertainty associated with toxicity values is the lack of RfDs, RfCs, SFs, and IURs for some COPCs. The cancer risks and noncancer health hazards can be assessed only where relevant toxicity values are available for those COPCs. The use of oral toxicity values to assess the dermal pathway introduces additional uncertainty into the results; risks may be overestimated or underestimated using this approach.

A third uncertainty is associated with the proposed change to acceptable blood lead levels from the IEUBK model. Both the current blood lead level of 10 ug/dL and the proposed new blood lead level of 5 ug/dL were modeled in the HHRA. DEQ will use evaluations for both blood lead levels to make risk management decisions in the proposed plan and Record of Decision.

11.4 RISK CHARACTERIZATION

DEQ requires cleanup to levels that do not result in a cumulative excess cancer risk greater than 1×10^{-5} or a cumulative hazard index greater than 1 for any critical effect or target organ. However, naturally occurring arsenic concentrations in Montana and at the Facility are greater than risk-based concentrations for residential or industrial exposure. Generally, cleanup levels are not set at concentrations below naturally occurring levels. Since the concentration of arsenic in native Montana soils exceeds risk-based concentrations for these exposures, DEQ applied the Facility-specific background concentration of 40.4 mg/kg as the cleanup level for these exposures. Shorter-term recreational exposures are evaluated in the HHRA to assess whether risks for certain EUs exceed DEQ thresholds. If the risks for any EU exceed cumulative excess cancer risk greater than 1×10^{-5} or a cumulative hazard index greater than 1 for any critical effect or target organ for recreational receptors, then risk-based cleanup levels are calculated and compared with the Facility-specific background concentration. The higher of the two concentrations will be the cleanup level for the EU.

For leaching to groundwater, both generic and EU-specific screening levels were used to assess the potential for risks at each EU. Although the EU-specific screening levels are expected to have lower uncertainty than the generic screening levels, there are still uncertainties associated with these screening levels. These include uncertainties associated with the measured soil concentrations, measured SPLP concentrations, the DAF used, and the estimated background levels.

12.0 SITE-SPECIFIC CLEANUP LEVELS

This section describes the process used to develop SSCLs for the UBMC. SSCLs are concentrations in environmental media that correspond to a specific, acceptable target risk or hazard level when a receptor contacts the contaminated medium according to a defined exposure scenario, and are protective of leaching to groundwater. SSCLs were developed for COCs in soil and sediment. The process used to develop the SSCLs for all COCs except lead consisted of the following four steps.

1. Calculation of risk-based concentrations (RBC).
2. Identification of applicable background concentrations.
3. Calculation of EU-specific soil screening levels for leaching to groundwater.
4. Comparison of the concentrations identified in the previous steps to determine the final numerical level.

The specific methods for these steps and the resulting soil and sediment SSCLs are described below. The method used to calculate SSCLs for lead is described in Section E4.0 of Appendix E.

12.1 CALCULATION OF RISK-BASED CONCENTRATIONS

The first step involved calculating exposure scenario- and exposure pathway-specific RBCs. The RBCs were calculated by adjusting the risk equations used in the HHRA. The risk equations used in the HHRA incorporated chemical-specific exposure point concentrations, exposure scenario- and pathway-specific assumptions, and chemical-specific toxicity criteria to calculate cancer risks and noncancer hazards.

The risk equations were adjusted for calculation of RBCs to solve for chemical concentrations that correspond to a cumulative target cancer risk of 1E-05 for carcinogenic COCs and a maximum target organ-adjusted noncancer HI of 1 for noncarcinogenic COCs. Arsenic and lead were the only human health COCs for the EUs. Tables C-5.1 through C-6.2 in Appendix C indicate the carcinogenicity of the COCs evaluated in the HHRA. Tables C-5.1 and C-5.2 also show the primary target organs associated with each noncarcinogenic COC. Using this approach, a target cancer risk of 1E-05 for oral, inhalation, and dermal exposures was used for arsenic for calculation of cancer-based RBCs A target HI of 1 for oral, inhalation, and dermal exposures was used for calculation of noncancer-based RBCs for arsenic. The exposure assumptions and toxicity criteria used in the HHRA to calculate risks were also used to calculate the RBCs; therefore, the resulting RBCs are concentrations that correspond to a cumulative cancer risk of 1E-5 and a total target-organ based cumulative noncancer HI of 1. RBCs were calculated for both cancer and noncancer endpoints for COCs with both carcinogenic and noncarcinogenic endpoints (that is, health effects).

Lead RBCs were calculated using the assumptions included in the HHRA and the IEUBK and Adult Lead Models with both 10 µg/dL and 5 µg/dL as the predicted blood lead levels.

12.2 IDENTIFICATION OF APPLICABLE BACKGROUND CONCENTRATIONS

The second step involved identifying applicable background concentrations for the COCs. As discussed in Section 5.3.1, the background data for the UBMC were used to develop BTVs for screening purposes. These data were also used for developing SSCLs (see Section 12.3).

12.3 CALCULATION OF SOIL LEACHING TO GROUNDWATER CONCENTRATIONS

The third step entailed the development of soil leaching to groundwater concentrations. The development of these EU-specific soil screening levels is discussed in detail in Section 10.3 and 10.4.

12.4 SSCLS

The final step in developing SSCLs involved comparing the RBCs developed in Section 12.1 to select a final, receptor-specific RBC. That is, RBCs were initially calculated for both cancer and noncancer endpoints for COCs with both carcinogenic and noncarcinogenic endpoints (health effects), and the lowest resulting RBC was selected as the SSCL. In addition, the EU-specific soil screening level for leaching to groundwater was compared to the lowest resulting RBC, and the lower of the two was selected as the SSCL.

The site-specific background screening concentrations for arsenic and lead were also compared with the receptor-specific RBCs. If the background screening concentrations exceeded the RBCs, then the background screening concentrations were selected as the SSCLs.

13.0 CONCLUSIONS OF THE HHRA

The HHRA evaluated health risks from recreational (ATV/motorcycle rider, fisherman, rock hound, and hunter), worker (industrial and construction), and residential exposure to eight COPCs in soil and sediment at 13 EUs at the UBMC: aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc. Before health risks were estimated, maximum concentrations of COPCs were compared with background and risk-based screening levels to refine the list of COPCs. Site concentrations of COPCs in soil and sediment were compared with the BTVs identified in Appendix B. Site concentrations for all EUs exceeded the screening level for arsenic. Comparison to risk-based screening levels indicated that all COPCs exceeded screening levels for one or more EUs; arsenic, copper, iron, and lead were the COPCs most frequently detected above risk-based screening levels.

Potentially complete exposure pathways for soil and sediment at the UBMC are incidental ingestion, dermal contact, and inhalation of COPCs released to outdoor air. The HHRA evaluated these pathways for all receptors. In addition, the HHRA evaluated exposure to COPCs from ingestion of fish for the recreational fisherman, using surface water data to estimate COPC concentrations in fish tissue.

Results of the HHRA are shown in Tables 13-1 through 13-5 and are briefly summarized below. The HHRA compared cancer risk results with the DEQ allowable cumulative risk level of 1E-05 and cumulative noncancer HI results with the threshold HI of 1 for each receptor and EU. If the total HI exceeded 1, the HHRA further evaluated potential synergistic effects by calculating HIs segregated by target organ. Risks and HIs that do not exceed these levels generally do not require further action. Risks and HIs that exceed these levels indicate that an unacceptable health risk is associated with exposure to COPCs at the EU, and that further action may be needed. The HHRA identified a COPC as a COC for all COPCs except lead if the COPC-specific risk exceeds 1E-05 or the COPC-specific HI exceeds 1. The HHRA used blood lead modeling to evaluate lead; lead is identified as a COC if the predicted 95th percentile blood lead level exceeds 10 µg/dL or 5 µg/dL. In addition, EU-specific soil screening levels for soil leaching to groundwater were calculated and compared to the concentrations measured at each EU.

The range of estimated cancer risks and noncancer HIs for each EU is provided in the summary below. Unless otherwise indicated, the lowest estimated cancer risk and noncancer HI are associated with the low frequency exposure scenario for the recreational hunter. The highest estimated risk and HI are associated with the residential receptor.

- **EU 1, Upper Anaconda Mine Waste Removal Areas and Waste Piles** – Health risks are based on exposure to surface soil. Cancer risks range from 1E-06 to 7E-05. Noncancer HIs range from 0.01 to 2; the highest segregated HI is 1. Predicted blood lead levels range from 11.7 to 93.2 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 2, Blackfoot River Dispersed Tailings Associated with EE/CA Removal Area and Overbank Deposits** – Health risks are based on exposure to surface and subsurface soil. Cancer risks for exposure to surface soil range from 1E-06 to 9E-05, and noncancer HIs range from 0.02 to 4; the highest segregated HI is 2. Predicted blood lead levels range from 5.3 to 47.7 µg/dL for the industrial worker, construction worker, and resident;. Arsenic and lead are COCs for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 7E-07 and the total HI is 0.4. The predicted blood lead level is 12.1 µg/dL. Lead is the only COC identified for subsurface soil.

  Arsenic, cadmium, lead, manganese, and zinc are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 3, Capital Mine Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 1E-05 to 6E-04. Noncancer HIs range from 0.09 to 15; the highest segregated HI is 13. The predicted blood lead level for the resident is 22 µg/dL; the predicted blood lead level for all other receptors is below 10 µg/dL with predicted blood lead levels of 7.2 and 9.6 µg/dL for the industrial and construction worker, respectively. Arsenic and lead are COCs.

  Arsenic is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 4, Carbonate Mine Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 2E-11 to 2E-08. Noncancer HIs range from 0.004 to 1. The predicted blood lead level for the resident is 10 µg/dL with 5.1 µ g/dL the predicted blood lead level for the construction worker. Lead is the only COC.

  Arsenic, iron, and manganese are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 5, Edith Mine Waste Areas** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-07 to 2E-05. Noncancer HIs range from 0.004 to 0.9. Predicted blood lead levels are all less than 5 µg/dL except for a predicted blood lead level for residents of 6.8 µg/dL. Arsenic and lead are the only COCs.

  No COC concentrations exceeded the leaching-to-groundwater SSCLs.

- **EU 6, Consolation Mine Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 4E-06 to 3E-04. Noncancer HIs range from 0.04 to 6; the highest segregated HI is 6. Predicted blood lead levels range from 10.3 to 31.3 µg/dL for the industrial worker, construction worker, and resident; predicted blood lead levels are 5.0 and 5.2 µg/dL for the ATV/motorcycle rider and child rock hound, respectively. Arsenic and lead are COCs.

  Arsenic and lead are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 7, Mary P. Mine Waste Pile** – Health risks are based on exposure to surface soil. Cancer risks range from 2E-06 to 1E-04. Noncancer HIs range from 0.02 to 3; the highest segregated HI is 2. Predicted blood lead levels range from 5.2 to 46.2 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on its leaching-to-groundwater SSCL.

- **EU 8, Mike Horse Mine Waste Piles** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-06 to 2E-04. Noncancer HIs range from 0.03 to 6; the highest segregated HI is 4. Predicted blood lead levels range from 6.6 to 58.9 µg/dL. Arsenic and lead are COCs.

  Lead is a COC for soil based on the leaching-to-groundwater SSCL.

- **EU 9, Paymaster Mine Waste Areas** – Health risks are based on exposure to surface and subsurface soil. Carcinogenic COCs were not identified for surface soil. Noncancer HIs range from 0.003 to 0.8. Lead was not evaluated for surface soil at EU 9 because the exposure point concentration was below the background threshold value. No COCs were identified for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 1E-05 and the total HI is 3. (The highest segregated HI is 2.) Lead was not evaluated for subsurface soil at EU 9 because the exposure point concentration was below the background threshold value. Arsenic is the only COC for subsurface soil.

  Arsenic and iron are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 10, Number 3 Tunnel Waste Area** – Health risks are based on exposure to surface soil. Cancer risks range from 3E-07 to 2E-05. Noncancer HIs range from 0.006 to 1. Lead was not evaluated for surface soil at EU 10 because the exposure point concentration was below the background threshold value. Arsenic is the only COC.

  Iron and manganese are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 11, Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area, Overbank Tailings Deposits, and Flossie Louise Mine Waste Piles –** Health risks are based on exposure to surface soil. Cancer risks range from 2E-06 to 1E-04. Noncancer HIs range from 0.02 to 5; the highest segregated HI is 3. Predicted blood lead levels range from 10.7 to 32.5 µg/dL for the industrial worker, construction worker, and resident; predicted blood lead levels are 5.1 and 5.3 µg/dL for the ATV/motorcycle rider and the child rock hound, respectively. Arsenic and lead are COCs for surface soil.

  Evaluation of exposure to subsurface soil was limited to the construction worker. The cancer risk is 2E-06 and the total HI is 0.8. The predicted blood lead level is 30.2 µg/dL. Lead is the only COC for subsurface soil.

  Cadmium, copper, lead, manganese, and zinc are COCs for soil based on leaching-to-groundwater SSCLs.

- **EU 12, Marsh** – Health risks are based on exposure to surface and subsurface sediment. Cancer risks range from 1E-06 to 4E-05. Noncancer HIs range from 0.03 to 2; the highest segregated HI is 0.5. Predicted blood lead levels range from 5.6 to 16 µg/dL. Leadis the only COC for surface sediment.

  Evaluation of exposure to subsurface sediment was limited to the construction worker. The cancer risk is 6E-07 and the total HI is 0.3. The predicted blood lead level is 6.4 µg/dL. Only lead was identified as a COC for subsurface sediment.

  Aluminum, arsenic, cadmium, copper, iron, lead, manganese, and zinc are COCs for sediment based on leaching-to-groundwater SSCLs.

- **EU 13, Stream Sediments** – Health risks are based on exposure to sediment. Cancer risks range from 4E-07 to 1E-05. Noncancer HIs range from 0.01 to 0.6. Predicted blood lead levels were below 5 µg/dL for all receptors. No COCs were identified for sediment.

- **WTP Area** – Health risks are based on the EU2 assessment (See EU2 above) of exposure to subsurface soil. Surface soils at the WTP are comprised of clean imported fill that overlay the area at depths of greater than two feet. Therefore, evaluation of exposure to subsurface soil was limited to the construction worker. One sample had an arsenic concentration that exceeded the leaching-to-groundwater SSCL, however, the arsenic leachate concentration from the collocated SPLP sample did not exceed the DEQ-7 standard (see Appendix F).

Health risks from exposure to COPCs from fish ingestion were also evaluated for the recreational fisherman. Risks were evaluated UBMC-wide rather than on an EU-specific, basis using surface water data to estimate COPC concentrations in fish tissue. There is no elevated cancer risk for fish ingestion range because no carcinogenic COPCs were detected in surface water. Noncancer HIs for fish ingestion range from 0.1 to 0.7. No COCs were identified for the fish ingestion exposure pathway.

Based on the HHRA results, arsenic and lead are COCs in soil or sediment for almost all EUs (arsenic is not a COC at EUs 4, 12, and 13 and lead is not a COC at EUs 9, 10, and 13).

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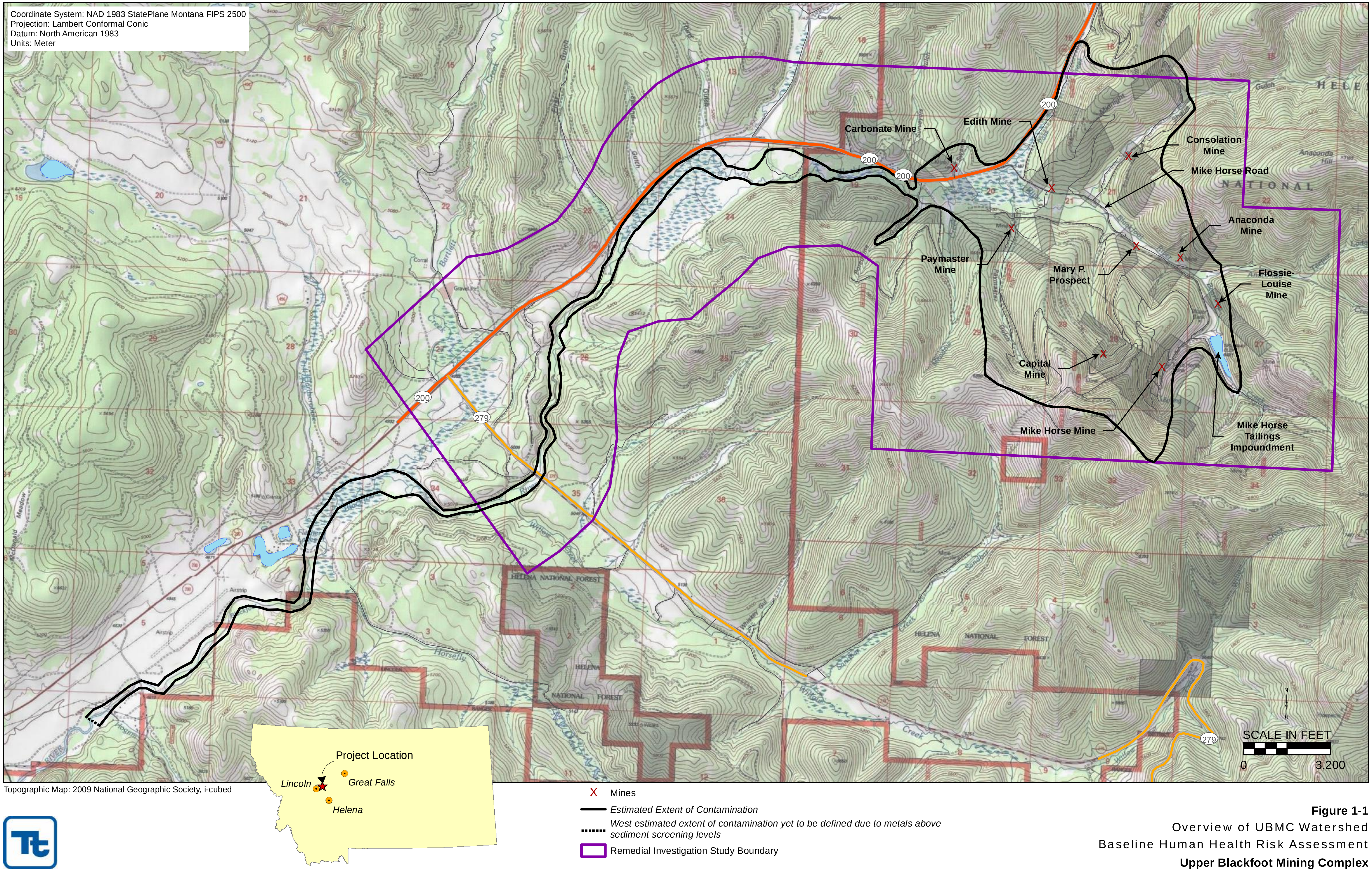


Topographic Map: 2009 National Geographic Society, i-cubed

X Mines

Estimated Extent of Contamination

West estimated extent of contamination yet to be defined due to metals above sediment screening levels

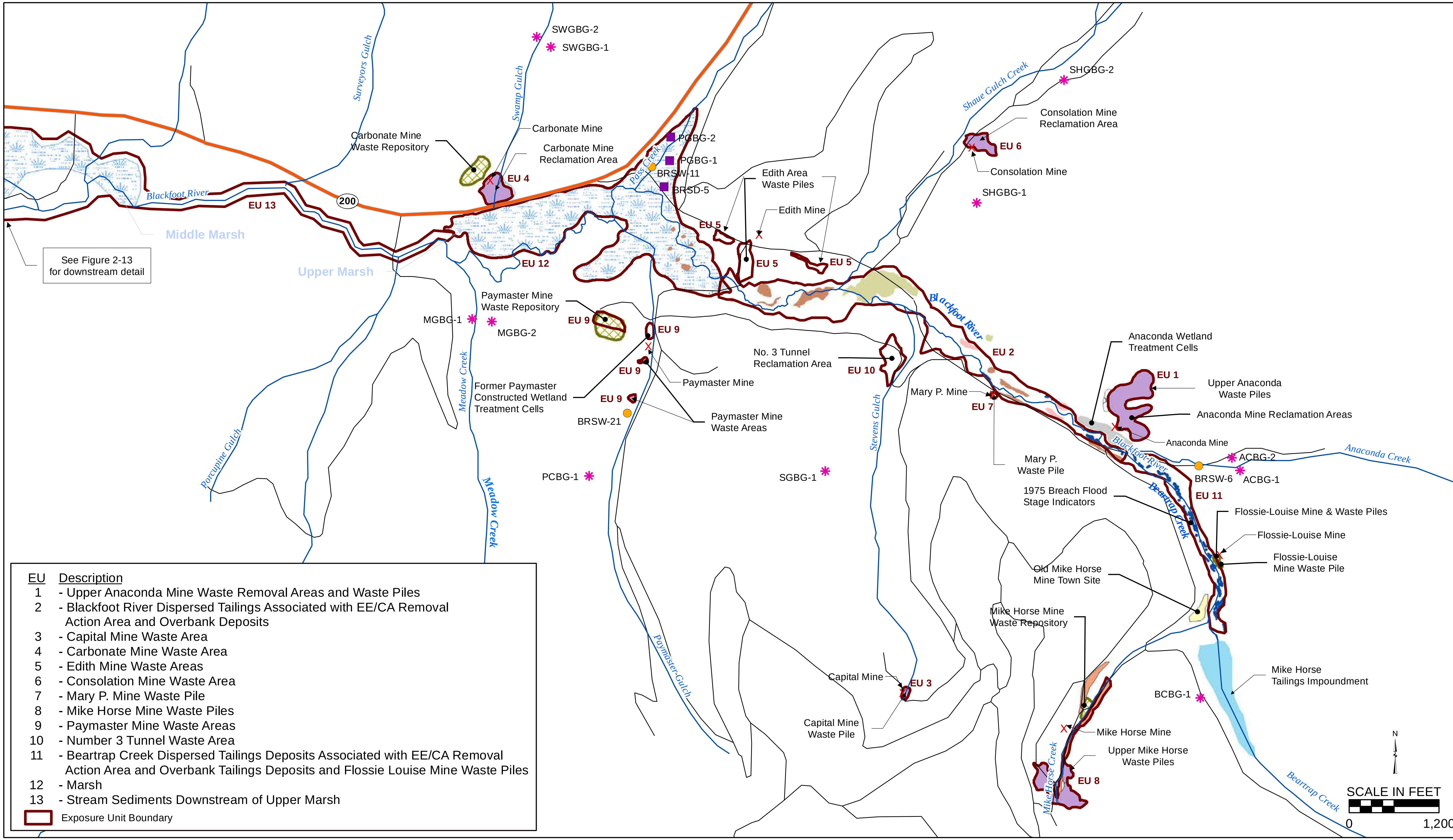
Remedial Investigation Study Boundary

Figure 1-1

Overview of UBMC Watershed

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex



Mines
Background Soil Samples
Stream Reference Surface Water and Sediment Samples
Marsh Reference Sediment Samples
Old Mike Horse Mine Town Site

Mine Waste Repository
Estimated Extent of Mine Waste Area (Sampled 2007)
Estimated Extent of Mine Waste Areas (Sampled 2008)
Mine Waste Removal/Reclaimed Areas (Not sampled)
1975 Breach Flood Stage Indicator

Estimated Edge of Streamside Impacts Soil Sampling
Mike Horse Creek and Repository Area Sampling
Marsh/Wetlands Area (Submerged)
Outcrop/Talus Slope
Mike Horse Tailings Impoundment
Streams

Area of Dispersed Sandy (Fine) Tailings
Area of Concentrated Tailings/Mine Waste
Area of Dispersed Coarse-Grained Tailings
Former Anaconda Wetland Treatment Cells
Local Roads
State Highway

Figure 1-2

Site Features Map and
Reference Sample Locations

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

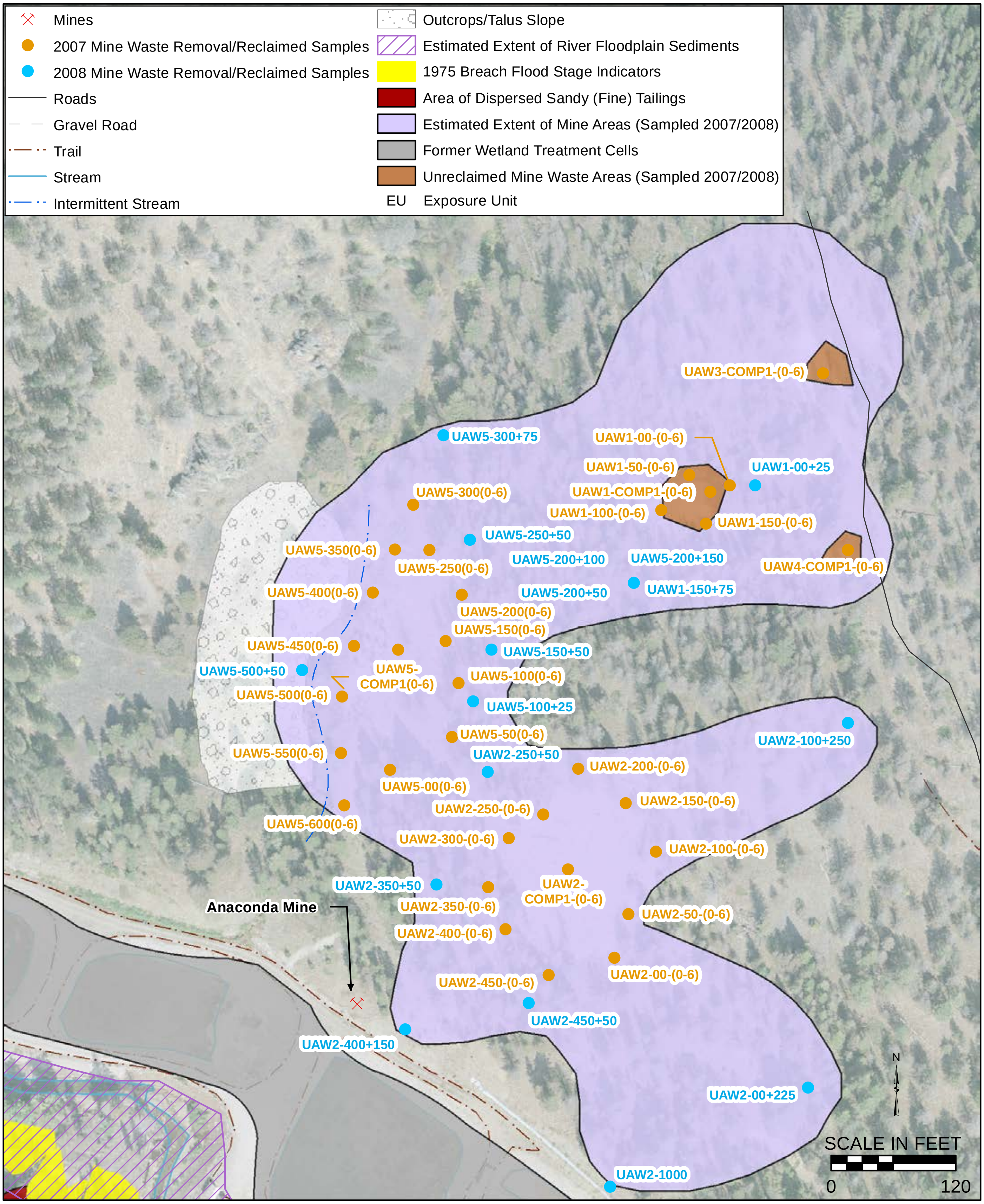


Figure 2-1

Site Features and Sampling Locations

EU 1 - Upper Anaconda Mine Waste Removal Areas and Waste Piles

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex

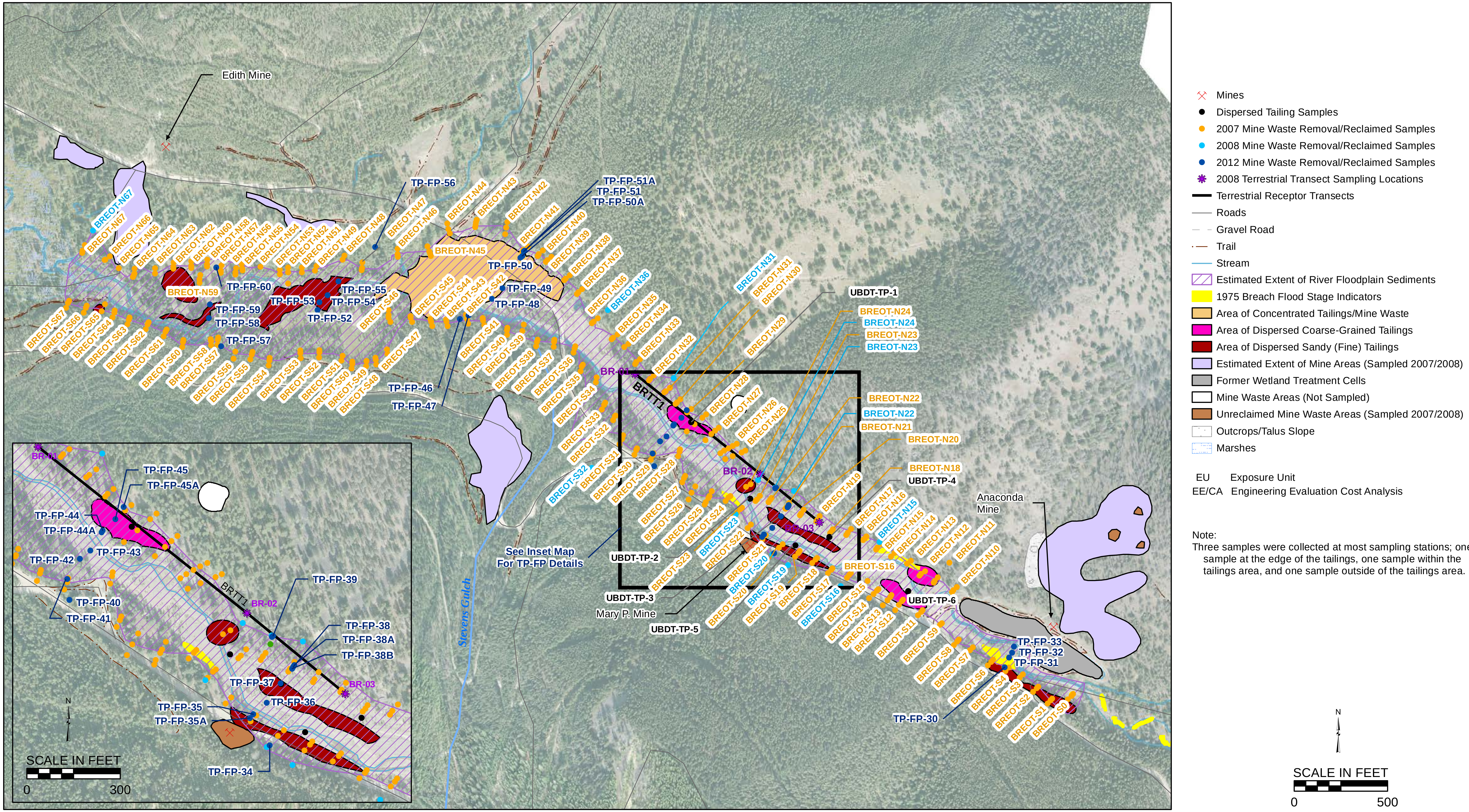
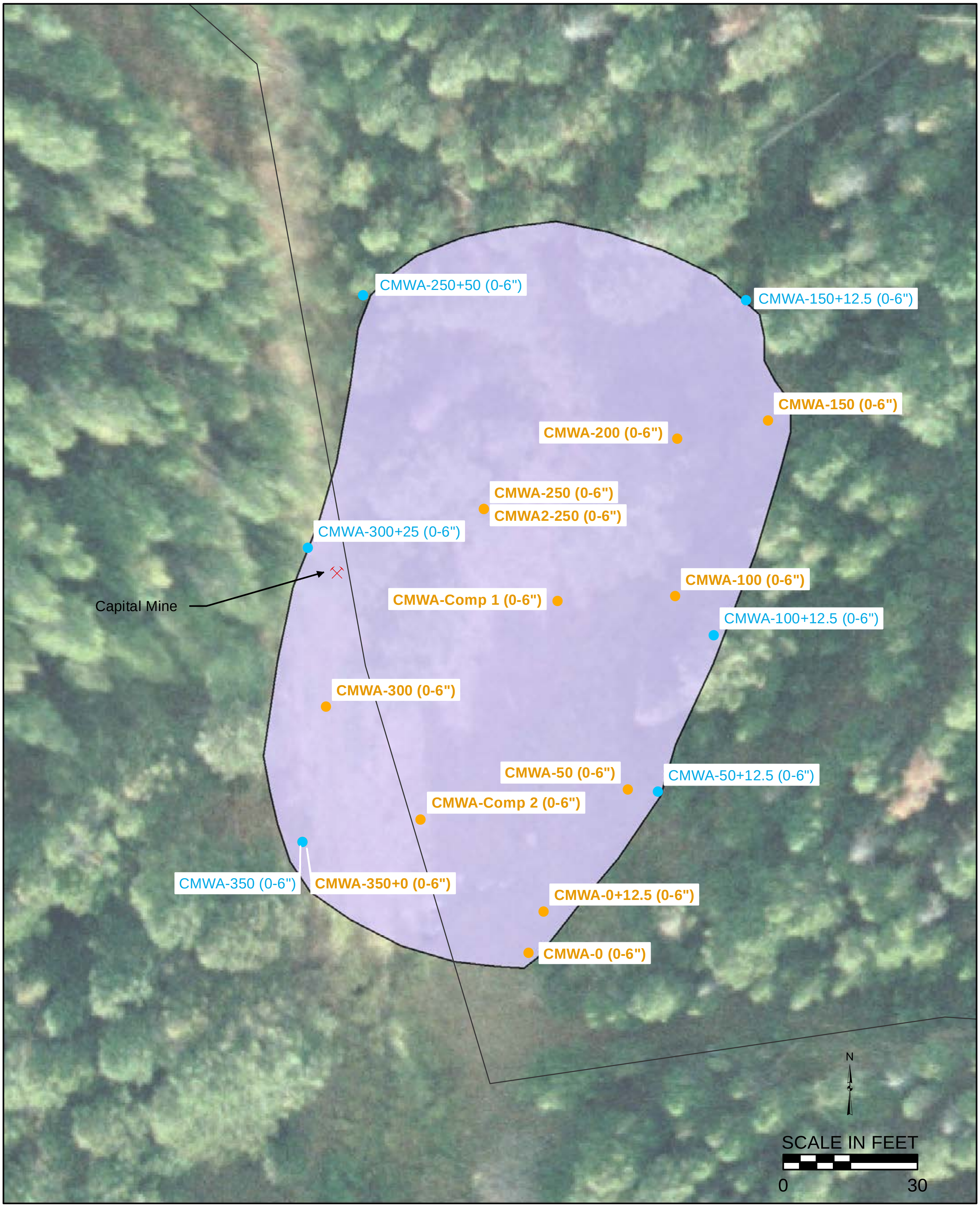


Figure 2-2

Site Features and Sample Locations

EU 2 - Blackfoot River Dispersed Tailings Associated with EE/CA Removal Action Area and Overbank Deposits

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



Mines
2007 Mine Waste Removal/Reclaimed Samples
2008 Mine Waste Removal/Reclaimed Samples
Roads
Estimated Extent of Mine Areas (Sampled 2007/2008)
EU Exposure Unit

Figure 2-3
Site Features and Sample Locations
EU 3 - Capital Mine Waste Area
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

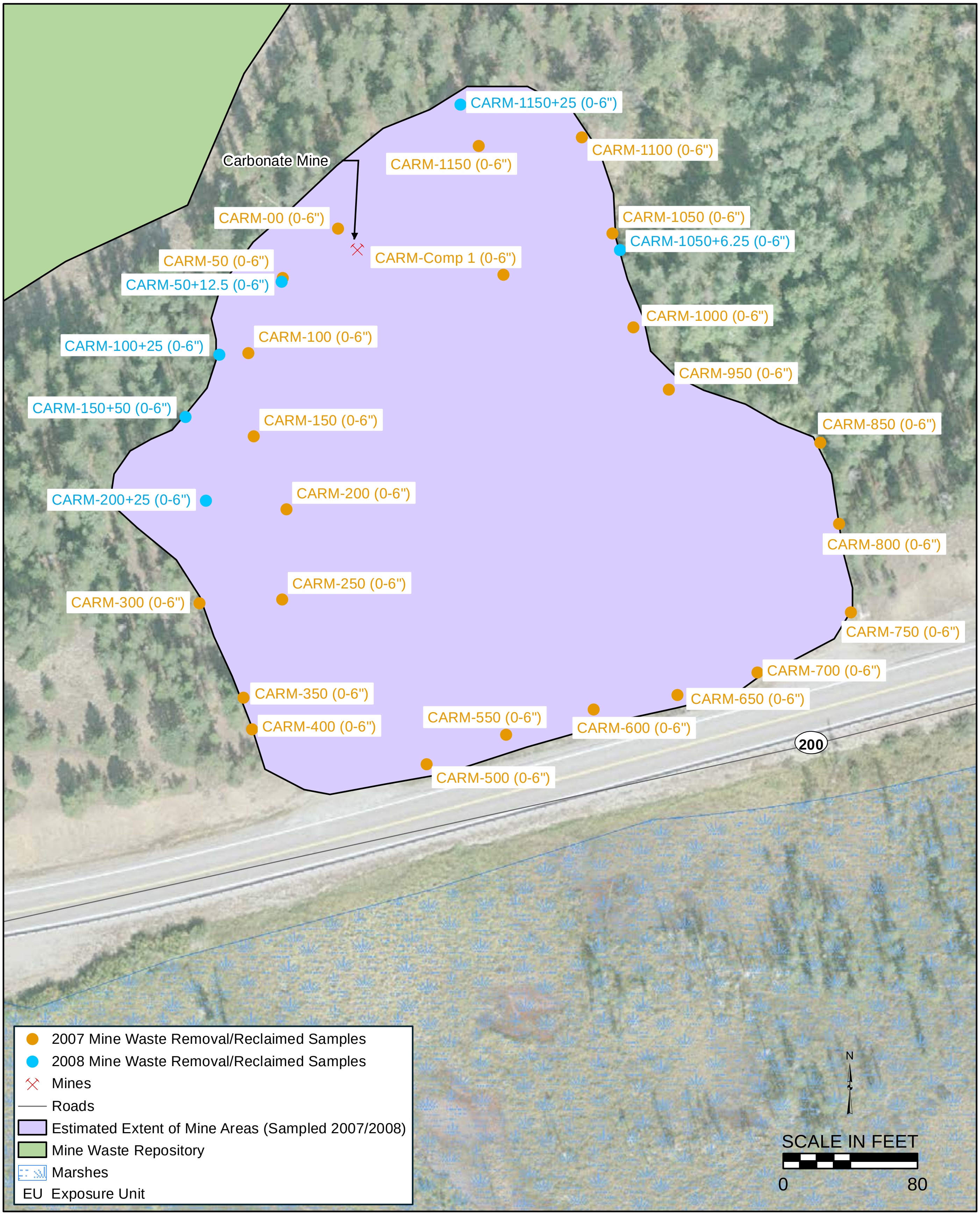
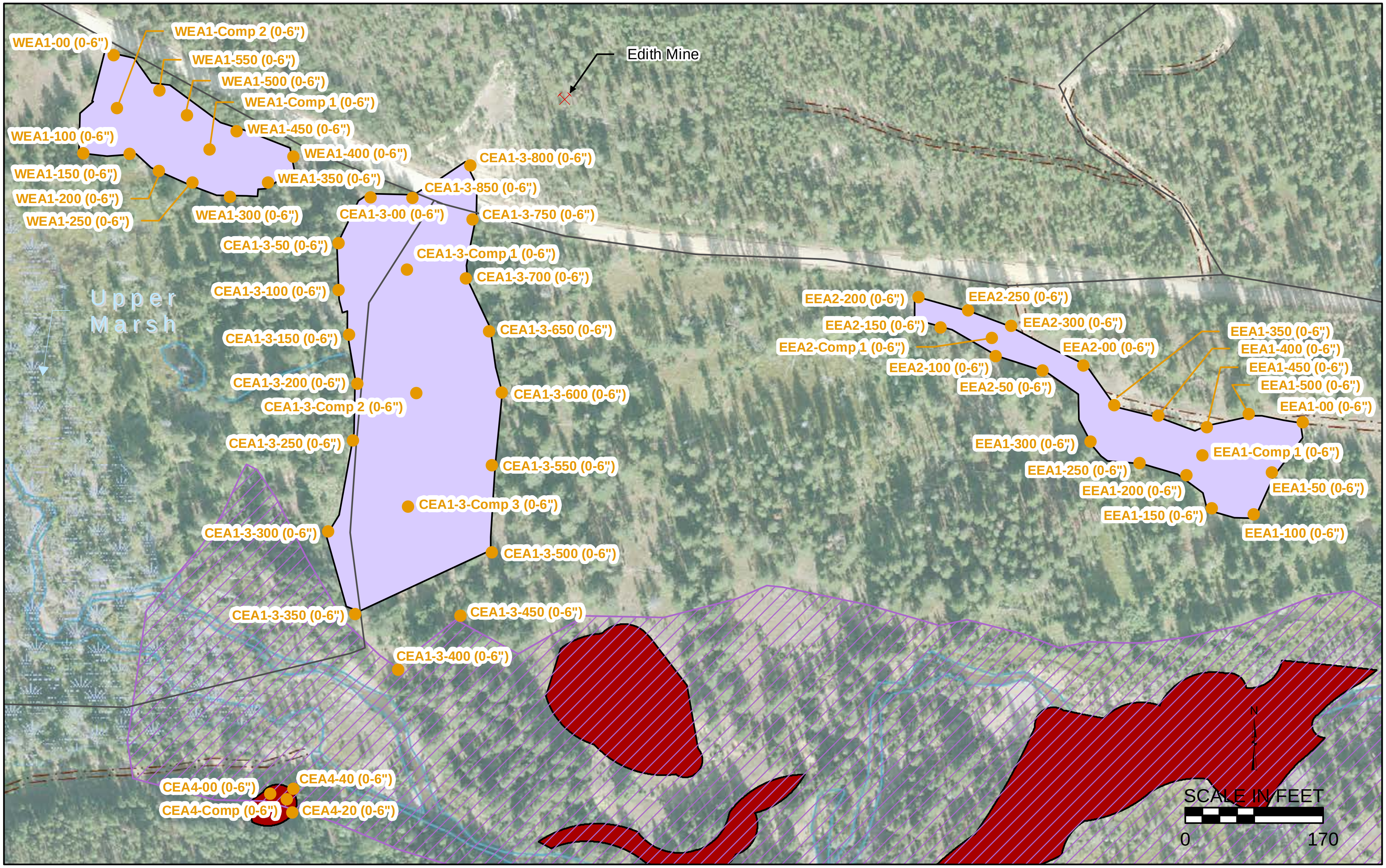


Figure 2-4

Site Features and Sample Locations

EU 4 - Carbonate Mine Waste Area

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



- 2007 Mine Waste Removal/Reclaimed Samples
- Mines
- Roads
- Gravel Road
- Trail
- Stream
- Estimated Extent of River Floodplain Sediments
- Area of Dispersed Sandy (Fine) Tailings
- Estimated Extent of Mine Areas (Sampled 2007/2008)
- Marshes

EU Exposure Unit

Figure 2-5

Site Features and Sample Locations

EU 5 - Edith Mine Waste Areas

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

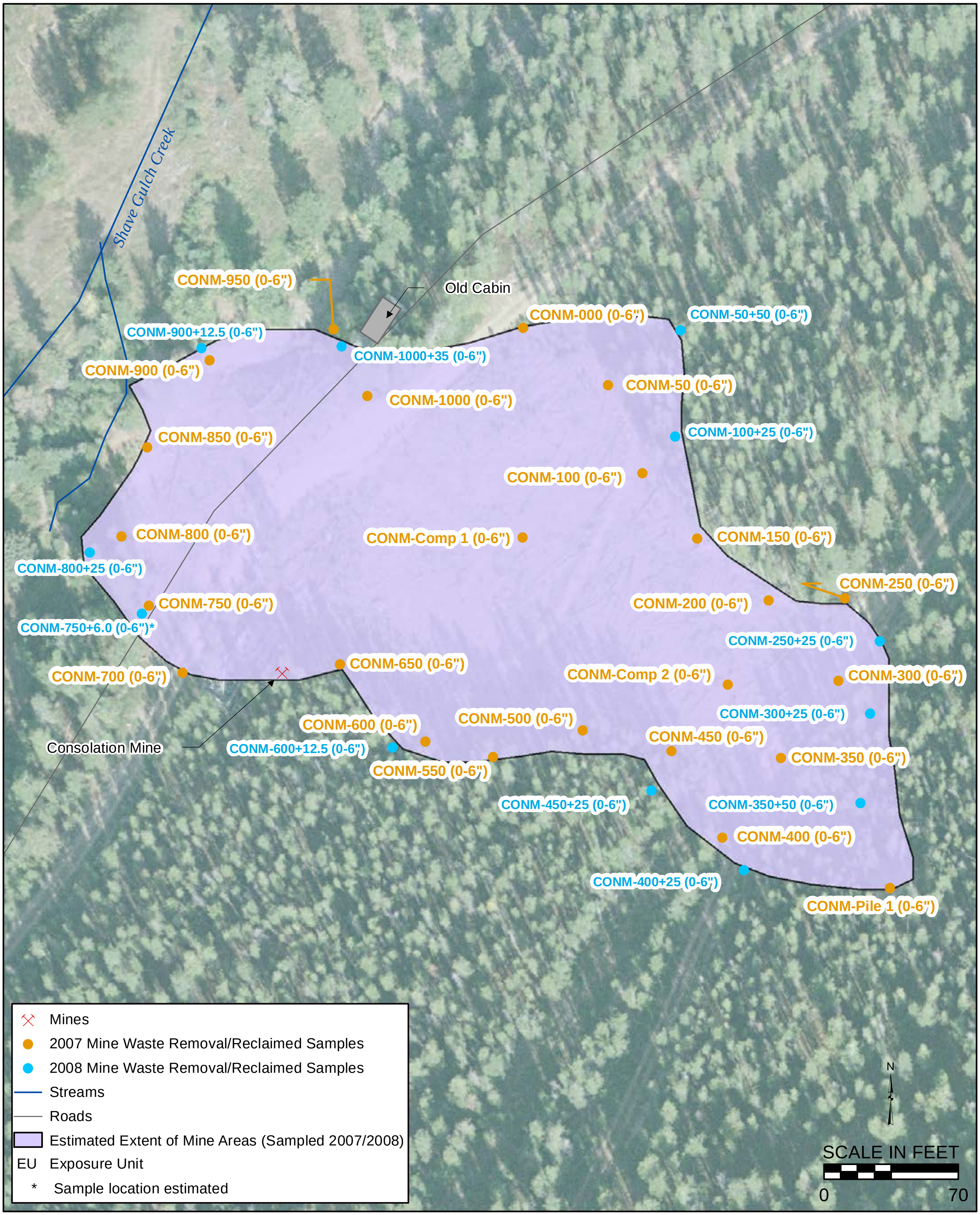


Figure 2-6

Site Features and Sample Locations

EU 6 - Consolation Mine Waste Area

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

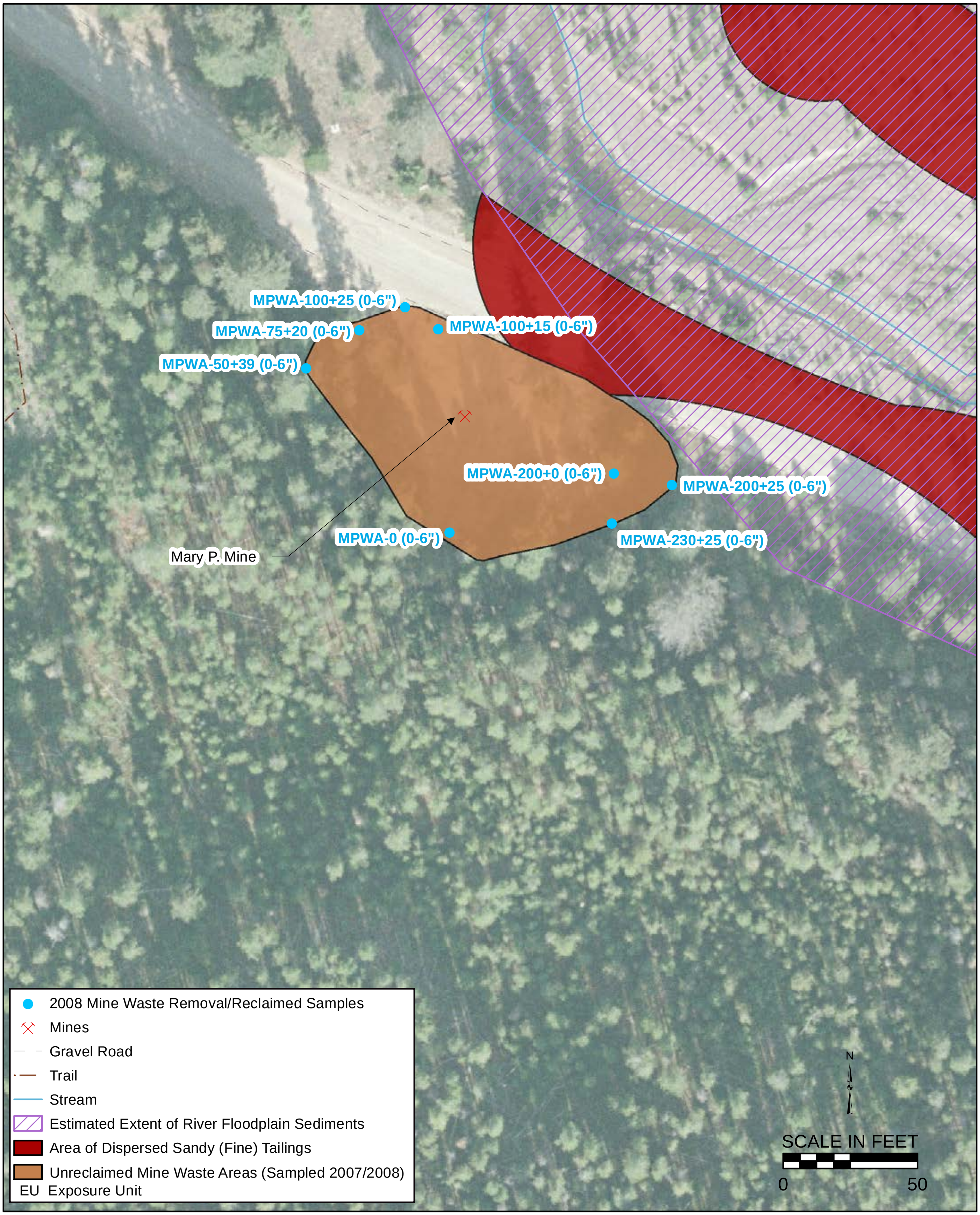
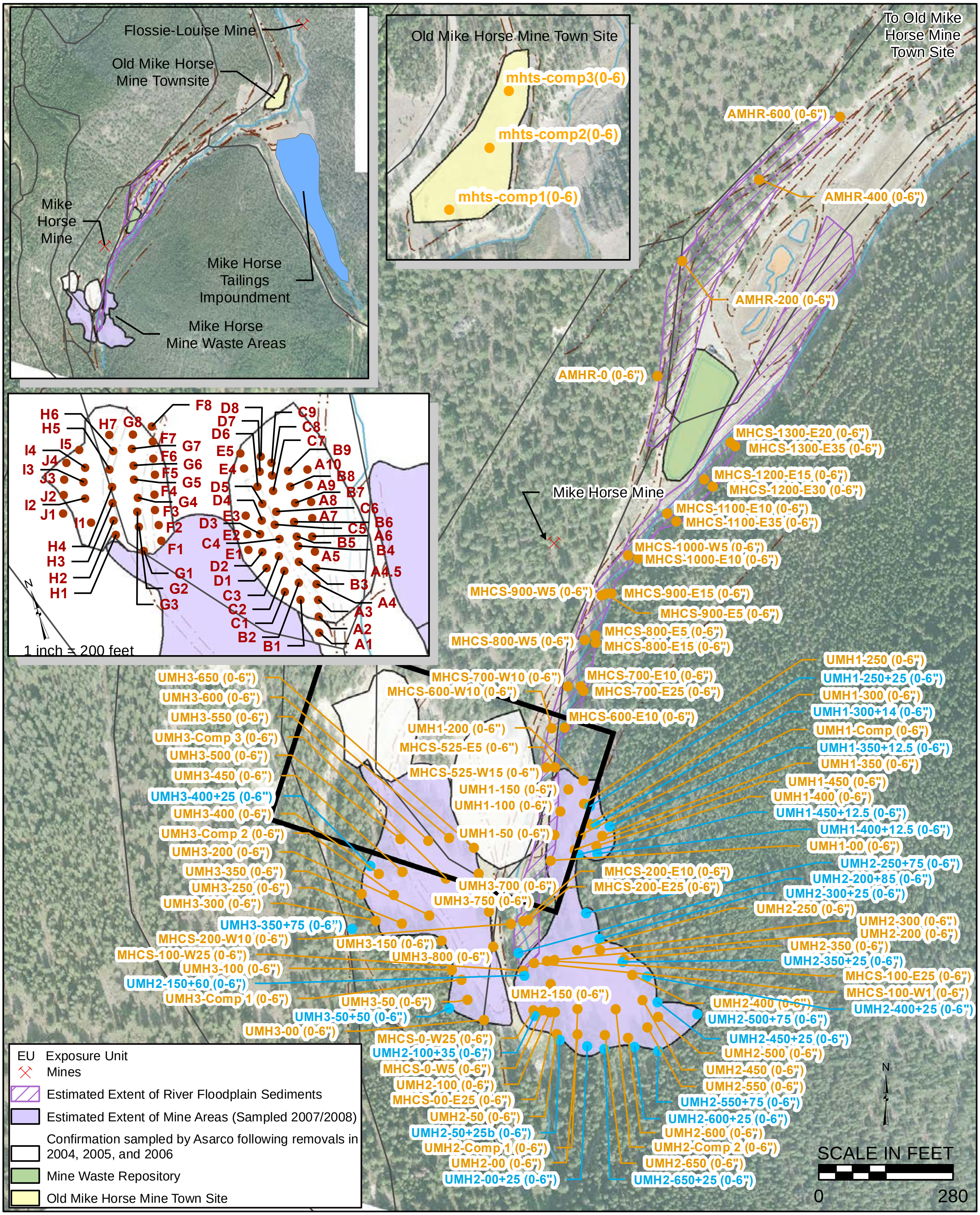


Figure 2-7
Site Features and Sample Locations
EU 7 - Mary P. Mine Waste Pile
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



2012 Mine Waster Removal/Reclaimed Samples ("UMH-" in labels were dropped for viewability)

2007 Mine Waste Removal/Reclaimed Samples

2008 Mine Waste Removal/Reclaimed Samples

Roads

Gravel Road

Trail

Stream

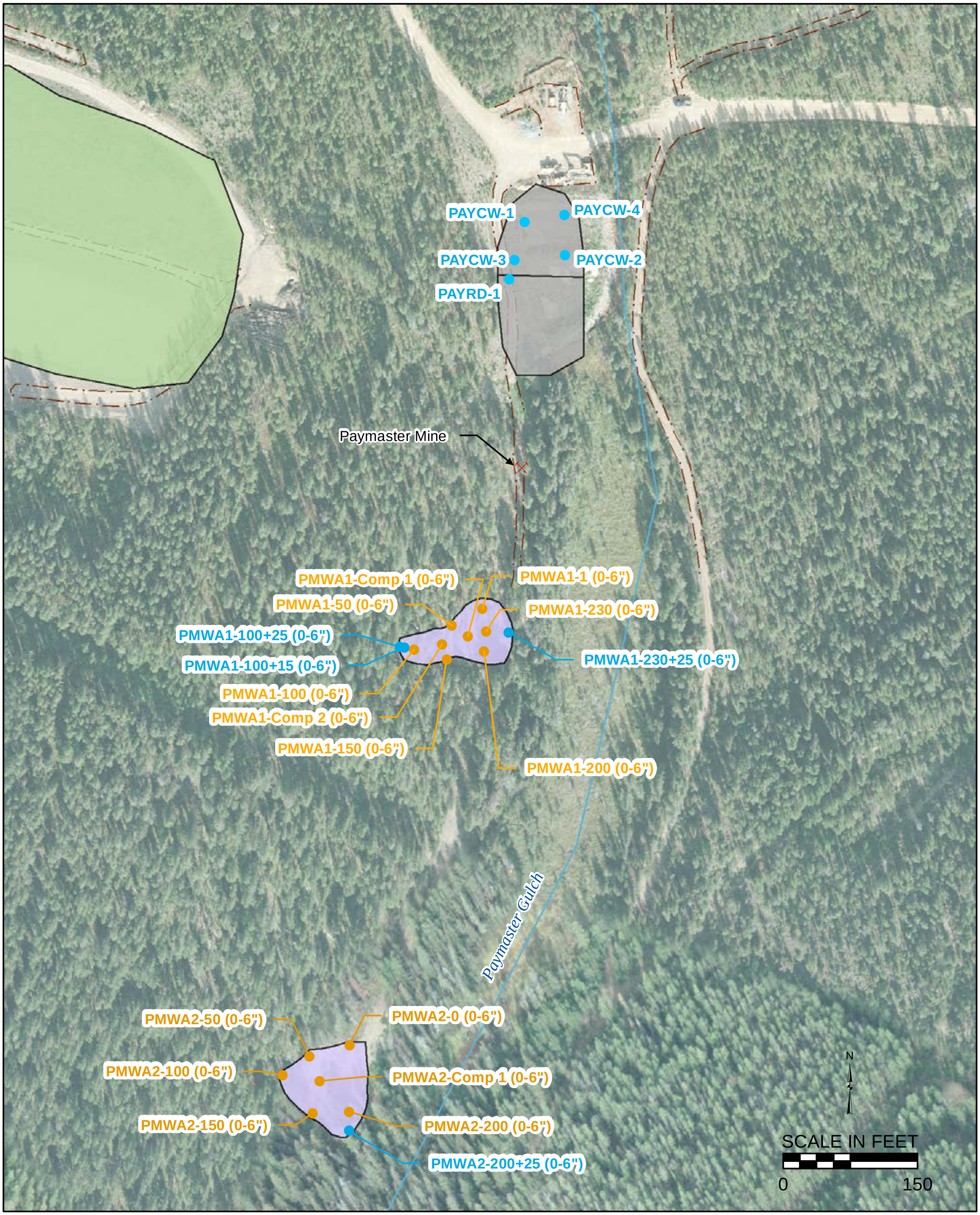
Figure 2-8

Site Features and Sample Locations

EU 8 - Mike Horse Mine Waste Piles

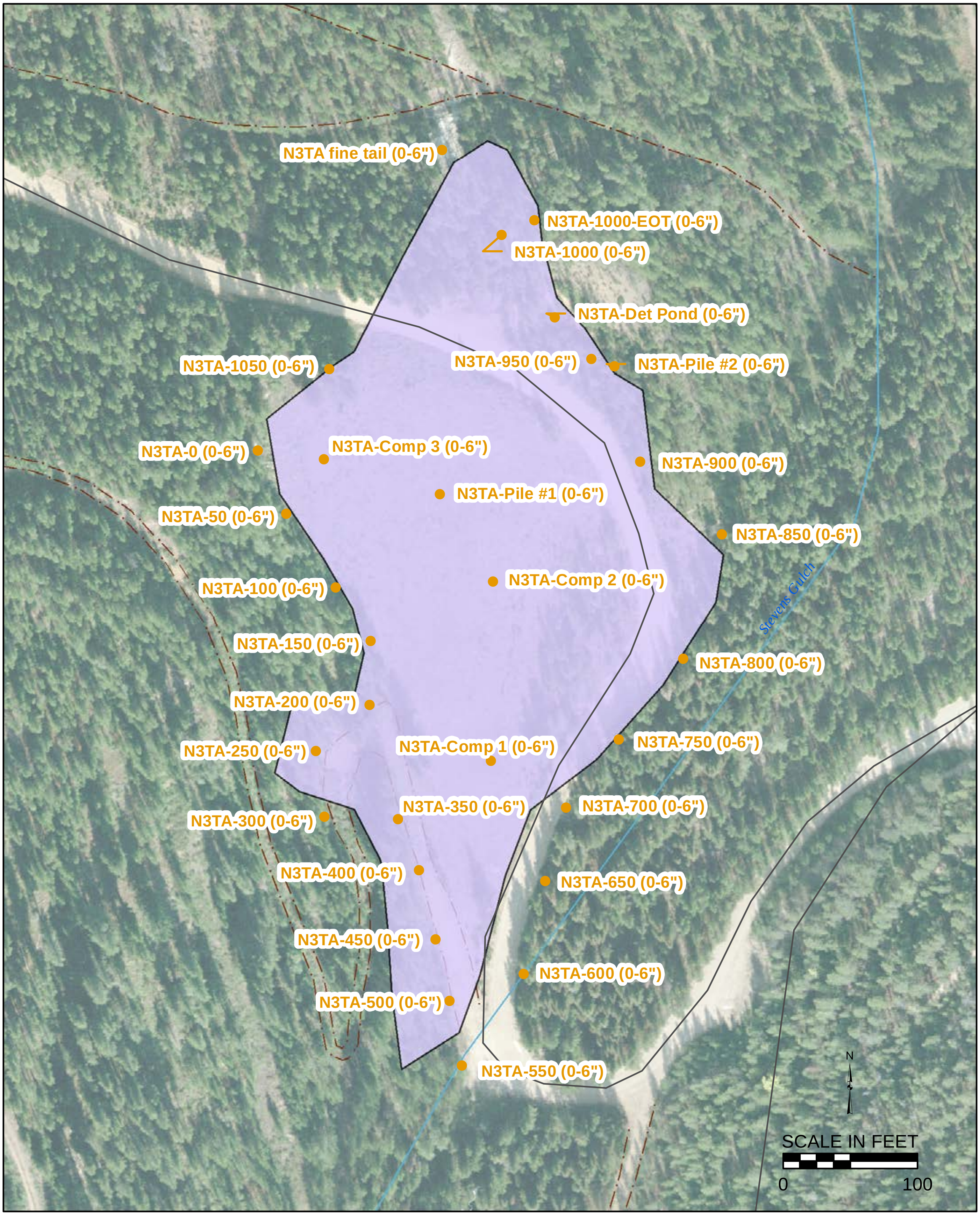
Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex



Mines
Trail
Streams
2007 Mine Waste Removal/Reclaimed Samples
2008 Mine Waste Removal/Reclaimed Samples
Estimated Extent of Mine Areas (Sampled 2007/2008)
Former Wetland Treatment Cells
Mine Waste Repository
EU Exposure Unit

Figure 2-9
Site Features and Sample Locations
EU 9 - Paymaster Mine Waste Areas
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



- 2007 Mine Waste Removal/Reclaimed Samples
- Roads
- Trail
- Stream
- Estimated Extent of Mine Areas (Sampled 2007/2008)

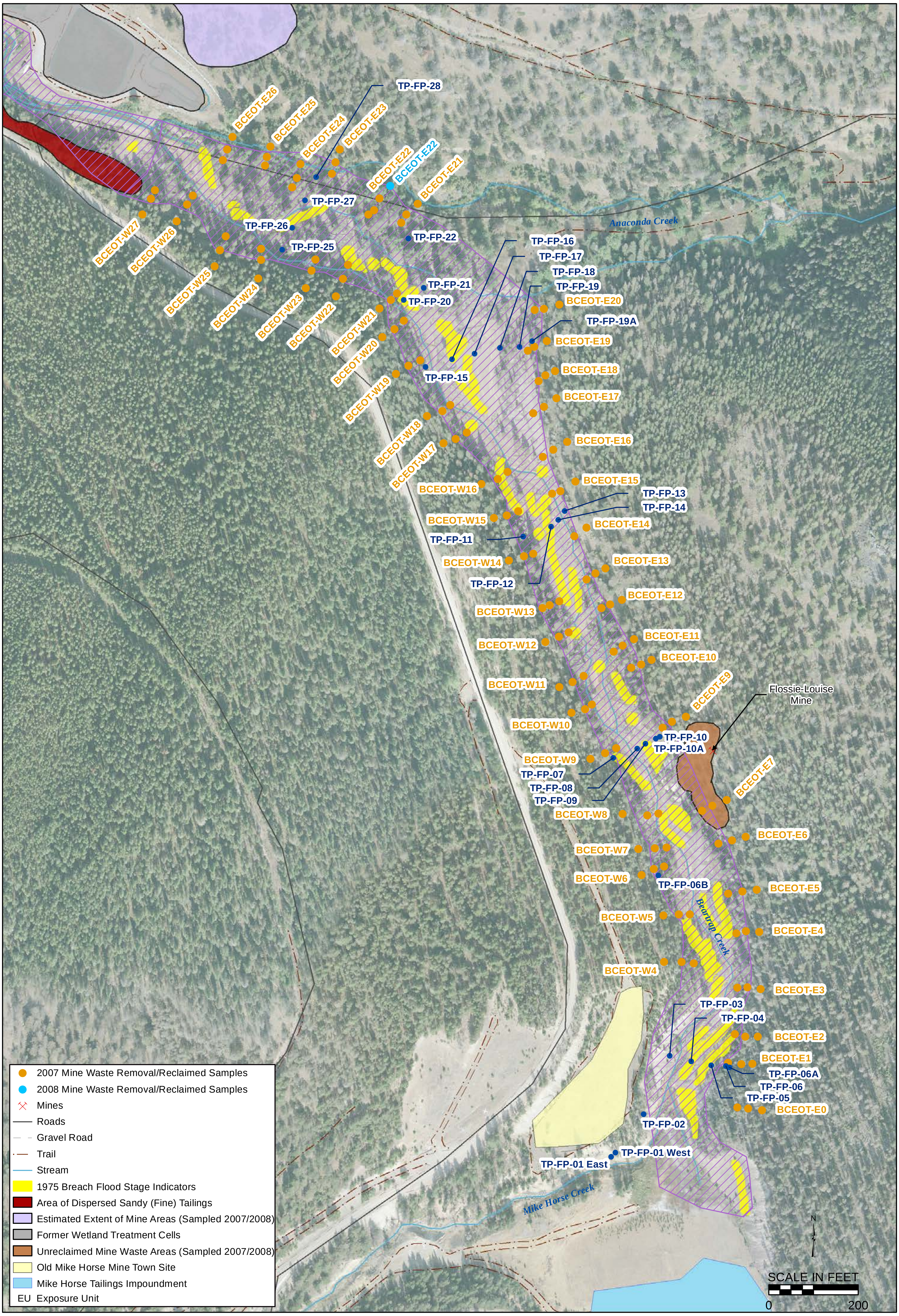
EU Exposure Unit

Figure 2-10

Site Features and Sample Locations

EU 10 - Number 3 Tunnel Waste Area

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



Note: Three samples were collected at most sampling stations; one sample at the edge of the tailings, one sample within the tailings area, and one sample outside of the tailings area.

Figure 2-11

Site Features and Sample Locations

EU 11 - Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area and Overbank Tailings Deposits and Flossie Louise Mine Waste Piles

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex

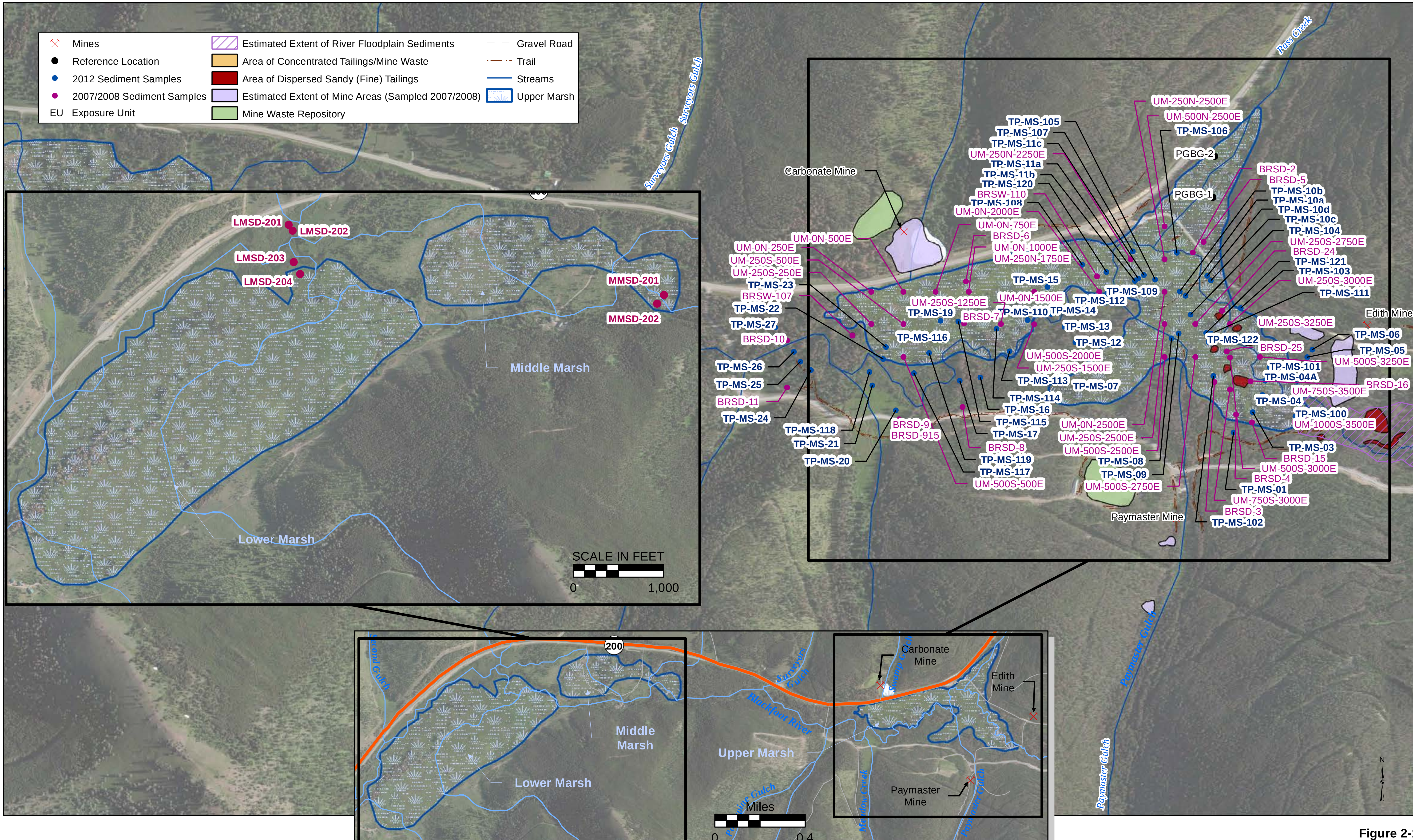


Figure 2-12

Site Features and Sample Locations

EU 12 - Marsh

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex

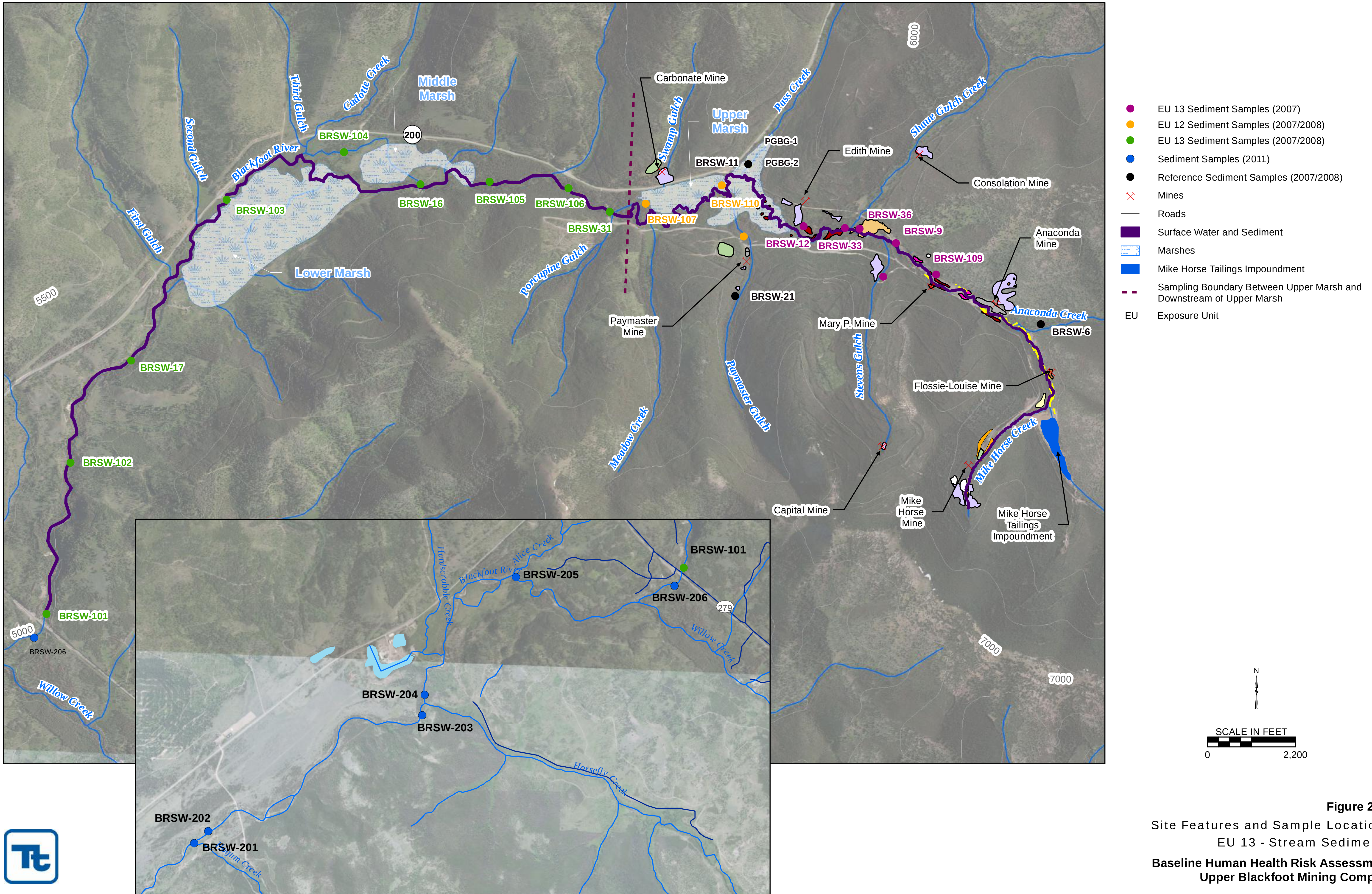
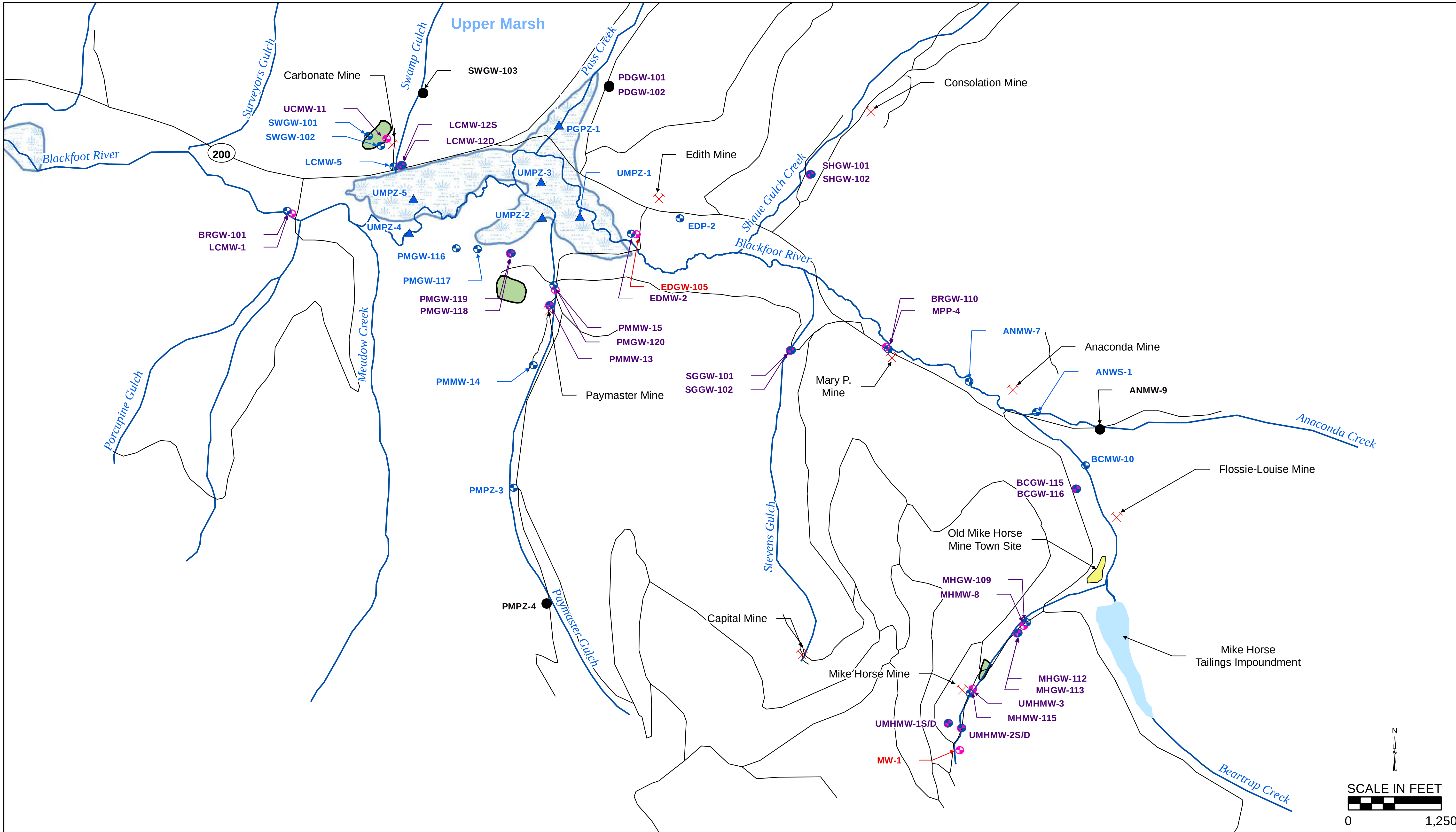


Figure 2-13

Site Features and Sample Locations

EU 13 - Stream Sediments

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



2008 Alluvial Piezometers
Existing Groundwater Monitoring Well - Alluvial/Bedrock Pair
Existing Groundwater Monitoring Well - Alluvial
Existing Groundwater Monitoring Well - Bedrock
Mines
Reference Locations
Mine Waste Repository
Old Mike Horse Mine Town Site
Roads
Streams
Mike Horse Tailings Impoundment
Marshes

Figure 2-14

2007/2008 Groundwater Sample Locations

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

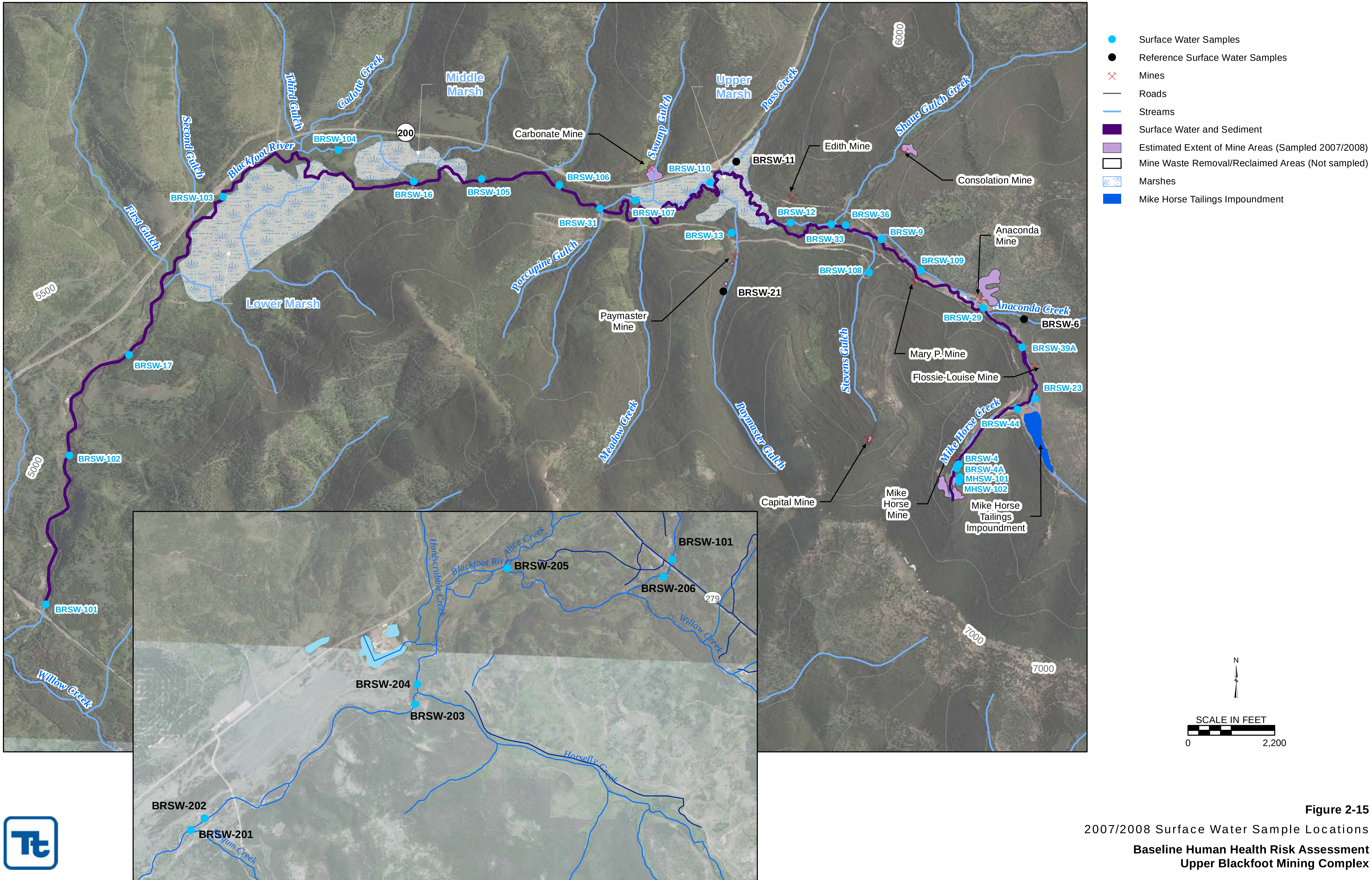
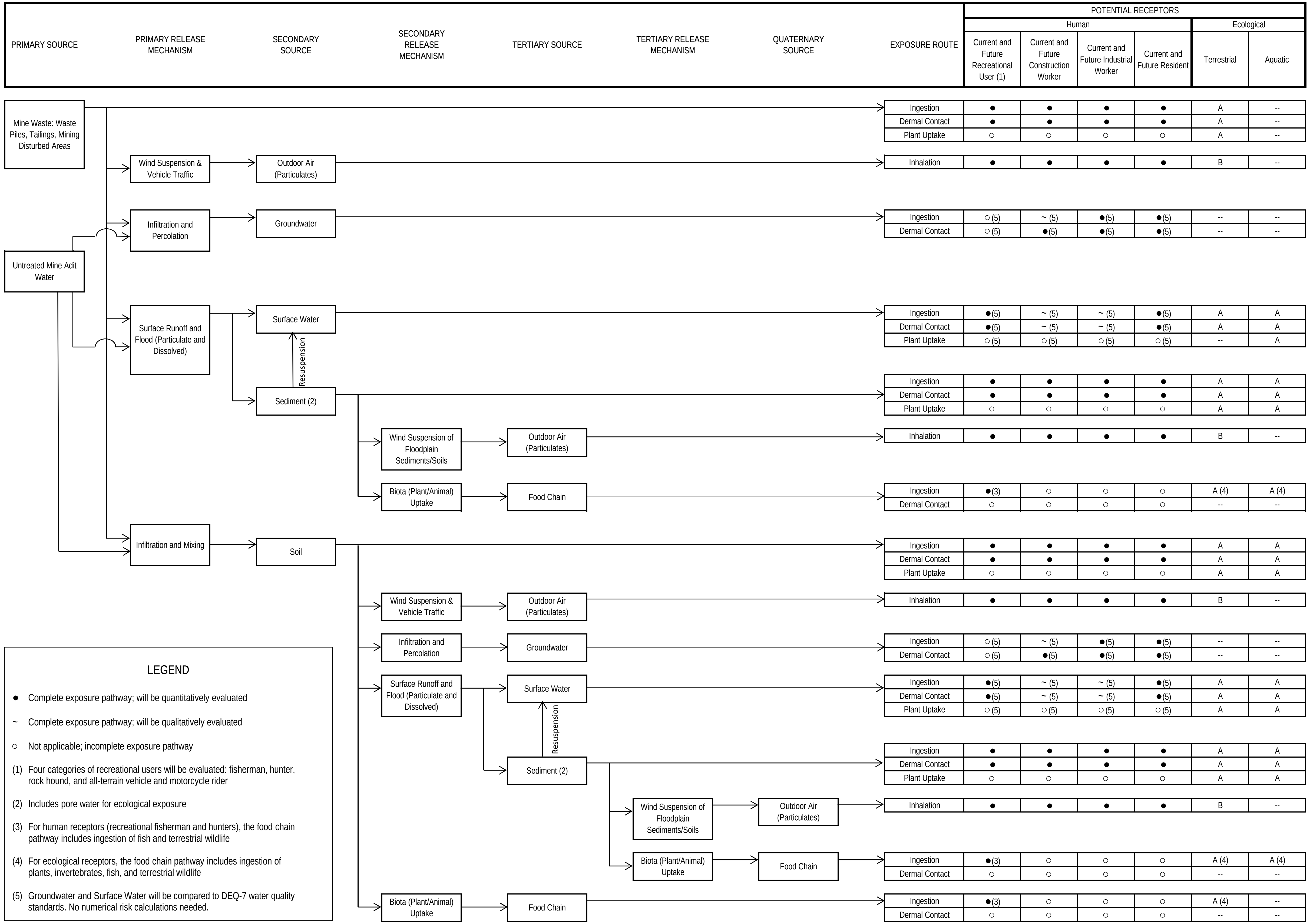


Figure 2-15

2007/2008 Surface Water Sample Locations

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex



Source (pathway)	Exposure Route	Current and Future Recreational User (1)	Current and Future Construction Worker	Current and Future Industrial Worker	Current and Future Resident	Terrestrial	Aquatic
Mine Waste	Ingestion	●	●	●	●	A	--
	Dermal Contact	●	●	●	●	A	--
	Plant Uptake	○	○	○	○	A	--
Outdoor Air (Particulates)	Inhalation	●	●	●	●	B	--
Groundwater	Ingestion	○ (5)	~ (5)	●(5)	●(5)	--	--
	Dermal Contact	○ (5)	●(5)	●(5)	●(5)	--	--
Surface Water	Ingestion	●(5)	~ (5)	~ (5)	●(5)	A	A
	Dermal Contact	●(5)	~ (5)	~ (5)	●(5)	A	A
	Plant Uptake	○ (5)	○ (5)	○ (5)	○ (5)	--	A
Sediment (2)	Ingestion	●	●	●	●	A	A
	Dermal Contact	●	●	●	●	A	A
	Plant Uptake	○	○	○	○	A	A
Outdoor Air (Particulates)	Inhalation	●	●	●	●	B	--
Food Chain	Ingestion	●(3)	○	○	○	A (4)	A (4)
	Dermal Contact	○	○	○	○	--	--
Soil	Ingestion	●	●	●	●	A	A
	Dermal Contact	●	●	●	●	A	A
	Plant Uptake	○	○	○	○	A	A
Outdoor Air (Particulates)	Inhalation	●	●	●	●	B	--
Groundwater	Ingestion	○ (5)	~ (5)	●(5)	●(5)	--	--
	Dermal Contact	○ (5)	●(5)	●(5)	●(5)	--	--
Surface Water	Ingestion	●(5)	~ (5)	~ (5)	●(5)	A	A
	Dermal Contact	●(5)	~ (5)	~ (5)	●(5)	A	A
	Plant Uptake	○ (5)	○ (5)	○ (5)	○ (5)	A	A
Sediment (2)	Ingestion	●	●	●	●	A	A
	Dermal Contact	●	●	●	●	A	A
	Plant Uptake	○	○	○	○	A	A
Outdoor Air (Particulates)	Inhalation	●	●	●	●	B	--
Food Chain	Ingestion	●(3)	○	○	○	A (4)	A (4)
	Dermal Contact	○	○	○	○	--	--
Food Chain	Ingestion	●(3)	○	○	○	A (4)	--
	Dermal Contact	○	○	○	○	--	--

LEGEND

● Complete exposure pathway; will be quantitatively evaluated

~ Complete exposure pathway; will be qualitatively evaluated

○ Not applicable; incomplete exposure pathway

(1) Four categories of recreational users will be evaluated: fisherman, hunter, rock hound, and all-terrain vehicle and motorcycle rider

(2) Includes pore water for ecological exposure

(3) For human receptors (recreational fisherman and hunters), the food chain pathway includes ingestion of fish and terrestrial wildlife

(4) For ecological receptors, the food chain pathway includes ingestion of plants, invertebrates, fish, and terrestrial wildlife

(5) Groundwater and Surface Water will be compared to DEQ-7 water quality standards. No numerical risk calculations needed.

Figure 4-1
Preliminary Conceptual
Site Exposure Model
Upper Blackfoot Mining Complex

TABLE ES-1: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SURFACE SOIL (0 TO 2 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 1	EU 2	EU 3	EU 4	EU 5	EU 6	EU 7	EU 8	EU 9	EU 10	EU 11
Surface Soil	Recreational ATV/ Motorcycle Rider	12	Cancer Risk	2E-06	3E-06	**2E-05**	2E-08	5E-07	8E-06	3E-06	6E-06	**--**	5E-07	4E-06
			Noncancer Hazard [a]	0.05 (0.04)	0.2 (0.2)	0.3 (0.3)	0.01 (0.008)	0.01 (0.009)	0.1 (0.1)	0.06 (0.05)	0.3 (0.3)	0.006 (0.006)	0.1 (0.09)	0.3 (0.2)
			COCs	Lead	Lead*	Arsenic	--	--	Lead*	Lead*	Lead*	--	--	Lead*
	Recreational Fisherman	24	Cancer Risk	2E-06	2E-06		4E-11	4E-07	6E-06	2E-06	5E-06		4E-07	3E-06
			Noncancer Hazard [a]	0.02 (0.01)	0.03 (0.02)	NE	0.006 (0.005)	0.006 (0.004)	0.06 (0.06)	0.03 (0.02)	0.05 (0.04)	NE	0.008 (0.004)	0.04 (0.02)
			COCs	Lead	Lead*		--	--	--	Lead*	Lead*		--	--
	Recreational Rock Hound	24	Cancer Risk	6E-06	8E-06	**6E-05**	1E-10	2E-06	**2E-05**	9E-06	**2E-05**	**--**	2E-06	1E-05
			Noncancer Hazard [a]	0.1 (0.09)	0.2 (0.1)	0.8 (0.8)	0.06 (0.05)	0.05 (0.03)	0.4 (0.3)	0.2 (0.1)	0.4 (0.3)	0.04 (0.04)	0.07 (0.03)	0.3 (0.2)
			COCs	Lead	Lead*	Arsenic	--	--	Arsenic, Lead*	Lead*	Arsenic, Lead*	--	--	Lead*
	Recreational Hunter	16	Cancer Risk	1E-06	1E-06	1E-05	3E-11	3E-07	4E-06	2E-06	3E-06	**--**	3E-07	2E-06
			Noncancer Hazard [a]	0.01 (0.009)	0.02 (0.01)	0.09 (0.08)	0.004 (0.003)	0.004 (0.002)	0.04 (0.04)	0.02 (0.01)	0.03 (0.03)	0.003 (0.003)	0.006 (0.002)	0.02 (0.02)
			COCs	Lead	Lead*	--	--	--	--	Lead*	Lead*	--	--	--
	Industrial Worker	165	Cancer Risk	**2E-05**	**2E-05**	**1E-04**	7E-10	4E-06	**6E-05**	**2E-05**	**5E-05**	**--**	4E-06	**3E-05**
			Noncancer Hazard [a]	0.2 (0.1)	0.3 (0.1)	1.0 (0.9)	0.08 (0.07)	0.06 (0.04)	0.5 (0.4)	0.2 (0.2)	0.4 (0.3)	0.05 (0.05)	0.09 (0.04)	0.3 (0.2)
			COCs	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead*	--	--	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	--	--	Arsenic, Lead
	Construction Worker	124	Cancer Risk	1E-06	2E-06	1E-05	2E-11	4E-07	5E-06	2E-06	4E-06	--	4E-07	2E-06
			Noncancer Hazard [a]	0.4 (0.2)	0.7 (0.3)	**2 (2)**	0.2 (0.2)	0.2 (0.09)	1 (1)	0.5 (0.4)	1 (0.7)	0.1 (0.1)	0.2 (0.09)	0.8 (0.4)
			COCs	Lead	Lead	Arsenic, Lead*	Lead*	--	Lead	Lead	Lead	--	--	Lead
	Resident	230	Cancer Risk	**7E-05**	**9E-05**	**6E-04**	3E-09	**2E-05**	**3E-04**	**1E-04**	**2E-04**	**--**	**2E-05**	**1E-04**
			Noncancer Hazard [a]	**2** (1)	**4 (2)**	**15 (13)**	1 (1)	0.9 (0.5)	**6 (6)**	**3 (2)**	**6 (4)**	0.8 (0.8)	1 (0.6)	**5 (3)**
			COCs	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	Lead	Arsenic. Lead*	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	--	Arsenic	Arsenic, Lead

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, surface soil) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

Cancer risks shown in **bold** exceed 1E-05. Noncancer hazards shown in **bold** exceed 1.

a The value shown in parentheses is the highest hazard index, segregated by target organ.

* Lead is only a COC with 5 µg/L blood lead as an endpoint. If no * is present, lease is a COC with both 5 and 10 µg/dL as endpoints.

--	Not applicable	EU	Exposure unit
ATV	All-terrain vehicle	NE	Not evaluated (see Section 4.4)
bgs	Below ground surface	UBMC	Upper Blackfoot Mining Complex
COC	Chemical of concern		

TABLE ES-2: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SUBSURFACE SOIL (2 TO 10 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 2	EU 9	EU 11
Subsurface Soil	Construction Worker	124	Cancer Risk	7E-07	1E-05	2E-06
			Noncancer Hazard [a]	0.4 (0.1)	**3 (2)**	0.8 (0.3)
			COCs	Lead	Arsenic	Lead

Notes: Collection of subsurface soil data was limited to EUs 2, 9, and 11.

COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, subsurface soil) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

Cancer risks shown in **bold** exceed 1E-05 (for cancer risk). Noncancer hazards shown in **bold** exceed 1.

a The value shown in parentheses is the highest hazard index, segregated by target organ.

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

TABLE ES-3: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SURFACE SEDIMENT (0 TO 2 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 12	EU 13
Sediment	Recreational Fisherman	24	Cancer Risk	2E-06	6E-07
			Noncancer Hazard [a]	0.03 (0.01)	0.01 (0.005)
			COCs	--	--
	Recreational Rock Hound	24	Cancer Risk	**2E-05**	5E-06
			Noncancer Hazard [a]	0.6 (0.4)	0.2 (0.1)
			COCs	Arsenic, Lead*	--
	Industrial Worker	165	Cancer Risk	1E-05	4E-06
			Noncancer Hazard [a]	0.3 (0.2)	0.1 (0.07)
			COCs	Lead	--
	Construction Worker	124	Cancer Risk	1E-06	4E-07
			Noncancer Hazard [a]	0.8 (0.4)	0.3 (0.2)
			COCs	Lead	--
	Modified Resident	50	Cancer Risk	**4E-05**	1E-05
			Noncancer Hazard [a]	2 (0.5)	0.6 (0.3)
			COCs	Arsenic, Lead*	--

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, sediment) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

Cancer risks shown in **bold** exceed 1E-05. Noncancer hazards shown in **bold** exceed 1.

a — The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

* — Lead is only a COC with 5 µg/L blood lead as an endpoint. If no * is present, lease is a COC with both 5 and 10 µg/dL as endpoints.

-- — Not applicable

bgs — Below ground surface

COC — Chemical of concern

EU — Exposure unit

TABLE ES-4: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SUBSURFACE SEDIMENT (2 TO 10 FEET BGS) AT EXPOSURE UNIT 12

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 12
Sediment	Construction Worker	124	Cancer Risk	6E-07
			Noncancer Hazard [a]	0.3 (0.1)
			COCs	Lead*

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, sediment) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

a The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

-- Not applicable

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

TABLE ES-5: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN FOR RECREATIONAL FISH INGESTION

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium[a]	Receptor	Exposure Frequency (days/year)	Risk	UBMC-Wide[b]
Fish Tissue	Recreational Fisherman - Adult	24	Cancer Risk	--
			Noncancer Hazard [c]	0.7 (0.5)
			COCs	--
	Recreational Fisherman - Child	24	Cancer Risk	--
			Noncancer Hazard [c]	0.1 (0.1)
			COCs	--

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, fish tissue) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1.

a Chemical concentrations in fish tissue were estimated using surface water data and bioconcentration factors (see Section 6.1.2).

b Health risks from fish consumption were estimated UBMC-wide, rather than on an exposure unit-specific basis.

c The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

-- Not applicable

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

UBMC Upper Blackfoot Mining Complex

TABLE ES-6. SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Residente
EU 1 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.51E+03	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.53E+01	NA	NA	NA	NA
	Copper	2.75E+02	3.05E+03	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	6.03E+03	5.32E+03	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	6.03E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	3.20E+03	NA	NA	NA	NA
EU 2 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.77E+02	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.40E+01	NA	NA	NA	NA
	Copper	2.75E+02	5.30E+03	NA	NA	NA	NA
	Iron	5.83E+04	2.59E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.11E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	2.95E+03	NA	NA	NA	NA
EU 3 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.11E+03	8.17E+01	3.27E+01	2.00E+02	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	2.39E+04	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.27E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.27E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	4.22E+04	NA	NA	NA	NA

TABLE ES-6. SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Residente
EU 4 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	4.04E+01	NA	NA	NA	NA
	Cadmium	4.80E+00	1.11E+01	NA	NA	NA	NA
	Copper	2.75E+02	2.06E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.27E+03	NA	NA	NA	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.27E+03	NA	NA	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	1.65E+04	NA	NA	NA	NA
EU 5 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.90E+03	NA	NA	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	4.66E+05	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	3.09E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	3.09E+03	NA	NA	NA	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	4.70E+05	NA	NA	NA	NA
EU 6 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.88E+02	8.17E+01	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	5.73E+02	NA	NA	NA	NA
	Copper	2.75E+02	4.10E+02	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.61E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.61E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	9.14E+02	NA	NA	NA	NA

TABLE ES-6. SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Residente
EU 7 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	6.23E+02	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	1.20E+05	NA	NA	NA	NA
	Iron	5.83E+04	7.62E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.11E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.51E+02	NA	NA	NA	NA
EU 8 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.49E+03	8.17E+01	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.07E+03	NA	NA	NA	NA
	Copper	2.75E+02	1.05E+05	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.24E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.24E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.98E+04	NA	NA	NA	NA
	Zinc	5.51E+02	1.69E+05	NA	NA	NA	NA
EU 9 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.67E+02	NA	NA	2.00E+02	NA
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	6.08E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.51E+02	NA	NA	NA	NA

TABLE ES-6. SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Residente
EU 10 Soil	Arsenic	4.04E+01	6.00E+01	NA	NA	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	2.87E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.10E+03	NA	NA	NA	NA
EU 11 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	6.14E+03	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	3.38E+01	NA	NA	NA	NA
	Copper	2.75E+02	3.65E+03	NA	NA	NA	NA
	Iron	5.83E+04	1.99E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	8.52E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	8.52E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	1.37E+04	NA	NA	NA	NA
EU 12 Sediment	Aluminum	8.03E+03	8.03E+03	NA	NA	NA	NA
	Arsenic	3.23E+01	3.23E+01	3.69E+01	NA	NA	1.71E+01
	Cadmium	1.84E+00	1.84E+00	NA	NA	NA	NA
	Copper	6.74E+01	1.24E+03	NA	NA	NA	NA
	Iron	1.45E+04	1.45E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.74E+02	1.74E+02	NA	1.87E+03	1.25E+03	NA
	Lead (5 µg/dL)	1.74E+02	1.74E+02	1.79E+03	6.46E+02	4.30E+02	8.51E+02
	Manganese	6.96E+02	6.96E+02	NA	NA	NA	NA
	Zinc	2.75E+02	3.00E+02	NA	NA	NA	NA

TABLE ES-6. SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Residente
EU 13 Sediment	Aluminum	8.98E+03	N/A	NA	NA	NA	NA
	Arsenic	1.54E+01	N/A	NA	NA	NA	NA
	Cadmium	5.00E-01	N/A	NA	NA	NA	NA
	Copper	1.14E+02	N/A	NA	NA	NA	NA
	Iron	2.39E+04	N/A	NA	NA	NA	NA
	Lead (10 µg/dL)	8.15E+01	N/A	NA	NA	NA	NA
	Lead (5 µg/dL)	8.15E+01	N/A	NA	NA	NA	NA
	Manganese	5.78E+02	N/A	NA	NA	NA	NA
	Zinc	1.36E+02	N/A	NA	NA	NA	NA

Notes: All concentrations are in milligrams per kilogram

a The risk-based site-specific cleanup level for recreational receptors is based on the rock hound receptor, which was the most conservative recreational receptor as seen in the RAGS D tables for recreational exposure.

b The SSCL exceeds the ceiling limit of 1.0E+05 representing 10 percent by weight of the soil sample, as specified by EPA (2009). At contaminant concentrations of 1.0E+05 and higher in soil, the assumptions for soil contact may be violated (for example, soil adherence and wind-borne dispersion assumptions) due to the presence of the foreign substance itself. Therefore, the ceiling limit of 1.0E+05 is recommended for use as the SSCL; however, the calculated SSCL is shown.

c The calculated SSCL exceeds the maximum possible concentration of 1.0E+06 representing 100 percent by weight of the sample. A contaminant concentration of greater than 1.0E+06 is not possible. Therefore, the value 1E+06 is used as the calculated SSCL.

d SSCLs for lead for recreational receptors are based on two target blood lead levels of 10 µg/dL and 5 µg/dL for 95 percent of the exposed population.

e SSCLs for residential exposure to lead were calculated assuming that UBMC groundwater is not used as a drinking water source. And residential exposure to sediment is based upon a modified residential scenario.

COPC Contaminant of potential concern
EU Exposure unit
NA Not applicable - chemical is not a COC at this EU.
µg/dL Micrograms per deciliter
SSCL Site-specifc cleanup level

TABLE 9-1: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	1E-06	4E-07	4E-07	2E-06	0.02	0.004	0.02	0.05	0.04	Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	17.8
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	7E-07	9E-07	7E-10	2E-06	0.011	0.008	0.00004	0.02	0.01	Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	11.7
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	5E-06	1E-06	2E-09	6E-06	0.1	0.02	0.00009	0.1	0.09	Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	16.9
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	5E-07	6E-07	5E-10	1E-06	0.007	0.005	0.00003	0.012	0.009	Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	14.0
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	1E-05	3E-06	1E-08	**2E-05**	0.2	0.02	0.001	0.2	0.1	Arsenic	C	34/46	16.30 - 255	7.7E+01	2E-05	0.1	--
												Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	49.4
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	1E-06	1E-07	4E-10	1E-06	0.4	0.02	0.0005	0.4	0.2	Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	73.0
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	6E-05	9E-06	5E-08	**7E-05**	2	0.2	0.003	2	1	Arsenic	C, NC	34/46	16.30 - 255	7.7E+01	7E-05	1	--
												Lead	PbB	46/46	41.76 - 55,200	1.2E+04	--	--	93.2

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-2: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SURFACE SOIL, EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)			EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated										
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	6E-07	5E-07	3E-06	0.03	0.005	0.2	0.2	0.2	Lead	PbB5	440/440	33.86	-	38,839	3.7E+03	--	--	7.3
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	1E-06	1E-09	2E-06	0.019	0.01	0.0004	0.03	0.02	Lead	PbB5	440/440	33.86	-	38,839	3.7E+03	--	--	5.30
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	6E-06	2E-06	3E-09	8E-06	0.2	0.02	0.0008	0.2	0.1	Lead	PbB5	440/440	33.86	-	38,839	3.7E+03	--	--	7.60
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	6E-07	8E-07	7E-10	1E-06	0.013	0.007	0.0003	0.02	0.012	Lead	PbB5	440/440	33.86	-	38,839	3.7E+03	--	--	6.1
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	2E-06	2E-08	**2E-05**	0.3	0.02	0.01	0.3	0.1	Arsenic	C	371/440	6.63	-	1,057	1.0E+02	2E-05	--	0.1
												Lead	PbB	440/440	33.86	-	38,839	3.7E+03	--	--	17
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	5E-10	2E-06	0.6	0.03	0.004	0.7	0.3	Lead	PbB	440/440	33.86	-	38,839	3.7E+03	--	--	24.9
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	8E-05	1E-05	8E-08	**9E-05**	4	0.2	0.02	4	**2**	Arsenic	C, NC	371/440	6.63	-	1,057	1.0E+02	9E-05	2	--
												Lead	PbB	440/440	33.86	-	38,839	3.7E+03	--	--	47.7

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-3: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SOIL, EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Cancer Risk				Noncancer Hazard Index												
Receptor	Exposure Medium	Exposure Frequency (days/year)	Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
Construction Worker	Soil / Mine Waste (2 to 10 feet bgs)	124	6E-07	7E-08	2E-10	7E-07	0.4	0.01	0.004	0.4	0.1	Lead	PbB	153/153	26.50 - 28,921	1.6E+03	--	--	12.1

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-4: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Cancer Risk				Noncancer Hazard Index												
Receptor	**Exposure Medium**	**Exposure Frequency (days/year)**	**Ingestion**	**Dermal Contact**	**Inhalation**	**Total**	**Ingestion**	**Dermal Contact**	**Inhalation**	**Total**	**Highest Segregated**	**Chemical of Concern**	**Basis**	**Detection Frequency**	**Range of Detected Concentrations (mg/kg)**	**EPC (mg/kg)**	**Chemical-Specific Cancer Risk**	**Chemical-Specific Noncancer HI**	**95th Percentile Blood Lead Level (µg/dL)**
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	1E-05	4E-06	3E-06	**2E-05**	0.1	0.03	0.2	0.3	0.3	Arsenic	C	15/17	14.17 - 1,570	6.8E+02	2E-05	0.3	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	4E-05	1E-05	2E-08	**6E-05**	0.7	0.2	0.0007	0.8	0.8	Arsenic	C	15/17	14.17 - 1,570	6.8E+02	6E-05	0.8	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	4E-06	5E-06	4E-09	1E-05	0.04	0.05	0.0002	0.09	0.08	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	1E-04	2E-05	1E-07	1E-04	1	0.2	0.005	1	1	Arsenic	C	15/17	14.17 - 1,570	6.8E+02	1E-04	0.9	--
												Lead	PbB5	18/18	125.47 - 2,270	1.2E+03	--	--	7.2
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	1E-05	1E-06	3E-09	1E-05	2	0.2	0.004	2	**2**	Arsenic	C, NC	15/17	14.17 - 1,570	6.8E+02	1E-05	2.2	--
												Lead	PbB5	18/18	125.47 - 2,270	1.2E+03	--	--	9.6
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	5E-04	8E-05	5E-07	**6E-04**	13	2	0.02	15	**13**	Arsenic	C, NC	15/17	14.17 - 1,570	6.8E+02	6E-04	13	--
												Lead	PbB	18/18	125.47 - 2,270	1.2E+03	--	--	21.9

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-5: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	0E+00	0E+00	2E-08	2E-08	0.01	0.00001	0.002	0.01	0.008	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	0E+00	0E+00	4E-11	4E-11	0.006	0.00002	0.000004	0.006	0.005	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	0E+00	0E+00	1E-10	1E-10	0.06	0.00005	0.000009	0.06	0.05	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	0E+00	0E+00	3E-11	3E-11	0.004	0.00001	0.000003	0.004	0.003	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	0E+00	0E+00	7E-10	7E-10	0.08	0.00005	0.00006	0.08	0.07	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	0E+00	0E+00	2E-11	2E-11	0.2	0.00007	0.00005	0.2	0.2	Lead	PbB5	18/18	125.47 - 2,270	4.4E+02	--	--	5.1
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	0E+00	0E+00	3E-09	3E-09	1	0.0005	0.0003	1	1	Lead	PbB	18/18	125.47 - 2,270	4.4E+02	--	--	10.4

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-6: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk: Ingestion	Cancer Risk: Dermal Contact	Cancer Risk: Inhalation	Cancer Risk: Total	Noncancer Hazard Index: Ingestion	Noncancer Hazard Index: Dermal Contact	Noncancer Hazard Index: Inhalation	Noncancer Hazard Index: Total	Noncancer Hazard Index: Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	3E-07	1E-07	9E-08	5E-07	0.007	0.001	0.006	0.01	0.009	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-07	2E-07	2E-10	4E-07	0.004	0.002	0.00001	0.006	0.004	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	4E-07	5E-10	2E-06	0.05	0.005	0.00002	0.05	0.03	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-07	2E-07	1E-10	3E-07	0.003	0.001	0.000007	0.004	0.002	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	3E-06	7E-07	3E-09	4E-06	0.06	0.005	0.0002	0.06	0.04	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	3E-07	4E-08	9E-11	4E-07	0.2	0.006	0.0001	0.2	0.09	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-05	2E-06	1E-08	**2E-05**	0.9	0.05	0.0006	0.9	0.5	Arsenic	C	37/58	8.07 - 85	2.0E+01	2E-05	0.4	--
												Lead	PbB5	58/58	21.2 - 1,380	2.5E+02	--	--	6.8

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-7: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Cancer Risk				Noncancer Hazard Index												
Receptor	Exposure Medium	Exposure Frequency (days/year)	Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	5E-06	2E-06	1E-06	8E-06	0.05	0.02	0.09	0.1	0.1	Lead	PbB5	36/36	108.82 -- 6,780	1.9E+03	--	--	5.0
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	3E-06	4E-06	3E-09	6E-06	0.03	0.03	0.0002	0.06	0.06	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-05	6E-06	7E-09	**2E-05**	0.3	0.07	0.0003	0.4	0.3	Arsenic	C	28/36	11.07 - 1,010	3.1E+02	3E-05	0.3	--
												Lead	PbB5	36/36	108.82 - 6,780	1.9E+03	--	--	5.2
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	2E-06	2E-06	2E-09	4E-06	0.018	0.02	0.0001	0.04	0.04	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	5E-05	1E-05	5E-08	**6E-05**	0.4	0.1	0.002	0.5	0.4	Arsenic	C	28/36	11.07 - 1,010	3.1E+02	6E-05	0.4	--
												Lead	PbB	36/36	108.82 - 6,780	1.9E+03	--	--	10.3
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	5E-06	5E-07	1E-09	5E-06	0.9	0.1	0.002	1	1	Lead	PbB	36/36	108.82 - 6,780	1.9E+03	--	--	14.3
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-04	4E-05	2E-07	**3E-04**	6	0.7	0.009	6	6	Arsenic	C, NC	28/36	11.07 - 1,010	3.1E+02	3E-04	6	--
												Lead	PbB	36/36	108.82 - 6,780	1.9E+03	--	--	31.3

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-8: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	7E-07	5E-07	3E-06	0.02	0.006	0.03	0.06	0.05	Lead	PbB5	8/8	123.42 -- 3,480	3.5E+03	--	--	7.0
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	1E-06	1E-09	2E-06	0.014	0.01	0.00006	0.03	0.02	Lead	PbB5	8/8	123.42 -- 3,480	3.5E+03	--	--	5.2
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	7E-06	2E-06	3E-09	9E-06	0.2	0.03	0.0001	0.2	0.1	Lead	PbB5	8/8	123.42 -- 3,480	3.5E+03	--	--	7.4
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	7E-07	9E-07	7E-10	2E-06	0.010	0.008	0.00004	0.02	0.01	Lead	PbB5	8/8	123.42 -- 3,480	3.5E+03	--	--	5.9
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	4E-06	2E-08	**2E-05**	0.2	0.03	0.0009	0.2	0.2	Arsenic	C	5/8	26.53 - 116	1.2E+02	2E-05	0.2	--
												Lead	PbB	8/8	123.42 - 3,480	3.5E+03	--	--	16.5
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	5E-10	2E-06	0.5	0.04	0.0006	0.5	0.4	Lead	PbB	8/8	123.42 - 3,480	3.5E+03	--	--	23.7
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	9E-05	1E-05	8E-08	**1E-04**	3	0.3	0.004	3	**2**	Arsenic	C, NC	5/8	26.53 - 116	1.2E+02	1E-04	2	--
												Lead	PbB	8/8	123.42 - 3,480	3.5E+03	--	--	46.2

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-9: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk: Ingestion	Cancer Risk: Dermal Contact	Cancer Risk: Inhalation	Cancer Risk: Total	Noncancer Hazard Index: Ingestion	Noncancer Hazard Index: Dermal Contact	Noncancer Hazard Index: Inhalation	Noncancer Hazard Index: Total	Noncancer Hazard Index: Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	4E-06	1E-06	1E-06	6E-06	0.05	0.01	0.3	0.3	0.3	Lead	PbB5	105/105	43.05 - 30,700	5.2E+03	--	--	9.30
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-06	3E-06	2E-09	5E-06	0.03	0.02	0.0005	0.05	0.04	Lead	PbB5	105/105	43.05 - 30,700	5.2E+03	--	--	6.6
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-05	5E-06	6E-09	**2E-05**	0.3	0.06	0.001	0.4	0.3	Arsenic	C	84/106	13.65 - 667	2.3E+02	2E-05	0.3	--
												Lead	PbB5	105/105	43.05 - 30,700	5.2E+03	--	--	9.5
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-06	2E-06	1E-09	3E-06	0.018	0.02	0.0004	0.03	0.03	Lead	PbB5	105/105	43.05 - 30,700	5.2E+03	--	--	7.6
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	4E-05	8E-06	4E-08	**5E-05**	0.4	0.06	0.007	0.4	0.3	Arsenic	C	84/106	13.65 - 667	2.3E+02	5E-05	0.3	--
												Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	23.5
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	4E-06	4E-07	1E-09	4E-06	0.9	0.1	0.005	1	0.7	Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	34.1
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-04	3E-05	2E-07	**2E-04**	6	0.5	0.03	6	**4**	Arsenic	C, NC	84/106	13.65 - 667	2.3E+02	2E-04	4	--
												Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	58.9

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-10: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SURFACE SOIL, EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	--	--	--	--	0.006	--	--	0.006	0.006	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	--	--	--	--	0.04	--	--	0.04	0.04	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	--	--	--	--	0.003	--	--	0.003	0.003	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	--	--	--	--	0.05	--	--	0.05	0.05	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	--	--	--	--	0.1	--	--	0.1	0.1	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	--	--	--	--	0.8	--	--	0.8	0.8	--	--	--	--	--	--	--	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-11: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SOIL, EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Soil / Mine Waste (2 to 10 feet bgs)	124	1E-05	1E-06	3E-09	1E-05	2	0.2	0.004	3	**2**	Arsenic	NC	13/13	18.60 - 1,370	7.5E+02	1E-05	2	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-12: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	3E-07	1E-07	1E-07	5E-07	0.01	0.001	0.09	0.1	0.09	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-07	2E-07	2E-10	4E-07	0.006	0.002	0.0002	0.008	0.004	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	4E-07	5E-10	2E-06	0.07	0.005	0.0003	0.07	0.03	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-07	2E-07	1E-10	3E-07	0.004	0.001	0.0001	0.006	0.002	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	3E-06	7E-07	3E-09	4E-06	0.08	0.005	0.002	0.09	0.04	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	3E-07	4E-08	1E-10	4E-07	0.2	0.006	0.0001	0.2	0.09	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-05	2E-06	1E-08	**2E-05**	1	0.05	0.01	1	0.6	Arsenic	C	15/30	11.00 - 53	2.1E+01	2E-05	0.6	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-13: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SURFACE SOIL, EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Cancer Risk				Noncancer Hazard Index												
Receptor	**Exposure Medium**	**Exposure Frequency (days/year)**	**Ingestion**	**Dermal Contact**	**Inhalation**	**Total**	**Ingestion**	**Dermal Contact**	**Inhalation**	**Total**	**Highest Segregated**	**Chemical of Concern**	**Basis**	**Detection Frequency**	**Range of Detected Concentrations (mg/kg)**	**EPC (mg/kg)**	**Chemical-Specific Cancer Risk**	**Chemical-Specific Noncancer HI**	**95th Percentile Blood Lead Level (µg/dL)**
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	8E-07	7E-07	4E-06	0.03	0.007	0.2	0.3	0.2	Lead	PbB5	200/200	26.36 -- 21,699	2.0E+03	--	--	5.10
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	2E-06	1E-09	3E-06	0.02	0.01	0.0004	0.04	0.02	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	8E-06	3E-06	3E-09	1E-05	0.23	0.03	0.0009	0.3	0.2	Lead	PbB5	200/200	26.36 -- 21,699	2.0E+03	--	--	5.30
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	9E-07	1E-06	9E-10	2E-06	0.014	0.009	0.0003	0.02	0.02	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	5E-06	2E-08	**3E-05**	0.3	0.03	0.006	0.3	0.2	Arsenic	C	182/200	9.25 - 616	1.4E+02	3E-05	0.2	--
												Lead	PbB	200/200	26.36 - 21,699	2.0E+03	--	--	10.7
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	7E-10	2E-06	0.7	0.04	0.005	0.8	0.4	Lead	PbB	200/200	26.36 - 21,699	2.0E+03	--	--	14.9
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	1E-04	2E-05	1E-07	**1E-04**	4	0.3	0.03	5	**3**	Arsenic	C, NC	182/200	9.25 - 616	1.4E+02	1E-04	3	--
												Lead	PbB	200/200	26.36 - 21,699	2.0E+03	--	--	32.5

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-14: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SOIL, EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Subsurface Soil / Mine Waste (2 to 10 feet bgs)	124	1E-06	2E-07	6E-10	2E-06	0.8	0.04	0.007	0.8	0.3	Lead	PbB	113/114	29.00 - 24,892	4.5E+03	--	--	30.2

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-15: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SEDIMENT, EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Cancer Risk				Noncancer Hazard Index												
Receptor	Exposure Medium	Exposure Frequency (days/year)	Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
Fisherman	Stream Sediment (0 to 2 feet bgs)	24	7E-07	8E-07	8E-07	2E-06	0.02	0.007	0.007	0.03	0.013	--	--	--	--	--	--	--	--
Rock Hound	Stream Sediment (0 to 2 feet bgs)	24	4E-06	1E-05	2E-09	**2E-05**	0.2	0.39	0.002	0.6	0.4	Arsenic	C	289/293	0.95 - 507	7.0E+01	2E-05	0.4	--
												Lead	PbB5	293/293	1.86 J - 30,867	2.2E+03	--	--	5.6
Industrial Worker	Stream Sediment (0 to 2 feet bgs)	165	1E-05	3E-06	1E-08	1E-05	0.3	0.02	0.014	0.3	0.2	Lead	PbB	293/293	1.86 J - 30,867	2.2E+03	--	--	11.4
Construction Worker	Stream Sediment (0 to 2 feet bgs)	124	1E-06	1E-07	3E-10	1E-06	0.7	0.02	0.01	0.8	0.4	Lead	PbB	293/293	1.86 J - 30,867	2.2E+03	--	--	16.0
Modified Resident	Stream Sediment (0 to 2 feet bgs)	50	1E-05	3E-05	4E-09	**4E-05**	0.9	0.80	0.004	1.7	1.0	Arsenic	C	289/293	0.95 - 507	7.0E+01	4E-05	1.0	--
												Lead	PbB5	293/293	1.86 J - 30,867	2.2E+03	--	--	8.9

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
J	Estimated value
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-16: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SEDIMENT, EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk: Ingestion	Cancer Risk: Dermal Contact	Cancer Risk: Inhalation	Cancer Risk: Total	Noncancer Hazard Index: Ingestion	Noncancer Hazard Index: Dermal Contact	Noncancer Hazard Index: Inhalation	Noncancer Hazard Index: Total	Noncancer Hazard Index: Highest Segregated	Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)			EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
Construction Worker	Stream Sediment (2 to 10 feet bgs)	124	5E-07	5E-08	1E-10	6E-07	0.3	0.01	0.003	0.3	0.1	Lead	PbB5	61/61	43.43	-	3,019	6.6E+02	--	--	6.4

Notes:

(a) Inhalation exposure for sediment was not evaluated for the fisherman receptor (see Section 4.4).

--	Not applicable
µg/dL	Microgram per deciliter
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
J	Estimated value
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling at 10 µg/dL
PbB5	Blood lead modeling at 5 µg/dL
UBMC	Upper Blackfoot Mining Complex

TABLE 9-17: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SEDIMENT, EU 13 - STREAM SEDIMENTS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (b)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Fisherman	Stream Sediment (0 to 2 feet bgs)	24	2E-07	2E-07	2E-07	6E-07	0.009	0.002	0.002	0.013	0.005	--	--	--	--	--	--	--	--
Rock Hound	Stream Sediment (0 to 2 feet bgs)	24	1E-06	4E-06	5E-10	5E-06	0.1	0.111	0.0009	0.2	0.1	--	--	--	--	--	--	--	--
Industrial Worker	Stream Sediment (0 to 2 feet bgs)	165	3E-06	1E-06	3E-09	4E-06	0.13	0.007	0.006	0.1	0.07	--	--	--	--	--	--	--	--
Construction Worker	Stream Sediment (0 to 2 feet bgs)	124	3E-07	3E-08	1E-10	4E-07	0.3	0.006	0.004	0.3	0.2	--	--	--	--	--	--	--	--
Modified Resident	Stream Sediment (0 to 2 feet bgs)	50	3E-06	8E-06	1E-09	1E-05	0.4	0.2	0.002	0.6	0.3	--	--	--	--	--	--	--	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
J	Estimated value
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE 9-18: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SURFACE WATER, FISH INGESTION

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard Index		Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI
			Total (a)	Total (a)	Highest Segregated							
Adult Fisherman	Surface Water (Fish Ingestion)	24	--	0.7	0.5	--	--	--	--	--	--	--
Child Fisherman	Surface Water (Fish Ingestion)	24	--	0.1	0.1	--	--	--	--	--	--	--

Notes:

(a) Total cancer risk and noncancer hazard index are evaluated for fish ingestion only; dermal and inhalation pathways are not complete for the surface water scenario.

-- Not applicable
EPC Exposure point concentration
HI Hazard index
mg/kg Milligram per kilogram

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Site Samples - Alluvial Groundwater Monitoring Wells							
Mike Horse Mine Waste Piles (EU 8) - Alluvial Groundwater							
MHGW-109 (2007)	10/12/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
MHGW-109 (2007)	10/12/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MHGW-109 (2007)	10/12/2007	Cadmium	0.03074	0.00008 U - 0.00156	0.005	Yes	6
MHGW-109 (2007)	10/12/2007	Copper	0.042	0.001 U - 0.08	1.3	No	--
MHGW-109 (2007)	10/12/2007	Iron	0.03	0.03 U - 14.96	14	No	--
MHGW-109 (2007)	10/12/2007	Lead	0.0012	0.0005 U - 0.0027	0.015	No	--
MHGW-109 (2007)	10/12/2007	Manganese	0.098	0.005 U - 0.897	0.94	No	--
MHGW-109 (2007)	10/12/2007	Zinc	7.24	0.01 U - 0.3	2	Yes	4
MHGW-109 (2008)	7/8/2008	Aluminum	0.13	0.03 U - 4.51	20	No	--
MHGW-109 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MHGW-109 (2008)	7/8/2008	Cadmium	0.05209	0.00008 U - 0.00156	0.005	Yes	10
MHGW-109 (2008)	7/8/2008	Copper	0.136	0.001 U - 0.08	1.3	No	--
MHGW-109 (2008)	7/8/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
MHGW-109 (2008)	7/8/2008	Lead	0.004	0.0005 U - 0.0027	0.015	No	--
MHGW-109 (2008)	7/8/2008	Manganese	0.567	0.005 U - 0.897	0.94	No	--
MHGW-109 (2008)	7/8/2008	Zinc	11.08	0.01 U - 0.3	2	Yes	6
MHGW-112 (2007)	10/26/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
MHGW-112 (2007)	10/26/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MHGW-112 (2007)	10/26/2007	Cadmium	0.00957	0.00008 U - 0.00156	0.005	Yes	2
MHGW-112 (2007)	10/26/2007	Copper	0.002	0.001 U - 0.08	1.3	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Alluvial Groundwater (continued)							
MHGW-112 (2007)	10/26/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
MHGW-112 (2007)	10/26/2007	Lead	0.001	0.0005 U - 0.0027	0.015	No	--
MHGW-112 (2007)	10/26/2007	Manganese	1.12	0.005 U - 0.897	0.94	Yes	1
MHGW-112 (2007)	10/26/2007	Zinc	1.79	0.01 U - 0.3	2	No	--
MHGW-112 (2008)	7/8/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
MHGW-112 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MHGW-112 (2008)	7/8/2008	Cadmium	0.0073	0.00008 U - 0.00156	0.005	Yes	1
MHGW-112 (2008)	7/8/2008	Copper	0.002	0.001 U - 0.08	1.3	No	--
MHGW-112 (2008)	7/8/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
MHGW-112 (2008)	7/8/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
MHGW-112 (2008)	7/8/2008	Manganese	0.005 U	0.005 U - 0.897	0.94	No	--
MHGW-112 (2008)	7/8/2008	Zinc	1.79	0.01 U - 0.3	2	No	--
UMHMW-1S (2008)	7/9/2008	Aluminum	58.52	0.03 U - 4.51	20	Yes	3
UMHMW-1S (2008)	7/9/2008	Arsenic	0.006	0.002 U - 0.002 U	0.01	No	--
UMHMW-1S (2008)	7/9/2008	Cadmium	1.061	0.00008 U - 0.00156	0.005	Yes	212
UMHMW-1S (2008)	7/9/2008	Copper	46.5	0.001 U - 0.08	1.3	Yes	36
UMHMW-1S (2008)	7/9/2008	Iron	0.05	0.03 U - 14.96	14	No	--
UMHMW-1S (2008)	7/9/2008	Lead	1.01	0.0005 U - 0.0027	0.015	Yes	67
UMHMW-1S (2008)	7/9/2008	Manganese	148.8	0.005 U - 0.897	0.94	Yes	158
UMHMW-1S (2008)	7/9/2008	Zinc	194.8	0.01 U - 0.3	2	Yes	97

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Alluvial Groundwater (continued)							
UMHMW-2S (2007)	10/11/2007	Aluminum	54.55	0.03 U - 4.51	20	Yes	3
UMHMW-2S (2007)	10/11/2007	Arsenic	0.003	0.002 U - 0.002 U	0.01	No	--
UMHMW-2S (2007)	10/11/2007	Cadmium	1.209	0.00008 U - 0.00156	0.005	Yes	242
UMHMW-2S (2007)	10/11/2007	Copper	50.4	0.001 U - 0.08	1.3	Yes	39
UMHMW-2S (2007)	10/11/2007	Iron	0.12	0.03 U - 14.96	14	No	--
UMHMW-2S (2007)	10/11/2007	Lead	1.191	0.0005 U - 0.0027	0.015	Yes	79
UMHMW-2S (2007)	10/11/2007	Manganese	66.05	0.005 U - 0.897	0.94	Yes	70
UMHMW-2S (2007)	10/11/2007	Zinc	149	0.01 U - 0.3	2	Yes	75
UMHMW-2S (2008)	7/9/2008	Aluminum	21.58	0.03 U - 4.51	20	Yes	1
UMHMW-2S (2008)	7/9/2008	Arsenic	0.005	0.002 U - 0.002 U	0.01	No	--
UMHMW-2S (2008)	7/9/2008	Cadmium	0.6406	0.00008 U - 0.00156	0.005	Yes	128
UMHMW-2S (2008)	7/9/2008	Copper	27.38	0.001 U - 0.08	1.3	Yes	21
UMHMW-2S (2008)	7/9/2008	Iron	0.12	0.03 U - 14.96	14	No	--
UMHMW-2S (2008)	7/9/2008	Lead	0.7229	0.0005 U - 0.0027	0.015	Yes	48
UMHMW-2S (2008)	7/9/2008	Manganese	37.36	0.005 U - 0.897	0.94	Yes	40
UMHMW-2S (2008)	7/9/2008	Zinc	83.7	0.01 U - 0.3	2	Yes	42

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area and Overbank Tailings Deposits and Flossie Louise Mine Waste Piles (EU 11) - Alluvial Groundwater							
BCGW-115 (2007)	10/26/2007	Aluminum	0.04	0.03 U - 4.51	20	No	--
BCGW-115 (2007)	10/26/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
BCGW-115 (2007)	10/26/2007	Cadmium	0.00018	0.00008 U - 0.00156	0.005	No	--
BCGW-115 (2007)	10/26/2007	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
BCGW-115 (2007)	10/26/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
BCGW-115 (2007)	10/26/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
BCGW-115 (2007)	10/26/2007	Manganese	0.015	0.005 U - 0.897	0.94	No	--
BCGW-115 (2007)	10/26/2007	Zinc	0.03	0.01 U - 0.3	2	No	--
BCGW-115 (2008)	7/9/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
BCGW-115 (2008)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
BCGW-115 (2008)	7/9/2008	Cadmium	0.00018	0.00008 U - 0.00156	0.005	No	--
BCGW-115 (2008)	7/9/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
BCGW-115 (2008)	7/9/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
BCGW-115 (2008)	7/9/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
BCGW-115 (2008)	7/9/2008	Manganese	0.005 U	0.005 U - 0.897	0.94	No	--
BCGW-115 (2008)	7/9/2008	Zinc	0.02	0.01 U - 0.3	2	No	--
BCMW-10 (2007)	10/17/2007	Aluminum	0.65	0.03 U - 4.51	20	No	--
BCMW-10 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
BCMW-10 (2007)	10/17/2007	Cadmium	0.08425	0.00008 U - 0.00156	0.005	Yes	17

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area and Overbank Tailings Deposits and Flossie Louise Mine Waste Piles (EU 11) - Alluvial Groundwater (continued)							
BCMW-10 (2007)	10/17/2007	Copper	0.176	0.001 U - 0.08	1.3	No	--
BCMW-10 (2007)	10/17/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
BCMW-10 (2007)	10/17/2007	Lead	0.0352	0.0005 U - 0.0027	0.015	Yes	2
BCMW-10 (2007)	10/17/2007	Manganese	6.74	0.005 U - 0.897	0.94	Yes	7
BCMW-10 (2007)	10/17/2007	Zinc	13.97	0.01 U - 0.3	2	Yes	7
BCMW-10 (2008)	7/7/2008	Aluminum	0.66	0.03 U - 4.51	20	No	--
BCMW-10 (2008)	7/7/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
BCMW-10 (2008)	7/7/2008	Cadmium	0.08954	0.00008 U - 0.00156	0.005	Yes	18
BCMW-10 (2008)	7/7/2008	Copper	0.156	0.001 U - 0.08	1.3	No	--
BCMW-10 (2008)	7/7/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
BCMW-10 (2008)	7/7/2008	Lead	0.0492	0.0005 U - 0.0027	0.015	Yes	3
BCMW-10 (2008)	7/7/2008	Manganese	5.24	0.005 U - 0.897	0.94	Yes	6
BCMW-10 (2008)	7/7/2008	Zinc	17.35	0.01 U - 0.3	2	Yes	9
Upper Anaconda Mine Waste Removal Areas and Waste Piles (EU 1) - Alluvial Groundwater							
ANMW-7 (2007)	10/12/2007	Aluminum	0.04 BJ	0.03 U - 4.51	20	No	--
ANMW-7 (2007)	10/12/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
ANMW-7 (2007)	10/12/2007	Cadmium	0.00241	0.00008 U - 0.00156	0.005	No	--
ANMW-7 (2007)	10/12/2007	Copper	0.069	0.001 U - 0.08	1.3	No	--
ANMW-7 (2007)	10/12/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
ANMW-7 (2007)	10/12/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Upper Anaconda Mine Waste Removal Areas and Waste Piles (EU 1) - Alluvial Groundwater (continued)							
ANMW-7 (2007)	10/12/2007	Manganese	0.245	0.005 U - 0.897	0.94	No	--
ANMW-7 (2007)	10/12/2007	Zinc	0.54	0.01 U - 0.3	2	No	--
ANMW-7 (2008)	7/9/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
ANMW-7 (2008)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
ANMW-7 (2008)	7/9/2008	Cadmium	0.00095	0.00008 U - 0.00156	0.005	No	--
ANMW-7 (2008)	7/9/2008	Copper	0.021	0.001 U - 0.08	1.3	No	--
ANMW-7 (2008)	7/9/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
ANMW-7 (2008)	7/9/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
ANMW-7 (2008)	7/9/2008	Manganese	0.051	0.005 U - 0.897	0.94	No	--
ANMW-7 (2008)	7/9/2008	Zinc	0.37	0.01 U - 0.3	2	No	--
ANWS-1 (2007)	10/12/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
ANWS-1 (2007)	10/12/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
ANWS-1 (2007)	10/12/2007	Cadmium	0.00009	0.00008 U - 0.00156	0.005	No	--
ANWS-1 (2007)	10/12/2007	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
ANWS-1 (2007)	10/12/2007	Iron	0.07	0.03 U - 14.96	14	No	--
ANWS-1 (2007)	10/12/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
ANWS-1 (2007)	10/12/2007	Manganese	0.008	0.005 U - 0.897	0.94	No	--
ANWS-1 (2007)	10/12/2007	Zinc	0.01 U	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Upper Anaconda Mine Waste Removal Areas and Waste Piles (EU 1) - Alluvial Groundwater (continued)							
ANWS-1 (2008)	7/8/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
ANWS-1 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
ANWS-1 (2008)	7/8/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
ANWS-1 (2008)	7/8/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
ANWS-1 (2008)	7/8/2008	Iron	0.06	0.03 U - 14.96	14	No	--
ANWS-1 (2008)	7/8/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
ANWS-1 (2008)	7/8/2008	Manganese	0.007	0.005 U - 0.897	0.94	No	--
ANWS-1 (2008)	7/8/2008	Zinc	0.01	0.01 U - 0.3	2	No	--
Mary P. Mine Waste Pile (EU 7) - Alluvial Groundwater							
MPP-4 (2007)	10/18/2007	Aluminum	0.29	0.03 U - 4.51	20	No	--
MPP-4 (2007)	10/18/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MPP-4 (2007)	10/18/2007	Cadmium	0.00254	0.00008 U - 0.00156	0.005	No	--
MPP-4 (2007)	10/18/2007	Copper	0.07	0.001 U - 0.08	1.3	No	--
MPP-4 (2007)	10/18/2007	Iron	0.12	0.03 U - 14.96	14	No	--
MPP-4 (2007)	10/18/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
MPP-4 (2007)	10/18/2007	Manganese	0.166	0.005 U - 0.897	0.94	No	--
MPP-4 (2007)	10/18/2007	Zinc	0.46	0.01 U - 0.3	2	No	--
MPP-4 (2008A)	7/9/2008	Aluminum	1.21	0.03 U - 4.51	20	No	--
MPP-4 (2008A)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MPP-4 (2008A)	7/9/2008	Cadmium	0.00338	0.00008 U - 0.00156	0.005	No	--
MPP-4 (2008A)	7/9/2008	Copper	0.104	0.001 U - 0.08	1.3	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mary P. Mine Waste Pile (EU 7) - Alluvial Groundwater (continued)							
MPP-4 (2008A)	7/9/2008	Iron	0.03	0.03 U - 14.96	14	No	--
MPP-4 (2008A)	7/9/2008	Lead	0.0012	0.0005 U - 0.0027	0.015	No	--
MPP-4 (2008A)	7/9/2008	Manganese	0.174	0.005 U - 0.897	0.94	No	--
MPP-4 (2008A)	7/9/2008	Zinc	0.71	0.01 U - 0.3	2	No	--
MPP-4 (2008B)	7/29/2008	Aluminum	1.15	0.03 U - 4.51	20	No	--
MPP-4 (2008B)	7/29/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
MPP-4 (2008B)	7/29/2008	Cadmium	0.00298	0.00008 U - 0.00156	0.005	No	--
MPP-4 (2008B)	7/29/2008	Copper	0.108	0.001 U - 0.08	1.3	No	--
MPP-4 (2008B)	7/29/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
MPP-4 (2008B)	7/29/2008	Lead	0.019	0.0005 U - 0.0027	0.015	Yes	1
MPP-4 (2008B)	7/29/2008	Manganese	0.13	0.005 U - 0.897	0.94	No	--
MPP-4 (2008B)	7/29/2008	Zinc	0.67	0.01 U - 0.3	2	No	--
Number 3 Tunnel Waste Area (EU 10) - Alluvial Groundwater							
SGGW-101 (2007)	10/15/2007	Aluminum	1.72	0.03 U - 4.51	20	No	--
SGGW-101 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SGGW-101 (2007)	10/15/2007	Cadmium	0.00048 J	0.00008 U - 0.00156	0.005	No	--
SGGW-101 (2007)	10/15/2007	Copper	0.266	0.001 U - 0.08	1.3	No	--
SGGW-101 (2007)	10/15/2007	Iron	0.1	0.03 U - 14.96	14	No	--
SGGW-101 (2007)	10/15/2007	Lead	0.0007 J	0.0005 U - 0.0027	0.015	No	--
SGGW-101 (2007)	10/15/2007	Manganese	0.164	0.005 U - 0.897	0.94	No	--
SGGW-101 (2007)	10/15/2007	Zinc	0.23	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Number 3 Tunnel Waste Area (EU 10) - Alluvial Groundwater (continued)							
SGGW-101 (2008)	7/10/2008	Aluminum	1.73	0.03 U - 4.51	20	No	--
SGGW-101 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SGGW-101 (2008)	7/10/2008	Cadmium	0.00053	0.00008 U - 0.00156	0.005	No	--
SGGW-101 (2008)	7/10/2008	Copper	0.223	0.001 U - 0.08	1.3	No	--
SGGW-101 (2008)	7/10/2008	Iron	0.29	0.03 U - 14.96	14	No	--
SGGW-101 (2008)	7/10/2008	Lead	0.0019	0.0005 U - 0.0027	0.015	No	--
SGGW-101 (2008)	7/10/2008	Manganese	0.158	0.005 U - 0.897	0.94	No	--
SGGW-101 (2008)	7/10/2008	Zinc	0.2	0.01 U - 0.3	2	No	--
Shave Gulch (a) - Alluvial Groundwater							
SHGW101 (2008)	7/31/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
SHGW101 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SHGW101 (2008)	7/31/2008	Cadmium	0.00013	0.00008 U - 0.00156	0.005	No	--
SHGW101 (2008)	7/31/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
SHGW101 (2008)	7/31/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
SHGW101 (2008)	7/31/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
SHGW101 (2008)	7/31/2008	Manganese	0.005 U	0.005 U - 0.897	0.94	No	--
SHGW101 (2008)	7/31/2008	Zinc	0.05	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes
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TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Edith Mine Waste Areas (EU 5) - Alluvial Groundwater							
EDMW-2 (2007)	10/17/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
EDMW-2 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
EDMW-2 (2007)	10/17/2007	Cadmium	0.00039	0.00008 U - 0.00156	0.005	No	--
EDMW-2 (2007)	10/17/2007	Copper	0.002	0.001 U - 0.08	1.3	No	--
EDMW-2 (2007)	10/17/2007	Iron	1.84	0.03 U - 14.96	14	No	--
EDMW-2 (2007)	10/17/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
EDMW-2 (2007)	10/17/2007	Manganese	1.039	0.005 U - 0.897	0.94	Yes	1
EDMW-2 (2007)	10/17/2007	Zinc	0.07	0.01 U - 0.3	2	No	--
EDMW-2 (2008)	7/10/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
EDMW-2 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
EDMW-2 (2008)	7/10/2008	Cadmium	0.00046	0.00008 U - 0.00156	0.005	No	--
EDMW-2 (2008)	7/10/2008	Copper	0.002	0.001 U - 0.08	1.3	No	--
EDMW-2 (2008)	7/10/2008	Iron	1.24	0.03 U - 14.96	14	No	--
EDMW-2 (2008)	7/10/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
EDMW-2 (2008)	7/10/2008	Manganese	0.56	0.005 U - 0.897	0.94	No	--
EDMW-2 (2008)	7/10/2008	Zinc	0.02	0.01 U - 0.3	2	No	--
EDP-2 (2007)	10/17/2007	Aluminum	3.73	0.03 U - 4.51	20	No	--
EDP-2 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
EDP-2 (2007)	10/17/2007	Cadmium	0.00115	0.00008 U - 0.00156	0.005	No	--
EDP-2 (2007)	10/17/2007	Copper	0.117	0.001 U - 0.08	1.3	No	--
EDP-2 (2007)	10/17/2007	Iron	23.98	0.03 U - 14.96	14	Yes	2

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Edith Mine Waste Areas (EU 5) - Alluvial Groundwater (continued)							
EDP-2 (2007)	10/17/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
EDP-2 (2007)	10/17/2007	Manganese	1.499	0.005 U - 0.897	0.94	Yes	2
EDP-2 (2007)	10/17/2007	Zinc	0.58	0.01 U - 0.3	2	No	--
EDP-2 (2008)	7/10/2008	Aluminum	4.2	0.03 U - 4.51	20	No	--
EDP-2 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
EDP-2 (2008)	7/10/2008	Cadmium	0.00122	0.00008 U - 0.00156	0.005	No	--
EDP-2 (2008)	7/10/2008	Copper	0.118	0.001 U - 0.08	1.3	No	--
EDP-2 (2008)	7/10/2008	Iron	24.15	0.03 U - 14.96	14	Yes	2
EDP-2 (2008)	7/10/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
EDP-2 (2008)	7/10/2008	Manganese	1.541	0.005 U - 0.897	0.94	Yes	2
EDP-2 (2008)	7/10/2008	Zinc	0.64	0.01 U - 0.3	2	No	--
Pass Creek (a) - Alluvial Groundwater							
PDGW101 (2008)	7/31/2008	Aluminum	3.47	0.03 U - 4.51	20	No	--
PDGW101 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PDGW101 (2008)	7/31/2008	Cadmium	0.0014	0.00008 U - 0.00156	0.005	No	--
PDGW101 (2008)	7/31/2008	Copper	0.08	0.001 U - 0.08	1.3	No	--
PDGW101 (2008)	7/31/2008	Iron	8.7	0.03 U - 14.96	14	No	--
PDGW101 (2008)	7/31/2008	Lead	0.0027	0.0005 U - 0.0027	0.015	No	--
PDGW101 (2008)	7/31/2008	Manganese	0.668	0.005 U - 0.897	0.94	No	--
PDGW101 (2008)	7/31/2008	Zinc	0.3	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Pass Creek (a) - Alluvial Groundwater (continued)							
PGPZ-1 (2008)	7/16/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
PGPZ-1 (2008)	7/16/2008	Arsenic	0.04	0.002 U - 0.002 U	0.01	Yes	4
PGPZ-1 (2008)	7/16/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
PGPZ-1 (2008)	7/16/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
PGPZ-1 (2008)	7/16/2008	Iron	18.56	0.03 U - 14.96	14	Yes	1
PGPZ-1 (2008)	7/16/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PGPZ-1 (2008)	7/16/2008	Manganese	2.149	0.005 U - 0.897	0.94	Yes	2
PGPZ-1 (2008)	7/16/2008	Zinc	0.02	0.01 U - 0.3	2	No	--
Upper Marsh (EU 12) - Alluvial Groundwater							
UMPZ-1 (2008)	7/15/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
UMPZ-1 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
UMPZ-1 (2008)	7/15/2008	Cadmium	0.00955	0.00008 U - 0.00156	0.005	Yes	2
UMPZ-1 (2008)	7/15/2008	Copper	0.003	0.001 U - 0.08	1.3	No	--
UMPZ-1 (2008)	7/15/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
UMPZ-1 (2008)	7/15/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
UMPZ-1 (2008)	7/15/2008	Manganese	0.055	0.005 U - 0.897	0.94	No	--
UMPZ-1 (2008)	7/15/2008	Zinc	4.08	0.01 U - 0.3	2	Yes	2
UMPZ-2 (2008)	7/15/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
UMPZ-2 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
UMPZ-2 (2008)	7/15/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
UMPZ-2 (2008)	7/15/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Upper Marsh (EU 12) - Alluvial Groundwater							
UMPZ-2 (2008)	7/15/2008	Iron	27.8	0.03 U - 14.96	14	Yes	2
UMPZ-2 (2008)	7/15/2008	Lead	0.0006	0.0005 U - 0.0027	0.015	No	--
UMPZ-2 (2008)	7/15/2008	Manganese	1.503	0.005 U - 0.897	0.94	Yes	2
UMPZ-2 (2008)	7/15/2008	Zinc	0.01	0.01 U - 0.3	2	No	--
UMPZ-3 (2008)	7/15/2008	Aluminum	0.03	0.03 U - 4.51	20	No	--
UMPZ-3 (2008)	7/15/2008	Arsenic	0.011	0.002 U - 0.002 U	0.01	Yes	1
UMPZ-3 (2008)	7/15/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
UMPZ-3 (2008)	7/15/2008	Copper	0.002	0.001 U - 0.08	1.3	No	--
UMPZ-3 (2008)	7/15/2008	Iron	28.84	0.03 U - 14.96	14	Yes	2
UMPZ-3 (2008)	7/15/2008	Lead	0.0019	0.0005 U - 0.0027	0.015	No	--
UMPZ-3 (2008)	7/15/2008	Manganese	3.074	0.005 U - 0.897	0.94	Yes	3
UMPZ-3 (2008)	7/15/2008	Zinc	0.08	0.01 U - 0.3	2	No	--
Upper Marsh (EU 12) - Alluvial Groundwater (continued)							
UMPZ-4 (2008)	7/15/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
UMPZ-4 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
UMPZ-4 (2008)	7/15/2008	Cadmium	0.00191	0.00008 U - 0.00156	0.005	No	--
UMPZ-4 (2008)	7/15/2008	Copper	0.001	0.001 U - 0.08	1.3	No	--
UMPZ-4 (2008)	7/15/2008	Iron	1.67	0.03 U - 14.96	14	No	--
UMPZ-4 (2008)	7/15/2008	Lead	0.0005	0.0005 U - 0.0027	0.015	No	--
UMPZ-4 (2008)	7/15/2008	Manganese	3.027	0.005 U - 0.897	0.94	Yes	3
UMPZ-4 (2008)	7/15/2008	Zinc	0.3	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Upper Marsh (EU 12) - Alluvial Groundwater (continued)							
UMPZ-5 (2008)	7/15/2008	Aluminum	0.85	0.03 U - 4.51	20	No	--
UMPZ-5 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
UMPZ-5 (2008)	7/15/2008	Cadmium	0.00009	0.00008 U - 0.00156	0.005	No	--
UMPZ-5 (2008)	7/15/2008	Copper	0.002	0.001 U - 0.08	1.3	No	--
UMPZ-5 (2008)	7/15/2008	Iron	24.63	0.03 U - 14.96	14	Yes	2
UMPZ-5 (2008)	7/15/2008	Lead	0.0006	0.0005 U - 0.0027	0.015	No	--
UMPZ-5 (2008)	7/15/2008	Manganese	0.756	0.005 U - 0.897	0.94	No	--
UMPZ-5 (2008)	7/15/2008	Zinc	0.25	0.01 U - 0.3	2	No	--
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater							
PMGW-116 (2007)	10/25/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
PMGW-116 (2007)	10/25/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-116 (2007)	10/25/2007	Cadmium	0.00263	0.00008 U - 0.00156	0.005	No	--
PMGW-116 (2007)	10/25/2007	Copper	0.004	0.001 U - 0.08	1.3	No	--
PMGW-116 (2007)	10/25/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMGW-116 (2007)	10/25/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMGW-116 (2007)	10/25/2007	Manganese	0.023	0.005 U - 0.897	0.94	No	--
PMGW-116 (2007)	10/25/2007	Zinc	0.3	0.01 U - 0.3	2	No	--
PMGW-116 (2008)	7/14/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
PMGW-116 (2008)	7/14/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-116 (2008)	7/14/2008	Cadmium	0.00222	0.00008 U - 0.00156	0.005	No	--
PMGW-116 (2008)	7/14/2008	Copper	0.003	0.001 U - 0.08	1.3	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater (continued)							
PMGW-116 (2008)	7/14/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMGW-116 (2008)	7/14/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMGW-116 (2008)	7/14/2008	Manganese	0.005	0.005 U - 0.897	0.94	No	--
PMGW-116 (2008)	7/14/2008	Zinc	0.29	0.01 U - 0.3	2	No	--
PMGW-117 (2007)	10/25/2007	Aluminum	2.74	0.03 U - 4.51	20	No	--
PMGW-117 (2007)	10/25/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-117 (2007)	10/25/2007	Cadmium	0.00562	0.00008 U - 0.00156	0.005	Yes	1
PMGW-117 (2007)	10/25/2007	Copper	0.895	0.001 U - 0.08	1.3	No	--
PMGW-117 (2007)	10/25/2007	Iron	0.05	0.03 U - 14.96	14	No	--
PMGW-117 (2007)	10/25/2007	Lead	0.0021	0.0005 U - 0.0027	0.015	No	--
PMGW-117 (2007)	10/25/2007	Manganese	0.938	0.005 U - 0.897	0.94	No	--
PMGW-117 (2007)	10/25/2007	Zinc	0.82	0.01 U - 0.3	2	No	--
PMGW-117 (2008)	7/14/2008	Aluminum	5.31	0.03 U - 4.51	20	No	--
PMGW-117 (2008)	7/14/2008	Arsenic	0.0002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-117 (2008)	7/14/2008	Cadmium	0.00431	0.00008 U - 0.00156	0.005	No	--
PMGW-117 (2008)	7/14/2008	Copper	1.029	0.001 U - 0.08	1.3	No	--
PMGW-117 (2008)	7/14/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMGW-117 (2008)	7/14/2008	Lead	0.0032	0.0005 U - 0.0027	0.015	No	--
PMGW-117 (2008)	7/14/2008	Manganese	0.783	0.005 U - 0.897	0.94	No	--
PMGW-117 (2008)	7/14/2008	Zinc	0.69	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater (continued)							
PMGW-118 (2007)	10/18/2007	Aluminum	0.29	0.03 U - 4.51	20	No	--
PMGW-118 (2007)	10/18/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-118 (2007)	10/18/2007	Cadmium	0.0022	0.00008 U - 0.00156	0.005	No	--
PMGW-118 (2007)	10/18/2007	Copper	0.127	0.001 U - 0.08	1.3	No	--
PMGW-118 (2007)	10/18/2007	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMGW-118 (2007)	10/18/2007	Lead	0.001	0.0005 U - 0.0027	0.015	No	--
PMGW-118 (2007)	10/18/2007	Manganese	1.739	0.005 U - 0.897	0.94	Yes	2
PMGW-118 (2007)	10/18/2007	Zinc	0.2	0.01 U - 0.3	2	No	--
PMGW-118 (2008)	7/14/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
PMGW-118 (2008)	7/14/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMGW-118 (2008)	7/14/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
PMGW-118 (2008)	7/14/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
PMGW-118 (2008)	7/14/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMGW-118 (2008)	7/14/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMGW-118 (2008)	7/14/2008	Manganese	0.163	0.005 U - 0.897	0.94	No	--
PMGW-118 (2008)	7/14/2008	Zinc	0.01 U	0.01 U - 0.3	2	No	--
PMMW-13 (2007)	10/16/2007	Aluminum	3.05	0.03 U - 4.51	20	No	--
PMMW-13 (2007)	10/16/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-13 (2007)	10/16/2007	Cadmium	0.00512	0.00008 U - 0.00156	0.005	Yes	1
PMMW-13 (2007)	10/16/2007	Copper	0.312	0.001 U - 0.08	1.3	No	--
PMMW-13 (2007)	10/16/2007	Iron	26.28	0.03 U - 14.96	14	Yes	2

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater (continued)							
PMMW-13 (2007)	10/16/2007	Lead	0.0007	0.0005 U - 0.0027	0.015	No	--
PMMW-13 (2007)	10/16/2007	Manganese	3.277	0.005 U - 0.897	0.94	Yes	3
PMMW-13 (2007)	10/16/2007	Zinc	0.86	0.01 U - 0.3	2	No	--
PMMW-13 (2008)	7/14/2008	Aluminum	3.55	0.03 U - 4.51	20	No	--
PMMW-13 (2008)	7/14/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-13 (2008)	7/14/2008	Cadmium	0.00482	0.00008 U - 0.00156	0.005	No	--
PMMW-13 (2008)	7/14/2008	Copper	0.397	0.001 U - 0.08	1.3	No	--
PMMW-13 (2008)	7/14/2008	Iron	24.6	0.03 U - 14.96	14	Yes	2
PMMW-13 (2008)	7/14/2008	Lead	0.0006	0.0005 U - 0.0027	0.015	No	--
PMMW-13 (2008)	7/14/2008	Manganese	3.296	0.005 U - 0.897	0.94	Yes	4
PMMW-13 (2008)	7/14/2008	Zinc	0.86	0.01 U - 0.3	2	No	--
PMMW-14 (2007)	10/15/2007	Aluminum	0.22	0.03 U - 4.51	20	No	--
PMMW-14 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-14 (2007)	10/15/2007	Cadmium	0.00104 J	0.00008 U - 0.00156	0.005	No	--
PMMW-14 (2007)	10/15/2007	Copper	0.1	0.001 U - 0.08	1.3	No	--
PMMW-14 (2007)	10/15/2007	Iron	14.91	0.03 U - 14.96	14	Yes	1
PMMW-14 (2007)	10/15/2007	Lead	0.0011 J	0.0005 U - 0.0027	0.015	No	--
PMMW-14 (2007)	10/15/2007	Manganese	1.546	0.005 U - 0.897	0.94	Yes	2
PMMW-14 (2007)	10/15/2007	Zinc	0.34	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater (continued)							
PMMW-14 (2008)	7/14/2008	Aluminum	0.25	0.03 U - 4.51	20	No	--
PMMW-14 (2008)	7/14/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-14 (2008)	7/14/2008	Cadmium	0.00134	0.00008 U - 0.00156	0.005	No	--
PMMW-14 (2008)	7/14/2008	Copper	0.186	0.001 U - 0.08	1.3	No	--
PMMW-14 (2008)	7/14/2008	Iron	11.3	0.03 U - 14.96	14	No	--
PMMW-14 (2008)	7/14/2008	Lead	0.001	0.0005 U - 0.0027	0.015	No	--
PMMW-14 (2008)	7/14/2008	Manganese	2.286	0.005 U - 0.897	0.94	Yes	2
PMMW-14 (2008)	7/14/2008	Zinc	0.35	0.01 U - 0.3	2	No	--
PMMW-15 (2007)	10/15/2007	Aluminum	0.03	0.03 U - 4.51	20	No	--
PMMW-15 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-15 (2007)	10/15/2007	Cadmium	0.00008 J	0.00008 U - 0.00156	0.005	No	--
PMMW-15 (2007)	10/15/2007	Copper	0.034	0.001 U - 0.08	1.3	No	--
PMMW-15 (2007)	10/15/2007	Iron	0.67	0.03 U - 14.96	14	No	--
PMMW-15 (2007)	10/15/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMMW-15 (2007)	10/15/2007	Manganese	0.038	0.005 U - 0.897	0.94	No	--
PMMW-15 (2007)	10/15/2007	Zinc	0.07	0.01 U - 0.3	2	No	--
PMMW-15 (2008)	7/15/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
PMMW-15 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMMW-15 (2008)	7/15/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
PMMW-15 (2008)	7/15/2008	Copper	0.001	0.001 U - 0.08	1.3	No	--
PMMW-15 (2008)	7/15/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Alluvial Groundwater (continued)							
PMMW-15 (2008)	7/15/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMMW-15 (2008)	7/15/2008	Manganese	0.005 U	0.005 U - 0.897	0.94	No	--
PMMW-15 (2008)	7/15/2008	Zinc	0.01 U	0.01 U - 0.3	2	No	--
PMPZ-3 (2008)	7/7/2008	Aluminum	3.93	0.03 U - 4.51	20	No	--
PMPZ-3 (2008)	7/7/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMPZ-3 (2008)	7/7/2008	Cadmium	0.00053	0.00008 U - 0.00156	0.005	No	--
PMPZ-3 (2008)	7/7/2008	Copper	0.002	0.001 U - 0.08	1.3	No	--
PMPZ-3 (2008)	7/7/2008	Iron	15.12	0.03 U - 14.96	14	Yes	1
PMPZ-3 (2008)	7/7/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMPZ-3 (2008)	7/7/2008	Manganese	0.495	0.005 U - 0.897	0.94	No	--
PMPZ-3 (2008)	7/7/2008	Zinc	0.19	0.01 U - 0.3	2	No	--
LCMW-1 (2007)	10/16/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-1 (2007)	10/16/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-1 (2007)	10/16/2007	Cadmium	0.00965	0.00008 U - 0.00156	0.005	Yes	2
LCMW-1 (2007)	10/16/2007	Copper	0.019	0.001 U - 0.08	1.3	No	--
LCMW-1 (2007)	10/16/2007	Iron	0.04 BJ	0.03 U - 14.96	14	No	--
LCMW-1 (2007)	10/16/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
LCMW-1 (2007)	10/16/2007	Manganese	0.119	0.005 U - 0.897	0.94	No	--
LCMW-1 (2007)	10/16/2007	Zinc	0.2	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Carbonate Mine Waste Area (EU 4) - Alluvial Groundwater (continued)							
LCMW-1 (2008)	7/11/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-1 (2008)	7/11/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-1 (2008)	7/11/2008	Cadmium	0.00325	0.00008 U - 0.00156	0.005	No	--
LCMW-1 (2008)	7/11/2008	Copper	0.02	0.001 U - 0.08	1.3	No	--
LCMW-1 (2008)	7/11/2008	Iron	0.17	0.03 U - 14.96	14	No	--
LCMW-1 (2008)	7/11/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
LCMW-1 (2008)	7/11/2008	Manganese	0.122	0.005 U - 0.897	0.94	No	--
LCMW-1 (2008)	7/11/2008	Zinc	0.2	0.01 U - 0.3	2	No	--
LCMW-12D (2007)	10/16/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-12D (2007)	10/16/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-12D (2007)	10/16/2007	Cadmium	0.01923	0.00008 U - 0.00156	0.005	Yes	4
LCMW-12D (2007)	10/16/2007	Copper	0.029	0.001 U - 0.08	1.3	No	--
LCMW-12D (2007)	10/16/2007	Iron	43.8	0.03 U - 14.96	14	Yes	3
LCMW-12D (2007)	10/16/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
LCMW-12D (2007)	10/16/2007	Manganese	39.16	0.005 U - 0.897	0.94	Yes	42
LCMW-12D (2007)	10/16/2007	Zinc	1.26	0.01 U - 0.3	2	No	--
LCMW-12D (2008)	7/11/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-12D (2008)	7/11/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-12D (2008)	7/11/2008	Cadmium	0.00576	0.00008 U - 0.00156	0.005	Yes	1
LCMW-12D (2008)	7/11/2008	Copper	0.004	0.001 U - 0.08	1.3	No	--
LCMW-12D (2008)	7/11/2008	Iron	10.16	0.03 U - 14.96	14	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Carbonate Mine Waste Area (EU 4) - Alluvial Groundwater (continued)							
LCMW-12D (2008)	7/11/2008	Lead	0.0006	0.0005 U - 0.0027	0.015	No	--
LCMW-12D (2008)	7/11/2008	Manganese	13.52	0.005 U - 0.897	0.94	Yes	14
LCMW-12D (2008)	7/11/2008	Zinc	0.48	0.01 U - 0.3	2	No	--
LCMW-12S (2007)	10/16/2007	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-12S (2007)	10/16/2007	Arsenic	0.004	0.002 U - 0.002 U	0.01	No	--
LCMW-12S (2007)	10/16/2007	Cadmium	0.00009	0.00008 U - 0.00156	0.005	No	--
LCMW-12S (2007)	10/16/2007	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
LCMW-12S (2007)	10/16/2007	Iron	45.23	0.03 U - 14.96	14	Yes	3
LCMW-12S (2007)	10/16/2007	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
LCMW-12S (2007)	10/16/2007	Manganese	28.88	0.005 U - 0.897	0.94	Yes	31
LCMW-12S (2007)	10/16/2007	Zinc	0.57	0.01 U - 0.3	2	No	--
LCMW-12S (2008)	7/15/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
LCMW-12S (2008)	7/15/2008	Arsenic	0.004	0.002 U - 0.002 U	0.01	No	--
LCMW-12S (2008)	7/15/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
LCMW-12S (2008)	7/15/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
LCMW-12S (2008)	7/15/2008	Iron	46.99	0.03 U - 14.96	14	Yes	3
LCMW-12S (2008)	7/15/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
LCMW-12S (2008)	7/15/2008	Manganese	34.14	0.005 U - 0.897	0.94	Yes	36
LCMW-12S (2008)	7/15/2008	Zinc	0.56	0.01 U - 0.3	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Carbonate Mine Waste Area (EU 4) - Alluvial Groundwater (continued)							
LCMW-5 (2007)	10/16/2007	Aluminum	1.83	0.03 U - 4.51	20	No	--
LCMW-5 (2007)	10/16/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-5 (2007)	10/16/2007	Cadmium	0.1562	0.00008 U - 0.00156	0.005	Yes	31
LCMW-5 (2007)	10/16/2007	Copper	0.761	0.001 U - 0.08	1.3	No	--
LCMW-5 (2007)	10/16/2007	Iron	15.79	0.03 U - 14.96	14	Yes	1
LCMW-5 (2007)	10/16/2007	Lead	0.0342	0.0005 U - 0.0027	0.015	Yes	2
LCMW-5 (2007)	10/16/2007	Manganese	20.01	0.005 U - 0.897	0.94	Yes	21
LCMW-5 (2007)	10/16/2007	Zinc	6.78	0.01 U - 0.3	2	Yes	3
LCMW-5 (2008)	7/10/2008	Aluminum	3.22	0.03 U - 4.51	20	No	--
LCMW-5 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
LCMW-5 (2008)	7/10/2008	Cadmium	0.1775	0.00008 U - 0.00156	0.005	Yes	36
LCMW-5 (2008)	7/10/2008	Copper	1.375	0.001 U - 0.08	1.3	Yes	1
LCMW-5 (2008)	7/10/2008	Iron	6.52	0.03 U - 14.96	14	No	--
LCMW-5 (2008)	7/10/2008	Lead	0.0602	0.0005 U - 0.0027	0.015	Yes	4
LCMW-5 (2008)	7/10/2008	Manganese	13.14	0.005 U - 0.897	0.94	Yes	14
LCMW-5 (2008)	7/10/2008	Zinc	7.53	0.01 U - 0.3	2	Yes	4
Site Samples - Bedrock Groundwater Monitoring Wells							
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater							
MHGW-113 (2007)	10/26/2007	Aluminum	0.18	0.03 U - 6.63	20	No	--
MHGW-113 (2007)	10/26/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
MHGW-113 (2007)	10/26/2007	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
MHGW-113 (2007)	10/26/2007	Copper	0.001 U	0.001 - 0.275	1.3	No	--

For footnote definitions, see Notes
section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater (continued)							
MHGW-113 (2007)	10/26/2007	Iron	0.03 U	0.42 - 12.73	14	No	--
MHGW-113 (2007)	10/26/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
MHGW-113 (2007)	10/26/2007	Manganese	0.177	0.376 - 1.928	0.94	No	--
MHGW-113 (2007)	10/26/2007	Zinc	0.01	0.21 - 0.26	2	No	--
MHGW-113 (2008)	7/8/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
MHGW-113 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
MHGW-113 (2008)	7/8/2008	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
MHGW-113 (2008)	7/8/2008	Copper	0.001 U	0.001 - 0.275	1.3	No	--
MHGW-113 (2008)	7/8/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
MHGW-113 (2008)	7/8/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
MHGW-113 (2008)	7/8/2008	Manganese	0.174	0.376 - 1.928	0.94	No	--
MHGW-113 (2008)	7/8/2008	Zinc	0.01 U	0.21 - 0.26	2	No	--
MHMW-8 (2007)	10/12/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
MHMW-8 (2007)	10/12/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
MHMW-8 (2007)	10/12/2007	Cadmium	0.06788	0.00008 U - 0.0019	0.005	Yes	14
MHMW-8 (2007)	10/12/2007	Copper	0.05	0.001 - 0.275	1.3	No	--
MHMW-8 (2007)	10/12/2007	Iron	0.03	0.42 - 12.73	14	No	--
MHMW-8 (2007)	10/12/2007	Lead	0.0006	0.0005 U - 0.0007	0.015	No	--
MHMW-8 (2007)	10/12/2007	Manganese	0.059	0.376 - 1.928	0.94	No	--
MHMW-8 (2007)	10/12/2007	Zinc	14.9	0.21 - 0.26	2	Yes	7

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater (continued)							
MHMW-8 (2008)	7/8/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
MHMW-8 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
MHMW-8 (2008)	7/8/2008	Cadmium	0.0669	0.00008 U - 0.0019	0.005	Yes	13
MHMW-8 (2008)	7/8/2008	Copper	0.046	0.001 - 0.275	1.3	No	--
MHMW-8 (2008)	7/8/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
MHMW-8 (2008)	7/8/2008	Lead	0.0009	0.0005 U - 0.0007	0.015	No	--
MHMW-8 (2008)	7/8/2008	Manganese	0.033	0.376 - 1.928	0.94	No	--
MHMW-8 (2008)	7/8/2008	Zinc	18.21	0.21 - 0.26	2	Yes	9
MW-1 (2007)	10/11/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
MW-1 (2007)	10/11/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
MW-1 (2007)	10/11/2007	Cadmium	0.0002	0.00008 U - 0.0019	0.005	No	--
MW-1 (2007)	10/11/2007	Copper	0.001	0.001 - 0.275	1.3	No	--
MW-1 (2007)	10/11/2007	Iron	0.03 U	0.42 - 12.73	14	No	--
MW-1 (2007)	10/11/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
MW-1 (2007)	10/11/2007	Manganese	0.005 U	0.376 - 1.928	0.94	No	--
MW-1 (2007)	10/11/2007	Zinc	0.04	0.21 - 0.26	2	No	--
MW-1 (2008)	7/7/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
MW-1 (2008)	7/7/2008	Arsenic	0.004	0.002 U - 0.003	0.01	No	--
MW-1 (2008)	7/7/2008	Cadmium	0.00041	0.00008 U - 0.0019	0.005	No	--
MW-1 (2008)	7/7/2008	Copper	0.001	0.001 - 0.275	1.3	No	--
MW-1 (2008)	7/7/2008	Iron	0.03 U	0.42 - 12.73	14	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater (continued)							
MW-1 (2008)	7/7/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
MW-1 (2008)	7/7/2008	Manganese	0.377	0.376 - 1.928	0.94	No	--
MW-1 (2008)	7/7/2008	Zinc	0.07	0.21 - 0.26	2	No	--
UMHMW-1D (2007)	10/11/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-1D (2007)	10/11/2007	Arsenic	0.01	0.002 U - 0.003	0.01	No	--
UMHMW-1D (2007)	10/11/2007	Cadmium	0.01535	0.00008 U - 0.0019	0.005	Yes	3
UMHMW-1D (2007)	10/11/2007	Copper	0.006	0.001 - 0.275	1.3	No	--
UMHMW-1D (2007)	10/11/2007	Iron	12.54	0.42 - 12.73	14	No	--
UMHMW-1D (2007)	10/11/2007	Lead	0.0032	0.0005 U - 0.0007	0.015	No	--
UMHMW-1D (2007)	10/11/2007	Manganese	16.46	0.376 - 1.928	0.94	Yes	18
UMHMW-1D (2007)	10/11/2007	Zinc	3.98	0.21 - 0.26	2	Yes	2
UMHMW-1D (2008)	7/9/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-1D (2008)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
UMHMW-1D (2008)	7/9/2008	Cadmium	0.01552	0.00008 U - 0.0019	0.005	Yes	3
UMHMW-1D (2008)	7/9/2008	Copper	0.02	0.001 - 0.275	1.3	No	--
UMHMW-1D (2008)	7/9/2008	Iron	1.46	0.42 - 12.73	14	No	--
UMHMW-1D (2008)	7/9/2008	Lead	0.006	0.0005 U - 0.0007	0.015	No	--
UMHMW-1D (2008)	7/9/2008	Manganese	15	0.376 - 1.928	0.94	Yes	16
UMHMW-1D (2008)	7/9/2008	Zinc	4.42	0.21 - 0.26	2	Yes	2

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater (continued)							
UMHMW-2D (2007)	10/11/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-2D (2007)	10/11/2007	Arsenic	0.008	0.002 U - 0.003	0.01	No	--
UMHMW-2D (2007)	10/11/2007	Cadmium	0.2139	0.00008 U - 0.0019	0.005	Yes	43
UMHMW-2D (2007)	10/11/2007	Copper	0.037	0.001 - 0.275	1.3	No	--
UMHMW-2D (2007)	10/11/2007	Iron	10.12	0.42 - 12.73	14	No	--
UMHMW-2D (2007)	10/11/2007	Lead	0.0231	0.0005 U - 0.0007	0.015	Yes	2
UMHMW-2D (2007)	10/11/2007	Manganese	26.64	0.376 - 1.928	0.94	Yes	28
UMHMW-2D (2007)	10/11/2007	Zinc	50.84	0.21 - 0.26	2	Yes	25
UMHMW-2D (2008)	7/9/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-2D (2008)	7/9/2008	Arsenic	0.008	0.002 U - 0.003	0.01	No	--
UMHMW-2D (2008)	7/9/2008	Cadmium	0.2491	0.00008 U - 0.0019	0.005	Yes	50
UMHMW-2D (2008)	7/9/2008	Copper	0.023	0.001 - 0.275	1.3	No	--
UMHMW-2D (2008)	7/9/2008	Iron	12.7	0.42 - 12.73	14	No	--
UMHMW-2D (2008)	7/9/2008	Lead	0.0296	0.0005 U - 0.0007	0.015	Yes	2
UMHMW-2D (2008)	7/9/2008	Manganese	33.58	0.376 - 1.928	0.94	Yes	36
UMHMW-2D (2008)	7/9/2008	Zinc	62.14	0.21 - 0.26	2	Yes	31
UMHMW-3 (2007)	10/12/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-3 (2007)	10/12/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
UMHMW-3 (2007)	10/12/2007	Cadmium	0.00043	0.00008 U - 0.0019	0.005	No	--
UMHMW-3 (2007)	10/12/2007	Copper	0.005	0.001 - 0.275	1.3	No	--
UMHMW-3 (2007)	10/12/2007	Iron	0.03 U	0.42 - 12.73	14	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mike Horse Mine Waste Piles (EU 8) - Bedrock Groundwater (continued)							
UMHMW-3 (2007)	10/12/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
UMHMW-3 (2007)	10/12/2007	Manganese	0.007	0.376 - 1.928	0.94	No	--
UMHMW-3 (2007)	10/12/2007	Zinc	0.04	0.21 - 0.26	2	No	--
UMHMW-3 (2008)	7/8/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
UMHMW-3 (2008)	7/8/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
UMHMW-3 (2008)	7/8/2008	Cadmium	0.00036	0.00008 U - 0.0019	0.005	No	--
UMHMW-3 (2008)	7/8/2008	Copper	0.002	0.001 - 0.275	1.3	No	--
UMHMW-3 (2008)	7/8/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
UMHMW-3 (2008)	7/8/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
UMHMW-3 (2008)	7/8/2008	Manganese	0.005 U	0.376 - 1.928	0.94	No	--
UMHMW-3 (2008)	7/8/2008	Zinc	0.01	0.21 - 0.26	2	No	--
Beartrap Creek Dispersed Tailings Deposits Associated with EE/CA Removal Action Area and Overbank Tailings Deposits and Flossie Louise Mine Waste Piles (EU 11) - Bedrock Groundwater							
BCGW-116 (2008)	7/31/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
BCGW-116 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
BCGW-116 (2008)	7/31/2008	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
BCGW-116 (2008)	7/31/2008	Copper	0.001 U	0.001 - 0.275	1.3	No	--
BCGW-116 (2008)	7/31/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
BCGW-116 (2008)	7/31/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
BCGW-116 (2008)	7/31/2008	Manganese	0.239	0.376 - 1.928	0.94	No	--
BCGW-116 (2008)	7/31/2008	Zinc	0.01 U	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Mary P. Mine Waste Pile (EU 7) - Bedrock Groundwater							
BRGW-110 (2007)	10/18/2007	Aluminum	0.04	0.03 U - 6.63	20	No	--
BRGW-110 (2007)	10/18/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
BRGW-110 (2007)	10/18/2007	Cadmium	0.0003	0.00008 U - 0.0019	0.005	No	--
BRGW-110 (2007)	10/18/2007	Copper	0.003	0.001 - 0.275	1.3	No	--
BRGW-110 (2007)	10/18/2007	Iron	0.15	0.42 - 12.73	14	No	--
BRGW-110 (2007)	10/18/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
BRGW-110 (2007)	10/18/2007	Manganese	0.186	0.376 - 1.928	0.94	No	--
BRGW-110 (2007)	10/18/2007	Zinc	0.04	0.21 - 0.26	2	No	--
BRGW-110 (2008)	7/9/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
BRGW-110 (2008)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
BRGW-110 (2008)	7/9/2008	Cadmium	0.00028	0.00008 U - 0.0019	0.005	No	--
BRGW-110 (2008)	7/9/2008	Copper	0.052	0.001 - 0.275	1.3	No	--
BRGW-110 (2008)	7/9/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
BRGW-110 (2008)	7/9/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
BRGW-110 (2008)	7/9/2008	Manganese	0.059	0.376 - 1.928	0.94	No	--
BRGW-110 (2008)	7/9/2008	Zinc	0.04	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Number 3 Tunnel Waste Area (EU 10) - Bedrock Groundwater							
SGGW-102 (2007)	10/15/2007	Aluminum	0.21	0.03 U - 6.63	20	No	--
SGGW-102 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
SGGW-102 (2007)	10/15/2007	Cadmium	0.00174 J	0.00008 U - 0.0019	0.005	No	--
SGGW-102 (2007)	10/15/2007	Copper	0.14	0.001 - 0.275	1.3	No	--
SGGW-102 (2007)	10/15/2007	Iron	0.06	0.42 - 12.73	14	No	--
SGGW-102 (2007)	10/15/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
SGGW-102 (2007)	10/15/2007	Manganese	0.206	0.376 - 1.928	0.94	No	--
SGGW-102 (2007)	10/15/2007	Zinc	0.33	0.21 - 0.26	2	No	--
SGGW-102 (2008)	7/9/2008	Aluminum	0.19	0.03 U - 6.63	20	No	--
SGGW-102 (2008)	7/9/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
SGGW-102 (2008)	7/9/2008	Cadmium	0.00132	0.00008 U - 0.0019	0.005	No	--
SGGW-102 (2008)	7/9/2008	Copper	0.104	0.001 - 0.275	1.3	No	--
SGGW-102 (2008)	7/9/2008	Iron	0.03 U	0.42 - 12.73	14	No	--
SGGW-102 (2008)	7/9/2008	Lead	0.0024	0.0005 U - 0.0007	0.015	No	--
SGGW-102 (2008)	7/9/2008	Manganese	0.115	0.376 - 1.928	0.94	No	--
SGGW-102 (2008)	7/9/2008	Zinc	0.21	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Shave Gulch (a) - Bedrock Groundwater							
SHGW102 (2008)	7/31/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
SHGW102 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
SHGW102 (2008)	7/31/2008	Cadmium	0.0019	0.00008 U - 0.0019	0.005	No	--
SHGW102 (2008)	7/31/2008	Copper	0.001	0.001 - 0.275	1.3	No	--
SHGW102 (2008)	7/31/2008	Iron	0.42	0.42 - 12.73	14	No	--
SHGW102 (2008)	7/31/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
SHGW102 (2008)	7/31/2008	Manganese	1.928	0.376 - 1.928	0.94	Yes	2
SHGW102 (2008)	7/31/2008	Zinc	0.21	0.21 - 0.26	2	No	--
Edith Mine Waste Areas (EU 5) - Bedrock Groundwater							
EDGW-105 (2007)	10/17/2007	Aluminum	1.91	0.03 U - 6.63	20	No	--
EDGW-105 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
EDGW-105 (2007)	10/17/2007	Cadmium	0.00071	0.00008 U - 0.0019	0.005	No	--
EDGW-105 (2007)	10/17/2007	Copper	0.463	0.001 - 0.275	1.3	No	--
EDGW-105 (2007)	10/17/2007	Iron	10.83	0.42 - 12.73	14	No	--
EDGW-105 (2007)	10/17/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
EDGW-105 (2007)	10/17/2007	Manganese	0.786	0.376 - 1.928	0.94	No	--
EDGW-105 (2007)	10/17/2007	Zinc	0.26	0.21 - 0.26	2	No	--
EDGW-105 (2008)	7/10/2008	Aluminum	3.58	0.03 U - 6.63	20	No	--
EDGW-105 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
EDGW-105 (2008)	7/10/2008	Cadmium	0.00065	0.00008 U - 0.0019	0.005	No	--
EDGW-105 (2008)	7/10/2008	Copper	0.555	0.001 - 0.275	1.3	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Edith Mine Waste Areas (EU 5) - Bedrock Groundwater (continued)							
EDGW-105 (2008)	7/10/2008	Iron	9.41	0.42 - 12.73	14	No	--
EDGW-105 (2008)	7/10/2008	Lead	0.0012	0.0005 U - 0.0007	0.015	No	--
EDGW-105 (2008)	7/10/2008	Manganese	0.495	0.376 - 1.928	0.94	No	--
EDGW-105 (2008)	7/10/2008	Zinc	0.26	0.21 - 0.26	2	No	--
Pass Creek (a) - Bedrock Groundwater							
PDGW102 (2008)	7/31/2008	Aluminum	6.63	0.03 U - 6.63	20	No	--
PDGW102 (2008)	7/31/2008	Arsenic	0.003	0.002 U - 0.003	0.01	No	--
PDGW102 (2008)	7/31/2008	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
PDGW102 (2008)	7/31/2008	Copper	0.275	0.001 - 0.275	1.3	No	--
PDGW102 (2008)	7/31/2008	Iron	12.73	0.42 - 12.73	14	No	--
PDGW102 (2008)	7/31/2008	Lead	0.0007	0.0005 U - 0.0007	0.015	No	--
PDGW102 (2008)	7/31/2008	Manganese	0.376	0.376 - 1.928	0.94	No	--
PDGW102 (2008)	7/31/2008	Zinc	0.26	0.21 - 0.26	2	No	--
Paymaster Mine Waste Areas (EU 9) - Bedrock Groundwater							
PMGW-119 (2007)	10/18/2007	Aluminum	0.53	0.03 U - 6.63	20	No	--
PMGW-119 (2007)	10/18/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
PMGW-119 (2007)	10/18/2007	Cadmium	0.00175	0.00008 U - 0.0019	0.005	No	--
PMGW-119 (2007)	10/18/2007	Copper	2.866	0.001 - 0.275	1.3	Yes	2
PMGW-119 (2007)	10/18/2007	Iron	1.37	0.42 - 12.73	14	No	--
PMGW-119 (2007)	10/18/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
PMGW-119 (2007)	10/18/2007	Manganese	1.215	0.376 - 1.928	0.94	Yes	1
PMGW-119 (2007)	10/18/2007	Zinc	0.41	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Bedrock Groundwater (continued)							
PMGW-119 (2008)	7/14/2008	Aluminum	4.44	0.03 U - 6.63	20	No	--
PMGW-119 (2008)	7/14/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
PMGW-119 (2008)	7/14/2008	Cadmium	0.00372	0.00008 U - 0.0019	0.005	No	--
PMGW-119 (2008)	7/14/2008	Copper	0.64	0.001 - 0.275	1.3	No	--
PMGW-119 (2008)	7/14/2008	Iron	4.66	0.42 - 12.73	14	No	--
PMGW-119 (2008)	7/14/2008	Lead	0.0007	0.0005 U - 0.0007	0.015	No	--
PMGW-119 (2008)	7/14/2008	Manganese	1.308	0.376 - 1.928	0.94	Yes	1
PMGW-119 (2008)	7/14/2008	Zinc	0.5	0.21 - 0.26	2	No	--
PMGW-120 (2007)	10/15/2007	Aluminum	11.64	0.03 U - 6.63	20	No	--
PMGW-120 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
PMGW-120 (2007)	10/15/2007	Cadmium	0.00102 J	0.00008 U - 0.0019	0.005	No	--
PMGW-120 (2007)	10/15/2007	Copper	1.666	0.001 - 0.275	1.3	Yes	1
PMGW-120 (2007)	10/15/2007	Iron	21.25	0.42 - 12.73	14	Yes	2
PMGW-120 (2007)	10/15/2007	Lead	0.001 J	0.0005 U - 0.0007	0.015	No	--
PMGW-120 (2007)	10/15/2007	Manganese	0.972	0.376 - 1.928	0.94	Yes	1
PMGW-120 (2007)	10/15/2007	Zinc	0.3	0.21 - 0.26	2	No	--
PMGW-120 (2008)	7/15/2008	Aluminum	15.24	0.03 U - 6.63	20	No	--
PMGW-120 (2008)	7/15/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
PMGW-120 (2008)	7/15/2008	Cadmium	0.00103	0.00008 U - 0.0019	0.005	No	--
PMGW-120 (2008)	7/15/2008	Copper	1.222	0.001 - 0.275	1.3	No	--
PMGW-120 (2008)	7/15/2008	Iron	18.87	0.42 - 12.73	14	Yes	1

For footnote definitions, see Notes
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TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Paymaster Mine Waste Areas (EU 9) - Bedrock Groundwater (continued)							
PMGW-120 (2008)	7/15/2008	Lead	0.0018	0.0005 U - 0.0007	0.015	No	--
PMGW-120 (2008)	7/15/2008	Manganese	0.689	0.376 - 1.928	0.94	No	--
PMGW-120 (2008)	7/15/2008	Zinc	0.2	0.21 - 0.26	2	No	--
Carbonate Mine Waste Area (EU 4) - Bedrock Groundwater							
BRGW-101 (2007)	10/16/2007	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
BRGW-101 (2007)	10/16/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
BRGW-101 (2007)	10/16/2007	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
BRGW-101 (2007)	10/16/2007	Copper	0.001 U	0.001 - 0.275	1.3	No	--
BRGW-101 (2007)	10/16/2007	Iron	0.25	0.42 - 12.73	14	No	--
BRGW-101 (2007)	10/16/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
BRGW-101 (2007)	10/16/2007	Manganese	0.184	0.376 - 1.928	0.94	No	--
BRGW-101 (2007)	10/16/2007	Zinc	0.01 U	0.21 - 0.26	2	No	--
BRGW-101 (2008)	7/11/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
BRGW-101 (2008)	7/11/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
BRGW-101 (2008)	7/11/2008	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
BRGW-101 (2008)	7/11/2008	Copper	0.001 U	0.001 - 0.275	1.3	No	--
BRGW-101 (2008)	7/11/2008	Iron	0.5	0.42 - 12.73	14	No	--
BRGW-101 (2008)	7/11/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
BRGW-101 (2008)	7/11/2008	Manganese	0.213	0.376 - 1.928	0.94	No	--
BRGW-101 (2008)	7/11/2008	Zinc	0.01 U	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Carbonate Mine Waste Area (EU 4) - Bedrock Groundwater							
UCMW-11 (2007)	10/17/2007	Aluminum	0.14	0.03 U - 6.63	20	No	--
UCMW-11 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
UCMW-11 (2007)	10/17/2007	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
UCMW-11 (2007)	10/17/2007	Copper	0.002	0.001 - 0.275	1.3	No	--
UCMW-11 (2007)	10/17/2007	Iron	20.72	0.42 - 12.73	14	Yes	1
UCMW-11 (2007)	10/17/2007	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
UCMW-11 (2007)	10/17/2007	Manganese	62.9	0.376 - 1.928	0.94	Yes	67
UCMW-11 (2007)	10/17/2007	Zinc	0.01 U	0.21 - 0.26	2	No	--
UCMW-11 (2008)	7/7/2008	Aluminum	21.06	0.03 U - 6.63	20	Yes	1
UCMW-11 (2008)	7/7/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
UCMW-11 (2008)	7/7/2008	Cadmium	0.04187	0.00008 U - 0.0019	0.005	Yes	8
UCMW-11 (2008)	7/7/2008	Copper	0.004	0.001 - 0.275	1.3	No	--
UCMW-11 (2008)	7/7/2008	Iron	9.5	0.42 - 12.73	14	No	--
UCMW-11 (2008)	7/7/2008	Lead	0.0006	0.0005 U - 0.0007	0.015	No	--
UCMW-11 (2008)	7/7/2008	Manganese	39.94	0.376 - 1.928	0.94	Yes	42
UCMW-11 (2008)	7/7/2008	Zinc	16.54	0.21 - 0.26	2	Yes	8
Reference Samples - Alluvial Groundwater Monitoring Wells							
ANMW-9 (2008)	7/7/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
ANMW-9 (2008)	7/7/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
ANMW-9 (2008)	7/7/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
ANMW-9 (2008)	7/7/2008	Copper	0.001	0.001 U - 0.08	1.3	No	--
ANMW-9 (2008)	7/7/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
ANMW-9 (2008)	7/7/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
ANMW-9 (2008)	7/7/2008	Manganese	0.008	0.005 U - 0.897	0.94	No	--
ANMW-9 (2008)	7/7/2008	Zinc	0.01 U	0.01 U - 0.3	2	No	--
PDGW101 (2008)	7/31/2008	Aluminum	3.47	0.03 U - 4.51	20	No	--
PDGW101 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PDGW101 (2008)	7/31/2008	Cadmium	0.0014	0.00008 U - 0.00156	0.005	No	--
PDGW101 (2008)	7/31/2008	Copper	0.08	0.001 U - 0.08	1.3	No	--
PDGW101 (2008)	7/31/2008	Iron	8.7	0.03 U - 14.96	14	No	--
PDGW101 (2008)	7/31/2008	Lead	0.0027	0.0005 U - 0.0027	0.015	No	--
PDGW101 (2008)	7/31/2008	Manganese	0.668	0.005 U - 0.897	0.94	No	--
PDGW101 (2008)	7/31/2008	Zinc	0.3	0.01 U - 0.3	2	No	--
PMPZ-4 (2007)	10/15/2007	Aluminum	4.51	0.03 U - 4.51	20	No	--
PMPZ-4 (2007)	10/15/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMPZ-4 (2007)	10/15/2007	Cadmium	0.00088 J	0.00008 U - 0.00156	0.005	No	--
PMPZ-4 (2007)	10/15/2007	Copper	0.002	0.001 U - 0.08	1.3	No	--
PMPZ-4 (2007)	10/15/2007	Iron	14.96	0.03 U - 14.96	14	Yes	1
PMPZ-4 (2007)	10/15/2007	Lead	0.0009 J	0.0005 U - 0.0027	0.015	No	--
PMPZ-4 (2007)	10/15/2007	Manganese	0.501	0.005 U - 0.897	0.94	No	--
PMPZ-4 (2007)	10/15/2007	Zinc	0.27	0.01 U - 0.3	2	No	--
Reference Samples - Alluvial Groundwater Monitoring Wells (continued)							

For footnote definitions, see Notes
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TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
PMPZ-4 (2008)	7/7/2008	Aluminum	0.42	0.03 U - 4.51	20	No	--
PMPZ-4 (2008)	7/7/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
PMPZ-4 (2008)	7/7/2008	Cadmium	0.00008 U	0.00008 U - 0.00156	0.005	No	--
PMPZ-4 (2008)	7/7/2008	Copper	0.004	0.001 U - 0.08	1.3	No	--
PMPZ-4 (2008)	7/7/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
PMPZ-4 (2008)	7/7/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
PMPZ-4 (2008)	7/7/2008	Manganese	0.133	0.005 U - 0.897	0.94	No	--
PMPZ-4 (2008)	7/7/2008	Zinc	0.03	0.01 U - 0.3	2	No	--
SHGW101 (2008)	7/31/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
SHGW101 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SHGW101 (2008)	7/31/2008	Cadmium	0.00013	0.00008 U - 0.00156	0.005	No	--
SHGW101 (2008)	7/31/2008	Copper	0.001 U	0.001 U - 0.08	1.3	No	--
SHGW101 (2008)	7/31/2008	Iron	0.03 U	0.03 U - 14.96	14	No	--
SHGW101 (2008)	7/31/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
SHGW101 (2008)	7/31/2008	Manganese	0.005 U	0.005 U - 0.897	0.94	No	--
SHGW101 (2008)	7/31/2008	Zinc	0.05	0.01 U - 0.3	2	No	--
SWGW-103 (2007)	10/17/2007	Aluminum	0.07	0.03 U - 4.51	20	No	--
SWGW-103 (2007)	10/17/2007	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SWGW-103 (2007)	10/17/2007	Cadmium	0.00156	0.00008 U - 0.00156	0.005	No	--
SWGW-103 (2007)	10/17/2007	Copper	0.043	0.001 U - 0.08	1.3	No	--
SWGW-103 (2007)	10/17/2007	Iron	1.56	0.03 U - 14.96	14	No	--
SWGW-103 (2007)	10/17/2007	Lead	0.0013	0.0005 U - 0.0027	0.015	No	--
SWGW-103 (2007)	10/17/2007	Manganese	0.897	0.005 U - 0.897	0.94	No	--
SWGW-103 (2007)	10/17/2007	Zinc	0.11	0.01 U - 0.3	2	No	--
SWGW-103 (2008)	7/10/2008	Aluminum	0.03 U	0.03 U - 4.51	20	No	--
SWGW-103 (2008)	7/10/2008	Arsenic	0.002 U	0.002 U - 0.002 U	0.01	No	--
SWGW-103 (2008)	7/10/2008	Cadmium	0.0004	0.00008 U - 0.00156	0.005	No	--
SWGW-103 (2008)	7/10/2008	Copper	0.022	0.001 U - 0.08	1.3	No	--
SWGW-103 (2008)	7/10/2008	Iron	0.21	0.03 U - 14.96	14	No	--
SWGW-103 (2008)	7/10/2008	Lead	0.0005 U	0.0005 U - 0.0027	0.015	No	--
SWGW-103 (2008)	7/10/2008	Manganese	0.323	0.005 U - 0.897	0.94	No	--
SWGW-103 (2008)	7/10/2008	Zinc	0.07	0.01 U - 0.3	2	No	--
Reference Samples - Bedrock Groundwater Monitoring Wells							
PDGW102 (2008)	7/31/2008	Aluminum	6.63	0.03 U - 6.63	20	No	--
PDGW102 (2008)	7/31/2008	Arsenic	0.003	0.002 U - 0.003	0.01	No	--
PDGW102 (2008)	7/31/2008	Cadmium	0.00008 U	0.00008 U - 0.0019	0.005	No	--
PDGW102 (2008)	7/31/2008	Copper	0.275	0.001 - 0.275	1.3	No	--
PDGW102 (2008)	7/31/2008	Iron	12.73	0.42 - 12.73	14	No	--
PDGW102 (2008)	7/31/2008	Lead	0.0007	0.0005 U - 0.0007	0.015	No	--
PDGW102 (2008)	7/31/2008	Manganese	0.376	0.376 - 1.928	0.94	No	--
PDGW102 (2008)	7/31/2008	Zinc	0.26	0.21 - 0.26	2	No	--

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-1: COMPARISON OF GROUNDWATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Groundwater Quality Standard	Result Exceeds Groundwater Quality Standard?	Factor of Exceedance of Groundwater Quality Standard
Reference Samples - Bedrock Groundwater Monitoring Wells (continued)							
SHGW102 (2008)	7/31/2008	Aluminum	0.03 U	0.03 U - 6.63	20	No	--
SHGW102 (2008)	7/31/2008	Arsenic	0.002 U	0.002 U - 0.003	0.01	No	--
SHGW102 (2008)	7/31/2008	Cadmium	0.0019	0.00008 U - 0.0019	0.005	No	--
SHGW102 (2008)	7/31/2008	Copper	0.001	0.001 - 0.275	1.3	No	--
SHGW102 (2008)	7/31/2008	Iron	0.42	0.42 - 12.73	14	No	--
SHGW102 (2008)	7/31/2008	Lead	0.0005 U	0.0005 U - 0.0007	0.015	No	--
SHGW102 (2008)	7/31/2008	Manganese	1.928	0.376 - 1.928	0.94	Yes	2
SHGW102 (2008)	7/31/2008	Zinc	0.21	0.21 - 0.26	2	No	--

Notes: Units are in miligrams per liter.
Numeric water quality standards from DEQ (2012), except for aluminum, iron, and manganese. The cleanup levels for aluminum, iron, and manganese are site-specific (EPA 2014) calculations.

(a) The location indicated is a tributary stream in the UBMC that drains to the Blackfoot River, and is not an EU for the HHRA.
-- Not applicable
B Analyte was detected in the associated blank as well as the sample.
DEQ Montana Department of Environmental Quality
EPA Environmental Protection Agency
EU Exposure unit
HHRA Human health risk assessment
ID Identification
J Estimated value
U Not detected
UMBC Upper Blackfoot Mining Complex

References:

DEQ. 2012. Circular DEQ-7. Montana Numeric Water Quality Standards. October. Available on-line at: http://deq.mt.gov/wqinfo/Standards

EPA. 2013. Risk-Based Concentration Table. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Avaiilable on-line at: <http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm>.

For footnote definitions, see Notes section on page 36 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
Site Surface Water Samples							
MHSW-102	7/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
MHSW-102	7/16/2008	Cadmium	0.00081	0.00008 U - 0.00008 U	0.005	No	--
MHSW-102	7/16/2008	Copper	0.001	0.001 U - 0.001 U	1.3	No	--
MHSW-102	7/16/2008	Iron	0.05 U	0.03 - 0.61	14	No	--
MHSW-102	7/16/2008	Lead	0.0058	0.0005 U - 0.0005 U	0.015	No	--
MHSW-102	7/16/2008	Manganese	0.005 U	0.003 U - 0.126	0.43	No	--
MHSW-102	7/16/2008	Zinc	0.12	0.01 U - 0.01 U	2	No	--
MHSW-101	7/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
MHSW-101	7/16/2008	Cadmium	0.00814	0.00008 U - 0.00008 U	0.005	Yes	1.63
MHSW-101	7/16/2008	Copper	0.077	0.001 U - 0.001 U	1.3	No	--
MHSW-101	7/16/2008	Iron	0.15	0.03 - 0.61	14	No	--
MHSW-101	7/16/2008	Lead	0.0252	0.0005 U - 0.0005 U	0.015	Yes	1.68
MHSW-101	7/16/2008	Manganese	0.091	0.003 U - 0.126	0.43	No	--
MHSW-101	7/16/2008	Zinc	1.04	0.01 U - 0.01 U	2	No	--
BRSW-4A (2008)	6/17/2008	Aluminum	0.08	0.03 U - 0.03	20	No	--
BRSW-4A (2008)	6/17/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-4A (2008)	6/17/2008	Cadmium	0.0204	0.00008 U - 0.00008 U	0.005	Yes	4.08
BRSW-4A (2008)	6/17/2008	Copper	0.886	0.001 U - 0.001 U	1.3	No	--
BRSW-4A (2008)	6/17/2008	Iron	0.2	0.03 - 0.61	14	No	--
BRSW-4A (2008)	6/17/2008	Lead	0.0798	0.0005 U - 0.0005 U	0.015	Yes	5.32
BRSW-4A (2008)	6/17/2008	Manganese	1.19	0.003 U - 0.126	0.43	Yes	2.77
BRSW-4A (2008)	6/17/2008	Zinc	2.54	0.01 U - 0.01 U	2	Yes	1.27
BRSW-4 (2007)	10/10/2007	Aluminum	0.05	0.03 U - 0.03	20	No	--
BRSW-4 (2007)	10/10/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-4 (2007)	10/10/2007	Cadmium	0.0342	0.00008 U - 0.00008 U	0.005	Yes	6.84
BRSW-4 (2007)	10/10/2007	Copper	0.682	0.001 U - 0.001 U	1.3	No	--
BRSW-4 (2007)	10/10/2007	Iron	0.06	0.03 - 0.61	14	No	--
BRSW-4 (2007)	10/10/2007	Lead	0.0481	0.0005 U - 0.0005 U	0.015	Yes	3.21
BRSW-4 (2007)	10/10/2007	Manganese	1.39	0.003 U - 0.126	0.43	Yes	3.23
BRSW-4 (2007)	10/10/2007	Zinc	4.01	0.01 U - 0.01 U	2	Yes	2.01
BRSW-44 (2007)	10/10/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-44 (2007)	10/10/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-44 (2007)	10/10/2007	Cadmium	0.0199	0.00008 U - 0.00008 U	0.005	Yes	3.98
BRSW-44 (2007)	10/10/2007	Copper	0.093	0.001 U - 0.001 U	1.3	No	--
BRSW-44 (2007)	10/10/2007	Iron	0.05	0.03 - 0.61	14	No	--
BRSW-44 (2007)	10/10/2007	Lead	0.0257	0.0005 U - 0.0005 U	0.015	Yes	1.71
BRSW-44 (2007)	10/10/2007	Manganese	0.596	0.003 U - 0.126	0.43	Yes	1.39
BRSW-44 (2007)	10/10/2007	Zinc	3.08	0.01 U - 0.01 U	2	Yes	1.54

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-44 (2008)	6/17/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-44 (2008)	6/17/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-44 (2008)	6/17/2008	Cadmium	0.00622	0.00008 U - 0.00008 U	0.005	Yes	1.24
BRSW-44 (2008)	6/17/2008	Copper	0.085	0.001 U - 0.001 U	1.3	No	--
BRSW-44 (2008)	6/17/2008	Iron	0.09	0.03 - 0.61	14	No	--
BRSW-44 (2008)	6/17/2008	Lead	0.0189	0.0005 U - 0.0005 U	0.015	Yes	1.26
BRSW-44 (2008)	6/17/2008	Manganese	1.019	0.003 U - 0.126	0.43	Yes	2.37
BRSW-44 (2008)	6/17/2008	Zinc	1.11	0.01 U - 0.01 U	2	No	--
BRSW-23 (2007)	10/10/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-23 (2007)	10/10/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-23 (2007)	10/10/2007	Cadmium	0.00328	0.00008 U - 0.00008 U	0.005	No	--
BRSW-23 (2007)	10/10/2007	Copper	0.014	0.001 U - 0.001 U	1.3	No	--
BRSW-23 (2007)	10/10/2007	Iron	0.7	0.03 - 0.61	14	No	--
BRSW-23 (2007)	10/10/2007	Lead	0.0063	0.0005 U - 0.0005 U	0.015	No	--
BRSW-23 (2007)	10/10/2007	Manganese	1.21	0.003 U - 0.126	0.43	Yes	2.81
BRSW-23 (2007)	10/10/2007	Zinc	0.69	0.01 U - 0.01 U	2	No	--
BRSW-39A (2007)	10/10/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-39A (2007)	10/10/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-39A (2007)	10/10/2007	Cadmium	0.005	0.00008 U - 0.00008 U	0.005	No	--
BRSW-39A (2007)	10/10/2007	Copper	0.009	0.001 U - 0.001 U	1.3	No	--
BRSW-39A (2007)	10/10/2007	Iron	0.41	0.03 - 0.61	14	No	--
BRSW-39A (2007)	10/10/2007	Lead	0.0063	0.0005 U - 0.0005 U	0.015	No	--
BRSW-39A (2007)	10/10/2007	Manganese	2.12	0.003 U - 0.126	0.43	Yes	4.93
BRSW-39A (2007)	10/10/2007	Zinc	1.06	0.01 U - 0.01 U	2	No	--
BRSW-29 (2007)	10/9/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-29 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-29 (2007)	10/9/2007	Cadmium	0.00426	0.00008 U - 0.00008 U	0.005	No	--
BRSW-29 (2007)	10/9/2007	Copper	0.006	0.001 U - 0.001 U	1.3	No	--
BRSW-29 (2007)	10/9/2007	Iron	0.13	0.03 - 0.61	14	No	--
BRSW-29 (2007)	10/9/2007	Lead	0.0024	0.0005 U - 0.0005 U	0.015	No	--
BRSW-29 (2007)	10/9/2007	Manganese	0.761	0.003 U - 0.126	0.43	Yes	1.77
BRSW-29 (2007)	10/9/2007	Zinc	0.84	0.01 U - 0.01 U	2	No	--
BRSW-109 (2007)	10/9/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-109 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-109 (2007)	10/9/2007	Cadmium	0.00632	0.00008 U - 0.00008 U	0.005	Yes	1.26
BRSW-109 (2007)	10/9/2007	Copper	0.015	0.001 U - 0.001 U	1.3	No	--
BRSW-109 (2007)	10/9/2007	Iron	0.11	0.03 - 0.61	14	No	--
BRSW-109 (2007)	10/9/2007	Lead	0.0019	0.0005 U - 0.0005 U	0.015	No	--
BRSW-109 (2007)	10/9/2007	Manganese	1.13	0.003 U - 0.126	0.43	Yes	2.63
BRSW-109 (2007)	10/9/2007	Zinc	2.6	0.01 U - 0.01 U	2	Yes	1.30

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-9 (2007)	10/9/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-9 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-9 (2007)	10/9/2007	Cadmium	0.00711	0.00008 U - 0.00008 U	0.005	Yes	1.42
BRSW-9 (2007)	10/9/2007	Copper	0.018	0.001 U - 0.001 U	1.3	No	--
BRSW-9 (2007)	10/9/2007	Iron	0.11	0.03 - 0.61	14	No	--
BRSW-9 (2007)	10/9/2007	Lead	0.0019	0.0005 U - 0.0005 U	0.015	No	--
BRSW-9 (2007)	10/9/2007	Manganese	1.47	0.003 U - 0.126	0.43	Yes	3.42
BRSW-9 (2007)	10/9/2007	Zinc	3.42	0.01 U - 0.01 U	2	Yes	1.71
BRSW-108 (2007)	10/10/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-108 (2007)	10/10/2007	Cadmium	0.0011	0.00008 U - 0.00008 U	0.005	No	--
BRSW-108 (2007)	10/10/2007	Copper	0.159	0.001 U - 0.001 U	1.3	No	--
BRSW-108 (2007)	10/10/2007	Iron	0.01 BJ	0.03 - 0.61	14	No	--
BRSW-108 (2007)	10/10/2007	Lead	0.0012	0.0005 U - 0.0005 U	0.015	No	--
BRSW-108 (2007)	10/10/2007	Manganese	0.374	0.003 U - 0.126	0.43	No	--
BRSW-108 (2007)	10/10/2007	Zinc	0.22	0.01 U - 0.01 U	2	No	--
BRSW-108 (2008)	6/17/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-108 (2008)	6/17/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-108 (2008)	6/17/2008	Cadmium	0.00042	0.00008 U - 0.00008 U	0.005	No	--
BRSW-108 (2008)	6/17/2008	Copper	0.055	0.001 U - 0.001 U	1.3	No	--
BRSW-108 (2008)	6/17/2008	Iron	0.23	0.03 - 0.61	14	No	--
BRSW-108 (2008)	6/17/2008	Lead	0.001	0.0005 U - 0.0005 U	0.015	No	--
BRSW-108 (2008)	6/17/2008	Manganese	0.137	0.003 U - 0.126	0.43	No	--
BRSW-108 (2008)	6/17/2008	Zinc	0.1	0.01 U - 0.01 U	2	No	--
BRSW-36 (2007)	10/9/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-36 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-36 (2007)	10/9/2007	Cadmium	0.00922	0.00008 U - 0.00008 U	0.005	Yes	1.84
BRSW-36 (2007)	10/9/2007	Copper	0.014	0.001 U - 0.001 U	1.3	No	--
BRSW-36 (2007)	10/9/2007	Iron	0.08	0.03 - 0.61	14	No	--
BRSW-36 (2007)	10/9/2007	Lead	0.0013	0.0005 U - 0.0005 U	0.015	No	--
BRSW-36 (2007)	10/9/2007	Manganese	1.31	0.003 U - 0.126	0.43	Yes	3.05
BRSW-36 (2007)	10/9/2007	Zinc	3.61	0.01 U - 0.01 U	2	Yes	1.81
BRSW-33 (2007)	10/9/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-33 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-33 (2007)	10/9/2007	Cadmium	0.00575	0.00008 U - 0.00008 U	0.005	Yes	1.15
BRSW-33 (2007)	10/9/2007	Copper	0.012	0.001 U - 0.001 U	1.3	No	--
BRSW-33 (2007)	10/9/2007	Iron	0.07 BJ	0.03 - 0.61	14	No	--
BRSW-33 (2007)	10/9/2007	Lead	0.0031	0.0005 U - 0.0005 U	0.015	No	--
BRSW-33 (2007)	10/9/2007	Manganese	0.341	0.003 U - 0.126	0.43	No	--
BRSW-33 (2007)	10/9/2007	Zinc	1.67	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-12 (2007)	10/5/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-12 (2007)	10/5/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-12 (2007)	10/5/2007	Cadmium	0.00511	0.00008 U - 0.00008 U	0.005	Yes	1.02
BRSW-12 (2007)	10/5/2007	Copper	0.012	0.001 U - 0.001 U	1.3	No	--
BRSW-12 (2007)	10/5/2007	Iron	0.09	0.03 - 0.61	14	No	--
BRSW-12 (2007)	10/5/2007	Lead	0.0019 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-12 (2007)	10/5/2007	Manganese	0.33	0.003 U - 0.126	0.43	No	--
BRSW-12 (2007)	10/5/2007	Zinc	1.75	0.01 U - 0.01 U	2	No	--
BRSW-21 (2007)	10/5/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-21 (2007)	10/5/2007	Cadmium	0.00012	0.00008 U - 0.00008 U	0.005	No	--
BRSW-21 (2007)	10/5/2007	Copper	0.007	0.001 U - 0.001 U	1.3	No	--
BRSW-21 (2007)	10/5/2007	Iron	6.1	0.03 - 0.61	14	No	--
BRSW-21 (2007)	10/5/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-21 (2007)	10/5/2007	Manganese	0.303	0.003 U - 0.126	0.43	No	--
BRSW-21 (2007)	10/5/2007	Zinc	0.06	0.01 U - 0.01 U	2	No	--
BRSW-13 (2007)	10/5/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-13 (2007)	10/5/2007	Cadmium	0.00038	0.00008 U - 0.00008 U	0.005	No	--
BRSW-13 (2007)	10/5/2007	Copper	0.136	0.001 U - 0.001 U	1.3	No	--
BRSW-13 (2007)	10/5/2007	Iron	6.72	0.03 - 0.61	14	No	--
BRSW-13 (2007)	10/5/2007	Lead	0.0062	0.0005 U - 0.0005 U	0.015	No	--
BRSW-13 (2007)	10/5/2007	Manganese	0.354	0.003 U - 0.126	0.43	No	--
BRSW-13 (2007)	10/5/2007	Zinc	0.07	0.01 U - 0.01 U	2	No	--
BRSW-110 (2007)	10/4/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-110 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-110 (2007)	10/4/2007	Cadmium	0.00316	0.00008 U - 0.00008 U	0.005	No	--
BRSW-110 (2007)	10/4/2007	Copper	0.015	0.001 U - 0.001 U	1.3	No	--
BRSW-110 (2007)	10/4/2007	Iron	3.18	0.03 - 0.61	14	No	--
BRSW-110 (2007)	10/4/2007	Lead	0.0156	0.0005 U - 0.0005 U	0.015	Yes	1.04
BRSW-110 (2007)	10/4/2007	Manganese	0.278	0.003 U - 0.126	0.43	No	--
BRSW-110 (2007)	10/4/2007	Zinc	1.04	0.01 U - 0.01 U	2	No	--
BRSW-107 (2007)	10/4/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-107 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-107 (2007)	10/4/2007	Cadmium	0.00228	0.00008 U - 0.00008 U	0.005	No	--
BRSW-107 (2007)	10/4/2007	Copper	0.027	0.001 U - 0.001 U	1.3	No	--
BRSW-107 (2007)	10/4/2007	Iron	0.81	0.03 - 0.61	14	No	--
BRSW-107 (2007)	10/4/2007	Lead	0.0048	0.0005 U - 0.0005 U	0.015	No	--
BRSW-107 (2007)	10/4/2007	Manganese	0.256	0.003 U - 0.126	0.43	No	--
BRSW-107 (2007)	10/4/2007	Zinc	0.93	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-107 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-107 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-107 (2008)	6/16/2008	Cadmium	0.00163	0.00008 U - 0.00008 U	0.005	No	--
BRSW-107 (2008)	6/16/2008	Copper	0.013	0.001 U - 0.001 U	1.3	No	--
BRSW-107 (2008)	6/16/2008	Iron	0.12	0.03 - 0.61	14	No	--
BRSW-107 (2008)	6/16/2008	Lead	0.0045	0.0005 U - 0.0005 U	0.015	No	--
BRSW-107 (2008)	6/16/2008	Manganese	0.063	0.003 U - 0.126	0.43	No	--
BRSW-107 (2008)	6/16/2008	Zinc	0.42	0.01 U - 0.01 U	2	No	--
BRSW-31 (2007)	10/4/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-31 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-31 (2007)	10/4/2007	Cadmium	0.00225	0.00008 U - 0.00008 U	0.005	No	--
BRSW-31 (2007)	10/4/2007	Copper	0.022	0.001 U - 0.001 U	1.3	No	--
BRSW-31 (2007)	10/4/2007	Iron	1.03	0.03 - 0.61	14	No	--
BRSW-31 (2007)	10/4/2007	Lead	0.0055	0.0005 U - 0.0005 U	0.015	No	--
BRSW-31 (2007)	10/4/2007	Manganese	0.273	0.003 U - 0.126	0.43	No	--
BRSW-31 (2007)	10/4/2007	Zinc	0.81	0.01 U - 0.01 U	2	No	--
BRSW-31 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-31 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-31 (2008)	6/16/2008	Cadmium	0.00149	0.00008 U - 0.00008 U	0.005	No	--
BRSW-31 (2008)	6/16/2008	Copper	0.012	0.001 U - 0.001 U	1.3	No	--
BRSW-31 (2008)	6/16/2008	Iron	0.13	0.03 - 0.61	14	No	--
BRSW-31 (2008)	6/16/2008	Lead	0.0042	0.0005 U - 0.0005 U	0.015	No	--
BRSW-31 (2008)	6/16/2008	Manganese	0.055	0.003 U - 0.126	0.43	No	--
BRSW-31 (2008)	6/16/2008	Zinc	0.39	0.01 U - 0.01 U	2	No	--
BRSW-106 (2007)	10/4/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-106 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-106 (2007)	10/4/2007	Cadmium	0.00193	0.00008 U - 0.00008 U	0.005	No	--
BRSW-106 (2007)	10/4/2007	Copper	0.015	0.001 U - 0.001 U	1.3	No	--
BRSW-106 (2007)	10/4/2007	Iron	0.82	0.03 - 0.61	14	No	--
BRSW-106 (2007)	10/4/2007	Lead	0.0035	0.0005 U - 0.0005 U	0.015	No	--
BRSW-106 (2007)	10/4/2007	Manganese	0.216	0.003 U - 0.126	0.43	No	--
BRSW-106 (2007)	10/4/2007	Zinc	0.76	0.01 U - 0.01 U	2	No	--
BRSW-106 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-106 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-106 (2008)	6/16/2008	Cadmium	0.00146	0.00008 U - 0.00008 U	0.005	No	--
BRSW-106 (2008)	6/16/2008	Copper	0.012	0.001 U - 0.001 U	1.3	No	--
BRSW-106 (2008)	6/16/2008	Iron	0.11	0.03 - 0.61	14	No	--
BRSW-106 (2008)	6/16/2008	Lead	0.0034 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-106 (2008)	6/16/2008	Manganese	0.059	0.003 U - 0.126	0.43	No	--
BRSW-106 (2008)	6/16/2008	Zinc	0.39	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-105 (2007)	10/4/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-105 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-105 (2007)	10/4/2007	Cadmium	0.00164	0.00008 U - 0.00008 U	0.005	No	--
BRSW-105 (2007)	10/4/2007	Copper	0.006	0.001 U - 0.001 U	1.3	No	--
BRSW-105 (2007)	10/4/2007	Iron	0.17	0.03 - 0.61	14	No	--
BRSW-105 (2007)	10/4/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-105 (2007)	10/4/2007	Manganese	0.139	0.003 U - 0.126	0.43	No	--
BRSW-105 (2007)	10/4/2007	Zinc	0.72	0.01 U - 0.01 U	2	No	--
BRSW-105 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-105 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-105 (2008)	6/16/2008	Cadmium	0.00139	0.00008 U - 0.00008 U	0.005	No	--
BRSW-105 (2008)	6/16/2008	Copper	0.013	0.001 U - 0.001 U	1.3	No	--
BRSW-105 (2008)	6/16/2008	Iron	0.13	0.03 - 0.61	14	No	--
BRSW-105 (2008)	6/16/2008	Lead	0.004	0.0005 U - 0.0005 U	0.015	No	--
BRSW-105 (2008)	6/16/2008	Manganese	0.051	0.003 U - 0.126	0.43	No	--
BRSW-105 (2008)	6/16/2008	Zinc	0.36	0.01 U - 0.01 U	2	No	--
BRSW-16 (2007)	10/4/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-16 (2007)	10/4/2007	Cadmium	0.00136	0.00008 U - 0.00008 U	0.005	No	--
BRSW-16 (2007)	10/4/2007	Copper	0.005	0.001 U - 0.001 U	1.3	No	--
BRSW-16 (2007)	10/4/2007	Iron	0.19	0.03 - 0.61	14	No	--
BRSW-16 (2007)	10/4/2007	Lead	0.0009 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-16 (2007)	10/4/2007	Manganese	0.076	0.003 U - 0.126	0.43	No	--
BRSW-16 (2007)	10/4/2007	Zinc	0.55	0.01 U - 0.01 U	2	No	--
BRSW-16 (2008)	6/17/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-16 (2008)	6/17/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-16 (2008)	6/17/2008	Cadmium	0.00141	0.00008 U - 0.00008 U	0.005	No	--
BRSW-16 (2008)	6/17/2008	Copper	0.01	0.001 U - 0.001 U	1.3	No	--
BRSW-16 (2008)	6/17/2008	Iron	0.12	0.03 - 0.61	14	No	--
BRSW-16 (2008)	6/17/2008	Lead	0.0034	0.0005 U - 0.0005 U	0.015	No	--
BRSW-16 (2008)	6/17/2008	Manganese	0.051	0.003 U - 0.126	0.43	No	--
BRSW-16 (2008)	6/17/2008	Zinc	0.42	0.01 U - 0.01 U	2	No	--
BRSW-104 (2007)	10/3/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-104 (2007)	10/3/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-104 (2007)	10/3/2007	Cadmium	0.0012	0.00008 U - 0.00008 U	0.005	No	--
BRSW-104 (2007)	10/3/2007	Copper	0.004	0.001 U - 0.001 U	1.3	No	--
BRSW-104 (2007)	10/3/2007	Iron	0.08	0.03 - 0.61	14	No	--
BRSW-104 (2007)	10/3/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-104 (2007)	10/3/2007	Manganese	0.039	0.003 U - 0.126	0.43	No	--
BRSW-104 (2007)	10/3/2007	Zinc	0.52	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-104 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-104 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-104 (2008)	6/16/2008	Cadmium	0.00129	0.00008 U - 0.00008 U	0.005	No	--
BRSW-104 (2008)	6/16/2008	Copper	0.01	0.001 U - 0.001 U	1.3	No	--
BRSW-104 (2008)	6/16/2008	Iron	0.14	0.03 - 0.61	14	No	--
BRSW-104 (2008)	6/16/2008	Lead	0.0037	0.0005 U - 0.0005 U	0.015	No	--
BRSW-104 (2008)	6/16/2008	Manganese	0.05	0.003 U - 0.126	0.43	No	--
BRSW-104 (2008)	6/16/2008	Zinc	0.38	0.01 U - 0.01 U	2	No	--
BRSW-103 (2007)	10/3/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-103 (2007)	10/3/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-103 (2007)	10/3/2007	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-103 (2007)	10/3/2007	Copper	0.002	0.001 U - 0.001 U	1.3	No	--
BRSW-103 (2007)	10/3/2007	Iron	0.88	0.03 - 0.61	14	No	--
BRSW-103 (2007)	10/3/2007	Lead	0.0016 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-103 (2007)	10/3/2007	Manganese	0.226	0.003 U - 0.126	0.43	No	--
BRSW-103 (2007)	10/3/2007	Zinc	0.01 U	0.01 U - 0.01 U	2	No	--
BRSW-103 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-103 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-103 (2008)	6/16/2008	Cadmium	0.00011	0.00008 U - 0.00008 U	0.005	No	--
BRSW-103 (2008)	6/16/2008	Copper	0.004	0.001 U - 0.001 U	1.3	No	--
BRSW-103 (2008)	6/16/2008	Iron	0.78	0.03 - 0.61	14	No	--
BRSW-103 (2008)	6/16/2008	Lead	0.0025	0.0005 U - 0.0005 U	0.015	No	--
BRSW-103 (2008)	6/16/2008	Manganese	0.103	0.003 U - 0.126	0.43	No	--
BRSW-103 (2008)	6/16/2008	Zinc	0.03	0.01 U - 0.01 U	2	No	--
BRSW-17 (2007)	10/3/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-17 (2007)	10/3/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-17 (2007)	10/3/2007	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-17 (2007)	10/3/2007	Copper	0.001	0.001 U - 0.001 U	1.3	No	--
BRSW-17 (2007)	10/3/2007	Iron	0.17	0.03 - 0.61	14	No	--
BRSW-17 (2007)	10/3/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-17 (2007)	10/3/2007	Manganese	0.111	0.003 U - 0.126	0.43	No	--
BRSW-17 (2007)	10/3/2007	Zinc	0.12	0.01 U - 0.01 U	2	No	--
BRSW-17 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-17 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-17 (2008)	6/16/2008	Cadmium	0.00053	0.00008 U - 0.00008 U	0.005	No	--
BRSW-17 (2008)	6/16/2008	Copper	0.003	0.001 U - 0.001 U	1.3	No	--
BRSW-17 (2008)	6/16/2008	Iron	0.06	0.03 - 0.61	14	No	--
BRSW-17 (2008)	6/16/2008	Lead	0.0006	0.0005 U - 0.0005 U	0.015	No	--
BRSW-17 (2008)	6/16/2008	Manganese	0.019	0.003 U - 0.126	0.43	No	--
BRSW-17 (2008)	6/16/2008	Zinc	0.23	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS
Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-102 (2007)	10/3/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-102 (2007)	10/3/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-102 (2007)	10/3/2007	Cadmium	0.00107	0.00008 U - 0.00008 U	0.005	No	--
BRSW-102 (2007)	10/3/2007	Copper	0.003	0.001 U - 0.001 U	1.3	No	--
BRSW-102 (2007)	10/3/2007	Iron	0.07	0.03 - 0.61	14	No	--
BRSW-102 (2007)	10/3/2007	Lead	0.0016 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-102 (2007)	10/3/2007	Manganese	0.012	0.003 U - 0.126	0.43	No	--
BRSW-102 (2007)	10/3/2007	Zinc	0.1	0.01 U - 0.01 U	2	No	--
BRSW-102 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-102 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-102 (2008)	6/16/2008	Cadmium	0.00051	0.00008 U - 0.00008 U	0.005	No	--
BRSW-102 (2008)	6/16/2008	Copper	0.003	0.001 U - 0.001 U	1.3	No	--
BRSW-102 (2008)	6/16/2008	Iron	0.06	0.03 - 0.61	14	No	--
BRSW-102 (2008)	6/16/2008	Lead	0.0006	0.0005 U - 0.0005 U	0.015	No	--
BRSW-102 (2008)	6/16/2008	Manganese	0.016	0.003 U - 0.126	0.43	No	--
BRSW-102 (2008)	6/16/2008	Zinc	0.22	0.01 U - 0.01 U	2	No	--
BRSW-101 (2007)	10/3/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-101 (2007)	10/3/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-101 (2007)	10/3/2007	Cadmium	0.00015	0.00008 U - 0.00008 U	0.005	No	--
BRSW-101 (2007)	10/3/2007	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-101 (2007)	10/3/2007	Iron	0.05	0.03 - 0.61	14	No	--
BRSW-101 (2007)	10/3/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-101 (2007)	10/3/2007	Manganese	0.004	0.003 U - 0.126	0.43	No	--
BRSW-101 (2007)	10/3/2007	Zinc	0.09	0.01 U - 0.01 U	2	No	--
BRSW-101 (2008)	6/16/2008	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-101 (2008)	6/16/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-101 (2008)	6/16/2008	Cadmium	0.0005	0.00008 U - 0.00008 U	0.005	No	--
BRSW-101 (2008)	6/16/2008	Copper	0.003	0.001 U - 0.001 U	1.3	No	--
BRSW-101 (2008)	6/16/2008	Iron	0.07	0.03 - 0.61	14	No	--
BRSW-101 (2008)	6/16/2008	Lead	0.0006 BJ	0.0005 U - 0.0005 U	0.015	No	--
BRSW-101 (2008)	6/16/2008	Manganese	0.015	0.003 U - 0.126	0.43	No	--
BRSW-101 (2008)	6/16/2008	Zinc	0.24	0.01 U - 0.01 U	2	No	--
BRSW-206	11/3/2011	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-206	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-206	11/3/2011	Cadmium	0.00017	0.00008 U - 0.00008 U	0.005	No	--
BRSW-206	11/3/2011	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-206	11/3/2011	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-206	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-206	11/3/2011	Manganese	0.013	0.003 U - 0.126	0.43	No	--
BRSW-206	11/3/2011	Zinc	0.12	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
BRSW-205	11/3/2011	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-205	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-205	11/3/2011	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-205	11/3/2011	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-205	11/3/2011	Iron	0.06	0.03 - 0.61	14	No	--
BRSW-205	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-205	11/3/2011	Manganese	0.007	0.003 U - 0.126	0.43	No	--
BRSW-205	11/3/2011	Zinc	0.03	0.01 U - 0.01 U	2	No	--
BRSW-204	11/3/2011	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-204	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-204	11/3/2011	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-204	11/3/2011	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-204	11/3/2011	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-204	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-204	11/3/2011	Manganese	0.008	0.003 U - 0.126	0.43	No	--
BRSW-204	11/3/2011	Zinc	0.01	0.01 U - 0.01 U	2	No	--
BRSW-203	11/3/2011	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-203	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-203	11/3/2011	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-203	11/3/2011	Copper	0.001	0.001 U - 0.001 U	1.3	No	--
BRSW-203	11/3/2011	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-203	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-203	11/3/2011	Manganese	0.008	0.003 U - 0.126	0.43	No	--
BRSW-203	11/3/2011	Zinc	0.01	0.01 U - 0.01 U	2	No	--
BRSW-202	11/3/2011	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-202	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-202	11/3/2011	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-202	11/3/2011	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-202	11/3/2011	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-202	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-202	11/3/2011	Manganese	0.005 U	0.003 U - 0.126	0.43	No	--
BRSW-202	11/3/2011	Zinc	0.02	0.01 U - 0.01 U	2	No	--
BRSW-201	11/3/2011	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-201	11/3/2011	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-201	11/3/2011	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-201	11/3/2011	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-201	11/3/2011	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-201	11/3/2011	Manganese	0.005 U	0.003 U - 0.126	0.43	No	--
BRSW-201	11/3/2011	Zinc	0.01	0.01 U - 0.01 U	2	No	--

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-2: COMPARISON OF SURFACE WATER ANALYTICAL RESULTS WITH DEQ WATER QUALITY STANDARDS AND REFERENCE RESULTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Result	Range of Reference Results	DEQ Numeric Surface Water Quality Standard	Result Exceeds Surface Water Quality Standard?	Factor of Exceedance of Surface Water Quality Standard
Reference Surface Water Samples							
BRSW-11 (2007)	10/5/2007	Aluminum	0.03 U	0.03 U - 0.03	20	No	--
BRSW-11 (2007)	10/5/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-11 (2007)	10/5/2007	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-11 (2007)	10/5/2007	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-11 (2007)	10/5/2007	Iron	0.61	0.03 - 0.61	14	No	--
BRSW-11 (2007)	10/5/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-11 (2007)	10/5/2007	Manganese	0.126	0.003 U - 0.126	0.43	No	--
BRSW-11 (2007)	10/5/2007	Zinc	0.01 U	0.01 U - 0.01 U	2	No	--
BRSW-6 (2007)	10/9/2007	Arsenic	0.002 U	0.002 U - 0.003 U	0.01	No	--
BRSW-6 (2007)	10/9/2007	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-6 (2007)	10/9/2007	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-6 (2007)	10/9/2007	Iron	0.03 BJ	0.03 - 0.61	14	No	--
BRSW-6 (2007)	10/9/2007	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-6 (2007)	10/9/2007	Manganese	0.003 U	0.003 U - 0.126	0.43	No	--
BRSW-6 (2007)	10/9/2007	Zinc	0.01 U	0.01 U - 0.01 U	2	No	--
BRSW-6 (2008)	6/17/2008	Aluminum	0.03	0.03 U - 0.03	20	No	--
BRSW-6 (2008)	6/17/2008	Arsenic	0.003 U	0.002 U - 0.003 U	0.01	No	--
BRSW-6 (2008)	6/17/2008	Cadmium	0.00008 U	0.00008 U - 0.00008 U	0.005	No	--
BRSW-6 (2008)	6/17/2008	Copper	0.001 U	0.001 U - 0.001 U	1.3	No	--
BRSW-6 (2008)	6/17/2008	Iron	0.05 U	0.03 - 0.61	14	No	--
BRSW-6 (2008)	6/17/2008	Lead	0.0005 U	0.0005 U - 0.0005 U	0.015	No	--
BRSW-6 (2008)	6/17/2008	Manganese	0.005 U	0.003 U - 0.126	0.43	No	--
BRSW-6 (2008)	6/17/2008	Zinc	0.01 U	0.01 U - 0.01 U	2	No	--

Notes: Units are in miligrams per liter.
Site samples are sorted from upstream to downstream, extending from the Mike Horse Mine Area to the areas downstream of the Upper Marsh.

Numeric water quality standards from DEQ (2012), except for aluminum, iron, and manganese. The cleanup levels for aluminum, iron, and manganese are site-specific (EPA 2014) calculations.

-- Not applicable
B Analyte was detected in the associated blank as well as the sample.
DEQ Montana Department of Environmental Quality
EPA Environmental Protection Agency
HHRA Human health risk assessment
ID Identification
J Estimated value
U Not detected

References:
DEQ. 2012. Circular DEQ-7. Montana Numeric Water Quality Standards. October. Available on-line at: http://deq.mt.gov/wqinfo/Standards
EPA. 2013. Risk-Based Concentration Table. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Availiable on-line at: <http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm>.

For footnote definitions, see Notes section on page 10 of this table

TABLE 10-3: SOIL AND SEDIMENT SCREENING FOR PROTECTION OF GROUNDWATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Maximum Concentration (mg/kg)	Location of Maximum Concentration	Background as the Groundwater SSCL (mg/kg)	Maximum > Screening Value	Final Groundwater SSCLs[a] (mg/kg)	Source	Maximum > Screening Value	Frequency of Exceedances of Final Groundwater SSCLs
EU1 Soil	Aluminum	18,200	UAW5-500+50 (0-6")	31,092	No	31,092	1	No	0 / 9
	Arsenic	255	UAW1-Comp 1 (0-6")	40.400	**Yes**	2,507	3	No	0 / 46
	Cadmium	15.3	UAW3-COMP 1 (0-6")	4.8	**Yes**	15.30	2	No	0 / 13
	Copper	3,050	UAW1-COMP 1 (0-6")	275	**Yes**	3,050	2	No	0 / 46
	Iron	135,404	UAW5-500 (0-6")	58,270	**Yes**	1,000,000	3	No	0 / 46
	Lead	55,200	UAW1-COMP 1 (0-6")	1,109	**Yes**	6,026	3	**Yes**	4 / 46
	Manganese	3,256	UAW2-100+250 (0-6")	4,893	No	4,893	1	No	0 / 46
	Zinc	3,200	UAW3-COMP 1 (0-6")	551	**Yes**	3,200	2	No	0 / 46
EU2 Soil	Aluminum	25,500	BREOT-S32+300 (0-6")	31,092	No	31,092	1	No	0 / 27
	Arsenic	1,057	BREOT-N13-0 (0-6")	40.400	**Yes**	177	3	**Yes**	62 / 593
	Cadmium	161 J	UBDT-TP-6 (12-24")	4.8	**Yes**	14.00	3	**Yes**	19 / 91
	Copper	4,246	BREOT-N10-0 (0-6")	275	**Yes**	5,295	3	No	0 / 593
	Iron	201,203	BREOT-S64+25 (0-6")	58,270	**Yes**	259,173	3	No	0 / 590
	Lead	38,839	TP-FP-45(1.8-2.0)	1,109	**Yes**	1,109	1	**Yes**	225 / 593
	Manganese	15,083	BREOT-S24-0 (0-6")	4,893	**Yes**	4,893	1	**Yes**	43 / 593
	Zinc	26,000 J	UBDT-TP-6 (12-24")	551	**Yes**	2,946	3	**Yes**	73 / 593
EU3 Soil	Aluminum	14,900	CMWA-0+12.5 (0-6")	31,092	No	31,092	1	No	0 / 6
	Arsenic	1,570	CMWA-COMP 1 (0-6")	40.400	**Yes**	1,112	3	**Yes**	1 / 17
	Cadmium	3.04	CMWA-COMP 1 (0-6")	4.8	No	4.80	1	No	0 / 7
	Copper	759	CMWA-50 (0-6")	275	**Yes**	23,925	3	No	0 / 18
	Iron	224,789	CMWA-200 (0-6")	58,270	**Yes**	1,000,000	3	No	0 / 18
	Lead	2,270	CMWA-COMP 2 (0-6")	1,109	**Yes**	2,270	2	No	0 / 18
	Manganese	1,458	CMWA-50 (0-6")	4,893	No	4,893	1	No	0 / 18
	Zinc	1,875	CMWA-100 (0-6")	551	**Yes**	42,189	3	No	0 / 18
EU4 Soil	Aluminum	18,800	CARM-100+25 (0-6")	31,092	No	31,092	1	No	0 / 3
	Arsenic	49.0	CARM-1050 (0-6")	40.400	**Yes**	40.4	1	**Yes**	1 / 29
	Cadmium	11.1	CARM-400 (0-6")	4.8	**Yes**	11.10	2	No	0 / 6
	Copper	648	CARM-800 (0-6")	275	**Yes**	20,637	3	No	0 / 29
	Iron	144,414	CARM-1000 (0-6")	58,270	**Yes**	58,270	1	**Yes**	18 / 29
	Lead	2,223	CARM-1050 (0-6")	1,109	**Yes**	2,270	2	No	0 / 29
	Manganese	14,145	CARM-1000 (0-6")	4,893	**Yes**	4,893	1	**Yes**	2 / 29
	Zinc	833	CARM-1050+6.25 (0-6")	551	**Yes**	16,459	3	No	0 / 29

TABLE 10-3: SOIL AND SEDIMENT SCREENING FOR PROTECTION OF GROUNDWATER

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Maximum Concentration (mg/kg)	Location of Maximum Concentration	Background as the Groundwater SSCL (mg/kg)	Maximum > Screening Value	Final Groundwater SSCLs[a] (mg/kg)	Source	Maximum > Screening Value	Frequency of Exceendances of Final Groundwater SSCLs
EU5 Soil	Aluminum	12,200	CEA1-3-COMP 1 (0-6")	31,092	No	31,092	1	No	0 / 2
	Arsenic	84.5	CEA1-3-COMP 3 (0-6")	40.400	**Yes**	1,898	3	No	0 / 58
	Cadmium	4.31	CEA1-3-COMP 3 (0-6")	4.8	No	4.80	1	No	0 / 9
	Copper	1,354	CEA1-3-600 (0-6")	275	**Yes**	466,497	3	No	0 / 58
	Iron	53,326	CEA4-00 (0-6")	58,270	No	58,270	1	No	0 / 58
	Lead	1,380	CEA1-3-COMP 3 (0-6")	1,109	**Yes**	3,094	3	No	0 / 58
	Manganese	2,784	WEA1-COMP 2 (0-6")	4,893	No	4,893	1	No	0 / 58
	Zinc	868	CEA1-3-COMP 3 (0-6")	551	**Yes**	470,368	3	No	0 / 58
EU6 Soil	Aluminum	27,000	CONM-50+50 (0-6")	31,092	No	31,092	1	No	0 / 8
	Arsenic	1,010	CONM-250 (0-6")	40.400	**Yes**	288	3	**Yes**	3 / 36
	Cadmium	6.72	CONM-750 (0-6")	4.8	**Yes**	573.00	3	No	0 / 11
	Copper	410	CONM-COMP 1 (0-6")	275	**Yes**	410	2	No	0 / 36
	Iron	77,437	CONM-250 (0-6")	58,270	**Yes**	1,000,000	3	No	0 / 36
	Lead	6,780	CONM-Pile 1 (0-6")	1,109	**Yes**	1,609	3	**Yes**	5 / 36
	Manganese	1,996	CONM-350+50 (0-6")	4,893	No	4,893	1	No	0 / 36
	Zinc	914	CONM-COMP 2 (0-6")	551	**Yes**	914	2	No	0 / 36
EU7 Soil	Aluminum	12,900	MPWA-0 (0-6")	31,092	No	31,092	1	No	0 / 3
	Arsenic	116	MPWA-75+20 (0-6")	40.400	**Yes**	623	3	No	0 / 8
	Cadmium	0.90	MPWA-0 (0-6")	4.8	No	4.80	1	No	0 / 3
	Copper	579	MPWA-0 (0-6")	275	**Yes**	119,814	3	No	0 / 8
	Iron	95,905	MPWA-0 (0-6")	58,270	**Yes**	762,134	3	No	0 / 8
	Lead	3,480	MPWA-0 (0-6")	1,109	**Yes**	1,109	1	**Yes**	1 / 8
	Manganese	902	MPWA-230+25 (0-6")	4,893	No	4,893	1	No	0 / 8
	Zinc	525	MPWA-50+39 (0-6")	551	No	551	1	No	0 / 8
EU8 Soil	Aluminum	20,200	UMH1-400+12.5 (0-6")	31,092	No	31,092	1	No	0 / 14
	Arsenic	952	UMH-C3	40.400	**Yes**	2,485	3	**No**	0 / 180
	Cadmium	33.4	UMH-C3	4.8	**Yes**	1,067.00	3	**No**	0 / 28
	Copper	4,940	UMH-C3	275	**Yes**	105,390	3	**No**	0 / 180
	Iron	221,158	MHCS-525-W15 (0-6")	58,270	**Yes**	1,000,000	3	**No**	0 / 106
	Lead	30,700	UMH3-COMP 3 (0-6")	1,109	**Yes**	2,240	2	**Yes**	97 / 179
	Manganese	9,626	MHCS-700-W10 (0-6")	4,893	**Yes**	49,789	3	**No**	0 / 180
	Zinc	7,824	UMH-A1	551	**Yes**	169,458	3	**No**	0 / 180

TABLE 10-3: SOIL AND SEDIMENT SCREENING FOR PROTECTION OF GROUNDWATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Maximum Concentration (mg/kg)	Location of Maximum Concentration	Background as the Groundwater SSCL (mg/kg)	Maximum > Screening Value	Final Groundwater SSCLs[a] (mg/kg)	Source	Maximum > Screening Value	Frequency of Exceedances of Final Groundwater SSCLs
EU9 Soil	Aluminum	19,200	PMWA1-100+25 (0-6")	31,092	No	31,092	1	No	0 / 20
	Arsenic	1,370	PAYCW-3 (0-6")	40.400	**Yes**	167	3	**Yes**	12 / 27
	Cadmium	0.70	PMWA2-200+25 (0-6")	4.8	No	4.80	1	No	0 / 22
	Copper	608	PMWA2-100 (0-6")	275	**Yes**	60,844	3	No	0 / 27
	Iron	218,000	PAYCW-2 (12-24")	58,270	**Yes**	58,270	1	**Yes**	13 / 27
	Lead	741	PMWA1-200 (0-6")	1,109	No	1,109	1	No	0 / 27
	Manganese	762	PMWA2-50 (0-6")	4,893	No	4,893	1	No	0 / 27
	Zinc	161	PMWA2-50 (0-6")	551	No	551	1	No	0 / 27
EU10 Soil	Arsenic	52.7	N3TA-700 (0-6")	40.400	**Yes**	60	3	No	0 / 30
	Cadmium	1.36	N3TA-750 (0-6")	4.8	No	4.80	1	No	0 / 3
	Copper	1,001	N3TA-Pile #1 (0-6")	275	**Yes**	28,709	3	No	0 / 30
	Iron	83,328	N3TA-750 (0-6")	58,270	**Yes**	58,270	1	**Yes**	2 / 30
	Lead	708	N3TA-COMP 3 (0-6")	1,109	No	1,109	1	No	0 / 30
	Manganese	5,152	N3TA-Pile #1 (0-6")	4,893	**Yes**	4,893	1	**Yes**	1 / 30
	Zinc	713	N3TA-800 (0-6")	551	**Yes**	5,095	3	No	0 / 30
EU11 Soil	Aluminum	14,400	TP-FP-15A(8.5-9.0)	31,092	No	31,092	1	No	0 / 16
	Arsenic	616	BCEOT-E17-12.5 (0-6")	40.400	**Yes**	6,138	3	No	0 / 310
	Cadmium	120	TP-FP-09(3.2-3.3)	4.8	**Yes**	33.80	3	**Yes**	8 / 31
	Copper	5,809	TP-FP-16(4.2-4.3)	275	**Yes**	3,652	3	**Yes**	1 / 310
	Iron	199,000	BCSD-202	58,270	**Yes**	199,000	3	No	0 / 310
	Lead	24,892	TP-FP-21A(3.4-3.7)	1,109	**Yes**	8,522	3	**Yes**	9 / 310
	Manganese	23,700 J	BCEOT-W22-12.5 (0-6")	4,893	**Yes**	4,893	1	**Yes**	34 / 310
	Zinc	18,108	BCEOT-E17-12.5 (0-6")	551	**Yes**	13,700	3	**Yes**	2 / 310
EU12 Sediment	Aluminum	33,600	TP-MS-07(2.75-3.5)	8,030	**Yes**	8,030	1	**Yes**	41 / 63
	Arsenic	507	BRSD-16 (2-6")	32.3000	**Yes**	32	1	**Yes**	149 / 354
	Cadmium	78 J	UM-0N-500E (2-6")	1.84	**Yes**	1.84	1	**Yes**	76 / 136
	Copper	2,760 J	UM-0N-500E (2-6")	67	**Yes**	1,240	2	**Yes**	33 / 354
	Iron	199,000	BRSD-16 (2-6")	14,500	**Yes**	14,500	1	**Yes**	268 / 281
	Lead	30,867	TP-MS-116(1.0-1.5)	174	**Yes**	174	1	**Yes**	239 / 354
	Manganese	75,108	TP-MS-10B(0.0-0.5)	696	**Yes**	696	1	**Yes**	160 / 354
	Zinc	36,572	TP-MS-11B(0.0-0.5)	275	**Yes**	300	2	**Yes**	258 / 354

TABLE 10-3: SOIL AND SEDIMENT SCREENING FOR PROTECTION OF GROUNDWATER

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Maximum Concentration (mg/kg)	Location of Maximum Concentration	Background as the Groundwater SSCL (mg/kg)	Maximum > Screening Value	Final Groundwater SSCLs[a] (mg/kg)	Source	Maximum > Screening Value	Frequency of Exceendances of Final Groundwater SSCLs

Notes:

a The development of final groundwater SSCLs is presented in Appendix G.

EU Exposure Unit
COPC Contaminant of Potential Concern
mg/kg Milligrams per kilogram
J Estimated value
SSCL Soil screening cleanup level

Sources:

1- Option 1. Background

2- Option 2. Highest soil concetration for which this, and all lower soil concentrations, have leachate concentration at or below the Leachate Criterion (NJDEP 2008).

3- Option 3. Determination of a site-specific soil remediation standard using a Site-Specific Kd value (NJDEP 2008).

TABLE 12-1: SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Resident
EU 1 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.51E+03	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.53E+01	NA	NA	NA	NA
	Copper	2.75E+02	3.05E+03	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	6.03E+03	5.32E+03	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	6.03E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	3.20E+03	NA	NA	NA	NA
EU 2 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.77E+02	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.40E+01	NA	NA	NA	NA
	Copper	2.75E+02	5.30E+03	NA	NA	NA	NA
	Iron	5.83E+04	2.59E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.11E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	2.95E+03	NA	NA	NA	NA
EU 3 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.11E+03	8.17E+01	3.27E+01	2.00E+02	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	2.39E+04	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.27E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.27E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	4.22E+04	NA	NA	NA	NA

TABLE 12-1: SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Resident
EU 4 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	4.04E+01	NA	NA	NA	NA
	Cadmium	4.80E+00	1.11E+01	NA	NA	NA	NA
	Copper	2.75E+02	2.06E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.27E+03	NA	NA	NA	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.27E+03	NA	NA	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	1.65E+04	NA	NA	NA	NA
EU 5 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.90E+03	NA	NA	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	4.66E+05	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	3.09E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	3.09E+03	NA	NA	NA	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	4.70E+05	NA	NA	NA	NA
EU 6 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.88E+02	8.17E+01	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	5.73E+02	NA	NA	NA	NA
	Copper	2.75E+02	4.10E+02	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.61E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.61E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	9.14E+02	NA	NA	NA	NA

TABLE 12-1: SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Resident
EU 7 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	6.23E+02	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	1.20E+05	NA	NA	NA	NA
	Iron	5.83E+04	7.62E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	1.11E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.51E+02	NA	NA	NA	NA
EU 8 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	2.49E+03	8.17E+01	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	1.07E+03	NA	NA	NA	NA
	Copper	2.75E+02	1.05E+05	NA	NA	NA	NA
	Iron	5.83E+04	1.00E+06	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	2.24E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	2.24E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.98E+04	NA	NA	NA	NA
	Zinc	5.51E+02	1.69E+05	NA	NA	NA	NA
EU 9 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	1.67E+02	NA	NA	2.00E+02	NA
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	6.08E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.51E+02	NA	NA	NA	NA

TABLE 12-1: SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Resident
EU 10 Soil	Arsenic	4.04E+01	6.00E+01	NA	NA	NA	7.19E+00
	Cadmium	4.80E+00	4.80E+00	NA	NA	NA	NA
	Copper	2.75E+02	2.87E+04	NA	NA	NA	NA
	Iron	5.83E+04	5.83E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Lead (5 µg/dL)	1.11E+03	1.11E+03	NA	NA	NA	NA
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	5.10E+03	NA	NA	NA	NA
EU 11 Soil	Aluminum	3.11E+04	3.11E+04	NA	NA	NA	NA
	Arsenic	4.04E+01	6.14E+03	NA	3.27E+01	NA	7.19E+00
	Cadmium	4.80E+00	3.38E+01	NA	NA	NA	NA
	Copper	2.75E+02	3.65E+03	NA	NA	NA	NA
	Iron	5.83E+04	1.99E+05	NA	NA	NA	NA
	Lead (10 µg/dL)	1.11E+03	8.52E+03	NA	1.87E+03	1.25E+03	4.00E+02
	Lead (5 µg/dL)	1.11E+03	8.52E+03	1.79E+03	6.46E+02	4.30E+02	1.53E+02
	Manganese	4.89E+03	4.89E+03	NA	NA	NA	NA
	Zinc	5.51E+02	1.37E+04	NA	NA	NA	NA
EU 12 Sediment	Aluminum	8.03E+03	8.03E+03	NA	NA	NA	NA
	Arsenic	3.23E+01	3.23E+01	3.69E+01	NA	NA	1.71E+01
	Cadmium	1.84E+00	1.84E+00	NA	NA	NA	NA
	Copper	6.74E+01	1.24E+03	NA	NA	NA	NA
	Iron	1.45E+04	1.45E+04	NA	NA	NA	NA
	Lead (10 µg/dL)	1.74E+02	1.74E+02	NA	1.87E+03	1.25E+03	NA
	Lead (5 µg/dL)	1.74E+02	1.74E+02	1.79E+03	6.46E+02	4.30E+02	8.51E+02
	Manganese	6.96E+02	6.96E+02	NA	NA	NA	NA
	Zinc	2.75E+02	3.00E+02	NA	NA	NA	NA

TABLE 12-1: SITE-SPECIFIC CLEANUP LEVELS FOR SOIL AND SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU Media	COPC	Site-Wide Background Concentration	Protection of Groundwater SSL	Human Health Risk-Based Site-Specific Cleanup Levels			
				Recreational Receptors a	Industrial Worker	Construction Worker	Resident
EU 13 Sediment	Aluminum	8.98E+03	N/A	NA	NA	NA	NA
	Arsenic	1.54E+01	N/A	NA	NA	NA	NA
	Cadmium	5.00E-01	N/A	NA	NA	NA	NA
	Copper	1.14E+02	N/A	NA	NA	NA	NA
	Iron	2.39E+04	N/A	NA	NA	NA	NA
	Lead (10 µg/dL)	8.15E+01	N/A	NA	NA	NA	NA
	Lead (5 µg/dL)	8.15E+01	N/A	NA	NA	NA	NA
	Manganese	5.78E+02	N/A	NA	NA	NA	NA
	Zinc	1.36E+02	N/A	NA	NA	NA	NA

Notes: All concentrations are in milligrams per kilogram

a The risk-based site-specific cleanup level for recreational receptors is based on the rock hound receptor, which was the most conservative recreational receptor as seen in the RAGS D tables for recreational exposure.

b The SSCL exceeds the ceiling limit of 1.0E+05 representing 10 percent by weight of the soil sample, as specified by EPA (2009). At contaminant concentrations of 1.0E+05 and higher in soil, the assumptions for soil contact may be violated (for example, soil adherence and wind-borne dispersion assumptions) due to the presence of the foreign substance itself. Therefore, the ceiling limit of 1.0E+05 is recommended for use as the SSCL; however, the calculated SSCL is shown.

c The calculated SSCL exceeds the maximum possible concentration of 1.0E+06 representing 100 percent by weight of the sample. A contaminant concentration of greater than 1.0E+06 is not possible. Therefore, the value 1E+06 is used as the calculated SSCL.

d SSCLs for lead for recreational receptors are based on two target blood lead levels of 10 µg/dL and 5 µg/dL for 95 percent of the exposed population.

e SSCLs for residential exposure to lead were calculated assuming that UBMC groundwater is not used as a drinking water source.

COPC Contaminant of potential concern
EU Exposure unit
NA Not applicable - chemical is not a COC at this EU.
µg/dL Micrograms per deciliter
SSCL Site-specifc cleanup level
SSL Soil screening level

TABLE 13-1: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SURFACE SOIL (0 TO 2 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 1	EU 2	EU 3	EU 4	EU 5	EU 6	EU 7	EU 8	EU 9	EU 10	EU 11
Surface Soil	Recreational ATV/ Motorcycle Rider	12	Cancer Risk	2E-06	3E-06	**2E-05**	2E-08	5E-07	8E-06	3E-06	6E-06	--	5E-07	4E-06
			Noncancer Hazard [a]	0.05 (0.04)	0.2 (0.2)	0.3 (0.3)	0.01 (0.008)	0.01 (0.009)	0.1 (0.1)	0.06 (0.05)	0.3 (0.3)	0.006 (0.006)	0.1 (0.09)	0.3 (0.2)
			COCs	Lead	Lead*	Arsenic	--	--	Lead*	Lead*	Lead*	--	--	Lead*
	Recreational Fisherman	24	Cancer Risk	2E-06	2E-06		4E-11	4E-07	6E-06	2E-06	5E-06		4E-07	3E-06
			Noncancer Hazard [a]	0.02 (0.01)	0.03 (0.02)	NE	0.006 (0.005)	0.006 (0.004)	0.06 (0.06)	0.03 (0.02)	0.05 (0.04)	NE	0.008 (0.004)	0.04 (0.02)
			COCs	Lead	Lead*		--	--	--	Lead*	Lead*		--	--
	Recreational Rock Hound	24	Cancer Risk	6E-06	8E-06	**6E-05**	1E-10	2E-06	**2E-05**	9E-06	**2E-05**	--	2E-06	1E-05
			Noncancer Hazard [a]	0.1 (0.09)	0.2 (0.1)	0.8 (0.8)	0.06 (0.05)	0.05 (0.03)	0.4 (0.3)	0.2 (0.1)	0.4 (0.3)	0.04 (0.04)	0.07 (0.03)	0.3 (0.2)
			COCs	Lead	Lead*	Arsenic	--	--	Arsenic, Lead*	Lead*	Arsenic, Lead*	--	--	Lead*
	Recreational Hunter	16	Cancer Risk	1E-06	1E-06	1E-05	3E-11	3E-07	4E-06	2E-06	3E-06	--	3E-07	2E-06
			Noncancer Hazard [a]	0.012 (0.009)	0.02 (0.01)	0.09 (0.08)	0.004 (0.003)	0.004 (0.002)	0.04 (0.04)	0.02 (0.01)	0.03 (0.03)	0.003 (0.003)	0.006 (0.002)	0.02 (0.02)
			COCs	Lead	Lead*	--	--	--	--	Lead*	Lead*	--	--	--
	Industrial Worker	165	Cancer Risk	**2E-05**	**2E-05**	**1E-04**	7E-10	4E-06	**6E-05**	**2E-05**	**5E-05**	--	4E-06	**3E-05**
			Noncancer Hazard [a]	0.2 (0.1)	0.3 (0.1)	1.0 (0.9)	0.08 (0.07)	0.06 (0.04)	0.5 (0.4)	0.2 (0.2)	0.4 (0.3)	0.05 (0.05)	0.09 (0.04)	0.3 (0.2)
			COCs	Lead	Lead	Arsenic, Lead*	--	--	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	--	--	Arsenic, Lead
	Construction Worker	124	Cancer Risk	1E-06	2E-06	1E-05	2E-11	4E-07	5E-06	2E-06	4E-06	--	4E-07	2E-06
			Noncancer Hazard [a]	0.4 (0.2)	0.7 (0.3)	**2 (2)**	0.2 (0.2)	0.2 (0.09)	1 (1)	0.5 (0.4)	1 (0.7)	0.1 (0.1)	0.2 (0.09)	0.8 (0.4)
			COCs	Lead	Lead	Arsenic, Lead*	Lead*	--	Lead	Lead	Lead	--	--	Lead
	Resident	230	Cancer Risk	**7E-05**	**9E-05**	**6E-04**	3E-09	**2E-05**	**3E-04**	**1E-04**	**2E-04**	--	**2E-05**	**1E-04**
			Noncancer Hazard [a]	**2** (1)	**4 (2)**	**15 (13)**	1 (1)	0.9 (0.5)	**6 (6)**	**3 (2)**	**6 (4)**	0.8 (0.8)	1 (0.6)	**5 (3)**
			COCs	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	Lead	Arsenic, Lead*	Arsenic, Lead	Arsenic, Lead	Arsenic, Lead	--	Arsenic	Arsenic, Lead

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, surface soil) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

Cancer risks shown in **bold** exceed 1E-05. Noncancer hazards shown in **bold** exceed 1.

a The value shown in parentheses is the highest hazard index, segregated by target organ.

* Lead is only a COC with 5 µg/L blood lead as an endpoint. If no * is present, lease is a COC with both 5 and 10 µg/dL as endpoints.

--	Not applicable	EU	Exposure unit
ATV	All-terrain vehicle	NE	Not evaluated (see Section 4.4)
bgs	Below ground surface	UBMC	Upper Blackfoot Mining Complex
COC	Chemical of concern		

TABLE 13-2: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SUBSURFACE SOIL (2 TO 10 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 2	EU 9	EU 11
Subsurface Soil	Construction Worker	124	Cancer Risk	7E-07	1E-05	2E-06
			Noncancer Hazard [a]	0.4 (0.1)	**3 (2)**	0.8 (0.3)
			COCs	Lead	Arsenic	Lead

Notes: Collection of subsurface soil data was limited to EUs 2, 9, and 11.

COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, subsurface soil) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

Cancer risks shown in **bold** exceed 1E-05 (for cancer risk). Noncancer hazards shown in **bold** exceed 1.

a The value shown in parentheses is the highest hazard index, segregated by target organ.

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

TABLE 13-3: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SURFACE SEDIMENT (0 TO 2 FEET BGS) BY EXPOSURE UNIT

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 12	EU 13
Sediment	Recreational Fisherman	24	Cancer Risk	2E-06	6E-07
			Noncancer Hazard [a]	0.03 (0.01)	0.010 (0.005)
			COCs	--	--
	Recreational Rock Hound	24	Cancer Risk	**2E-05**	5E-06
			Noncancer Hazard [a]	0.6 (0.4)	0.2 (0.1)
			COCs	Arsenic, Lead*	--
	Industrial Worker	165	Cancer Risk	1E-05	4E-06
			Noncancer Hazard [a]	0.3 (0.20)	0.1 (0.07)
			COCs	Lead	--
	Construction Worker	124	Cancer Risk	1E-06	4E-07
			Noncancer Hazard [a]	0.8 (0.4)	0.3 (0.2)
			COCs	Lead	--
	Modified Resident	50	Cancer Risk	**4E-05**	1E-05
			Noncancer Hazard [a]	2 (0.5)	0.6 (0.3)
			COCs	Arsenic, Lead*	--

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, sediment) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).
Cancer risks shown in **bold** exceed 1E-05.

a The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

* Lead is only a COC with 5 µg/L blood lead as an endpoint. If no * is present, lease is a COC with both 5 and 10 µg/dL as endpoints.
Cancer risks shown in **bold** exceed 1E-05 (for cancer risk). Noncancer hazards shown in **bold** exceed 1.

-- Not applicable

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

TABLE 13-4: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN IN SUBSURFACE SEDIMENT (2 TO 10 FEET BGS) AT EXPOSURE UNIT 12

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium	Receptor	Exposure Frequency (days/year)	Risk	EU 12
Sediment	Construction Worker	124	Cancer Risk	6E-07
			Noncancer Hazard [a]	0.3 (0.1)
			COCs	Lead*

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, sediment) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1. Identification of lead as a COC was based on blood lead modeling (see Appendix E).

a The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

-- Not applicable

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

TABLE 13-5: SUMMARY OF CANCER RISKS, NONCANCER HAZARDS, AND CHEMICALS OF CONCERN FOR FISH INGESTION

Baseline Human Health Risk Assessment, Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Exposure Medium[a]	Receptor	Exposure Frequency (days/year)	Risk	UBMC-Wide[b]
Fish Tissue	Recreational Fisherman - Adult	24	Cancer Risk	--
			Noncancer Hazard [c]	0.7 (0.5)
			COCs	--
	Recreational Fisherman - Child	24	Cancer Risk	--
			Noncancer Hazard [c]	0.1 (0.1)
			COCs	--

Notes: COCs are those chemicals for which the chemical-specific cancer risk for a given exposure medium (for example, fish tissue) exceeds 1E-05 or the chemical-specific noncancer hazard index exceeds 1.

Noncancer hazards shown in **bold** exceed 1.

a Chemical concentrations in fish tissue were estimated using surface water data and bioconcentration factors (see Section 6.1.2).

b Health risks from fish consumption were estimated UBMC-wide, rather than on an exposure unit-specific basis.

c The value shown in parentheses is the highest segregated hazard index, segregated by target organ.

-- Not applicable

bgs Below ground surface

COC Chemical of concern

EU Exposure unit

UBMC Upper Blackfoot Mining Complex

APPENDIX A
PROUCL OUTPUT

Attachment A1
ProUCL Output for EU 1 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	EU1_ProUCL input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	46	Number of Detected Data	34
Number of Distinct Detected Data	34	Number of Non-Detect Data	12
		Percent Non-Detects	26.09%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	16.3	Minimum Detected	2.791
Maximum Detected	255.2	Maximum Detected	5.542
Mean of Detected	74.3	Mean of Detected	4.003
SD of Detected	66.38	SD of Detected	0.76
Minimum Non-Detect	12.26	Minimum Non-Detect	2.507
Maximum Non-Detect	29.06	Maximum Non-Detect	3.369

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	21
Number treated as Detected	25
Single DL Non-Detect Percentage	45.65%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.753	Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.933	5% Shapiro Wilk Critical Value	0.933
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	57.82	Mean	3.579
SD	63.4	SD	0.981
95% DL/2 (t) UCL	73.52	95% H-Stat (DL/2) UCL	81.29
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	29.94	Mean in Log Scale	3.608
SD	92.36	SD in Log Scale	0.945
95% MLE (t) UCL	52.81	Mean in Original Scale	58.15
95% MLE (Tiku) UCL	56.95	SD in Original Scale	63.16
		95% t UCL	73.78
		95% Percentile Bootstrap UCL	73.73
		95% BCA Bootstrap UCL	76.87
		95% H UCL	79.34

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.652	Data appear Lognormal at 5% Significance Level	
Theta Star	44.99		
nu star	112.3		
A-D Test Statistic	1.191	Nonparametric Statistics	
5% A-D Critical Value	0.762	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.762	Mean	59.59
5% K-S Critical Value	0.153	SD	61.45
Data not Gamma Distributed at 5% Significance Level		SE of Mean	9.201
		95% KM (t) UCL	75.04
Assuming Gamma Distribution		95% KM (z) UCL	74.73
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	74.48
Minimum	0.000001	95% KM (bootstrap t) UCL	78.84
Maximum	255.2	95% KM (BCA) UCL	77.17
Mean	54.92	95% KM (Percentile Bootstrap) UCL	75.1
Median	32.64	95% KM (Chebyshev) UCL	99.7
SD	65.72	97.5% KM (Chebyshev) UCL	117.1
k star	0.167	99% KM (Chebyshev) UCL	151.1
Theta star	328.7		
Nu star	15.37	Potential UCLs to Use	
AppChi2	7.52	95% KM (BCA) UCL	77.17
95% Gamma Approximate UCL (Use when n >= 40)	112.2		
95% Adjusted Gamma UCL (Use when n < 40)	115		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	13
Number of Missing Values	33		

Raw Statistics		Log-transformed Statistics	
Minimum	0.4	Minimum of Log Data	-0.916
Maximum	15.3	Maximum of Log Data	2.728
Mean	4.215	Mean of log Data	1.002
Geometric Mean	2.724	SD of log Data	1.023
Median	3.41		
SD	4.103		
Std. Error of Mean	1.138		
Coefficient of Variation	0.974		
Skewness	1.781		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.811	Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	6.243	95% H-UCL	10.79
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.16
95% Adjusted-CLT UCL (Chen-1995)	6.687	97.5% Chebyshev (MVUE) UCL	12.67
95% Modified-t UCL (Johnson-1978)	6.337	99% Chebyshev (MVUE) UCL	17.61
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.041	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.049		
MLE of Mean	4.215		
MLE of Standard Deviation	4.131		
nu star	27.06		
Approximate Chi Square Value (.05)	16.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	6.087
Adjusted Chi Square Value	15.01	95% Jackknife UCL	6.243
		95% Standard Bootstrap UCL	6.018
Anderson-Darling Test Statistic	0.259	95% Bootstrap-t UCL	7.232
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	9.153
Kolmogorov-Smirnov Test Statistic	0.138	95% Percentile Bootstrap UCL	6.168
Kolmogorov-Smirnov 5% Critical Value	0.242	95% BCA Bootstrap UCL	6.733
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.175
		97.5% Chebyshev(Mean, Sd) UCL	11.32
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	15.54
95% Approximate Gamma UCL (Use when n >= 40)	7.041		
95% Adjusted Gamma UCL (Use when n < 40)	7.598		
Potential UCL to Use		Use 95% Approximate Gamma UCL	7.041

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	46	Number of Distinct Observations	45
Raw Statistics		**Log-transformed Statistics**	
Minimum	37.43	Minimum of Log Data	3.622
Maximum	3050	Maximum of Log Data	8.023
Mean	310.9	Mean of log Data	5.186
Geometric Mean	178.8	SD of log Data	0.993
Median	151.4		
SD	477.8		
Std. Error of Mean	70.45		
Coefficient of Variation	1.537		
Skewness	4.505		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.532	Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	429.2	95% H-UCL	412.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	503.2
95% Adjusted-CLT UCL (Chen-1995)	476.8	97.5% Chebyshev (MVUE) UCL	596.2
95% Modified-t UCL (Johnson-1978)	437	99% Chebyshev (MVUE) UCL	779.1

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.985	Data appear Lognormal at 5% Significance Level	
Theta Star	315.6		
MLE of Mean	310.9		
MLE of Standard Deviation	313.3		
nu star	90.63		
Approximate Chi Square Value (.05)	69.68	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0448	95% CLT UCL	426.8
Adjusted Chi Square Value	69.09	95% Jackknife UCL	429.2
		95% Standard Bootstrap UCL	424.9
Anderson-Darling Test Statistic	1.377	95% Bootstrap-t UCL	549.1
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	894.5
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	431.7
Kolmogorov-Smirnov 5% Critical Value	0.134	95% BCA Bootstrap UCL	495.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	618
		97.5% Chebyshev(Mean, Sd) UCL	750.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1012
95% Approximate Gamma UCL (Use when n >= 40)	404.4		
95% Adjusted Gamma UCL (Use when n < 40)	407.9		

Potential UCL to Use		Use 95% H-UCL	412.4

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	46	Number of Distinct Observations	46

Raw Statistics		Log-transformed Statistics	
Minimum	15724	Minimum of Log Data	9.663
Maximum	135404	Maximum of Log Data	11.82
Mean	42043	Mean of log Data	10.47
Geometric Mean	35365	SD of log Data	0.562
Median	30908		
SD	28718		
Std. Error of Mean	4234		
Coefficient of Variation	0.683		
Skewness	1.8		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.776	Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	49154	95% H-UCL	48691
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	57094
95% Adjusted-CLT UCL (Chen-1995)	50208	97.5% Chebyshev (MVUE) UCL	63945
95% Modified-t UCL (Johnson-1978)	49342	99% Chebyshev (MVUE) UCL	77403
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.863	Data do not follow a Discernable Distribution (0.05)	
Theta Star	14685		
MLE of Mean	42043		
MLE of Standard Deviation	24848		
nu star	263.4		
Approximate Chi Square Value (.05)	226.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0448	95% CLT UCL	49008
Adjusted Chi Square Value	225.7	95% Jackknife UCL	49154
		95% Standard Bootstrap UCL	48879
Anderson-Darling Test Statistic	1.778	95% Bootstrap-t UCL	50748
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	50374
Kolmogorov-Smirnov Test Statistic	0.186	95% Percentile Bootstrap UCL	48945
Kolmogorov-Smirnov 5% Critical Value	0.131	95% BCA Bootstrap UCL	50336
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	60500
		97.5% Chebyshev(Mean, Sd) UCL	68486
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	84173
95% Approximate Gamma UCL (Use when n >= 40)	48824		
95% Adjusted Gamma UCL (Use when n < 40)	49061		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	60500

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	46	Number of Distinct Observations	46
Raw Statistics		**Log-transformed Statistics**	
Minimum	41.76	Minimum of Log Data	3.732
Maximum	55200	Maximum of Log Data	10.92
Mean	4092	Mean of log Data	6.77
Geometric Mean	871.1	SD of log Data	1.492
Median	642.6		
SD	11590		
Std. Error of Mean	1709		
Coefficient of Variation	2.832		
Skewness	4.046		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.364	Shapiro Wilk Test Statistic	0.915
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6962	95% H-UCL	5061
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5717
95% Adjusted-CLT UCL (Chen-1995)	7992	97.5% Chebyshev (MVUE) UCL	7097
95% Modified-t UCL (Johnson-1978)	7131	99% Chebyshev (MVUE) UCL	9808

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.409	Data do not follow a Discernable Distribution (0.05)	
Theta Star	10010		
MLE of Mean	4092		
MLE of Standard Deviation	6400		
nu star	37.61		
Approximate Chi Square Value (.05)	24.56	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0448	95% CLT UCL	6903
Adjusted Chi Square Value	24.22	95% Jackknife UCL	6962
		95% Standard Bootstrap UCL	6919
Anderson-Darling Test Statistic	5.378	95% Bootstrap-t UCL	15258
Anderson-Darling 5% Critical Value	0.833	95% Hall's Bootstrap UCL	18909
Kolmogorov-Smirnov Test Statistic	0.297	95% Percentile Bootstrap UCL	7154
Kolmogorov-Smirnov 5% Critical Value	0.139	95% BCA Bootstrap UCL	8177
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	11540
		97.5% Chebyshev(Mean, Sd) UCL	14763
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	21094
95% Approximate Gamma UCL (Use when n >= 40)	6264		
95% Adjusted Gamma UCL (Use when n < 40)	6353		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	11540

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Observations	46	Number of Distinct Observations	46

Raw Statistics		Log-transformed Statistics	
Minimum	57.67	Minimum of Log Data	4.055
Maximum	3200	Maximum of Log Data	8.071
Mean	551	Mean of log Data	6.076
Geometric Mean	435.1	SD of log Data	0.713
Median	442		
SD	472.7		
Std. Error of Mean	69.7		
Coefficient of Variation	0.858		
Skewness	4.085		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.641	Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	668	95% H-UCL	696.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	836.7
95% Adjusted-CLT UCL (Chen-1995)	710.5	97.5% Chebyshev (MVUE) UCL	957.7
95% Modified-t UCL (Johnson-1978)	675	99% Chebyshev (MVUE) UCL	1195

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.137	Data do not follow a Discernable Distribution (0.05)	
Theta Star	257.8		
MLE of Mean	551		
MLE of Standard Deviation	376.9		
nu star	196.6		
Approximate Chi Square Value (.05)	165.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0448	95% CLT UCL	665.6
Adjusted Chi Square Value	164.2	95% Jackknife UCL	668
		95% Standard Bootstrap UCL	662.6
Anderson-Darling Test Statistic	1.112	95% Bootstrap-t UCL	751.5
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	1200
Kolmogorov-Smirnov Test Statistic	0.141	95% Percentile Bootstrap UCL	680.9
Kolmogorov-Smirnov 5% Critical Value	0.132	95% BCA Bootstrap UCL	714.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	854.8
		97.5% Chebyshev(Mean, Sd) UCL	986.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1244
95% Approximate Gamma UCL (Use when n >= 40)	655.8		
95% Adjusted Gamma UCL (Use when n < 40)	659.5		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	854.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	11540
		97.5% Chebyshev(Mean, Sd) UCL	14763
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	21094
95% Approximate Gamma UCL (Use when n >= 40)	6264		
95% Adjusted Gamma UCL (Use when n < 40)	6353		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	11540

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Observations	46	Number of Distinct Observations	46

Raw Statistics		Log-transformed Statistics	
Minimum	57.67	Minimum of Log Data	4.055
Maximum	3200	Maximum of Log Data	8.071
Mean	551	Mean of log Data	6.076
Geometric Mean	435.1	SD of log Data	0.713
Median	442		
SD	472.7		
Std. Error of Mean	69.7		
Coefficient of Variation	0.858		
Skewness	4.085		

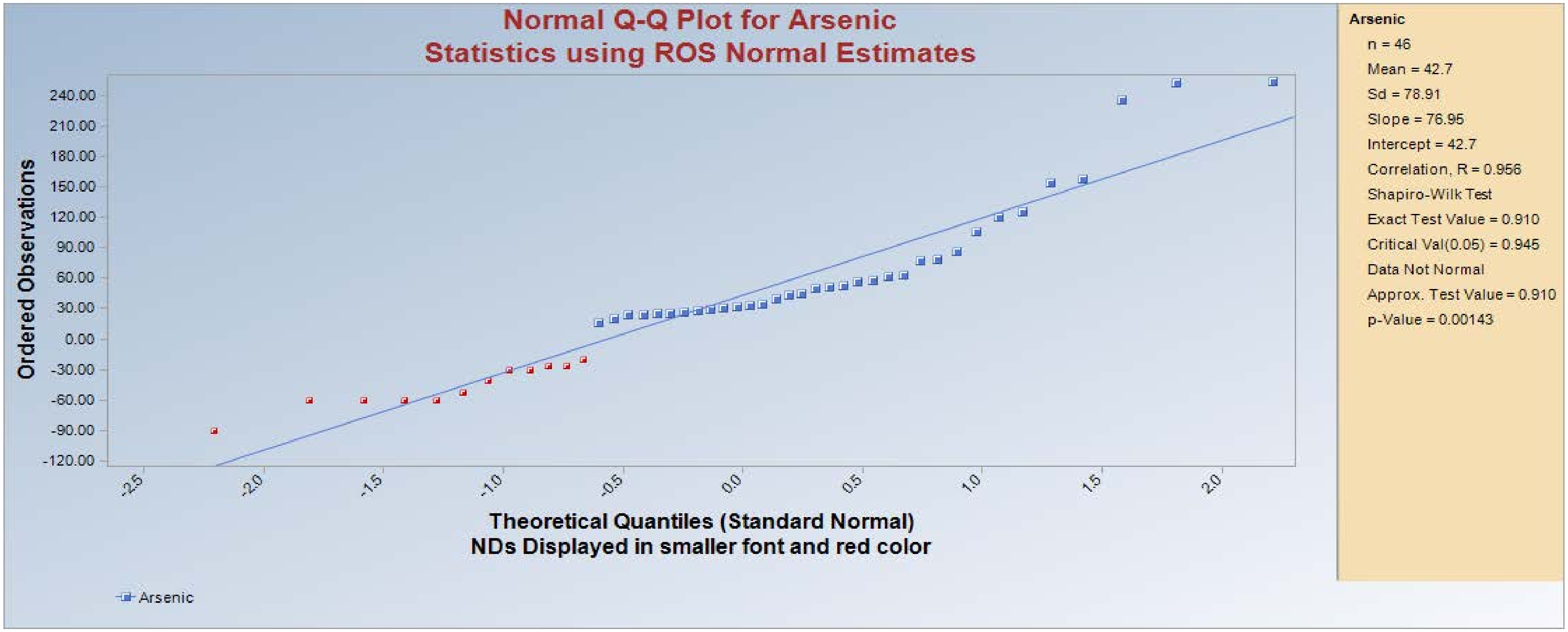
Relevant UCL Statistics

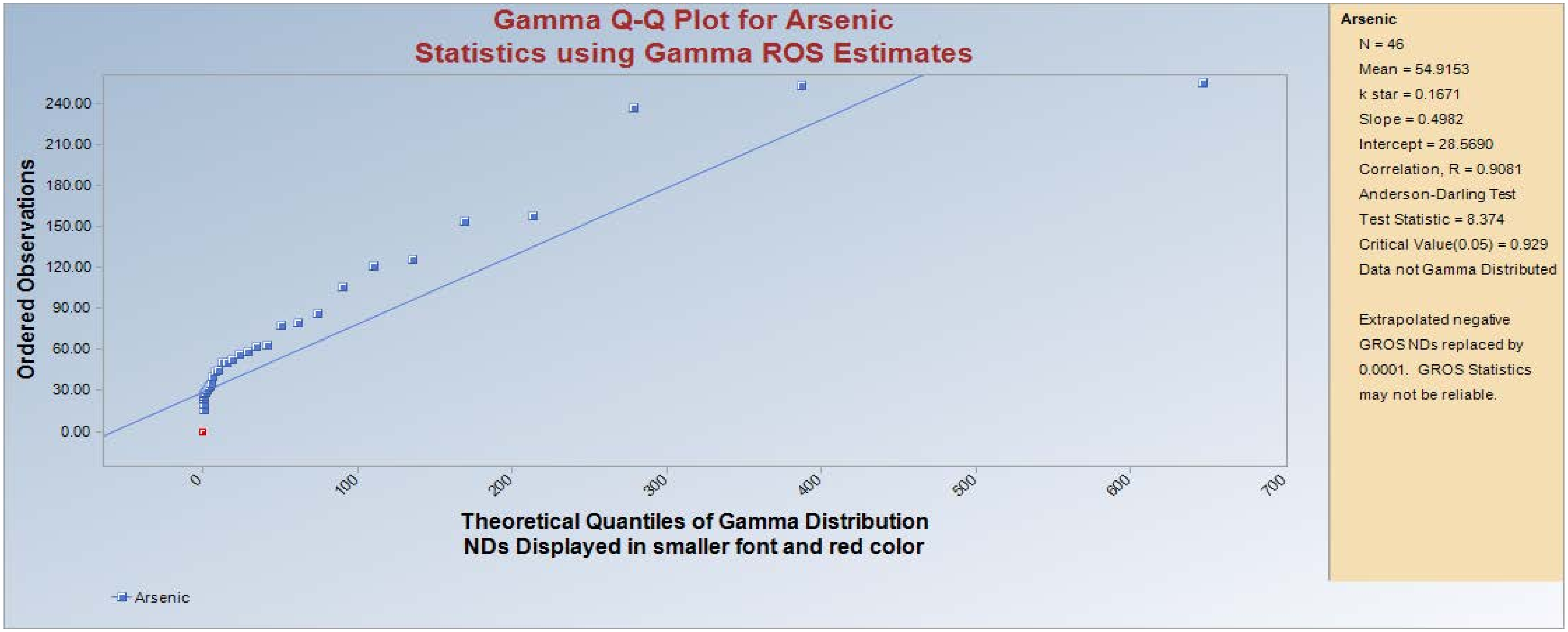
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.641	Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	668	95% H-UCL	696.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	836.7
95% Adjusted-CLT UCL (Chen-1995)	710.5	97.5% Chebyshev (MVUE) UCL	957.7
95% Modified-t UCL (Johnson-1978)	675	99% Chebyshev (MVUE) UCL	1195

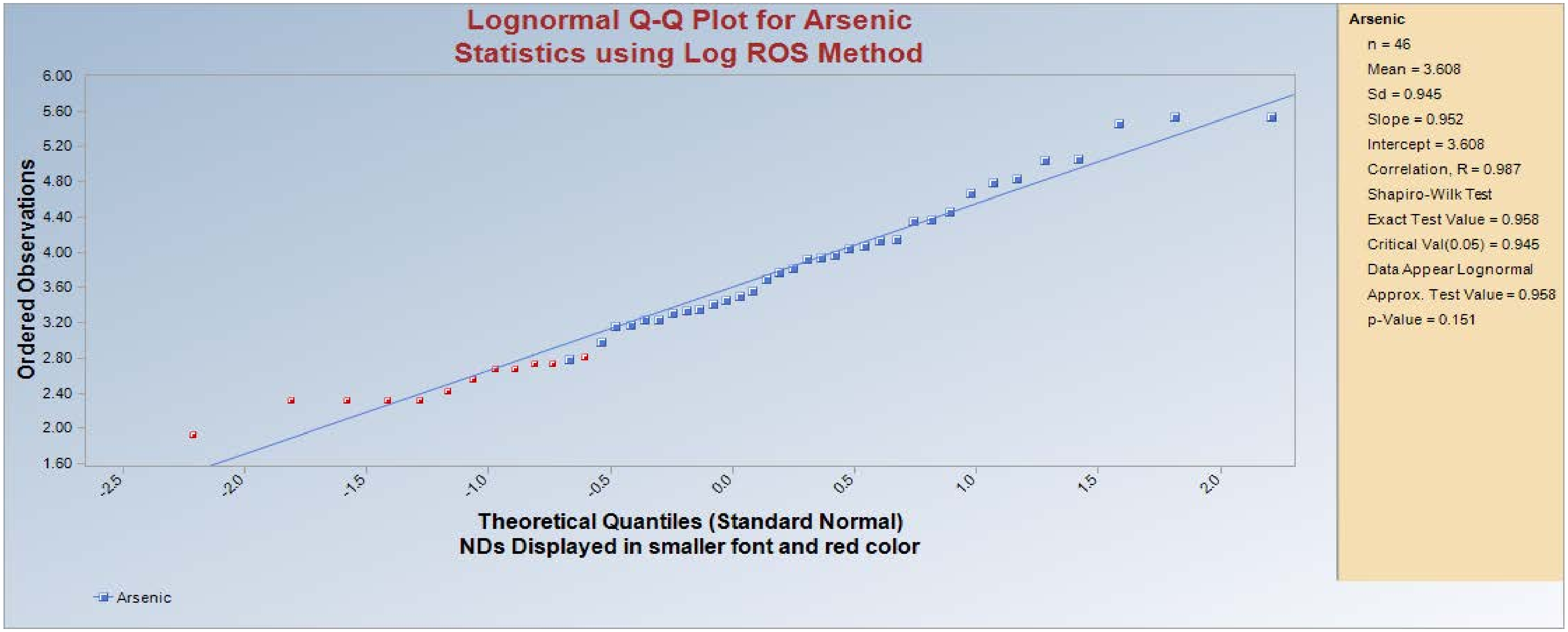
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.137	Data do not follow a Discernable Distribution (0.05)	
Theta Star	257.8		
MLE of Mean	551		
MLE of Standard Deviation	376.9		
nu star	196.6		
Approximate Chi Square Value (.05)	165.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0448	95% CLT UCL	665.6
Adjusted Chi Square Value	164.2	95% Jackknife UCL	668
		95% Standard Bootstrap UCL	662.6
Anderson-Darling Test Statistic	1.112	95% Bootstrap-t UCL	751.5
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	1200
Kolmogorov-Smirnov Test Statistic	0.141	95% Percentile Bootstrap UCL	680.9
Kolmogorov-Smirnov 5% Critical Value	0.132	95% BCA Bootstrap UCL	714.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	854.8
		97.5% Chebyshev(Mean, Sd) UCL	986.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1244
95% Approximate Gamma UCL (Use when n >= 40)	655.8		
95% Adjusted Gamma UCL (Use when n < 40)	659.5		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	854.8

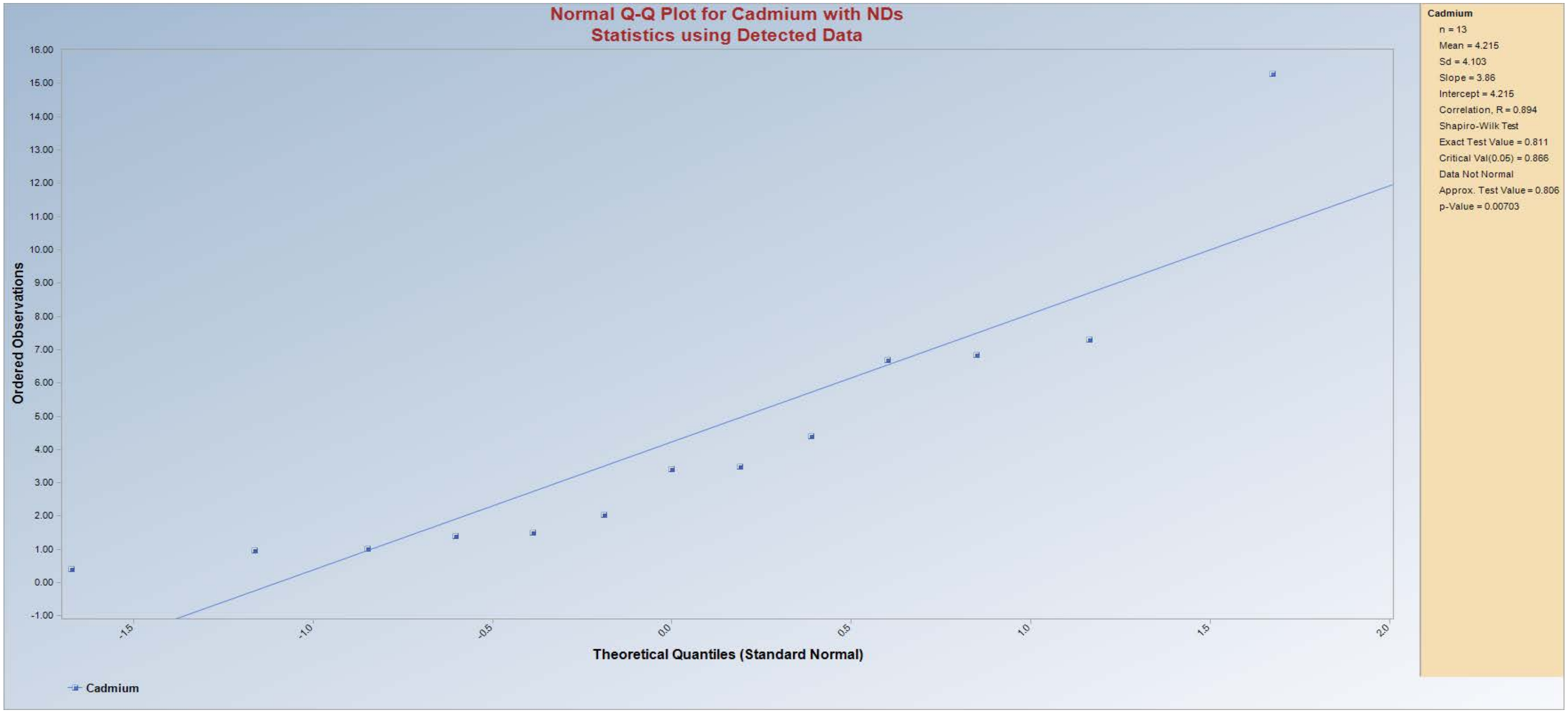
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
240.00
210.00
180.00
150.00
120.00
90.00
60.00
30.00
0.00
-30.00
-60.00
-90.00
-120.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 46
Mean = 42.7
Sd = 78.91
Slope = 76.95
Intercept = 42.7
Correlation, R = 0.956
Shapiro-Wilk Test
Exact Test Value = 0.910
Critical Val(0.05) = 0.945
Data Not Normal
Approx. Test Value = 0.910
p-Value = 0.00143

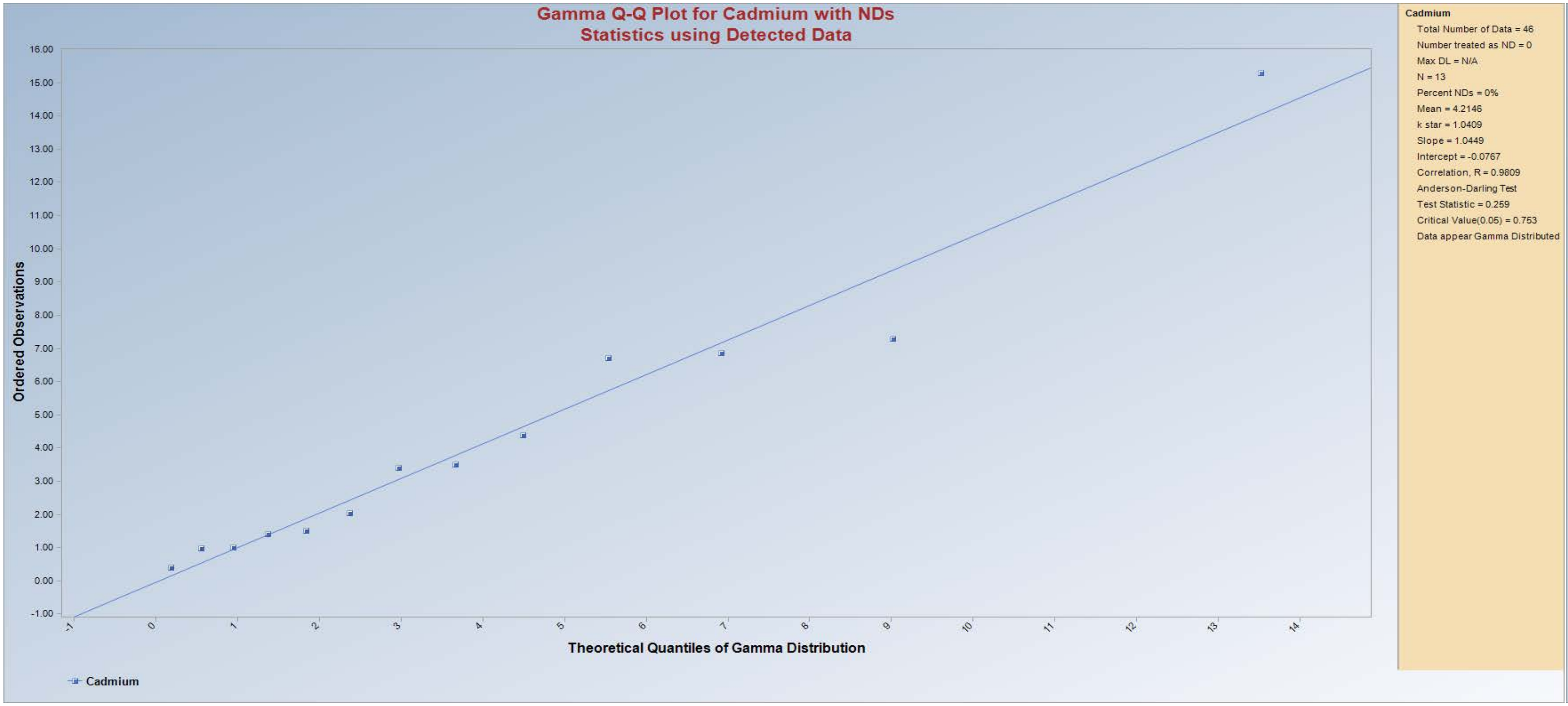

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
240.00
210.00
180.00
150.00
120.00
90.00
60.00
30.00
0.00
0
100
200
300
400
500
600
700
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 46
Mean = 54.9153
k star = 0.1671
Slope = 0.4982
Intercept = 28.5690
Correlation, R = 0.9081
Anderson-Darling Test
Test Statistic = 8.374
Critical Value(0.05) = 0.929
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



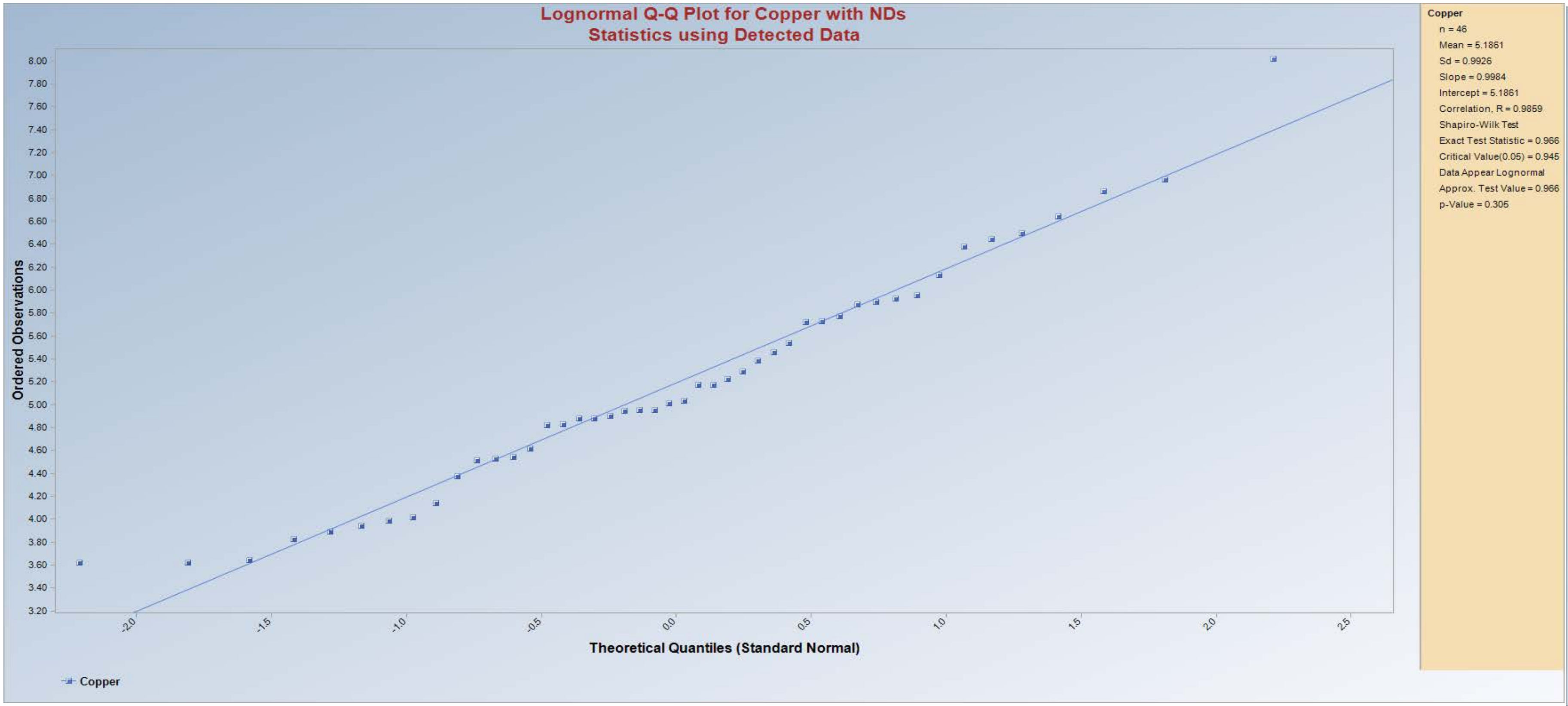
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 46
Mean = 3.608
Sd = 0.945
Slope = 0.952
Intercept = 3.608
Correlation, R = 0.987
Shapiro-Wilk Test
Exact Test Value = 0.958
Critical Val(0.05) = 0.945
Data Appear Lognormal
Approx. Test Value = 0.958
p-Value = 0.151

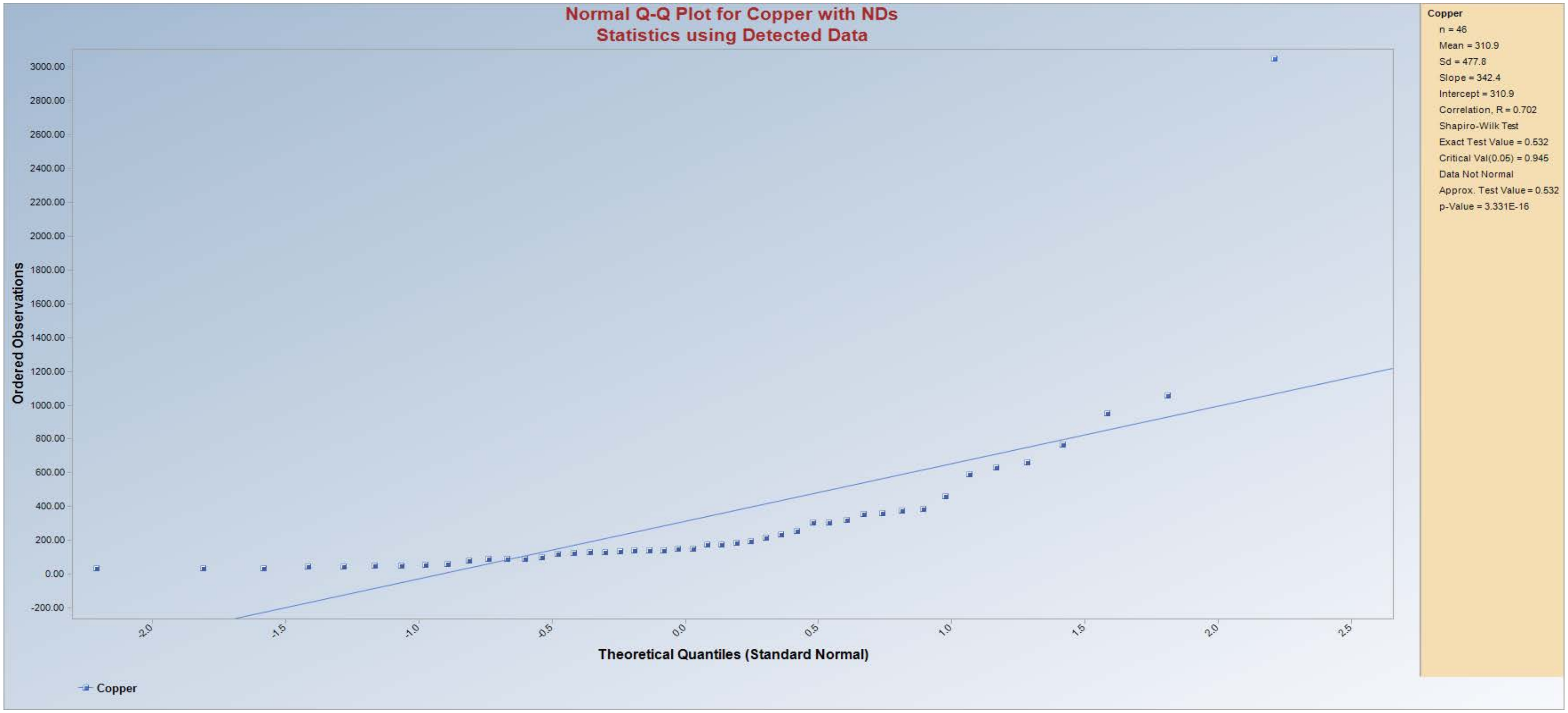


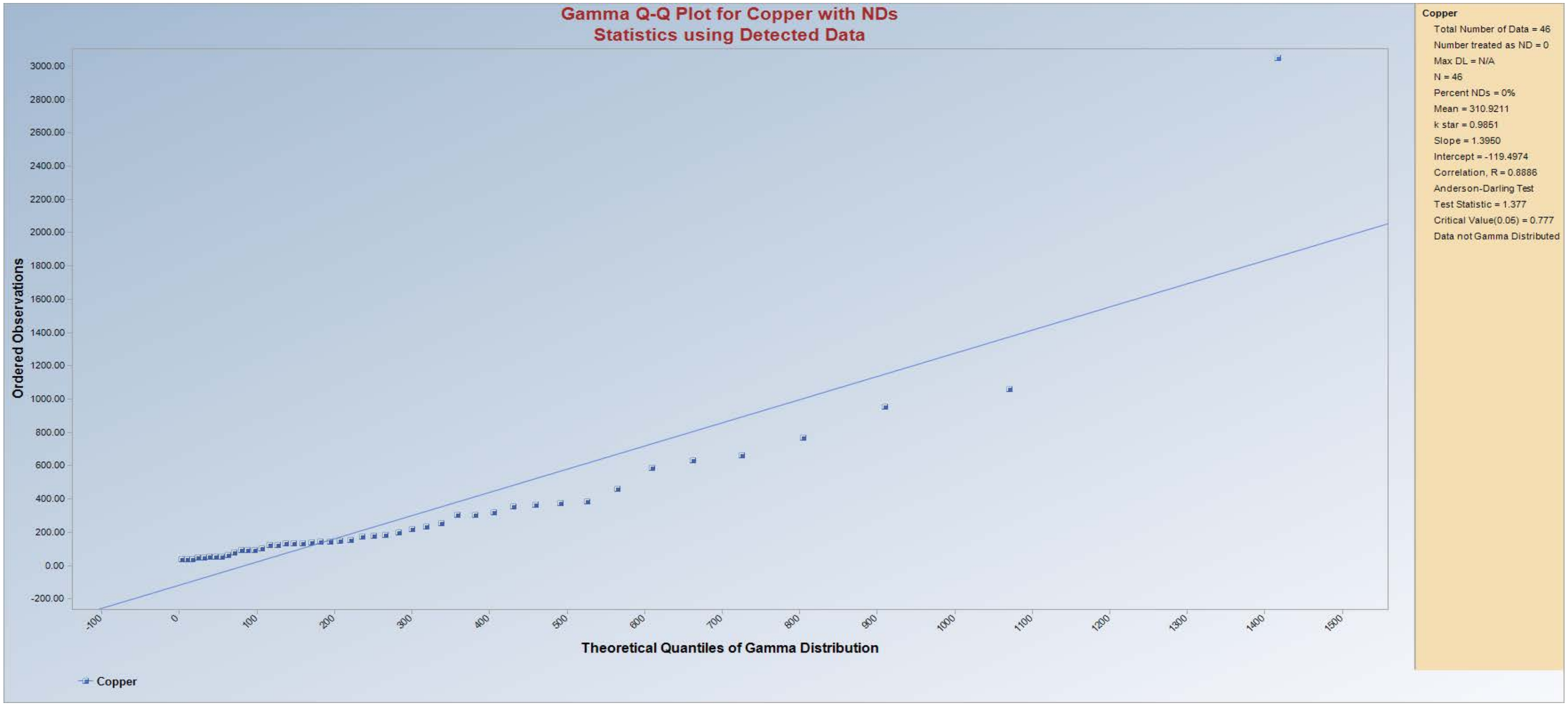
Normal Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Cadmium
Cadmium
n = 13
Mean = 4.215
Sd = 4.103
Slope = 3.86
Intercept = 4.215
Correlation, R = 0.894
Shapiro-Wilk Test
Exact Test Value = 0.811
Critical Val(0.05) = 0.866
Data Not Normal
Approx. Test Value = 0.806
p-Value = 0.00703



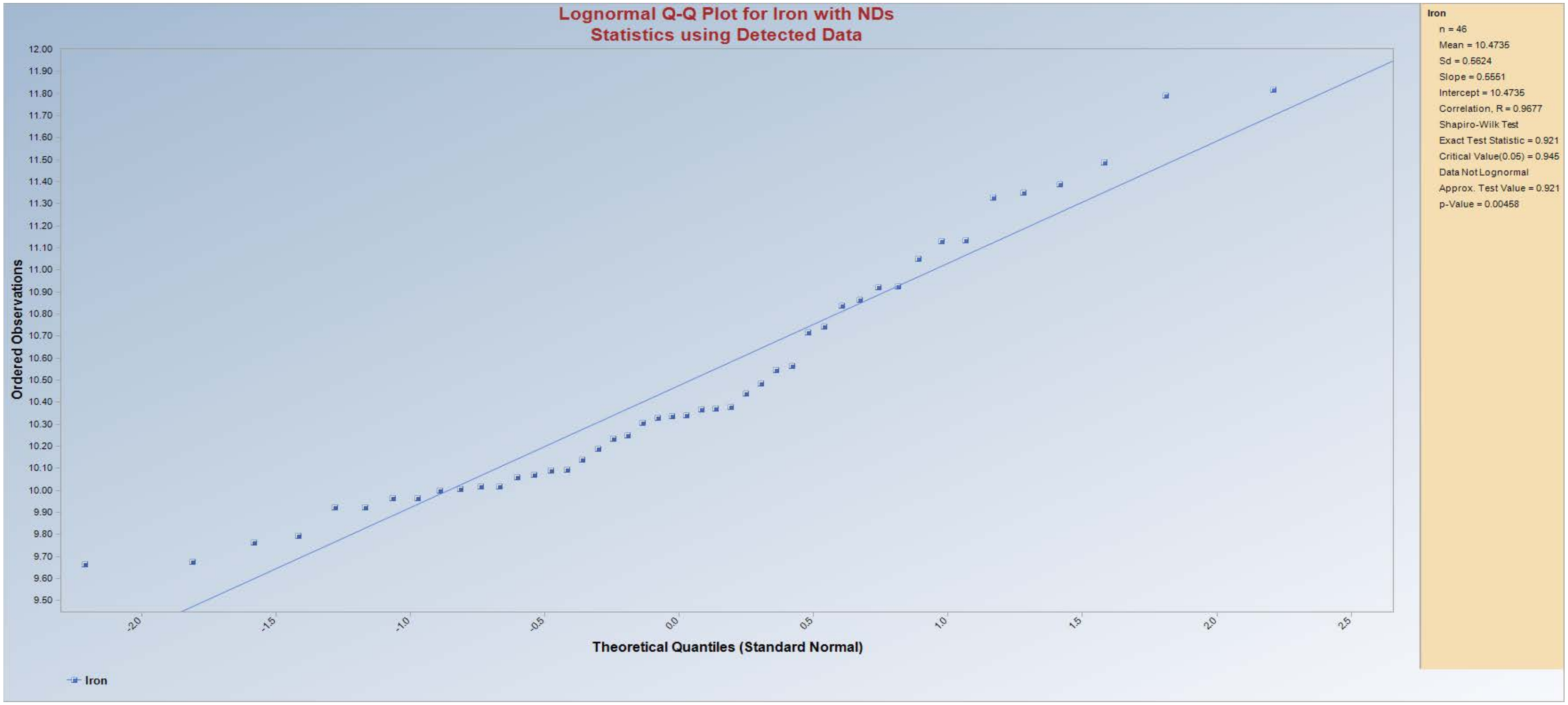
Gamma Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Cadmium
Cadmium
Total Number of Data = 46
Number treated as ND = 0
Max DL = N/A
N = 13
Percent NDs = 0%
Mean = 4.2146
k star = 1.0409
Slope = 1.0449
Intercept = -0.0767
Correlation, R = 0.9809
Anderson-Darling Test
Test Statistic = 0.259
Critical Value(0.05) = 0.753
Data appear Gamma Distributed


Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 46
Mean = 5.1861
Sd = 0.9926
Slope = 0.9984
Intercept = 5.1861
Correlation, R = 0.9859
Shapiro-Wilk Test
Exact Test Statistic = 0.966
Critical Value(0.05) = 0.945
Data Appear Lognormal
Approx. Test Value = 0.966
p-Value = 0.305

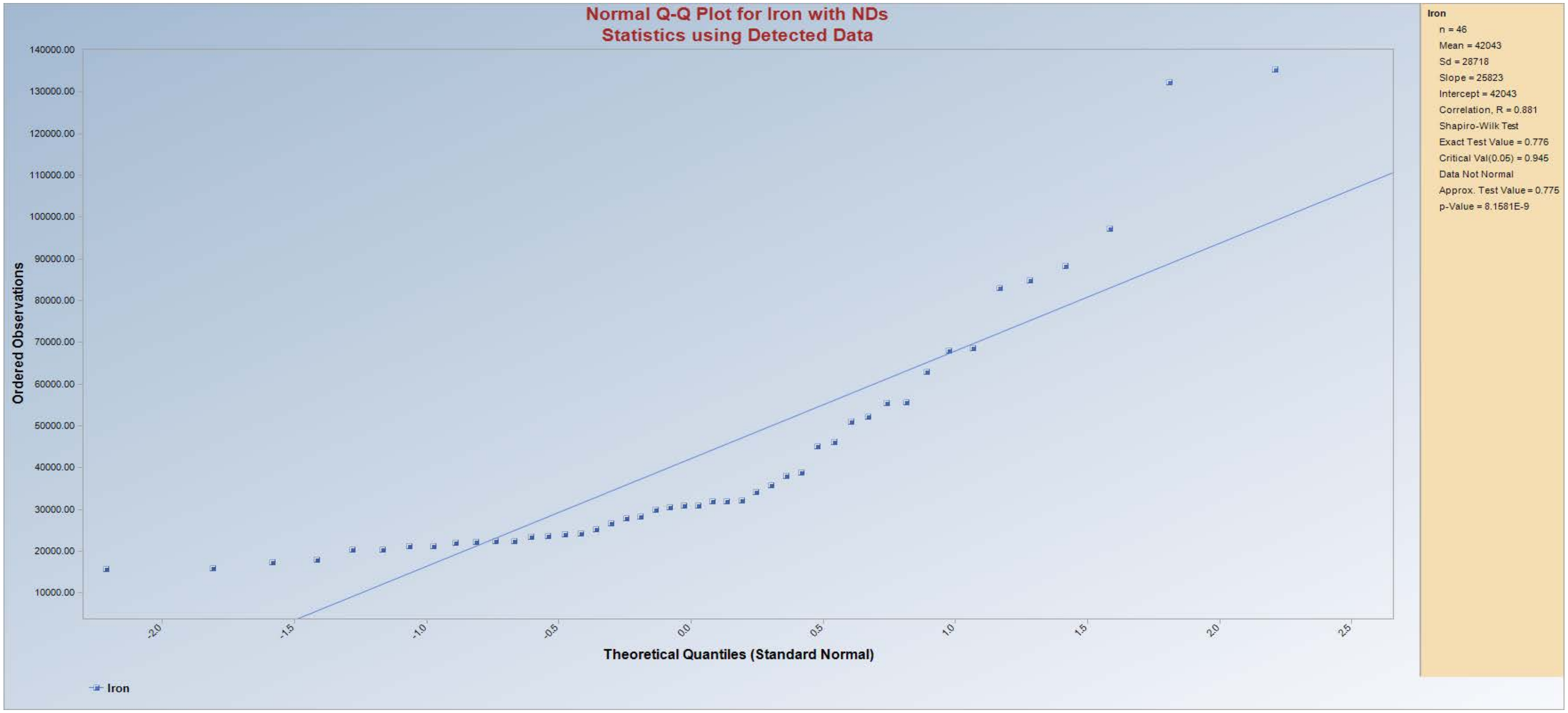

Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 46
Mean = 310.9
Sd = 477.8
Slope = 342.4
Intercept = 310.9
Correlation, R = 0.702
Shapiro-Wilk Test
Exact Test Value = 0.532
Critical Val(0.05) = 0.945
Data Not Normal
Approx. Test Value = 0.532
p-Value = 3.331E-16



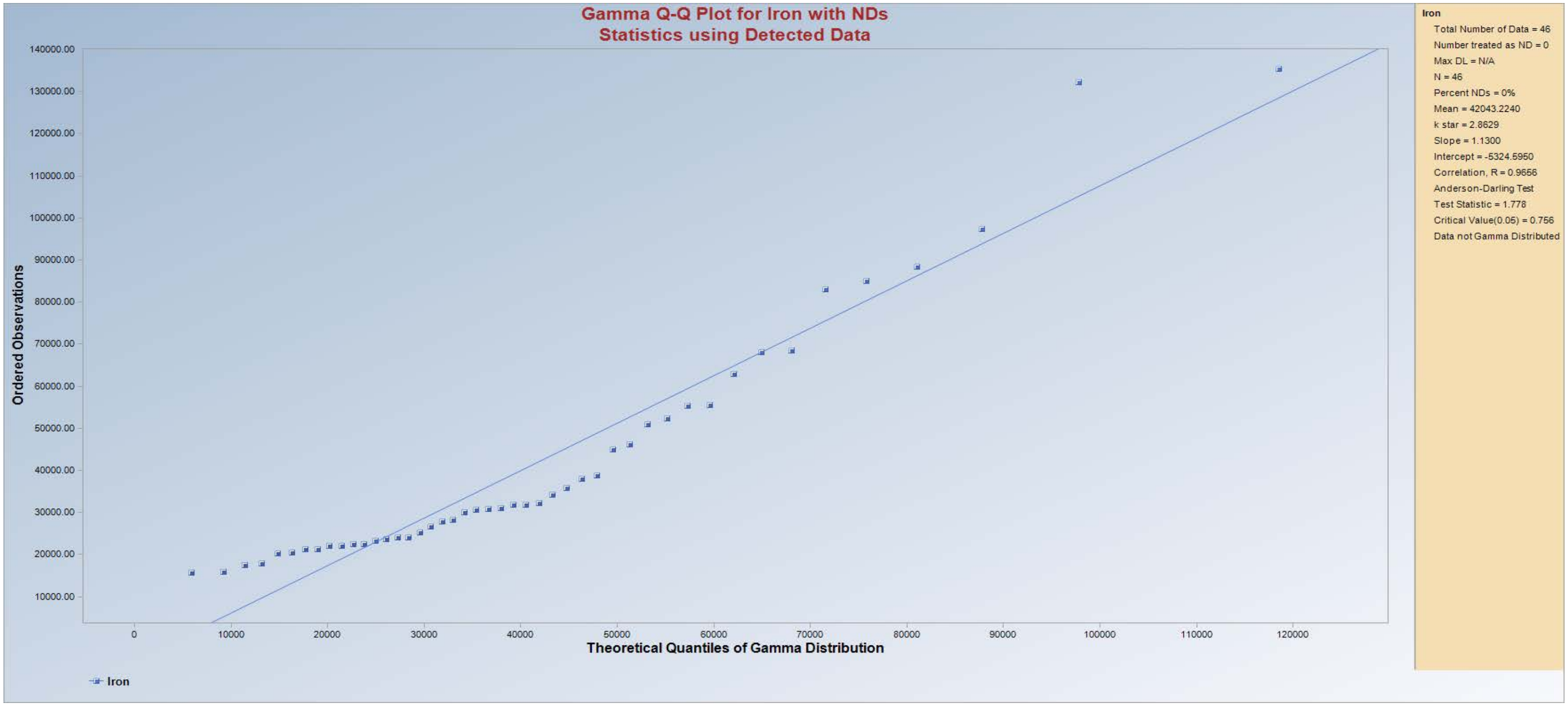
Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 46
Number treated as ND = 0
Max DL = N/A
N = 46
Percent NDs = 0%
Mean = 310.9211
k star = 0.9851
Slope = 1.3950
Intercept = -119.4974
Correlation, R = 0.8886
Anderson-Darling Test
Test Statistic = 1.377
Critical Value(0.05) = 0.777
Data not Gamma Distributed



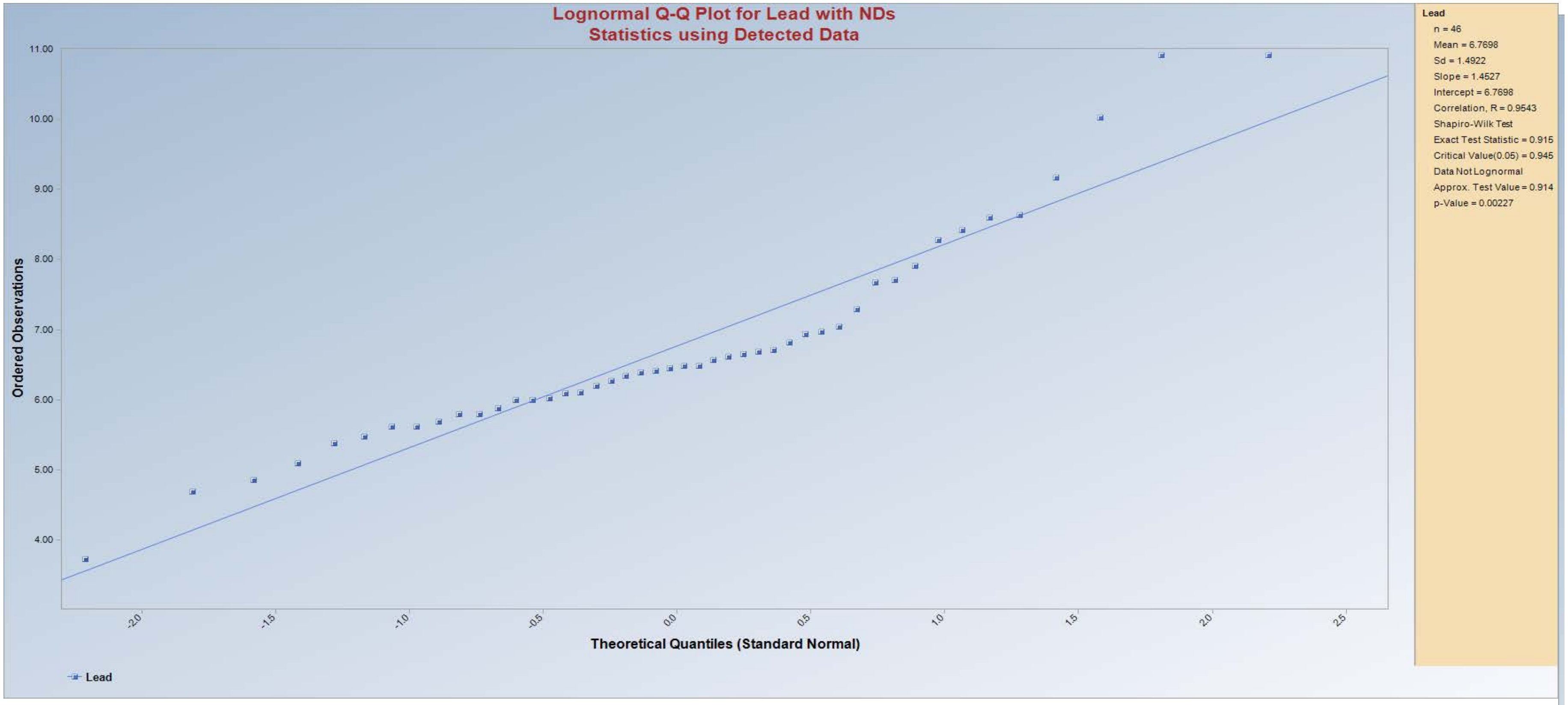
Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
12.00
11.90
11.80
11.70
11.60
11.50
11.40
11.30
11.20
11.10
11.00
10.90
10.80
10.70
10.60
10.50
10.40
10.30
10.20
10.10
10.00
9.90
9.80
9.70
9.60
9.50
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 46
Mean = 10.4735
Sd = 0.5624
Slope = 0.5551
Intercept = 10.4735
Correlation, R = 0.9677
Shapiro-Wilk Test
Exact Test Statistic = 0.921
Critical Value(0.05) = 0.945
Data Not Lognormal
Approx. Test Value = 0.921
p-Value = 0.00458

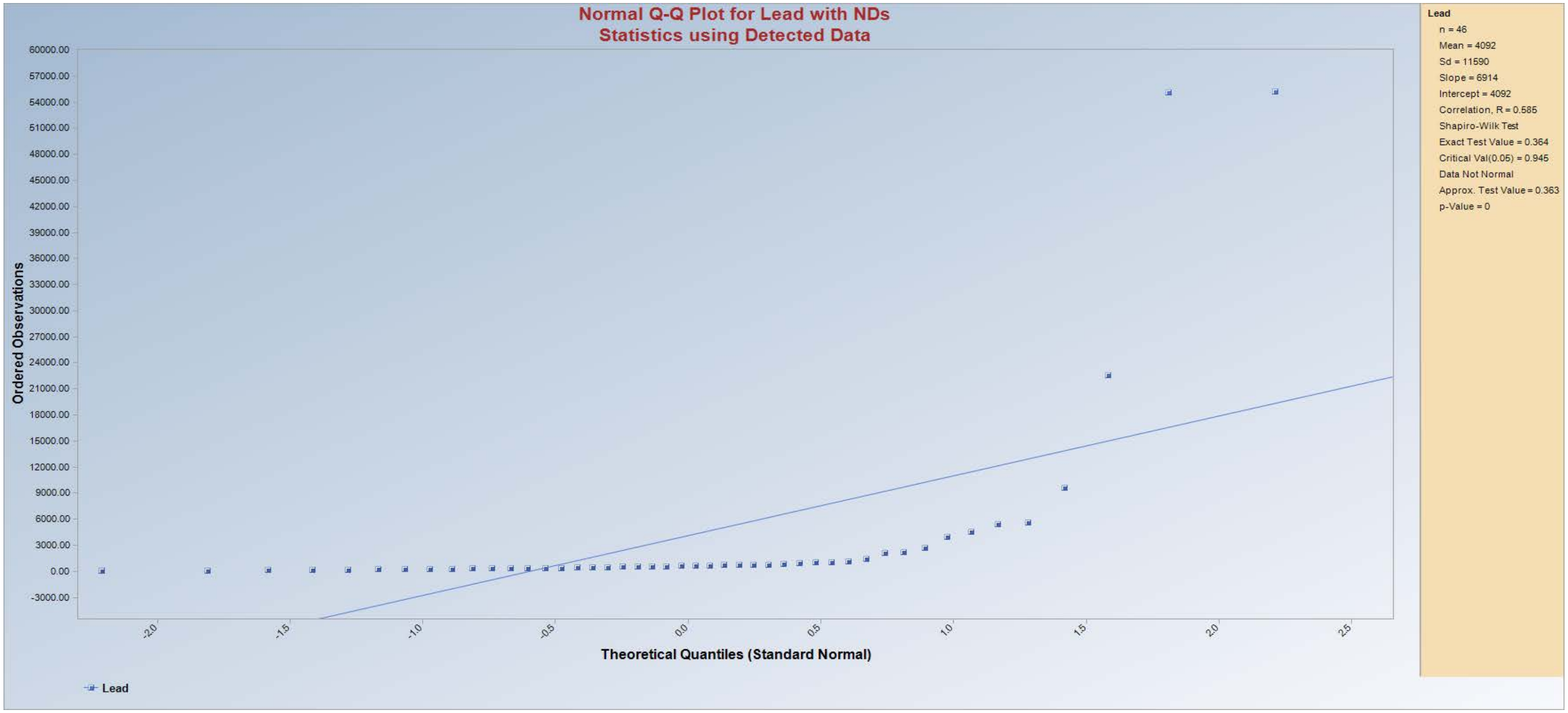


Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 46
Mean = 42043
Sd = 28718
Slope = 25823
Intercept = 42043
Correlation, R = 0.881
Shapiro-Wilk Test
Exact Test Value = 0.776
Critical Val(0.05) = 0.945
Data Not Normal
Approx. Test Value = 0.775
p-Value = 8.1581E-9

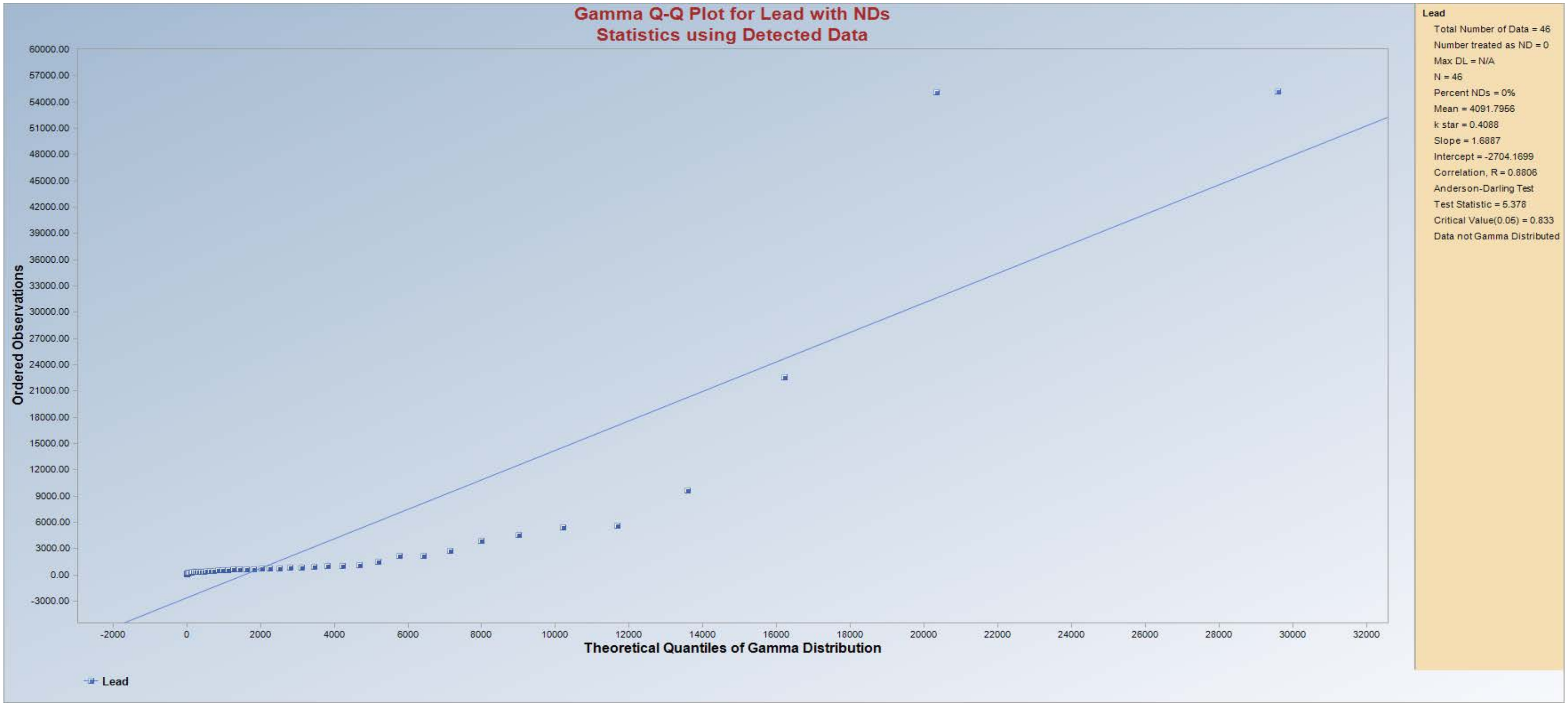


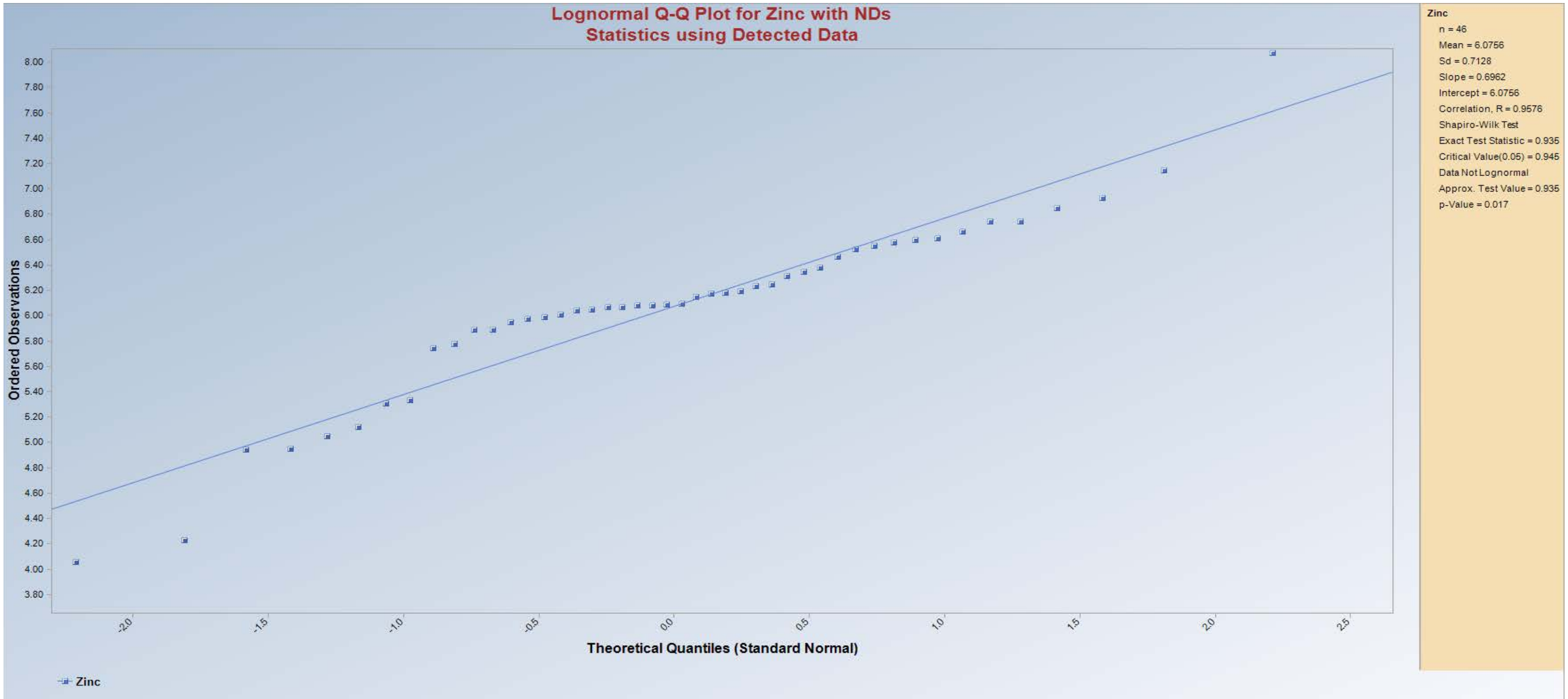
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 46
Number treated as ND = 0
Max DL = N/A
N = 46
Percent NDs = 0%
Mean = 42043.2240
k star = 2.8629
Slope = 1.1300
Intercept = -5324.5950
Correlation, R = 0.9656
Anderson-Darling Test
Test Statistic = 1.778
Critical Value(0.05) = 0.756
Data not Gamma Distributed


Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 46
Mean = 6.7698
Sd = 1.4922
Slope = 1.4527
Intercept = 6.7698
Correlation, R = 0.9543
Shapiro-Wilk Test
Exact Test Statistic = 0.916
Critical Value(0.05) = 0.945
Data Not Lognormal
Approx. Test Value = 0.914
p-Value = 0.00227

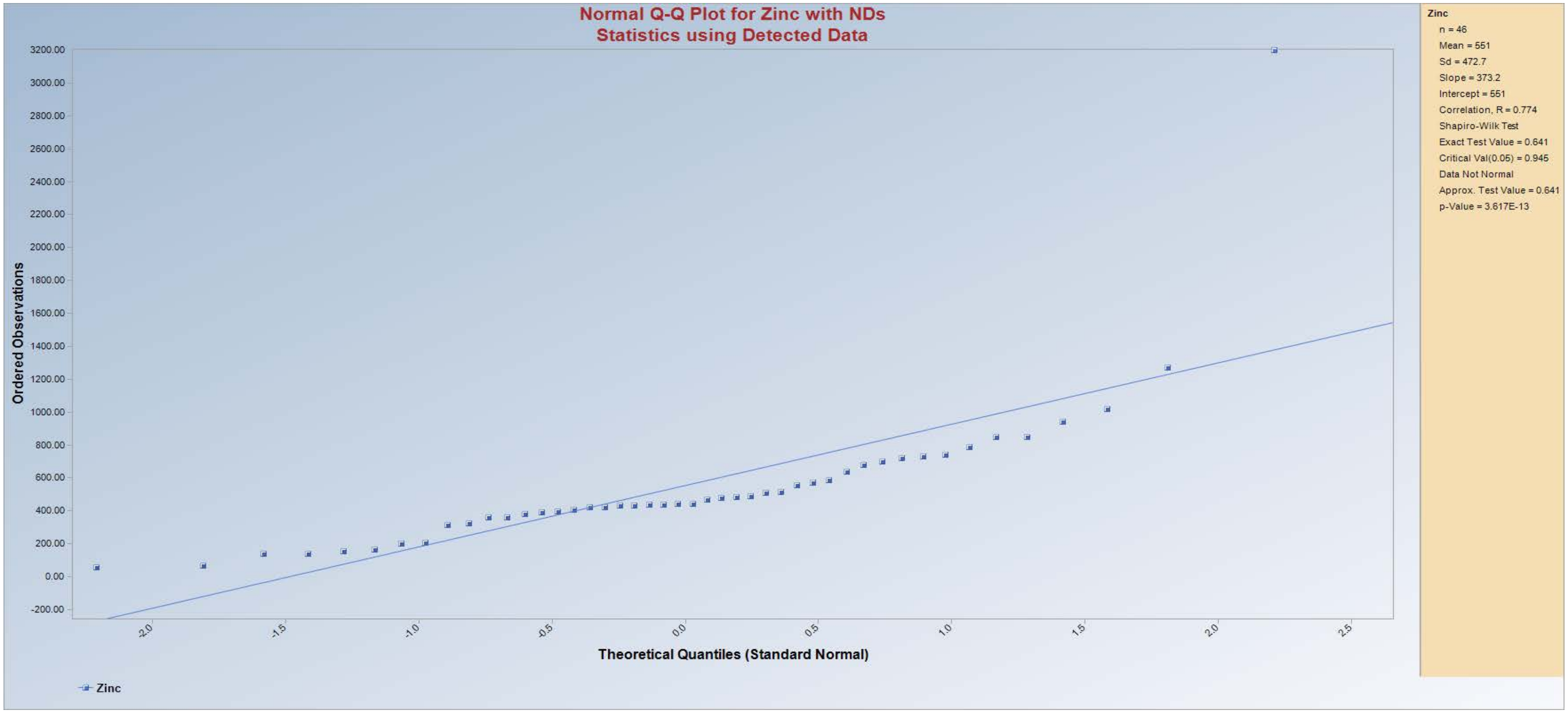


Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
60000.00
57000.00
54000.00
51000.00
48000.00
45000.00
42000.00
39000.00
36000.00
33000.00
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 46
Mean = 4092
Sd = 11590
Slope = 6914
Intercept = 4092
Correlation, R = 0.585
Shapiro-Wilk Test
Exact Test Value = 0.364
Critical Val(0.05) = 0.945
Data Not Normal
Approx. Test Value = 0.363
p-Value = 0

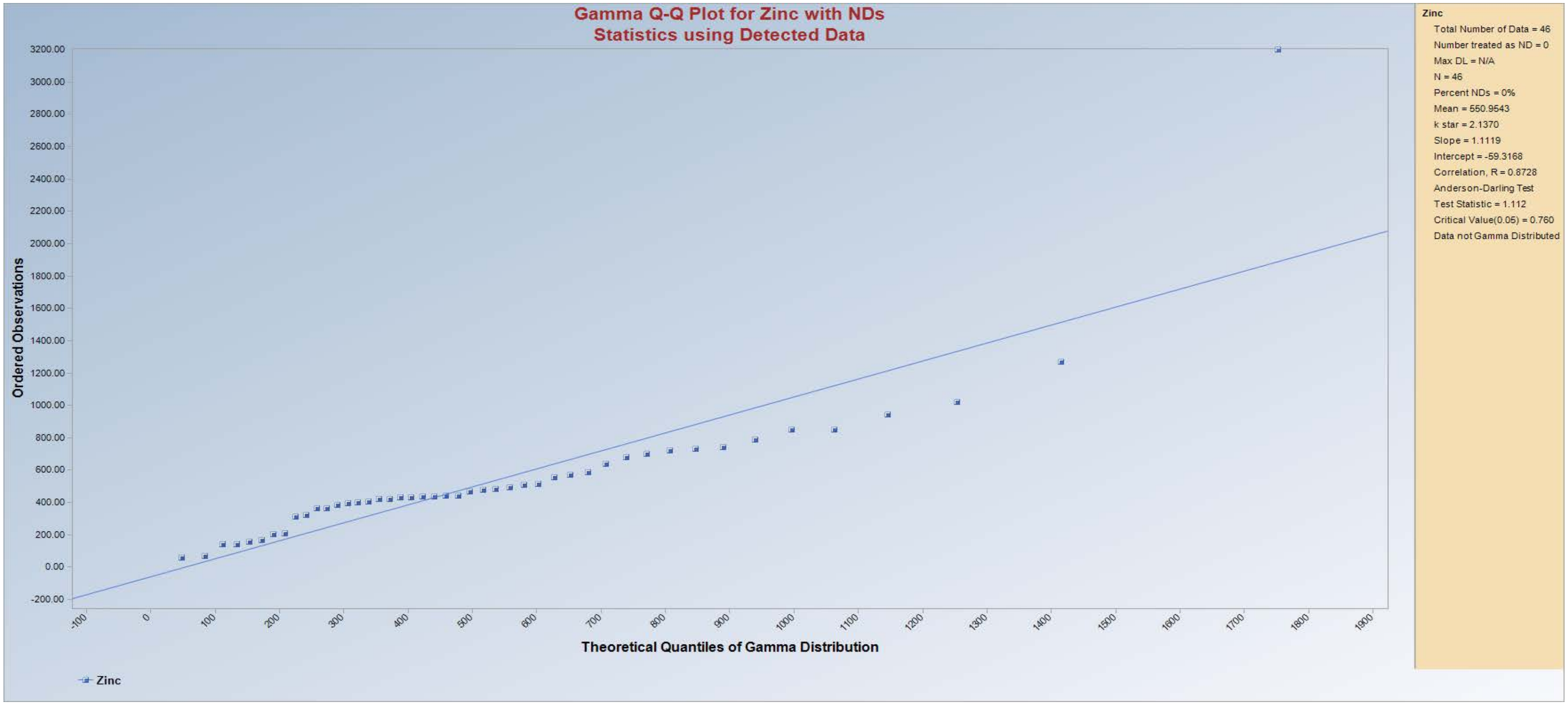

Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 46
Number treated as ND = 0
Max DL = N/A
N = 46
Percent NDs = 0%
Mean = 4091.7956
k star = 0.4088
Slope = 1.6887
Intercept = -2704.1699
Correlation, R = 0.8806
Anderson-Darling Test
Test Statistic = 5.378
Critical Value(0.05) = 0.833
Data not Gamma Distributed



Lognormal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 46
Mean = 6.0756
Sd = 0.7128
Slope = 0.6962
Intercept = 6.0756
Correlation, R = 0.9576
Shapiro-Wilk Test
Exact Test Statistic = 0.935
Critical Value(0.05) = 0.945
Data Not Lognormal
Approx. Test Value = 0.935
p-Value = 0.017



Normal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 46
Mean = 551
Sd = 472.7
Slope = 373.2
Intercept = 551
Correlation, R = 0.774
Shapiro-Wilk Test
Exact Test Value = 0.641
Critical Val(0.05) = 0.945
Data Not Normal
Approx. Test Value = 0.641
p-Value = 3.617E-13



Gamma Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Zinc
Zinc
Total Number of Data = 46
Number treated as ND = 0
Max DL = N/A
N = 46
Percent NDs = 0%
Mean = 550.9543
k star = 2.1370
Slope = 1.1119
Intercept = -59.3168
Correlation, R = 0.8728
Anderson-Darling Test
Test Statistic = 1.112
Critical Value(0.05) = 0.760
Data not Gamma Distributed

Attachment A2
ProUCL Output for EU 2 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	\\EMIS016FP1\Shared\Project\MDEQ\Upper Blackfoot\HHRA 2013\Working directory for EPCs\EU2_0-2_Data for EPCs.xls.ws
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	440	Number of Detected Data	371
Number of Distinct Detected Data	369	Number of Non-Detect Data	69
		Percent Non-Detects	15.68%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	6.634	Minimum Detected	1.892
Maximum Detected	1057	Maximum Detected	6.963
Mean of Detected	108.8	Mean of Detected	4.239
SD of Detected	121.6	SD of Detected	0.982
Minimum Non-Detect	8.12	Minimum Non-Detect	2.094
Maximum Non-Detect	52.38	Maximum Non-Detect	3.959

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	207
Number treated as Detected	233
Single DL Non-Detect Percentage	47.05%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.2	Lilliefors Test Statistic	0.0841
5% Lilliefors Critical Value	0.046	5% Lilliefors Critical Value	0.046
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	93.16	Mean	3.906
SD	117.4	SD	1.197
95% DL/2 (t) UCL	102.4	95% H-Stat (DL/2) UCL	115.7
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	42.7	Mean in Log Scale	3.954
SD	170.5	SD in Log Scale	1.124
95% MLE (t) UCL	56.1	Mean in Original Scale	93.61
95% MLE (Tiku) UCL	58.78	SD in Original Scale	117.1
		95% t UCL	102.8
		95% Percentile Bootstrap UCL	103.2
		95% BCA Bootstrap UCL	103.8
		95% H UCL	110.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.241	Data do not follow a Discernable Distribution (0.05)	
Theta Star	87.69		
nu star	920.8		
A-D Test Statistic	3.079	Nonparametric Statistics	
5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.779	Mean	93.45
5% K-S Critical Value	0.0483	SD	117
Data not Gamma Distributed at 5% Significance Level		SE of Mean	5.588
		95% KM (t) UCL	102.7
Assuming Gamma Distribution		95% KM (z) UCL	102.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	102.7
Minimum	0.000001	95% KM (bootstrap t) UCL	104.1
Maximum	1057	95% KM (BCA) UCL	102.7
Mean	91.76	95% KM (Percentile Bootstrap) UCL	102.7
Median	61.32	95% KM (Chebyshev) UCL	117.8
SD	118.4	97.5% KM (Chebyshev) UCL	128.4
k star	0.231	99% KM (Chebyshev) UCL	149.1
Theta star	397		
Nu star	203.4	Potential UCLs to Use	
AppChi2	171.4	95% KM (BCA) UCL	102.7
95% Gamma Approximate UCL (Use when n >= 40)	108.9		
95% Adjusted Gamma UCL (Use when n < 40)	109		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Observations	69	Number of Distinct Observations	64
Number of Missing Values	371		
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.16	Minimum of Log Data	-1.833
Maximum	161	Maximum of Log Data	5.081
Mean	14.61	Mean of log Data	1.412
Geometric Mean	4.104	SD of log Data	1.599
Median	2.96		
SD	27.97		
Std. Error of Mean	3.367		
Coefficient of Variation	1.914		
Skewness	3.186		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.303	Lilliefors Test Statistic	0.1
Lilliefors Critical Value	0.107	Lilliefors Critical Value	0.107
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	20.23	95% H-UCL	23.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	30.72
95% Adjusted-CLT UCL (Chen-1995)	21.53	97.5% Chebyshev (MVUE) UCL	37.89
95% Modified-t UCL (Johnson-1978)	20.44	99% Chebyshev (MVUE) UCL	51.96
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.488	Data appear Lognormal at 5% Significance Level	
Theta Star	29.95		
MLE of Mean	14.61		
MLE of Standard Deviation	20.92		
nu star	67.35		
Approximate Chi Square Value (.05)	49.46	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0465	95% CLT UCL	20.15
Adjusted Chi Square Value	49.14	95% Jackknife UCL	20.23
		95% Standard Bootstrap UCL	20.23
Anderson-Darling Test Statistic	3.399	95% Bootstrap-t UCL	22.96
Anderson-Darling 5% Critical Value	0.817	95% Hall's Bootstrap UCL	22.17
Kolmogorov-Smirnov Test Statistic	0.186	95% Percentile Bootstrap UCL	20.26
Kolmogorov-Smirnov 5% Critical Value	0.113	95% BCA Bootstrap UCL	21.43
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	29.29
		97.5% Chebyshev(Mean, Sd) UCL	35.64
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	48.11
95% Approximate Gamma UCL (Use when n >= 40)	19.9		
95% Adjusted Gamma UCL (Use when n < 40)	20.03		
Potential UCL to Use		Use 95% H-UCL	23.7

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	440	Number of Distinct Observations	433

Raw Statistics		Log-transformed Statistics	
Minimum	37.4	Minimum of Log Data	3.622
Maximum	4246	Maximum of Log Data	8.354
Mean	489.7	Mean of log Data	5.717
Geometric Mean	304.1	SD of log Data	0.908
Median	276.1		
SD	635.8		
Std. Error of Mean	30.31		
Coefficient of Variation	1.298		
Skewness	3.108		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.241	Lilliefors Test Statistic	0.071
Lilliefors Critical Value	0.0422	Lilliefors Critical Value	0.0422
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	539.6	95% H-UCL	501.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	561.1
95% Adjusted-CLT UCL (Chen-1995)	544.3	97.5% Chebyshev (MVUE) UCL	605.4
95% Modified-t UCL (Johnson-1978)	540.4	99% Chebyshev (MVUE) UCL	692.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.182	Data do not follow a Discernable Distribution (0.05)	
Theta Star	414.3		
MLE of Mean	489.7		
MLE of Standard Deviation	450.4		
nu star	1040		
Approximate Chi Square Value (.05)	966.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0495	95% CLT UCL	539.5
Adjusted Chi Square Value	966	95% Jackknife UCL	539.6
		95% Standard Bootstrap UCL	540
Anderson-Darling Test Statistic	15.75	95% Bootstrap-t UCL	544.5
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL	543.9
Kolmogorov-Smirnov Test Statistic	0.144	95% Percentile Bootstrap UCL	540.8
Kolmogorov-Smirnov 5% Critical Value	0.0444	95% BCA Bootstrap UCL	542.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	621.8
		97.5% Chebyshev(Mean, Sd) UCL	679
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	791.3
95% Approximate Gamma UCL (Use when n >= 40)	527.1		
95% Adjusted Gamma UCL (Use when n < 40)	527.3		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	621.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	437
Number of Missing Values	3
Number of Distinct Observations	437

Raw Statistics

Minimum	7856
Maximum	201203
Mean	51028
Geometric Mean	43822
Median	45448
SD	28871
Std. Error of Mean	1381
Coefficient of Variation	0.566
Skewness	1.4

Log-transformed Statistics

Minimum of Log Data	8.969
Maximum of Log Data	12.21
Mean of log Data	10.69
SD of log Data	0.563

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.0887
Lilliefors Critical Value	0.0424

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0509
Lilliefors Critical Value	0.0424

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	53305

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	53399
95% Modified-t UCL (Johnson-1978)	53320

Assuming Lognormal Distribution

95% H-UCL	53912
95% Chebyshev (MVUE) UCL	57784
97.5% Chebyshev (MVUE) UCL	60583
99% Chebyshev (MVUE) UCL	66082

Gamma Distribution Test

k star (bias corrected)	3.42
Theta Star	14922
MLE of Mean	51028
MLE of Standard Deviation	27595
nu star	2989
Approximate Chi Square Value (.05)	2863
Adjusted Level of Significance	0.0495
Adjusted Chi Square Value	2862
Anderson-Darling Test Statistic	1.423
Anderson-Darling 5% Critical Value	0.76
Kolmogorov-Smirnov Test Statistic	0.0591
Kolmogorov-Smirnov 5% Critical Value	0.0437

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	53300
95% Jackknife UCL	53305
95% Standard Bootstrap UCL	53285
95% Bootstrap-t UCL	53557
95% Hall's Bootstrap UCL	53445
95% Percentile Bootstrap UCL	53298
95% BCA Bootstrap UCL	53390
95% Chebyshev(Mean, Sd) UCL	57049
97.5% Chebyshev(Mean, Sd) UCL	59653
99% Chebyshev(Mean, Sd) UCL	64770

Assuming Gamma Distribution

95% Approximate Gamma UCL (Use when n >= 40)	53275
95% Adjusted Gamma UCL (Use when n < 40)	53282

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 57049

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	440	Number of Distinct Observations	438

Raw Statistics		Log-transformed Statistics	
Minimum	33.86	Minimum of Log Data	3.522
Maximum	38839	Maximum of Log Data	10.57
Mean	2552	Mean of log Data	6.653
Geometric Mean	775	SD of log Data	1.555
Median	947.5		
SD	5396		
Std. Error of Mean	257.3		
Coefficient of Variation	2.114		
Skewness	4.237		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.32	Lilliefors Test Statistic	0.0956
Lilliefors Critical Value	0.0422	Lilliefors Critical Value	0.0422
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2976	95% H-UCL	3150
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3805
95% Adjusted-CLT UCL (Chen-1995)	3031	97.5% Chebyshev (MVUE) UCL	4334
95% Modified-t UCL (Johnson-1978)	2985	99% Chebyshev (MVUE) UCL	5374

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.526	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4849		
MLE of Mean	2552		
MLE of Standard Deviation	3518		
nu star	463.2		
Approximate Chi Square Value (.05)	414.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0495	95% CLT UCL	2975
Adjusted Chi Square Value	414.1	95% Jackknife UCL	2976
		95% Standard Bootstrap UCL	2968
Anderson-Darling Test Statistic	14.62	95% Bootstrap-t UCL	3047
Anderson-Darling 5% Critical Value	0.82	95% Hall's Bootstrap UCL	3015
Kolmogorov-Smirnov Test Statistic	0.11	95% Percentile Bootstrap UCL	3017
Kolmogorov-Smirnov 5% Critical Value	0.0457	95% BCA Bootstrap UCL	3003
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3674
		97.5% Chebyshev(Mean, Sd) UCL	4159
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5112
95% Approximate Gamma UCL (Use when n >= 40)	2853		
95% Adjusted Gamma UCL (Use when n < 40)	2854		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	3674

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	440	Number of Detected Data	405
Number of Distinct Detected Data	404	Number of Non-Detect Data	35
		Percent Non-Detects	7.95%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	37.22	Minimum Detected	3.617
Maximum Detected	15083	Maximum Detected	9.621
Mean of Detected	1639	Mean of Detected	6.781
SD of Detected	1987	SD of Detected	1.13
Minimum Non-Detect	47.13	Minimum Non-Detect	3.853
Maximum Non-Detect	237.1	Maximum Non-Detect	5.468

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	86
Number treated as Detected	354
Single DL Non-Detect Percentage	19.55%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.244	Lilliefors Test Statistic	0.0849
5% Lilliefors Critical Value	0.044	5% Lilliefors Critical Value	0.044
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1513	Mean	6.548
SD	1954	SD	1.349
95% DL/2 (t) UCL	1666	95% H-Stat (DL/2) UCL	2023
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1246	Mean in Log Scale	6.59
SD	2263	SD in Log Scale	1.267
95% MLE (t) UCL	1424	Mean in Original Scale	1515
95% MLE (Tiku) UCL	1422	SD in Original Scale	1952
		95% t UCL	1668
		95% Percentile Bootstrap UCL	1673
		95% BCA Bootstrap UCL	1692
		95% H UCL	1869

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.932	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1758		
nu star	755.3		
A-D Test Statistic	11.29	Nonparametric Statistics	
5% A-D Critical Value	0.788	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.788	Mean	1513
5% K-S Critical Value	0.0464	SD	1952
Data not Gamma Distributed at 5% Significance Level		SE of Mean	93.17
		95% KM (t) UCL	1666
Assuming Gamma Distribution		95% KM (z) UCL	1666
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1664
Minimum	0.000001	95% KM (bootstrap t) UCL	1680
Maximum	15083	95% KM (BCA) UCL	1670
Mean	1508	95% KM (Percentile Bootstrap) UCL	1665
Median	627.3	95% KM (Chebyshev) UCL	1919
SD	1957	97.5% KM (Chebyshev) UCL	2094
k star	0.314	99% KM (Chebyshev) UCL	2440
Theta star	4806		
Nu star	276.2	Potential UCLs to Use	
AppChi2	238.7	95% KM (Chebyshev) UCL	1919
95% Gamma Approximate UCL (Use when n >= 40)	1745		
95% Adjusted Gamma UCL (Use when n < 40)	1746		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics			
Number of Valid Data	440	Number of Detected Data	422
Number of Distinct Detected Data	422	Number of Non-Detect Data	18
		Percent Non-Detects	4.09%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	27.8	Minimum Detected	3.325
Maximum Detected	26000	Maximum Detected	10.17
Mean of Detected	1812	Mean of Detected	6.479
SD of Detected	3536	SD of Detected	1.337
Minimum Non-Detect	24.17	Minimum Non-Detect	3.185
Maximum Non-Detect	56.88	Maximum Non-Detect	4.041
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	26
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	414
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	5.91%

UCL Statistics

Normal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.307
5% Lilliefors Critical Value	0.0431
Data not Normal at 5% Significance Level	

Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.131
5% Lilliefors Critical Value	0.0431
Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	1739
SD	3481
95% DL/2 (t) UCL	2012
Maximum Likelihood Estimate(MLE) Method	
Mean	1599
SD	3619
95% MLE (t) UCL	1883
95% MLE (Tiku) UCL	1858

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean	6.333
SD	1.49
95% H-Stat (DL/2) UCL	2044
Log ROS Method	
Mean in Log Scale	6.355
SD in Log Scale	1.442
Mean in Original Scale	1739
SD in Original Scale	3481
95% t UCL	2013
95% Percentile Bootstrap UCL	2030
95% BCA Bootstrap UCL	2067
95% H UCL	1930

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.601
Theta Star	3017
nu star	506.9
A-D Test Statistic	25.33
5% A-D Critical Value	0.812
K-S Test Statistic	0.812
5% K-S Critical Value	0.0464
Data not Gamma Distributed at 5% Significance Level	

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	26000
Mean	1738
Median	439.5
SD	3482
k star	0.367
Theta star	4734
Nu star	323.1
AppChi2	282.4
95% Gamma Approximate UCL (Use when n >= 40)	1988
95% Adjusted Gamma UCL (Use when n < 40)	1989

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	1739
SD	3477
SE of Mean	166
95% KM (t) UCL	2013
95% KM (z) UCL	2012
95% KM (jackknife) UCL	2013
95% KM (bootstrap t) UCL	2054
95% KM (BCA) UCL	2026
95% KM (Percentile Bootstrap) UCL	2015
95% KM (Chebyshev) UCL	2462
97.5% KM (Chebyshev) UCL	2775
99% KM (Chebyshev) UCL	3390

Potential UCLs to Use	
95% KM (Chebyshev) UCL	2462

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	26
Number treated as Detected	415
Single DL Non-Detect Percentage	5.90%

UCL Statistics

Normal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.307
5% Lilliefors Critical Value	0.0431
Data not Normal at 5% Significance Level	

Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.132
5% Lilliefors Critical Value	0.0431
Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	1736
SD	3478
95% DL/2 (t) UCL	2009
Maximum Likelihood Estimate(MLE) Method	
Mean	1597
SD	3615
95% MLE (t) UCL	1880
95% MLE (Tiku) UCL	1855

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean	6.332
SD	1.488
95% H-Stat (DL/2) UCL	2036
Log ROS Method	
Mean in Log Scale	6.354
SD in Log Scale	1.44
Mean in Original Scale	1736
SD in Original Scale	3477
95% t UCL	2009
95% Percentile Bootstrap UCL	2032
95% BCA Bootstrap UCL	2057
95% H UCL	1923

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.601
Theta Star	3009
nu star	508.5
A-D Test Statistic	25.5
5% A-D Critical Value	0.812
K-S Test Statistic	0.812
5% K-S Critical Value	0.0463
Data not Gamma Distributed at 5% Significance Level	

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

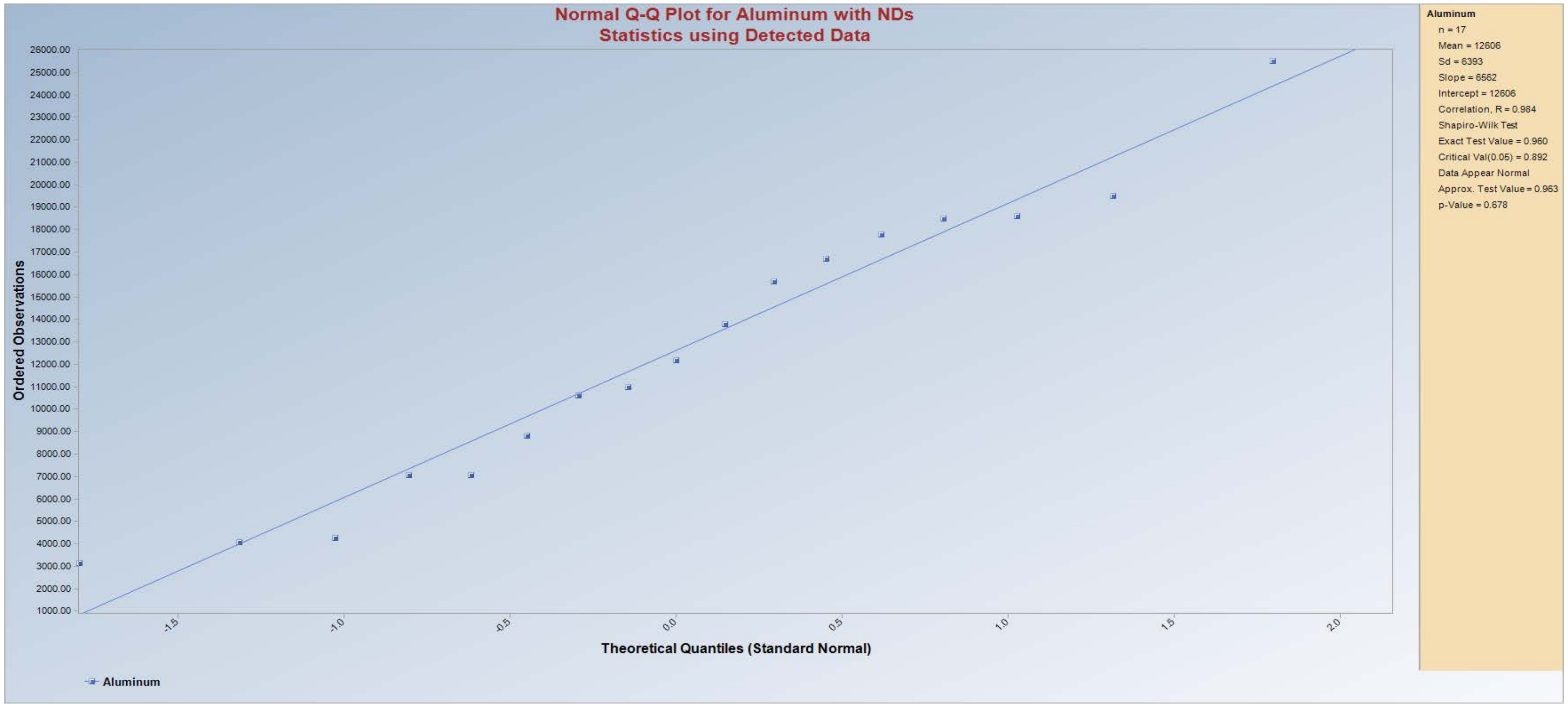
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	26000
Mean	1735
Median	443
SD	3478
k star	0.368
Theta star	4720
Nu star	324.2
AppChi2	283.5
95% Gamma Approximate UCL (Use when n >= 40)	1984
95% Adjusted Gamma UCL (Use when n < 40)	1985

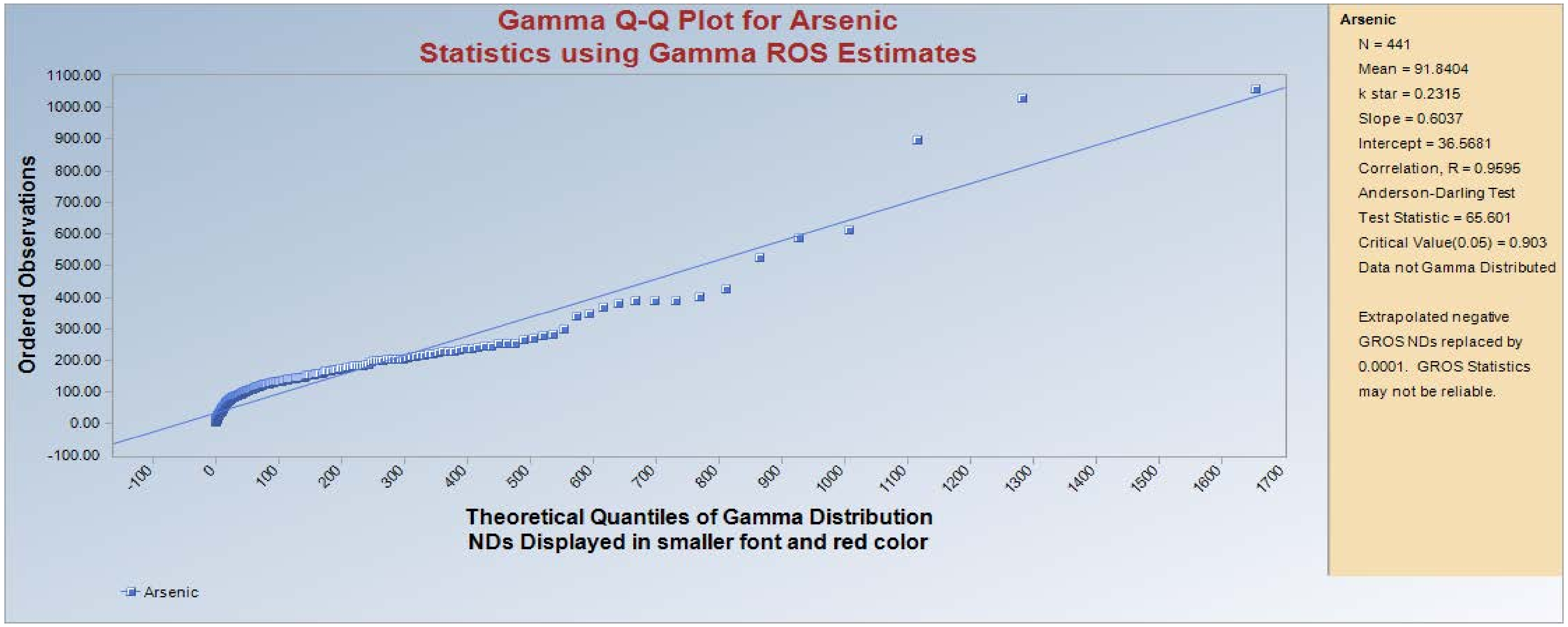
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	1736
SD	3474
SE of Mean	165.6
95% KM (t) UCL	2009
95% KM (z) UCL	2008
95% KM (jackknife) UCL	2009
95% KM (bootstrap t) UCL	2049
95% KM (BCA) UCL	2009
95% KM (Percentile Bootstrap) UCL	2029
95% KM (Chebyshev) UCL	2458
97.5% KM (Chebyshev) UCL	2770
99% KM (Chebyshev) UCL	3384

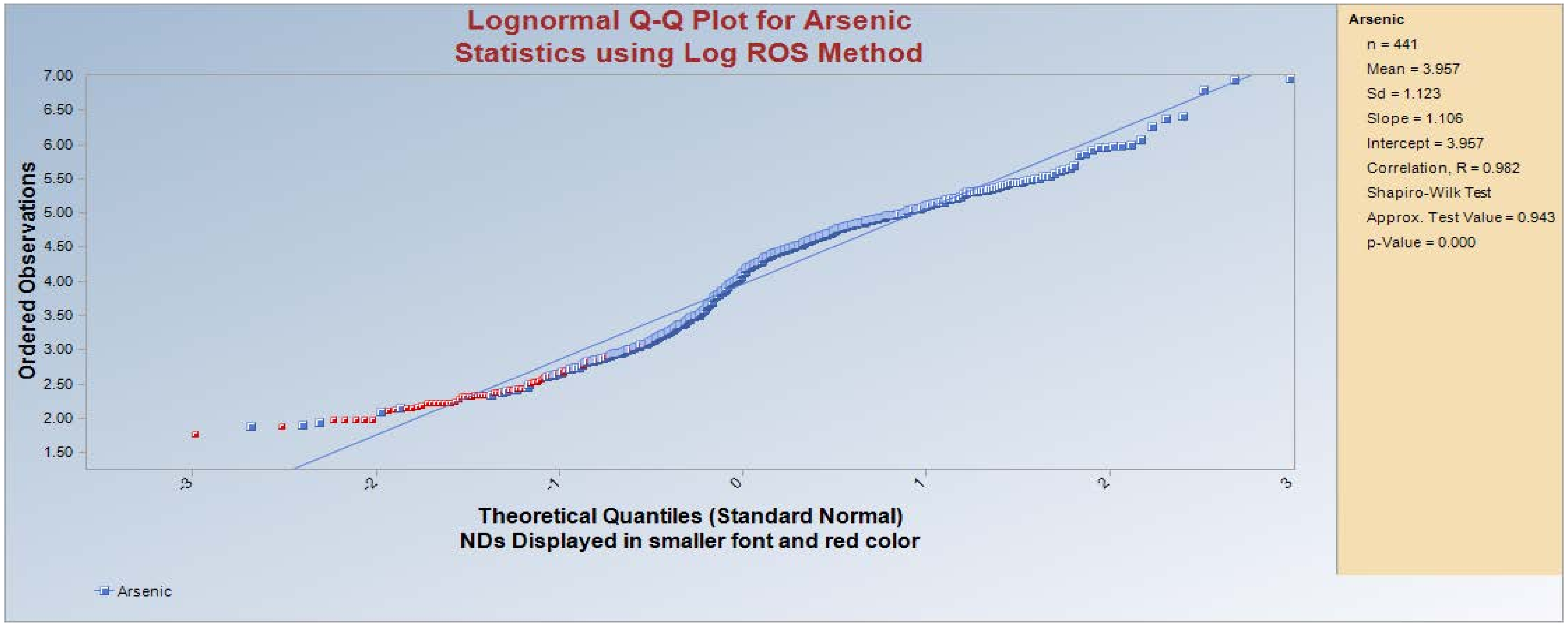
Potential UCLs to Use	
95% KM (Chebyshev) UCL	2458

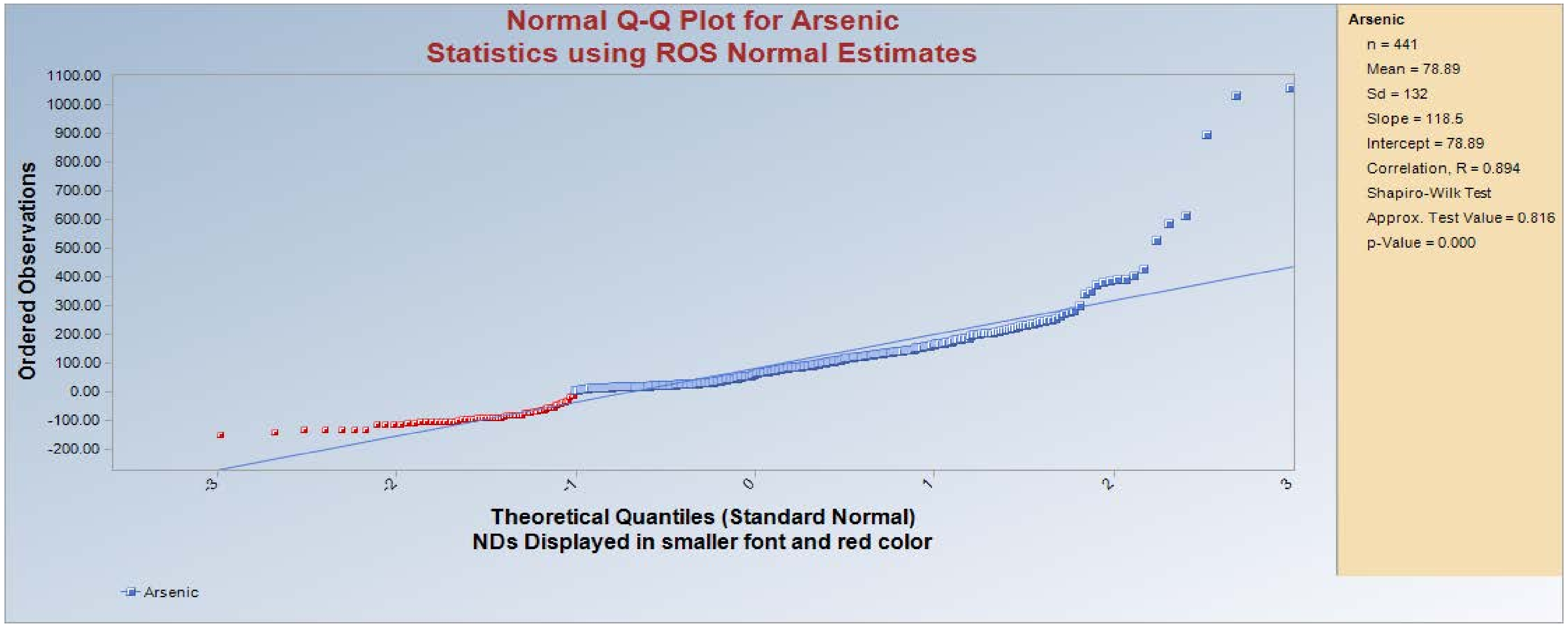
Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

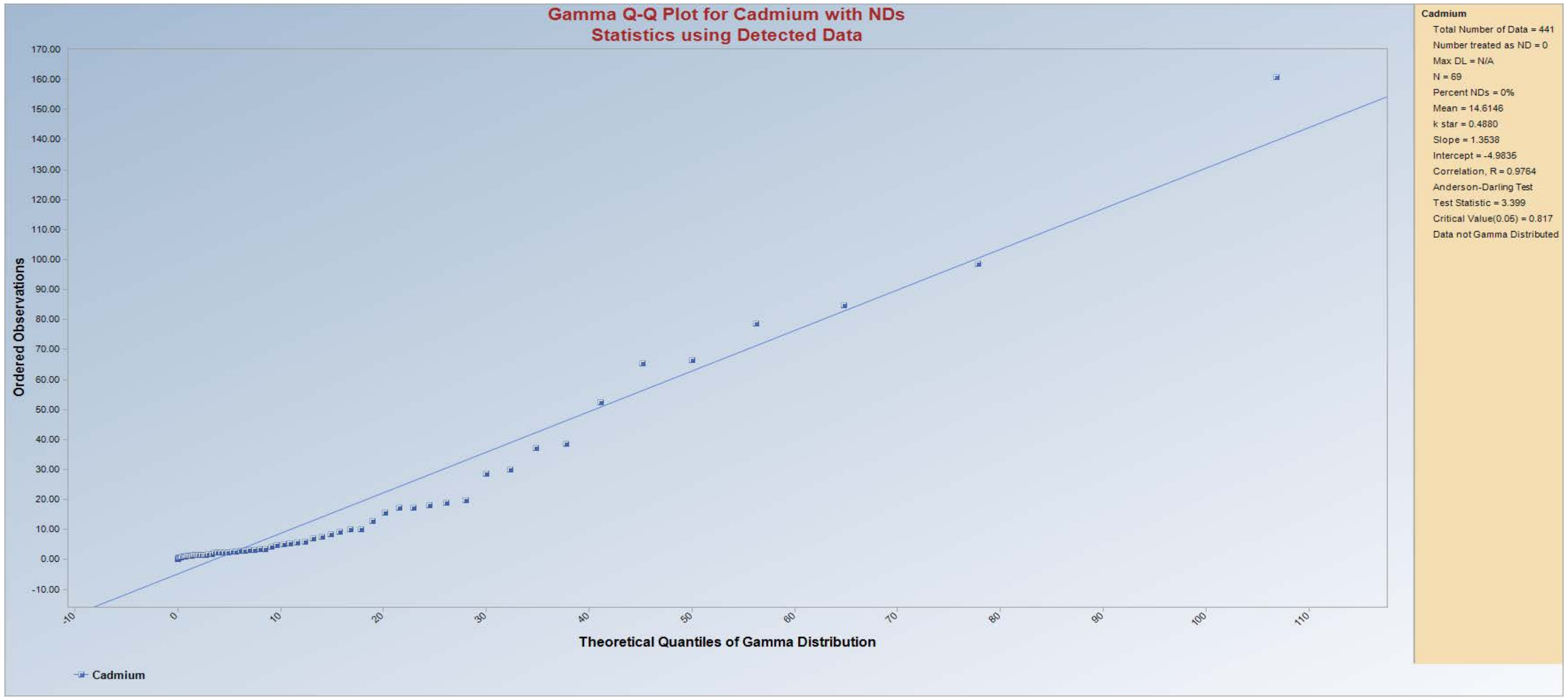

Normal Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
26000.00
25000.00
24000.00
23000.00
22000.00
21000.00
20000.00
19000.00
18000.00
17000.00
16000.00
15000.00
14000.00
13000.00
12000.00
11000.00
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Aluminum
Aluminum
n = 17
Mean = 12606
Sd = 6393
Slope = 6562
Intercept = 12606
Correlation, R = 0.984
Shapiro-Wilk Test
Exact Test Value = 0.960
Critical Val(0.05) = 0.892
Data Appear Normal
Approx. Test Value = 0.963
p-Value = 0.678


Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 441
Mean = 91.8404
k star = 0.2315
Slope = 0.6037
Intercept = 36.5681
Correlation, R = 0.9595
Anderson-Darling Test
Test Statistic = 65.601
Critical Value(0.05) = 0.903
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

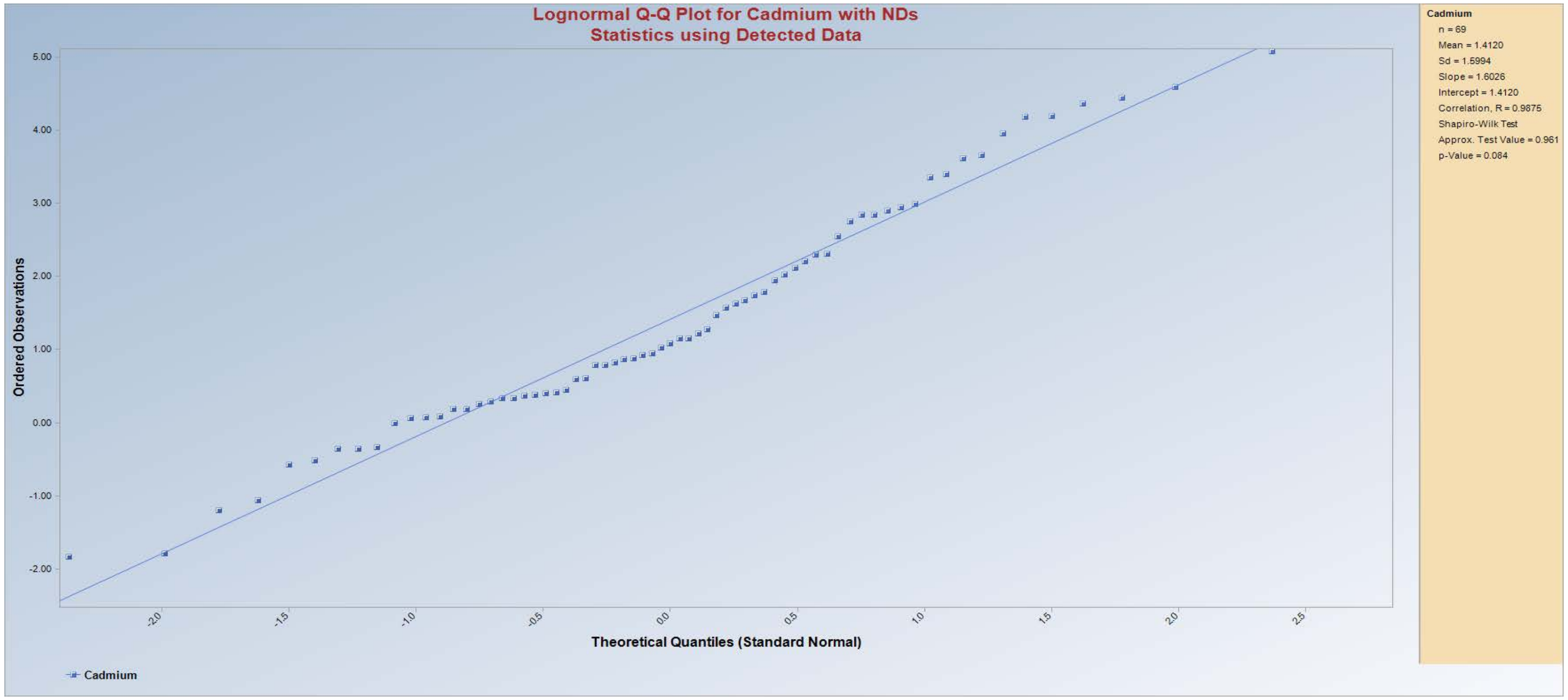

Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 441
Mean = 3.957
Sd = 1.123
Slope = 1.106
Intercept = 3.957
Correlation, R = 0.982
Shapiro-Wilk Test
Approx. Test Value = 0.943
p-Value = 0.000

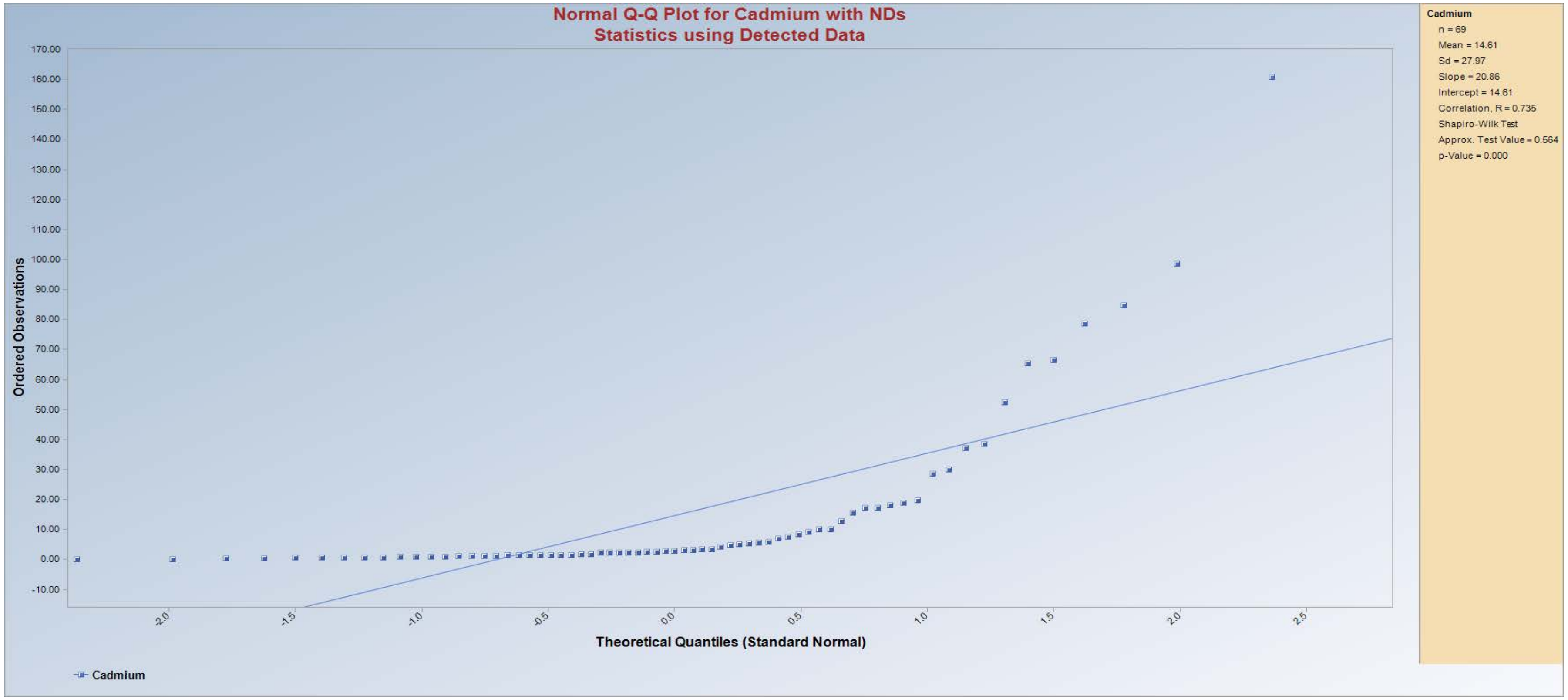


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-200.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 441
Mean = 78.89
Sd = 132
Slope = 118.5
Intercept = 78.89
Correlation, R = 0.894
Shapiro-Wilk Test
Approx. Test Value = 0.816
p-Value = 0.000

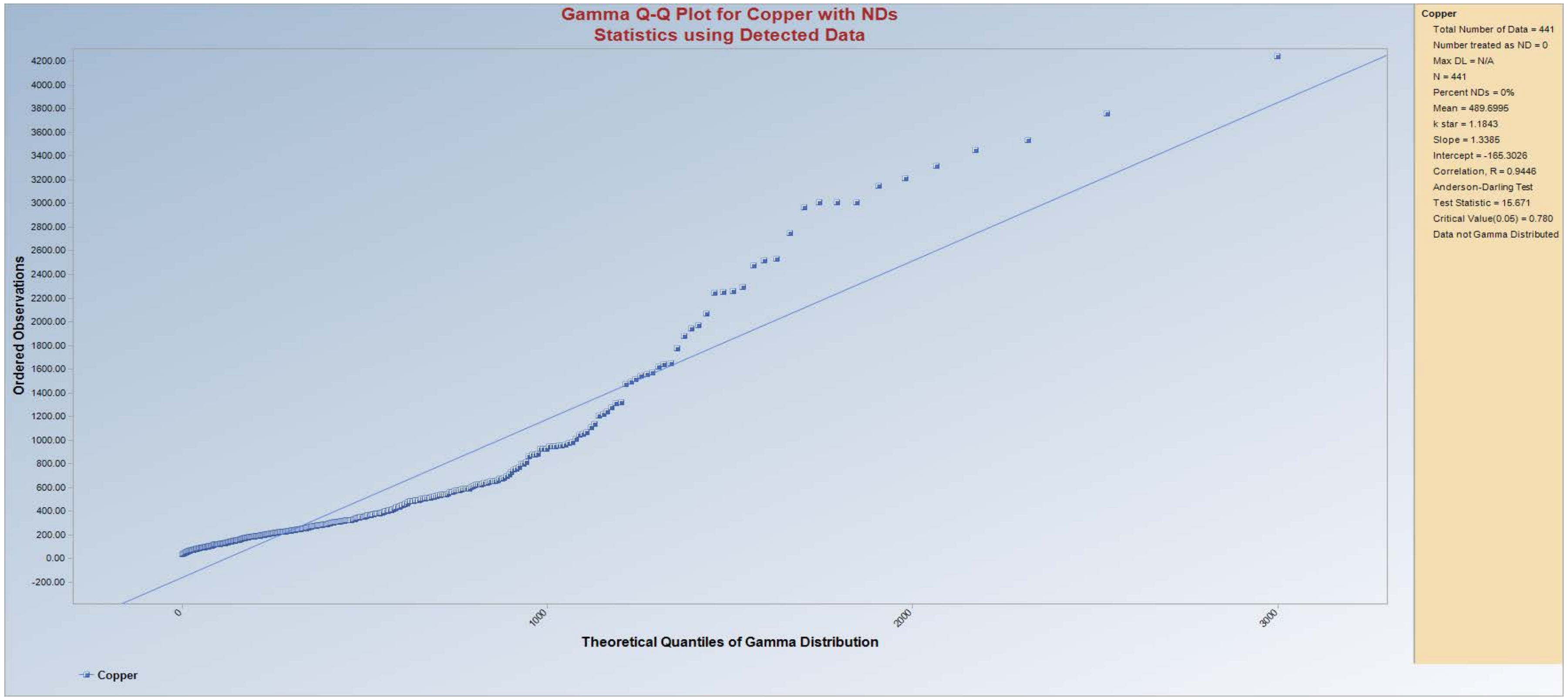


Gamma Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Cadmium
Cadmium
Total Number of Data = 441
Number treated as ND = 0
Max DL = N/A
N = 69
Percent NDs = 0%
Mean = 14.6146
k star = 0.4880
Slope = 1.3538
Intercept = -4.9835
Correlation, R = 0.9764
Anderson-Darling Test
Test Statistic = 3.399
Critical Value(0.05) = 0.817
Data not Gamma Distributed

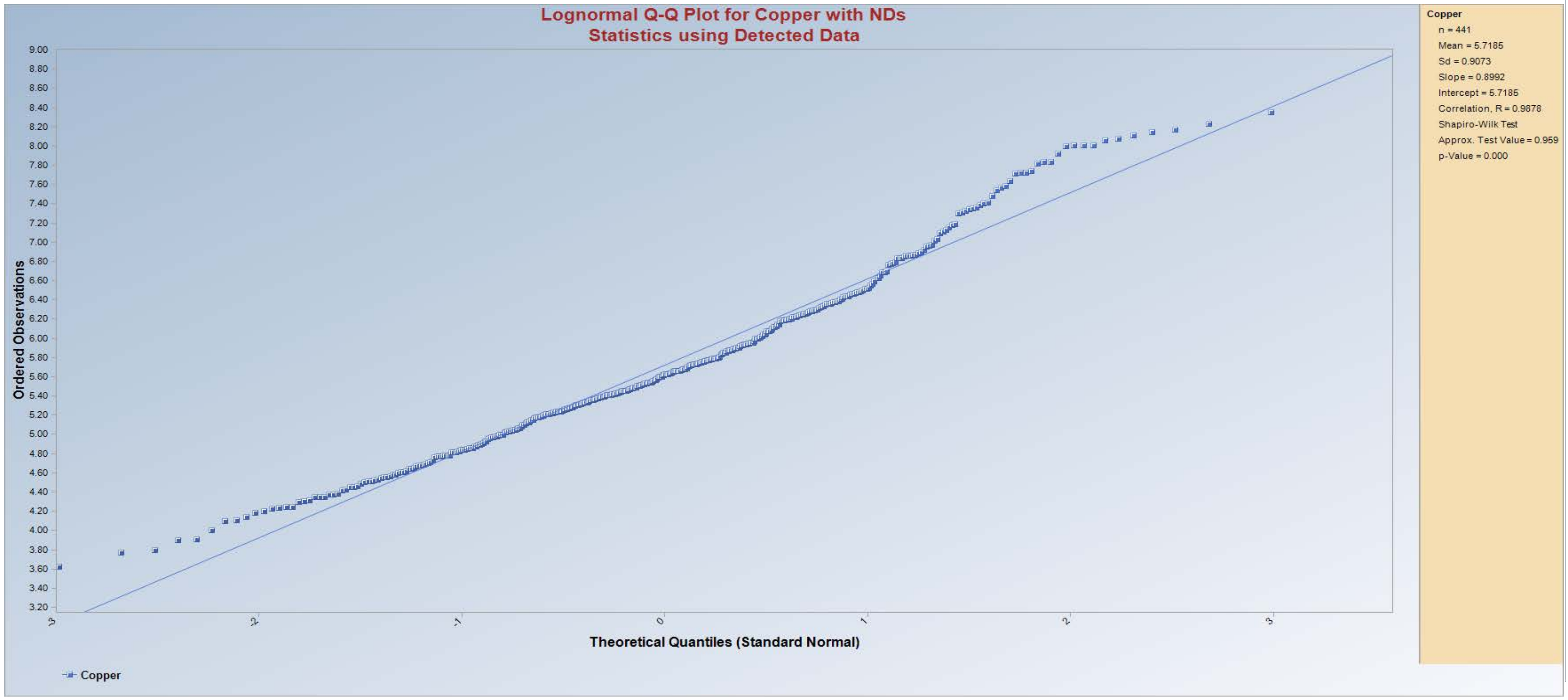

Lognormal Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Cadmium
Cadmium
n = 69
Mean = 1.4120
Sd = 1.5994
Slope = 1.6026
Intercept = 1.4120
Correlation, R = 0.9875
Shapiro-Wilk Test
Approx. Test Value = 0.961
p-Value = 0.084

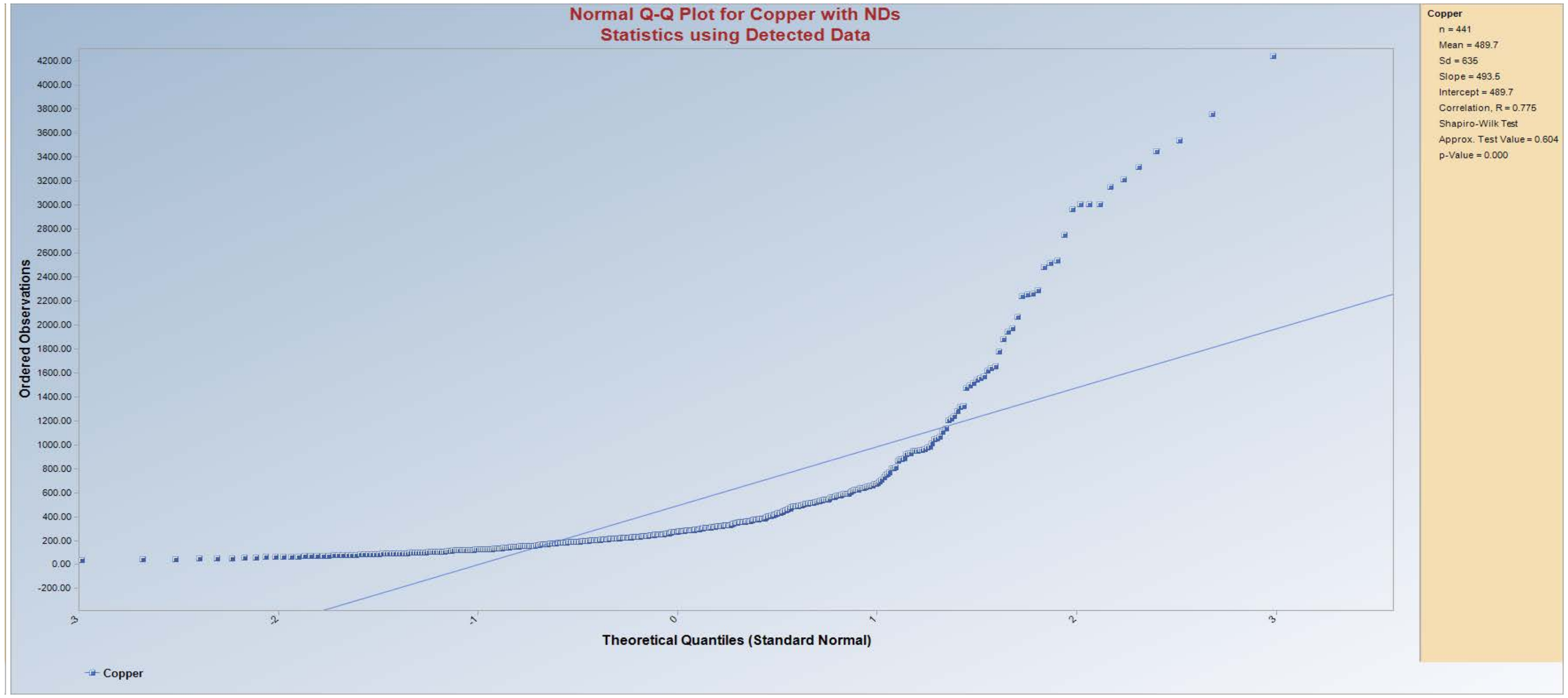


Normal Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Cadmium
Cadmium
n = 69
Mean = 14.61
Sd = 27.97
Slope = 20.86
Intercept = 14.61
Correlation, R = 0.735
Shapiro-Wilk Test
Approx. Test Value = 0.564
p-Value = 0.000

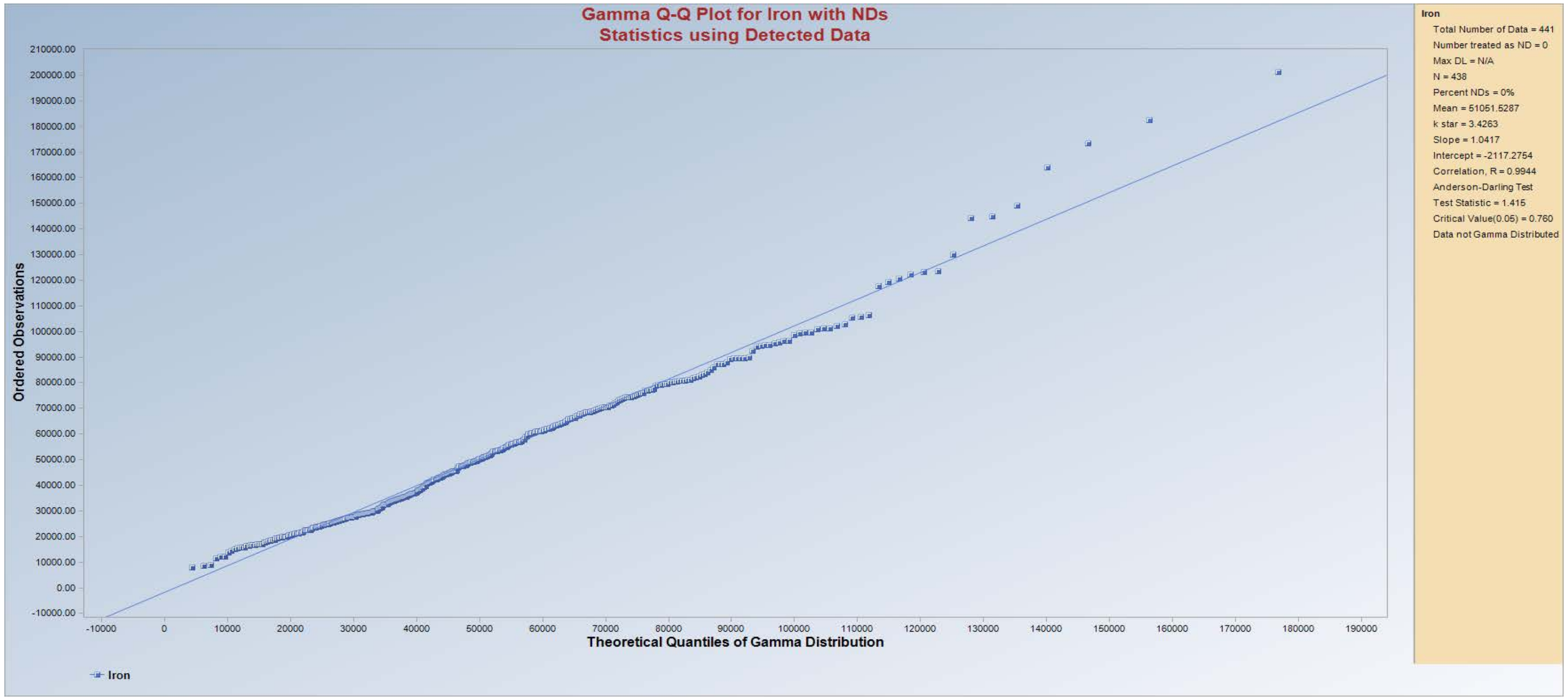


Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
4200.00
4000.00
3800.00
3600.00
3400.00
3200.00
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
0
1000
2000
3000
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 441
Number treated as ND = 0
Max DL = N/A
N = 441
Percent NDs = 0%
Mean = 489.6995
k star = 1.1843
Slope = 1.3385
Intercept = -165.3026
Correlation, R = 0.9446
Anderson-Darling Test
Test Statistic = 15.671
Critical Value(0.05) = 0.780
Data not Gamma Distributed

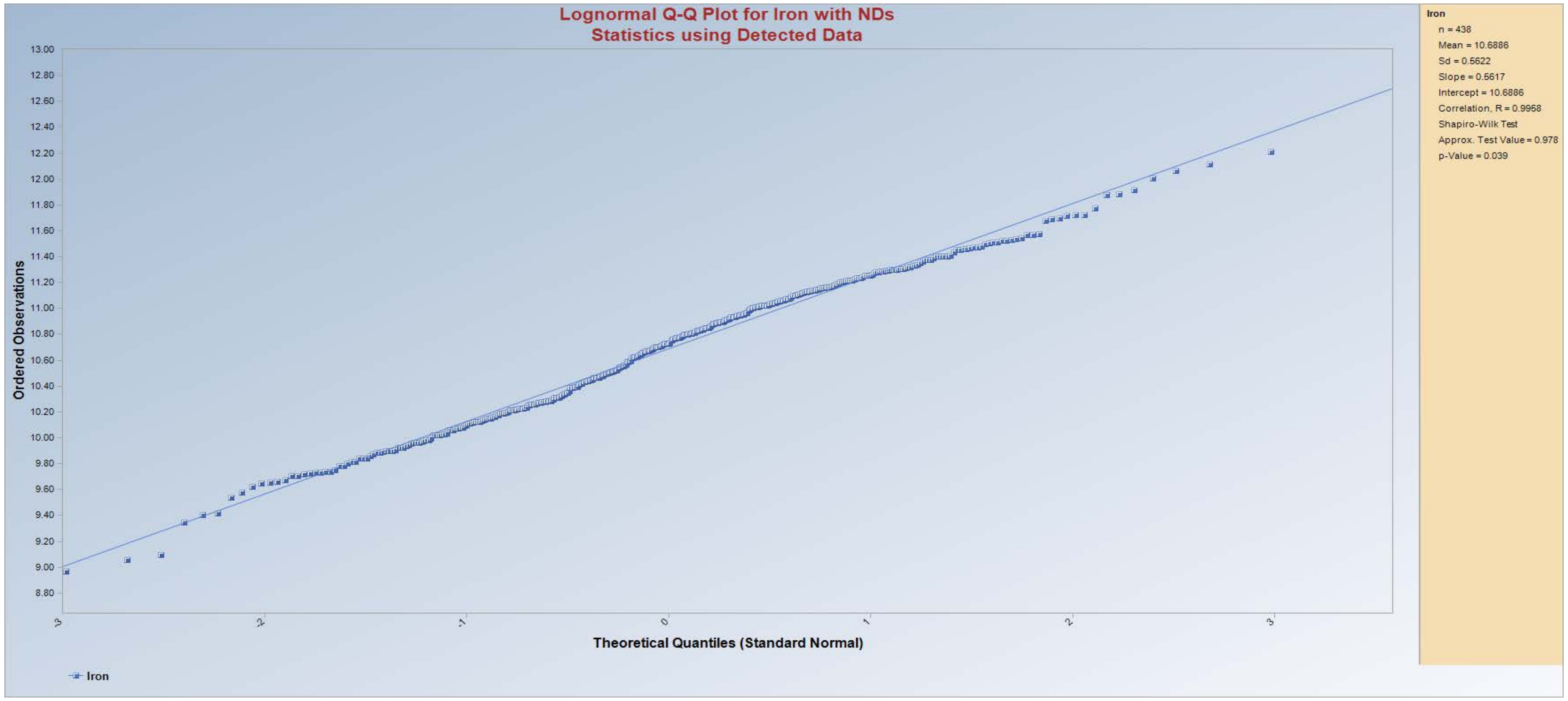

Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
9.00
8.80
8.60
8.40
8.20
8.00
7.80
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 441
Mean = 5.7185
Sd = 0.9073
Slope = 0.8992
Intercept = 5.7185
Correlation, R = 0.9878
Shapiro-Wilk Test
Approx. Test Value = 0.959
p-Value = 0.000

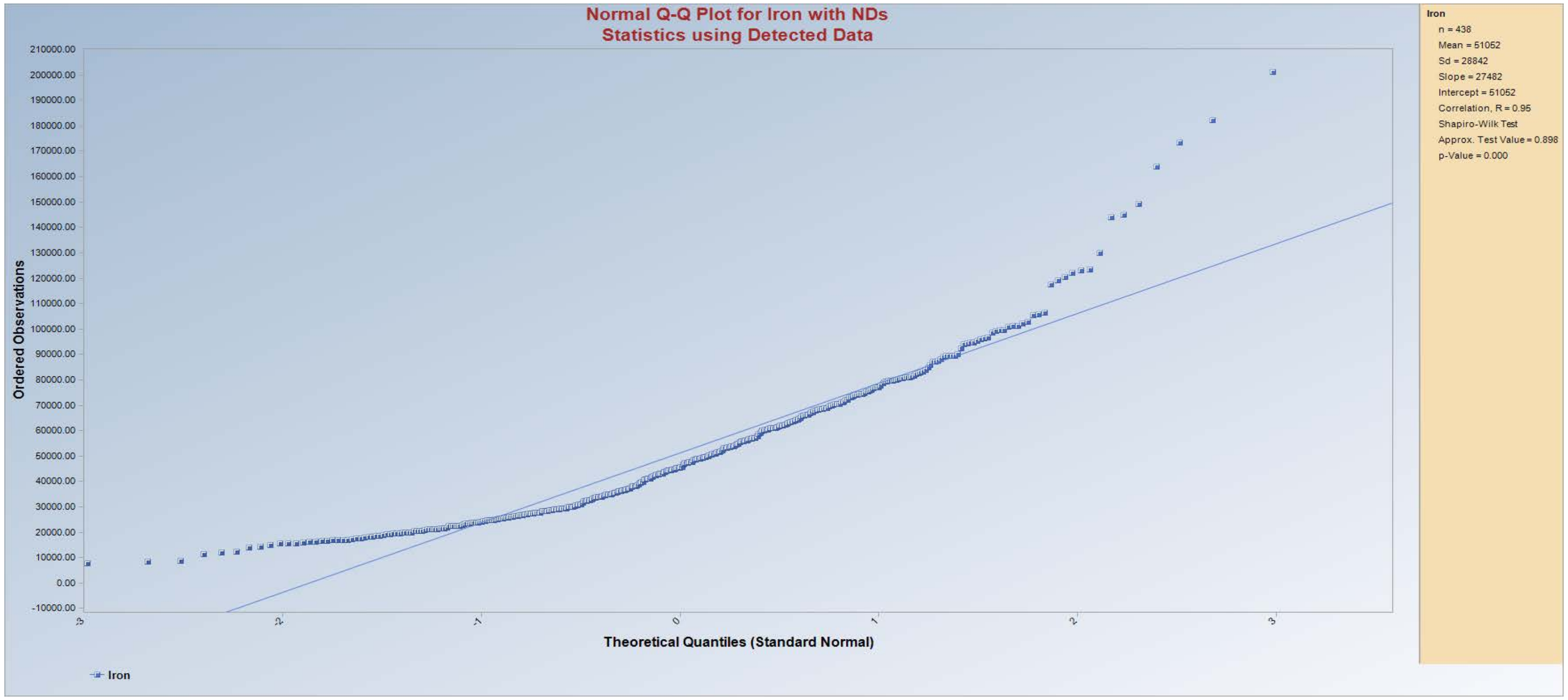


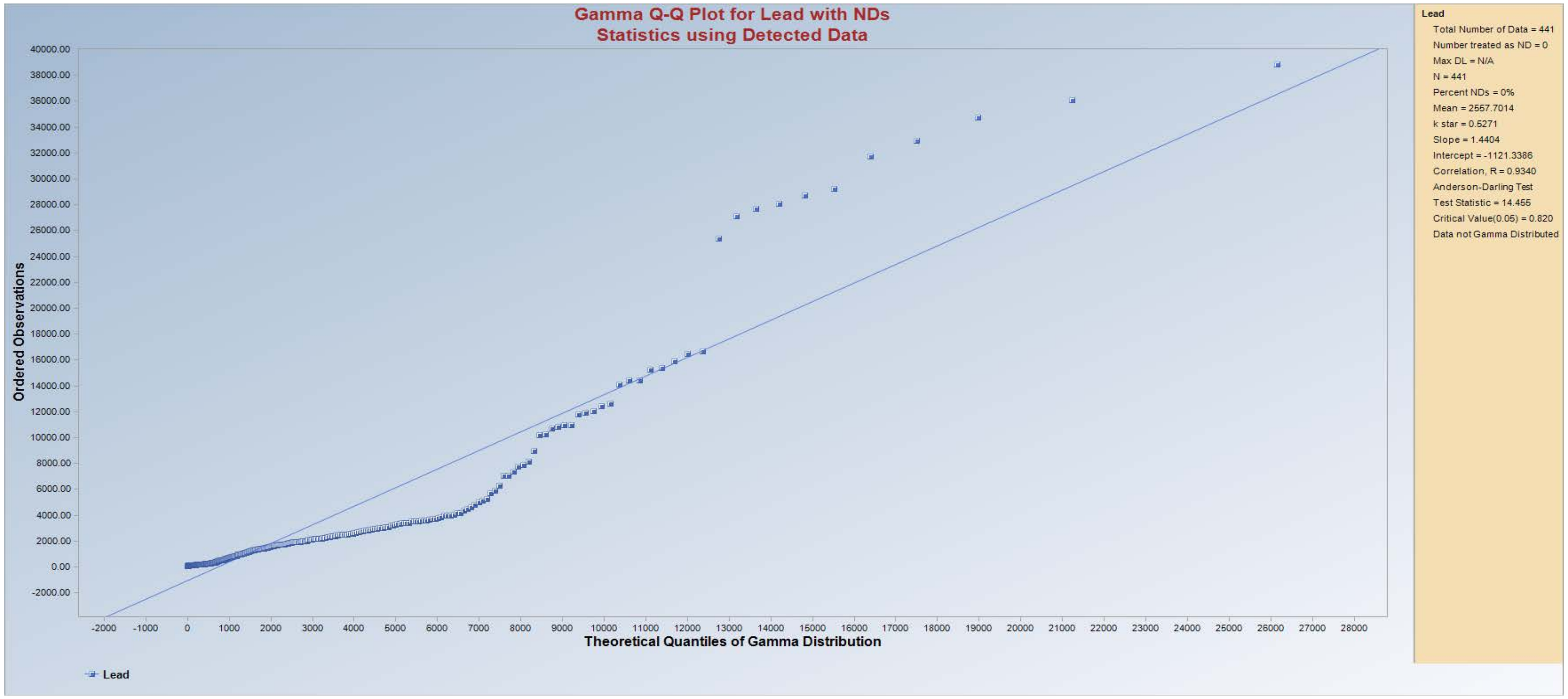
Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 441
Mean = 489.7
Sd = 636
Slope = 493.5
Intercept = 489.7
Correlation, R = 0.776
Shapiro-Wilk Test
Approx. Test Value = 0.604
p-Value = 0.000

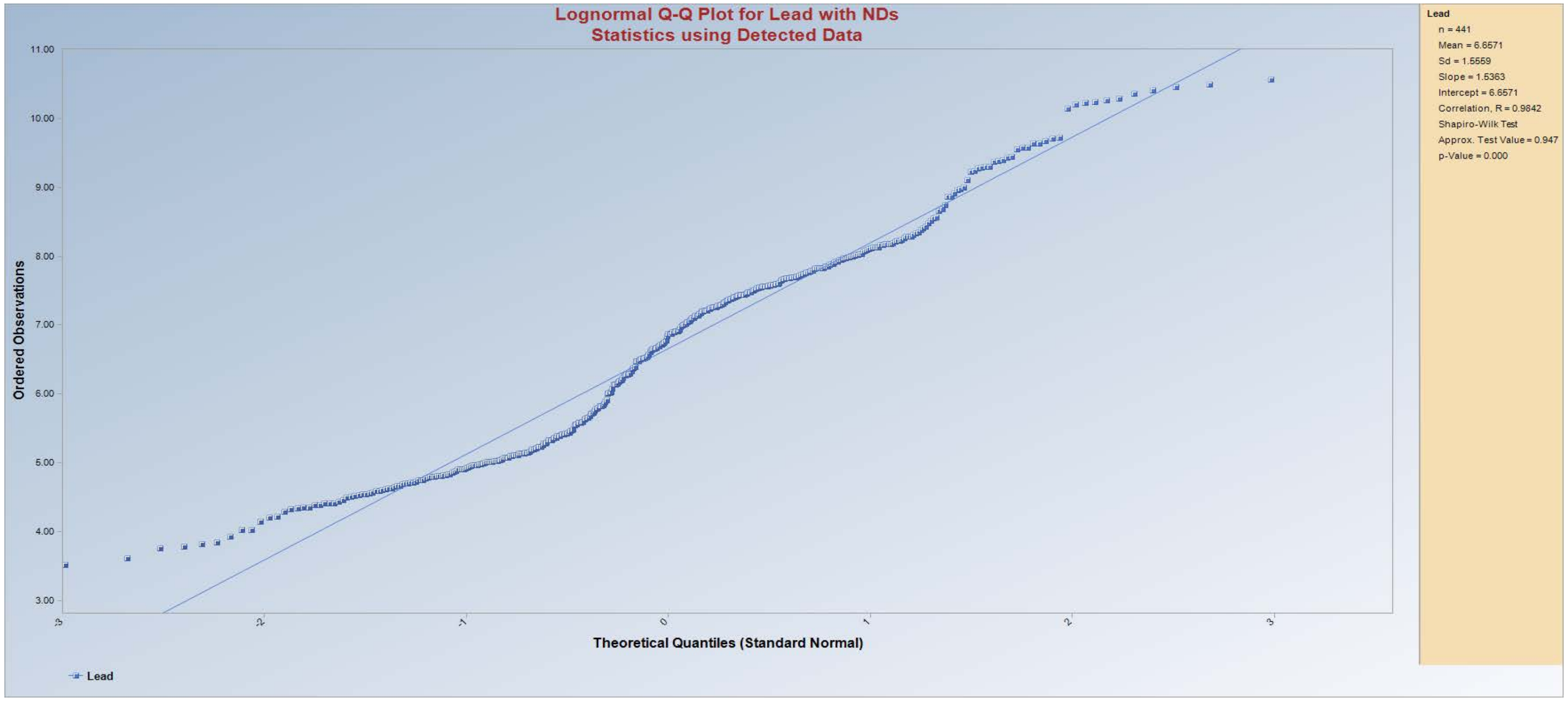


Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 441
Number treated as ND = 0
Max DL = N/A
N = 438
Percent NDs = 0%
Mean = 51051.5287
k star = 3.4263
Slope = 1.0417
Intercept = -2117.2754
Correlation, R = 0.9944
Anderson-Darling Test
Test Statistic = 1.415
Critical Value(0.05) = 0.760
Data not Gamma Distributed

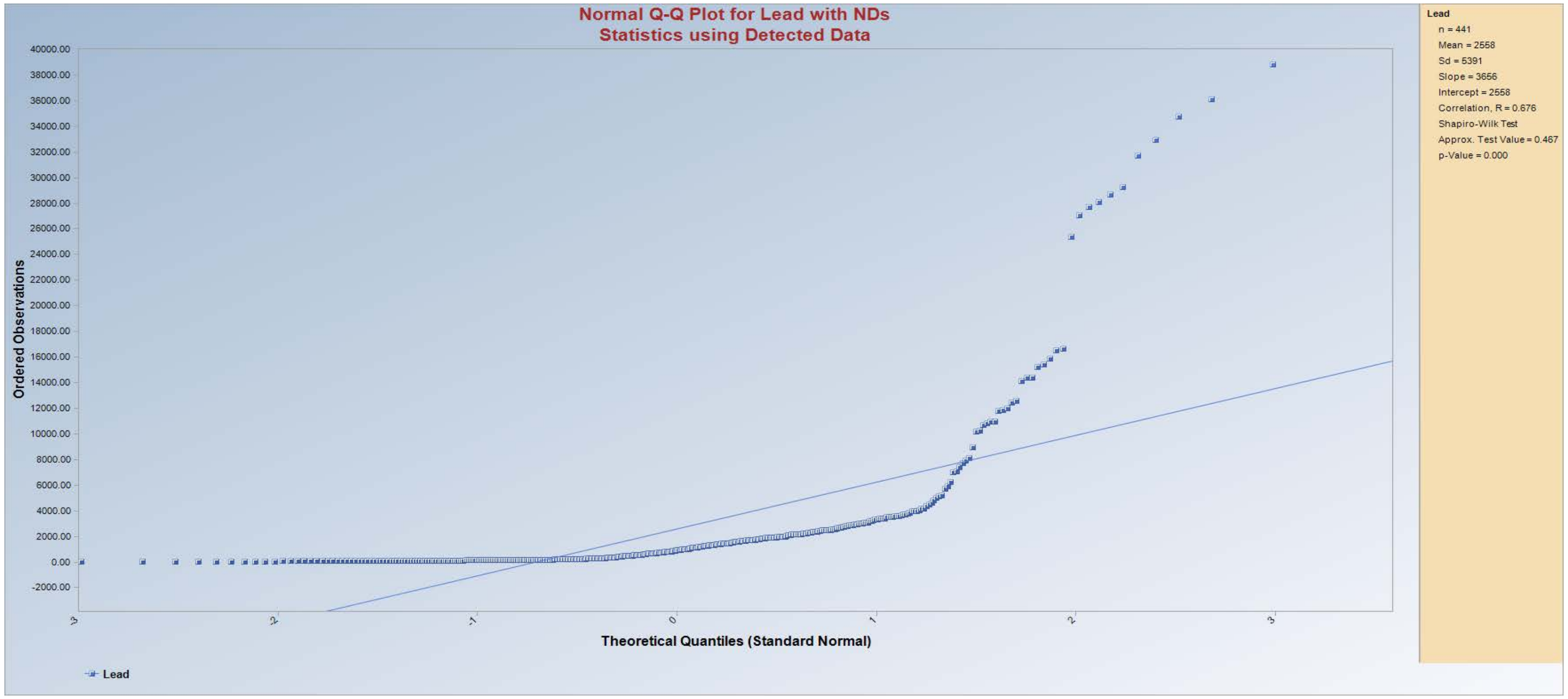

Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
13.00
12.80
12.60
12.40
12.20
12.00
11.80
11.60
11.40
11.20
11.00
10.80
10.60
10.40
10.20
10.00
9.80
9.60
9.40
9.20
9.00
8.80
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 438
Mean = 10.6886
Sd = 0.5622
Slope = 0.5617
Intercept = 10.6886
Correlation, R = 0.9958
Shapiro-Wilk Test
Approx. Test Value = 0.978
p-Value = 0.039

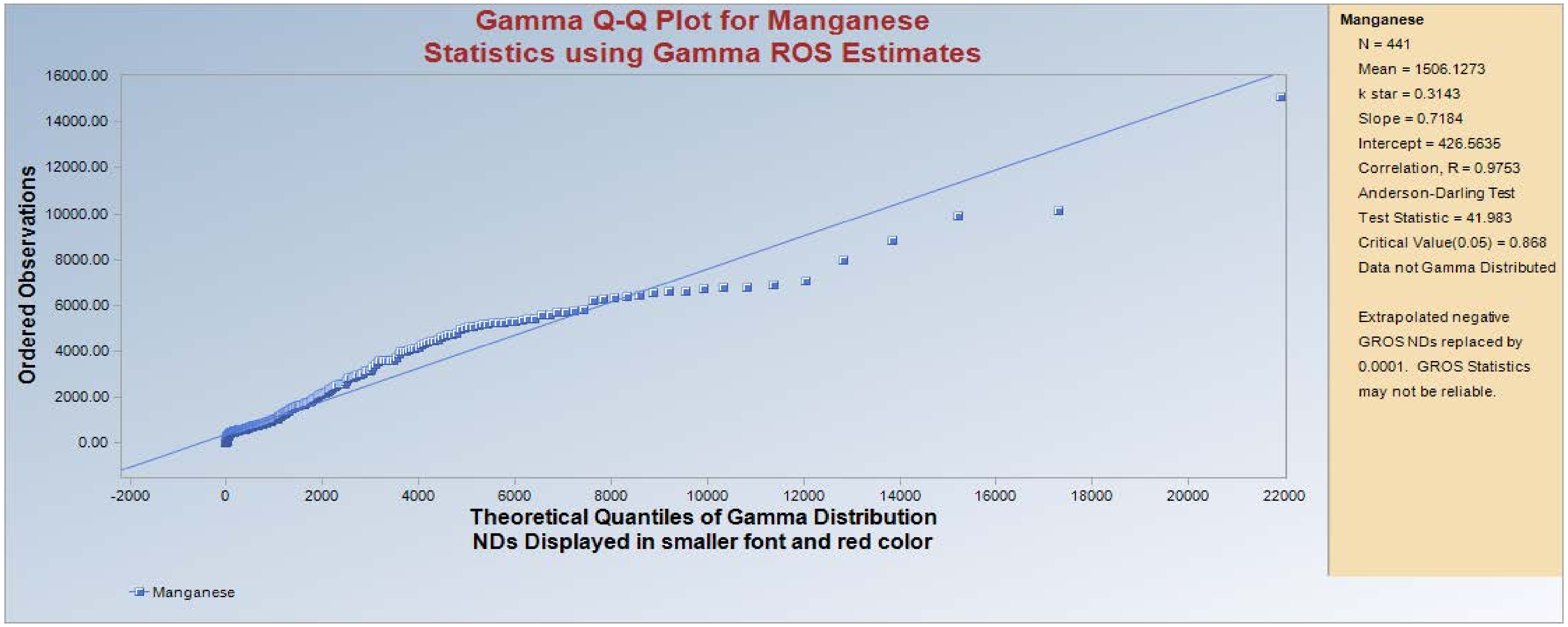

Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
210000.00
200000.00
190000.00
180000.00
170000.00
160000.00
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
-10000.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 438
Mean = 51052
Sd = 28842
Slope = 27482
Intercept = 51052
Correlation, R = 0.95
Shapiro-Wilk Test
Approx. Test Value = 0.898
p-Value = 0.000


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
40000.00
38000.00
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-2000 -1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000
Lead
Lead
Total Number of Data = 441
Number treated as ND = 0
Max DL = N/A
N = 441
Percent NDs = 0%
Mean = 2557.7014
k star = 0.5271
Slope = 1.4404
Intercept = -1121.3386
Correlation, R = 0.9340
Anderson-Darling Test
Test Statistic = 14.455
Critical Value(0.05) = 0.820
Data not Gamma Distributed

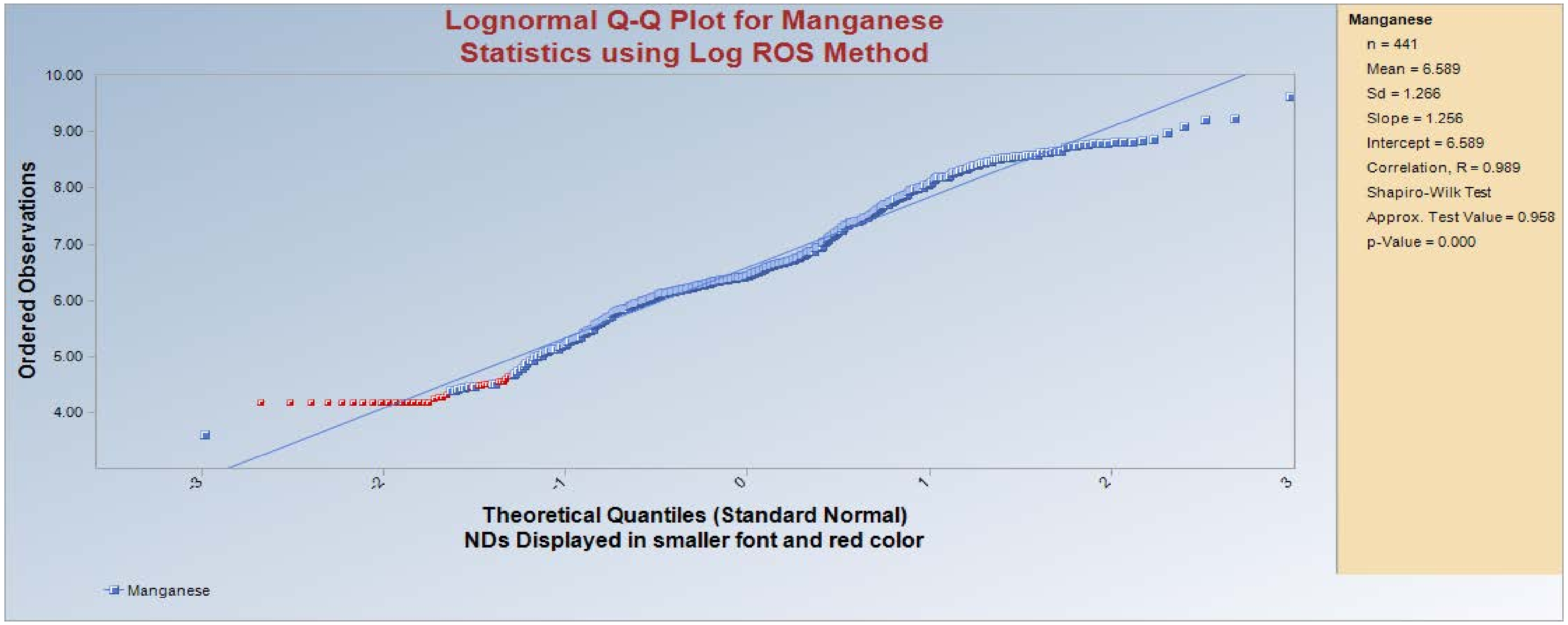


Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 441
Mean = 6.6571
Sd = 1.5559
Slope = 1.5363
Intercept = 6.6571
Correlation, R = 0.9842
Shapiro-Wilk Test
Approx. Test Value = 0.947
p-Value = 0.000

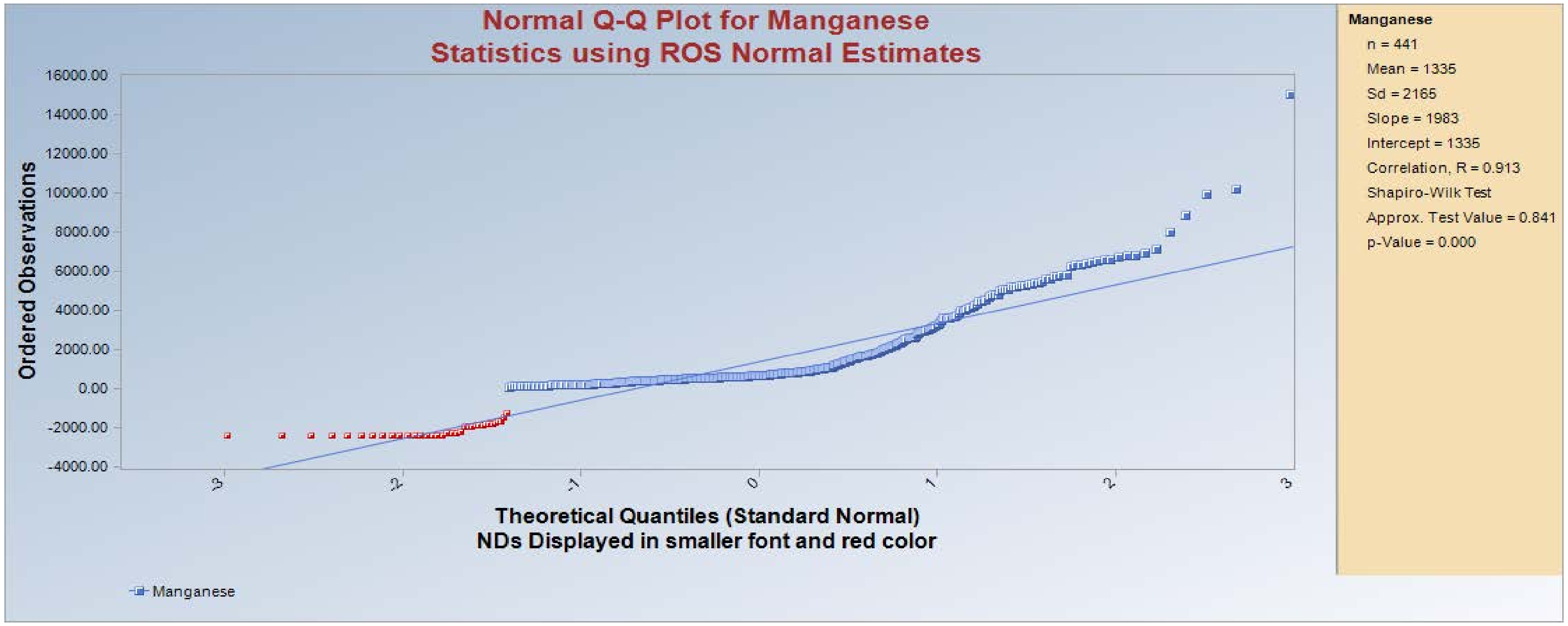

Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
40000.00
38000.00
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 441
Mean = 2558
Sd = 5391
Slope = 3656
Intercept = 2558
Correlation, R = 0.676
Shapiro-Wilk Test
Approx. Test Value = 0.467
p-Value = 0.000



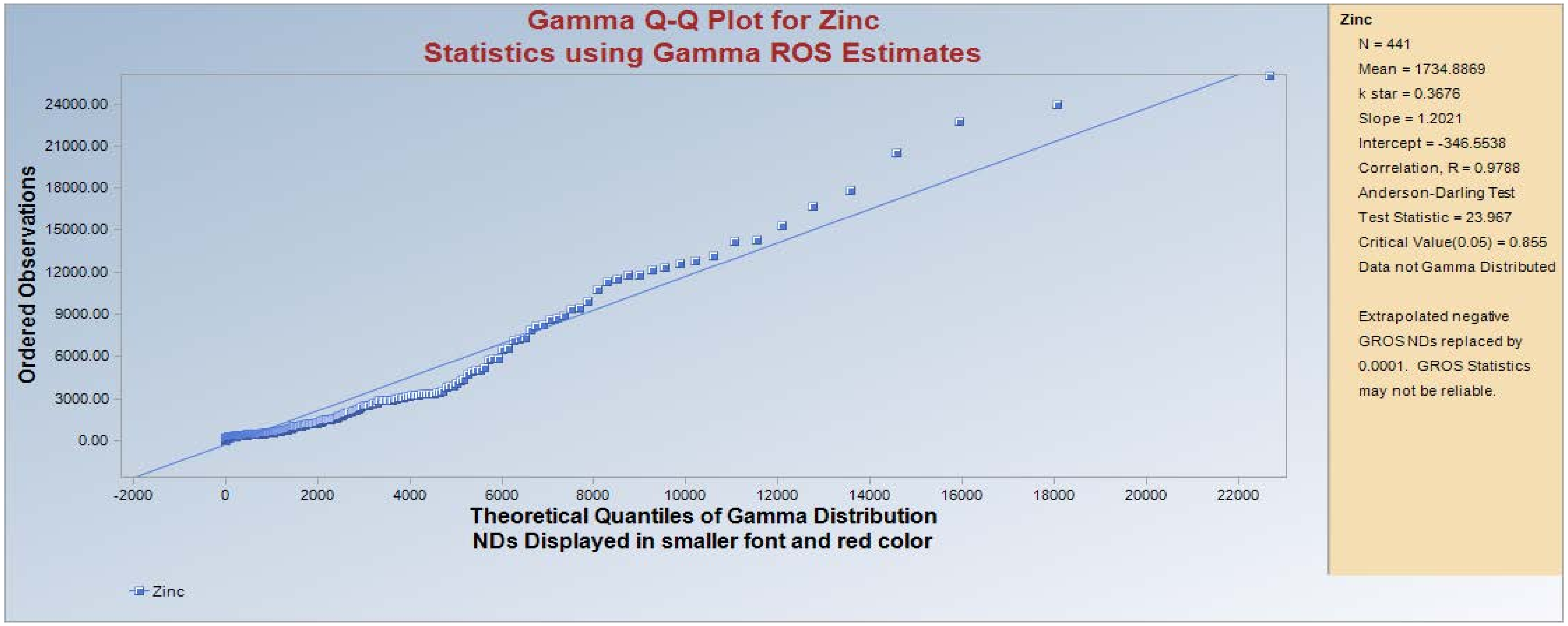
Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 441
Mean = 1506.1273
k star = 0.3143
Slope = 0.7184
Intercept = 426.5635
Correlation, R = 0.9753
Anderson-Darling Test
Test Statistic = 41.983
Critical Value(0.05) = 0.868
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



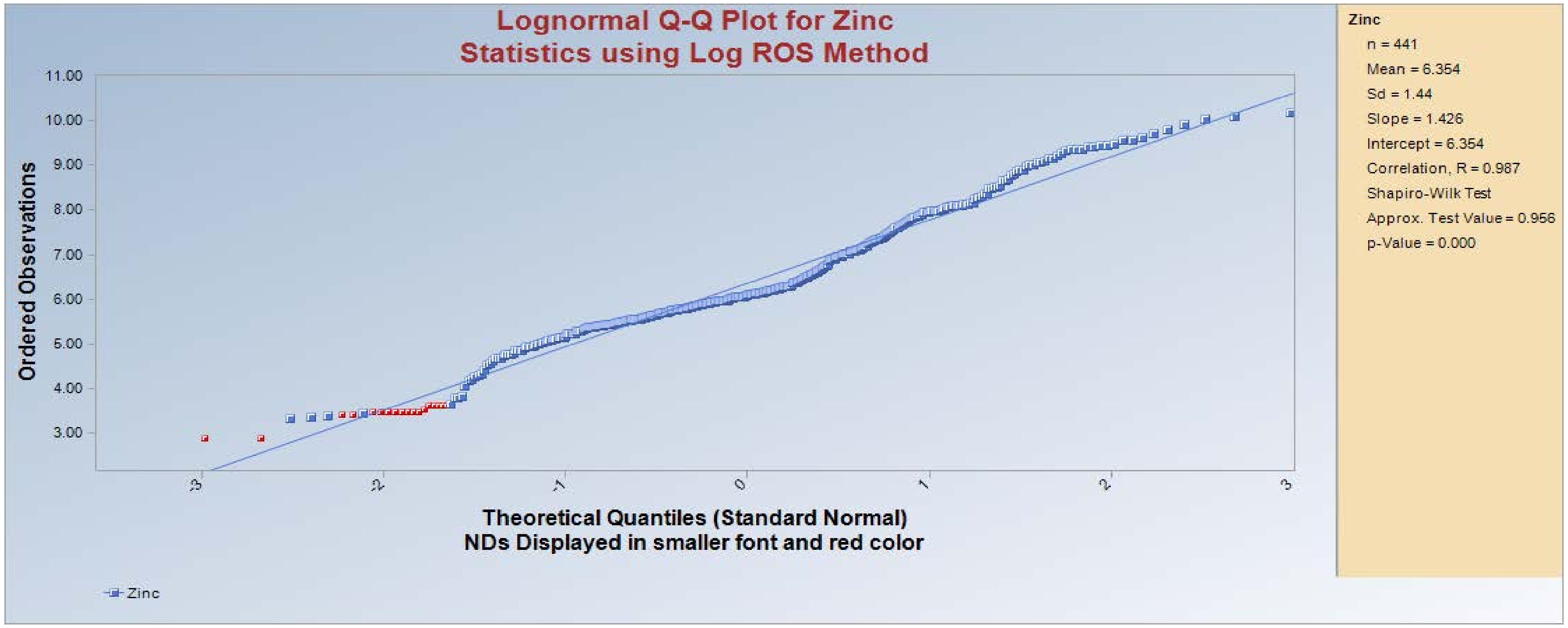
Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
10.00
9.00
8.00
7.00
6.00
5.00
4.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 441
Mean = 6.589
Sd = 1.266
Slope = 1.256
Intercept = 6.589
Correlation, R = 0.989
Shapiro-Wilk Test
Approx. Test Value = 0.958
p-Value = 0.000



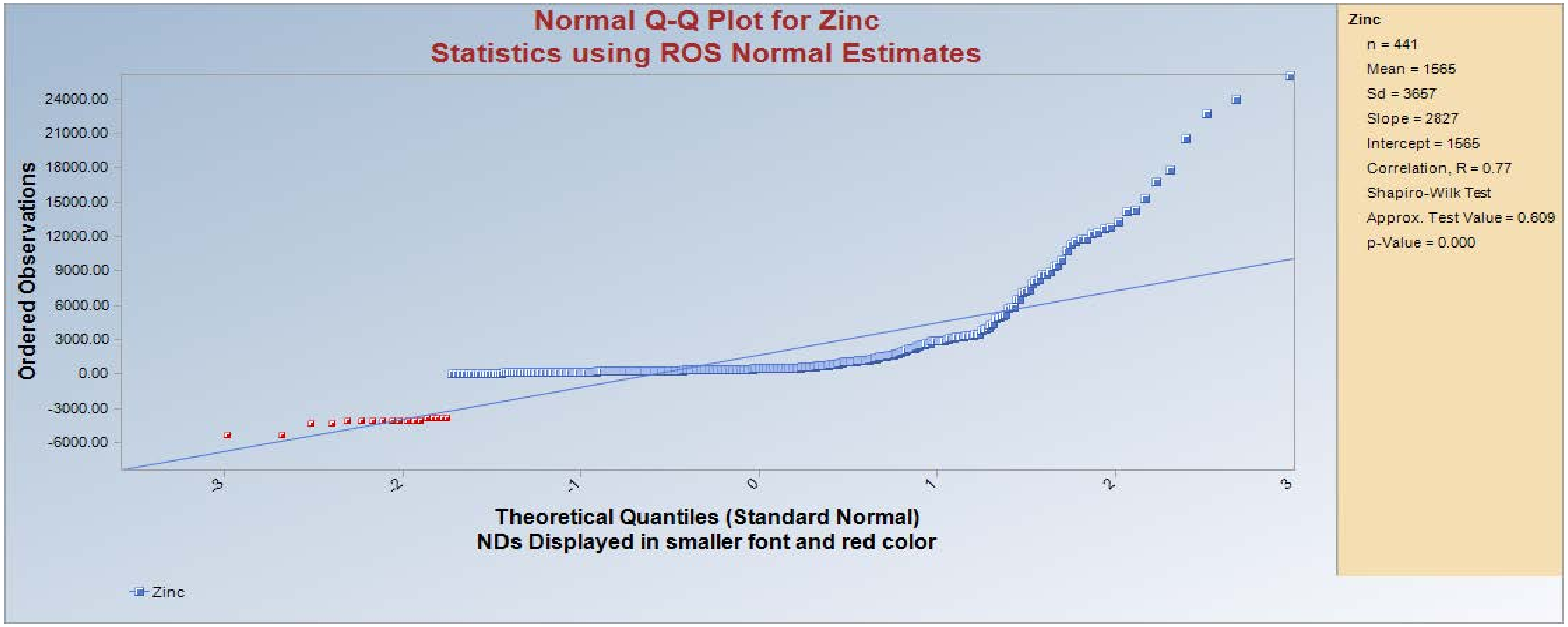
Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-4000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 441
Mean = 1335
Sd = 2165
Slope = 1983
Intercept = 1335
Correlation, R = 0.913
Shapiro-Wilk Test
Approx. Test Value = 0.841
p-Value = 0.000



Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Zinc
Zinc
N = 441
Mean = 1734.8869
k star = 0.3676
Slope = 1.2021
Intercept = -346.5538
Correlation, R = 0.9788
Anderson-Darling Test
Test Statistic = 23.967
Critical Value(0.05) = 0.855
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
Ordered Observations
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 441
Mean = 6.354
Sd = 1.44
Slope = 1.426
Intercept = 6.354
Correlation, R = 0.987
Shapiro-Wilk Test
Approx. Test Value = 0.956
p-Value = 0.000


Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-6000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 441
Mean = 1565
Sd = 3657
Slope = 2827
Intercept = 1565
Correlation, R = 0.77
Shapiro-Wilk Test
Approx. Test Value = 0.609
p-Value = 0.000

Attachment A3
ProUCL Output for EU 2 Subsurface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	153	Number of Detected Data	150
Number of Distinct Detected Data	149	Number of Non-Detect Data	3
		Percent Non-Detects	1.96%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.668	Minimum Detected	1.3
Maximum Detected	729.7	Maximum Detected	6.593
Mean of Detected	30.23	Mean of Detected	2.945
SD of Detected	64.64	SD of Detected	0.782
Minimum Non-Detect	2.178	Minimum Non-Detect	0.778
Maximum Non-Detect	3.902	Maximum Non-Detect	1.361

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	149
Single DL Non-Detect Percentage	2.61%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.341	Lilliefors Test Statistic	0.106
5% Lilliefors Critical Value	0.0723	5% Lilliefors Critical Value	0.0723
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	29.67	Mean	2.894
SD	64.12	SD	0.855
95% DL/2 (t) UCL	38.24	95% H-Stat (DL/2) UCL	30.08
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	28.57	Mean in Log Scale	2.907
SD	64.98	SD in Log Scale	0.819
95% MLE (t) UCL	37.26	Mean in Original Scale	29.69
95% MLE (Tiku) UCL	36.33	SD in Original Scale	64.11
		95% t UCL	38.27
		95% Percentile Bootstrap UCL	38.6
		95% BCA Bootstrap UCL	43.95
		95% H UCL	29.33

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.198	Data do not follow a Discernable Distribution (0.05)	
Theta Star	25.24		
nu star	359.3		
A-D Test Statistic	10.06	Nonparametric Statistics	
5% A-D Critical Value	0.778	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.778	Mean	29.71
5% K-S Critical Value	0.0784	SD	63.89
Data not Gamma Distributed at 5% Significance Level		SE of Mean	5.183
		95% KM (t) UCL	38.29
Assuming Gamma Distribution		95% KM (z) UCL	38.23
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	38.27
Minimum	0.000001	95% KM (bootstrap t) UCL	49.88
Maximum	729.7	95% KM (BCA) UCL	39.42
Mean	29.64	95% KM (Percentile Bootstrap) UCL	38.71
Median	16.91	95% KM (Chebyshev) UCL	52.3
SD	64.13	97.5% KM (Chebyshev) UCL	62.07
k star	0.761	99% KM (Chebyshev) UCL	81.28
Theta star	38.94		
Nu star	232.9	Potential UCLs to Use	
AppChi2	198.5	95% KM (BCA) UCL	39.42
95% Gamma Approximate UCL (Use when n >= 40)	34.76		
95% Adjusted Gamma UCL (Use when n < 40)	34.81		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Data	22	Number of Detected Data	21
Number of Distinct Detected Data	21	Number of Non-Detect Data	1
Number of Missing Values	131	Percent Non-Detects	4.55%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.6	Minimum Detected	-0.511
Maximum Detected	27.5	Maximum Detected	3.314
Mean of Detected	6.478	Mean of Detected	1.462
SD of Detected	6.213	SD of Detected	0.969
Minimum Non-Detect	0.2	Minimum Non-Detect	-1.609
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.974
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.188	Mean	1.291
SD	6.214	SD	1.24
95% DL/2 (t) UCL	8.467	95% H-Stat (DL/2) UCL	17.35
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	6.038	Mean in Log Scale	1.353
SD	6.287	SD in Log Scale	1.074
95% MLE (t) UCL	8.344	Mean in Original Scale	6.201
95% MLE (Tiku) UCL	8.233	SD in Original Scale	6.201
		95% t UCL	8.476
		95% Percentile Bootstrap UCL	8.439
		95% BCA Bootstrap UCL	8.831
		95% H UCL	12.94

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.208	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5.362		
nu star	50.74		
A-D Test Statistic	0.32	**Nonparametric Statistics**	
5% A-D Critical Value	0.761	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.761	Mean	6.21
5% K-S Critical Value	0.193	SD	6.049
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.322
		95% KM (t) UCL	8.485
Assuming Gamma Distribution		95% KM (z) UCL	8.384
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8.467
Minimum	0.000001	95% KM (bootstrap t) UCL	9.534
Maximum	27.5	95% KM (BCA) UCL	8.664
Mean	6.183	95% KM (Percentile Bootstrap) UCL	8.6
Median	5.15	95% KM (Chebyshev) UCL	11.97
SD	6.219	97.5% KM (Chebyshev) UCL	14.46
k star	0.538	99% KM (Chebyshev) UCL	19.36
Theta star	11.5		
Nu star	23.67	Potential UCLs to Use	
AppChi2	13.6	95% KM (Chebyshev) UCL	11.97
95% Gamma Approximate UCL (Use when n >= 40)	10.76		
95% Adjusted Gamma UCL (Use when n < 40)	11.23		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	153	Number of Detected Data	152
Number of Distinct Detected Data	151	Number of Non-Detect Data	1
		Percent Non-Detects	0.65%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	11.46	Minimum Detected	2.439
Maximum Detected	2076	Maximum Detected	7.638
Mean of Detected	347.5	Mean of Detected	5.525
SD of Detected	323.4	SD of Detected	0.819
Minimum Non-Detect	7.735	Minimum Non-Detect	2.046
Maximum Non-Detect	7.735	Maximum Non-Detect	2.046

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.168	Lilliefors Test Statistic	0.0528
5% Lilliefors Critical Value	0.0719	5% Lilliefors Critical Value	0.0719
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	345.2	Mean	5.497
SD	323.6	SD	0.883
95% DL/2 (t) UCL	388.5	95% H-Stat (DL/2) UCL	419
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	344.2	Mean in Log Scale	5.509
SD	324.1	SD in Log Scale	0.837
95% MLE (t) UCL	387.5	Mean in Original Scale	345.4
95% MLE (Tiku) UCL	385	SD in Original Scale	323.4
		95% t UCL	388.6
		95% Percentile Bootstrap UCL	389.9
		95% BCA Bootstrap UCL	395.1
		95% H UCL	403.5

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	1.652
Theta Star	210.3
nu star	502.2
A-D Test Statistic	1.726
5% A-D Critical Value	0.769
K-S Test Statistic	0.769
5% K-S Critical Value	0.0773

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	2076
Mean	345.2
Median	240.4
SD	323.6
k star	1.241
Theta star	278.1
Nu star	379.9
AppChi2	335.7
95% Gamma Approximate UCL (Use when n >= 40)	390.6
95% Adjusted Gamma UCL (Use when n < 40)	391.1

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	345.3
SD	322.4
SE of Mean	26.15
95% KM (t) UCL	388.6
95% KM (z) UCL	388.3
95% KM (jackknife) UCL	388.4
95% KM (bootstrap t) UCL	395.7
95% KM (BCA) UCL	390.6
95% KM (Percentile Bootstrap) UCL	388.5
95% KM (Chebyshev) UCL	459.3
97.5% KM (Chebyshev) UCL	508.6
99% KM (Chebyshev) UCL	605.5

Potential UCLs to Use

95% KM (BCA) UCL	390.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations 153

Number of Distinct Observations 153

Raw Statistics	
Minimum	18139
Maximum	98761
Mean	40523
Geometric Mean	38265
Median	37417
SD	14667
Std. Error of Mean	1186
Coefficient of Variation	0.362
Skewness	1.371

Log-transformed Statistics	
Minimum of Log Data	9.806
Maximum of Log Data	11.5
Mean of log Data	10.55
SD of log Data	0.333

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.148	Lilliefors Test Statistic	0.0806
Lilliefors Critical Value	0.0716	Lilliefors Critical Value	0.0716
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	42485	95% H-UCL	42409
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	45312
95% Adjusted-CLT UCL (Chen-1995)	42614	97.5% Chebyshev (MVUE) UCL	47421
95% Modified-t UCL (Johnson-1978)	42507	99% Chebyshev (MVUE) UCL	51564
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.715	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4650		
MLE of Mean	40523		
MLE of Standard Deviation	13727		
nu star	2667		
Approximate Chi Square Value (.05)	2548	Nonparametric Statistics	
Adjusted Level of Significance	0.0484	95% CLT UCL	42473
Adjusted Chi Square Value	2547	95% Jackknife UCL	42485
		95% Standard Bootstrap UCL	42524
Anderson-Darling Test Statistic	1.288	95% Bootstrap-t UCL	42635
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	42519
Kolmogorov-Smirnov Test Statistic	0.102	95% Percentile Bootstrap UCL	42568
Kolmogorov-Smirnov 5% Critical Value	0.0758	95% BCA Bootstrap UCL	42681
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	45691
		97.5% Chebyshev(Mean, Sd) UCL	47928
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	52320
95% Approximate Gamma UCL (Use when n >= 40)	42415		
95% Adjusted Gamma UCL (Use when n < 40)	42433		
Potential UCL to Use		Use 95% Student's-t UCL	42485
		or 95% Modified-t UCL	42507

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Raw Statistics		Log-transformed Statistics	
Number of Valid Observations	153	Number of Distinct Observations	153
Minimum	26.5	Minimum of Log Data	3.277
Maximum	28921	Maximum of Log Data	10.27
Mean	725	Mean of log Data	5.671
Geometric Mean	290.3	SD of log Data	1.12
Median	212.2		
SD	2434		
Std. Error of Mean	196.7		
Coefficient of Variation	3.357		
Skewness	10.46		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.387	Lilliefors Test Statistic	0.121
Lilliefors Critical Value	0.0716	Lilliefors Critical Value	0.0716
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1051	95% H-UCL	670.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	806.6
95% Adjusted-CLT UCL (Chen-1995)	1226	97.5% Chebyshev (MVUE) UCL	922
95% Modified-t UCL (Johnson-1978)	1078	99% Chebyshev (MVUE) UCL	1149

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.657	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1104		
MLE of Mean	725		
MLE of Standard Deviation	894.8		
nu star	200.9		
Approximate Chi Square Value (.05)	169.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0484	95% CLT UCL	1049
Adjusted Chi Square Value	168.8	95% Jackknife UCL	1051
		95% Standard Bootstrap UCL	1047
Anderson-Darling Test Statistic	10.87	95% Bootstrap-t UCL	1660
Anderson-Darling 5% Critical Value	0.804	95% Hall's Bootstrap UCL	2227
Kolmogorov-Smirnov Test Statistic	0.188	95% Percentile Bootstrap UCL	1082
Kolmogorov-Smirnov 5% Critical Value	0.0792	95% BCA Bootstrap UCL	1276
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1583
		97.5% Chebyshev(Mean, Sd) UCL	1954
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2683
95% Approximate Gamma UCL (Use when n >= 40)	861.3		
95% Adjusted Gamma UCL (Use when n < 40)	862.7		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	1583

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	153	Number of Detected Data	151
Number of Distinct Detected Data	150	Number of Non-Detect Data	2
		Percent Non-Detects	1.31%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	37.37	Minimum Detected	3.621
Maximum Detected	14749	Maximum Detected	9.599
Mean of Detected	1422	Mean of Detected	6.722
SD of Detected	1813	SD of Detected	1.067
Minimum Non-Detect	34.89	Minimum Non-Detect	3.552
Maximum Non-Detect	65.17	Maximum Non-Detect	4.177

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	149
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	2.61%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.227	Lilliefors Test Statistic	0.0374
5% Lilliefors Critical Value	0.0721	5% Lilliefors Critical Value	0.0721
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1403	Mean	6.676
SD	1808	SD	1.135
95% DL/2 (t) UCL	1645	95% H-Stat (DL/2) UCL	1873
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1376	Mean in Log Scale	6.686
SD	1836	SD in Log Scale	1.106
95% MLE (t) UCL	1621	Mean in Original Scale	1404
95% MLE (Tiku) UCL	1602	SD in Original Scale	1807
		95% t UCL	1645
		95% Percentile Bootstrap UCL	1644
		95% BCA Bootstrap UCL	1707
		95% H UCL	1816
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.049	Data appear Lognormal at 5% Significance Level	
Theta Star	1355		
nu star	316.9		
A-D Test Statistic	1.705	**Nonparametric Statistics**	
5% A-D Critical Value	0.782	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.782	Mean	1403
5% K-S Critical Value	0.0784	SD	1802
Data not Gamma Distributed at 5% Significance Level		SE of Mean	146.1
		95% KM (t) UCL	1645
Assuming Gamma Distribution		95% KM (z) UCL	1644
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1645
Minimum	0.000001	95% KM (bootstrap t) UCL	1718
Maximum	14749	95% KM (BCA) UCL	1647
Mean	1403	95% KM (Percentile Bootstrap) UCL	1657
Median	800.5	95% KM (Chebyshev) UCL	2040
SD	1808	97.5% KM (Chebyshev) UCL	2316
k star	0.744	99% KM (Chebyshev) UCL	2858
Theta star	1886		
Nu star	227.7	**Potential UCLs to Use**	
AppChi2	193.8	95% KM (Chebyshev) UCL	2040
95% Gamma Approximate UCL (Use when n >= 40)	1649		
95% Adjusted Gamma UCL (Use when n < 40)	1651		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Observations	153	Number of Distinct Observations	150

Raw Statistics		Log-transformed Statistics	
Minimum	35	Minimum of Log Data	3.555
Maximum	9763	Maximum of Log Data	9.186
Mean	1140	Mean of log Data	6.591
Geometric Mean	728.5	SD of log Data	0.977
Median	846.3		
SD	1226		
Std. Error of Mean	99.08		
Coefficient of Variation	1.075		
Skewness	3.265		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.194	Lilliefors Test Statistic	0.0701
Lilliefors Critical Value	0.0716	Lilliefors Critical Value	0.0716
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1304	95% H-UCL	1396
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1651
95% Adjusted-CLT UCL (Chen-1995)	1330	97.5% Chebyshev (MVUE) UCL	1860
95% Modified-t UCL (Johnson-1978)	1308	99% Chebyshev (MVUE) UCL	2270
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.238	Data appear Lognormal at 5% Significance Level	
Theta Star	920.6		
MLE of Mean	1140		
MLE of Standard Deviation	1024		
nu star	378.8		
Approximate Chi Square Value (.05)	334.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0484	95% CLT UCL	1303
Adjusted Chi Square Value	334.3	95% Jackknife UCL	1304
		95% Standard Bootstrap UCL	1295
Anderson-Darling Test Statistic	1.293	95% Bootstrap-t UCL	1340
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	1368
Kolmogorov-Smirnov Test Statistic	0.0887	95% Percentile Bootstrap UCL	1307
Kolmogorov-Smirnov 5% Critical Value	0.0776	95% BCA Bootstrap UCL	1341
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1571
		97.5% Chebyshev(Mean, Sd) UCL	1758
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2125
95% Approximate Gamma UCL (Use when n >= 40)	1290		
95% Adjusted Gamma UCL (Use when n < 40)	1291		
Potential UCL to Use		Use 95% H-UCL	1396

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

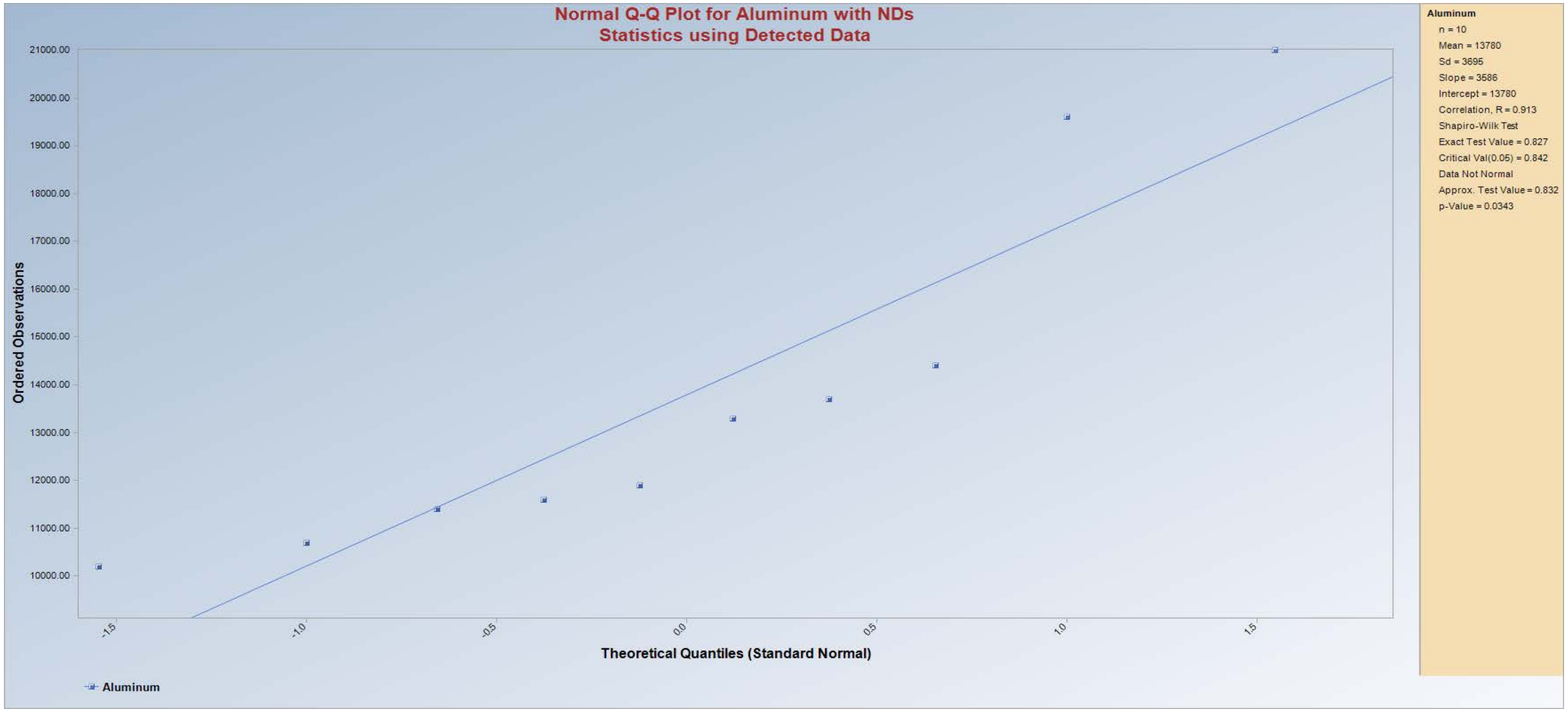
Number of Valid Observations	153	Number of Distinct Observations	150
Raw Statistics		**Log-transformed Statistics**	
Minimum	35	Minimum of Log Data	3.555
Maximum	9763	Maximum of Log Data	9.186
Mean	1140	Mean of log Data	6.591
Geometric Mean	728.5	SD of log Data	0.977
Median	846.3		
SD	1226		
Std. Error of Mean	99.08		
Coefficient of Variation	1.075		
Skewness	3.265		

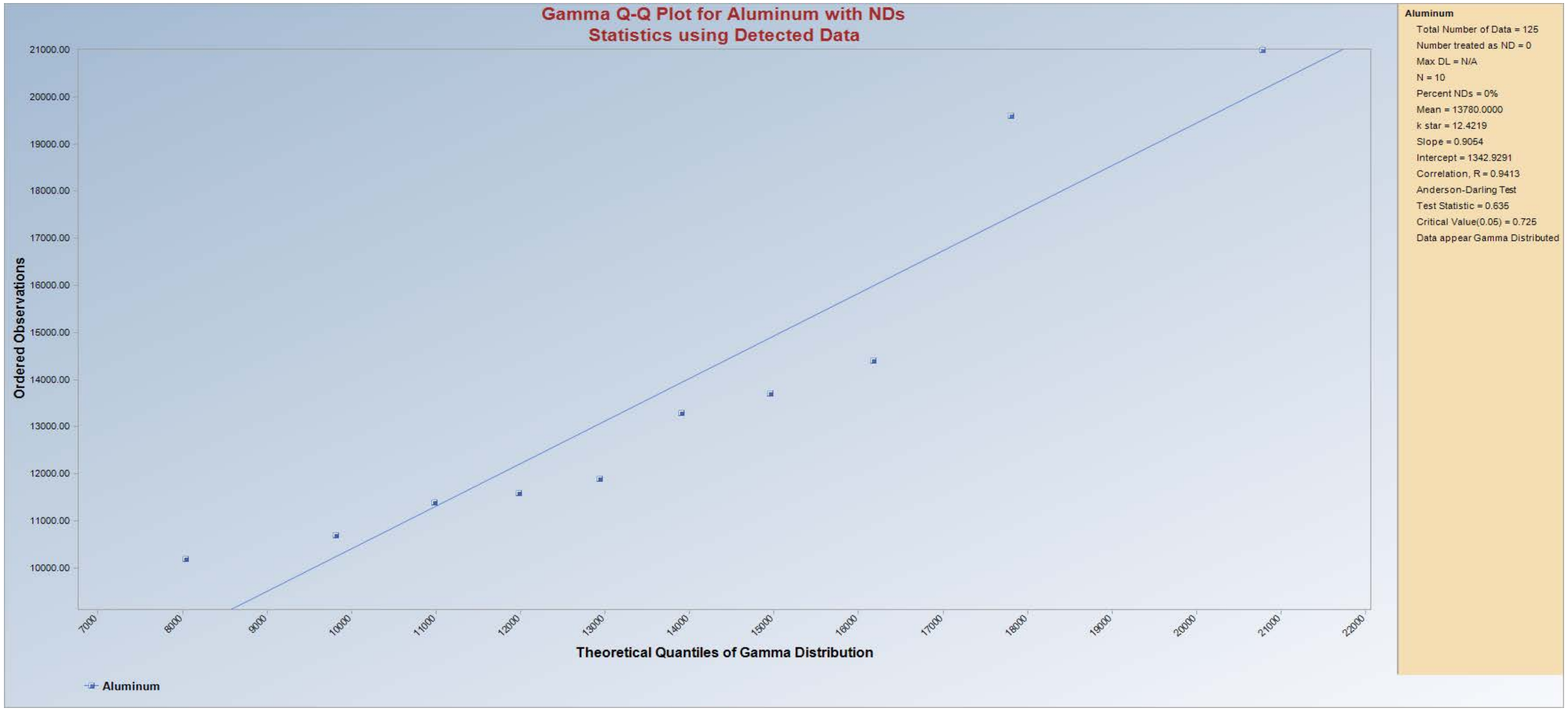
Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.194	Lilliefors Test Statistic	0.0701
Lilliefors Critical Value	0.0716	Lilliefors Critical Value	0.0716
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1304	95% H-UCL	1396
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1651
95% Adjusted-CLT UCL (Chen-1995)	1330	97.5% Chebyshev (MVUE) UCL	1860
95% Modified-t UCL (Johnson-1978)	1308	99% Chebyshev (MVUE) UCL	2270
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.238	Data appear Lognormal at 5% Significance Level	
Theta Star	920.6		
MLE of Mean	1140		
MLE of Standard Deviation	1024		
nu star	378.8		
Approximate Chi Square Value (.05)	334.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0484	95% CLT UCL	1303
Adjusted Chi Square Value	334.3	95% Jackknife UCL	1304
		95% Standard Bootstrap UCL	1295
Anderson-Darling Test Statistic	1.293	95% Bootstrap-t UCL	1340
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	1368
Kolmogorov-Smirnov Test Statistic	0.0887	95% Percentile Bootstrap UCL	1307
Kolmogorov-Smirnov 5% Critical Value	0.0776	95% BCA Bootstrap UCL	1341
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1571
		97.5% Chebyshev(Mean, Sd) UCL	1758
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2125
95% Approximate Gamma UCL (Use when n >= 40)	1290		
95% Adjusted Gamma UCL (Use when n < 40)	1291		
Potential UCL to Use		Use 95% H-UCL	1396

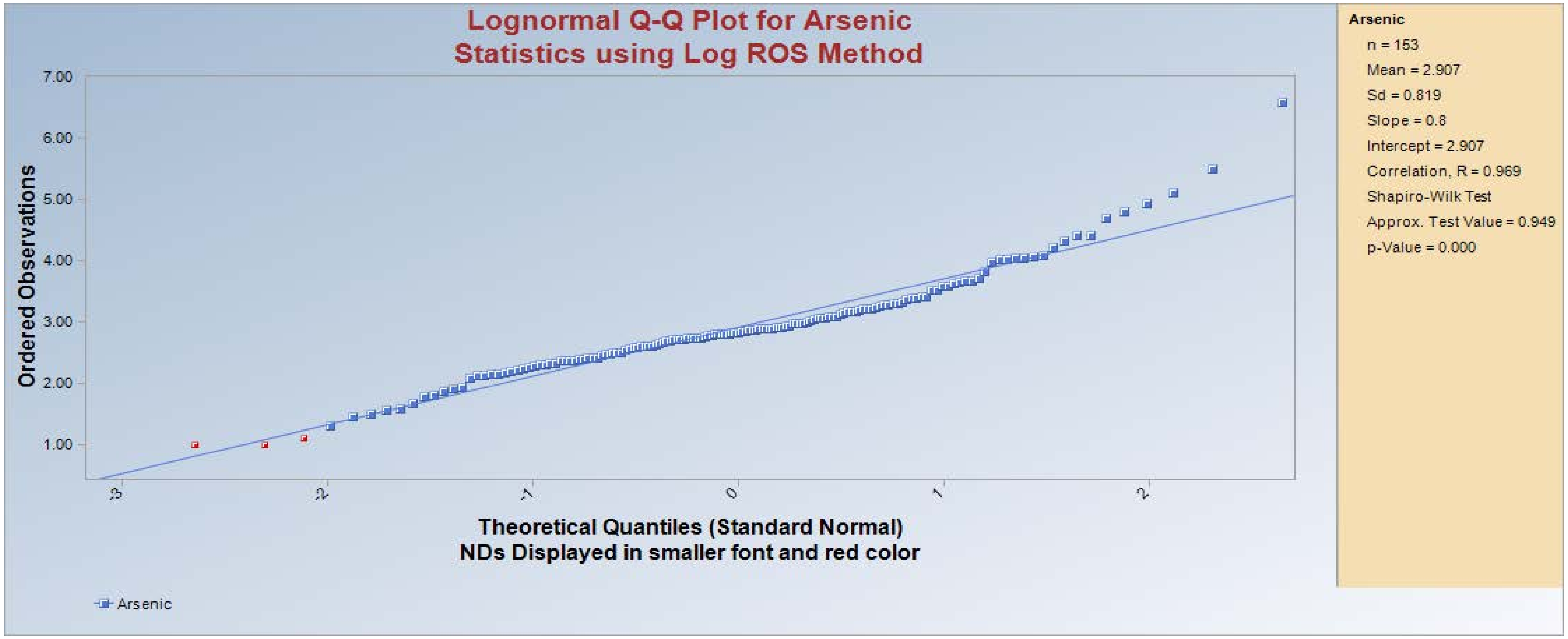
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

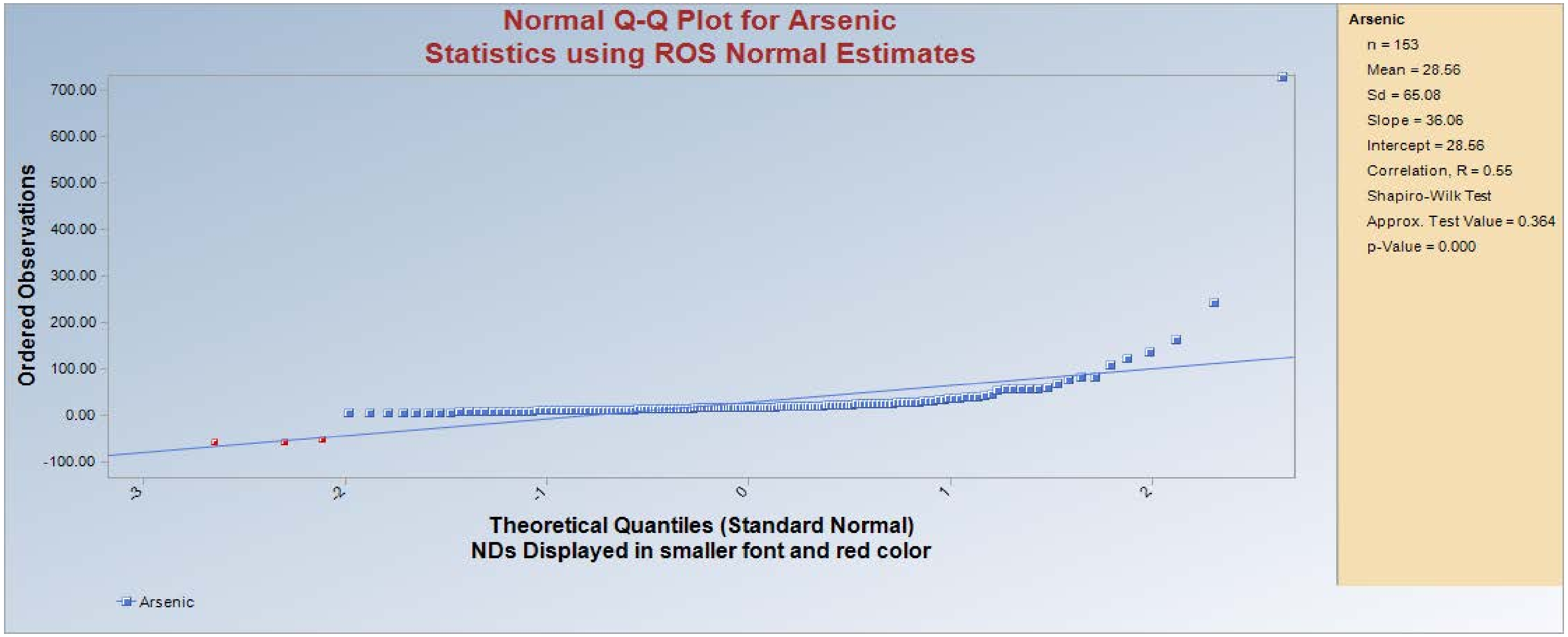

Normal Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Aluminum
Aluminum
n = 10
Mean = 13780
Sd = 3695
Slope = 3586
Intercept = 13780
Correlation, R = 0.913
Shapiro-Wilk Test
Exact Test Value = 0.827
Critical Val(0.05) = 0.842
Data Not Normal
Approx. Test Value = 0.832
p-Value = 0.0343



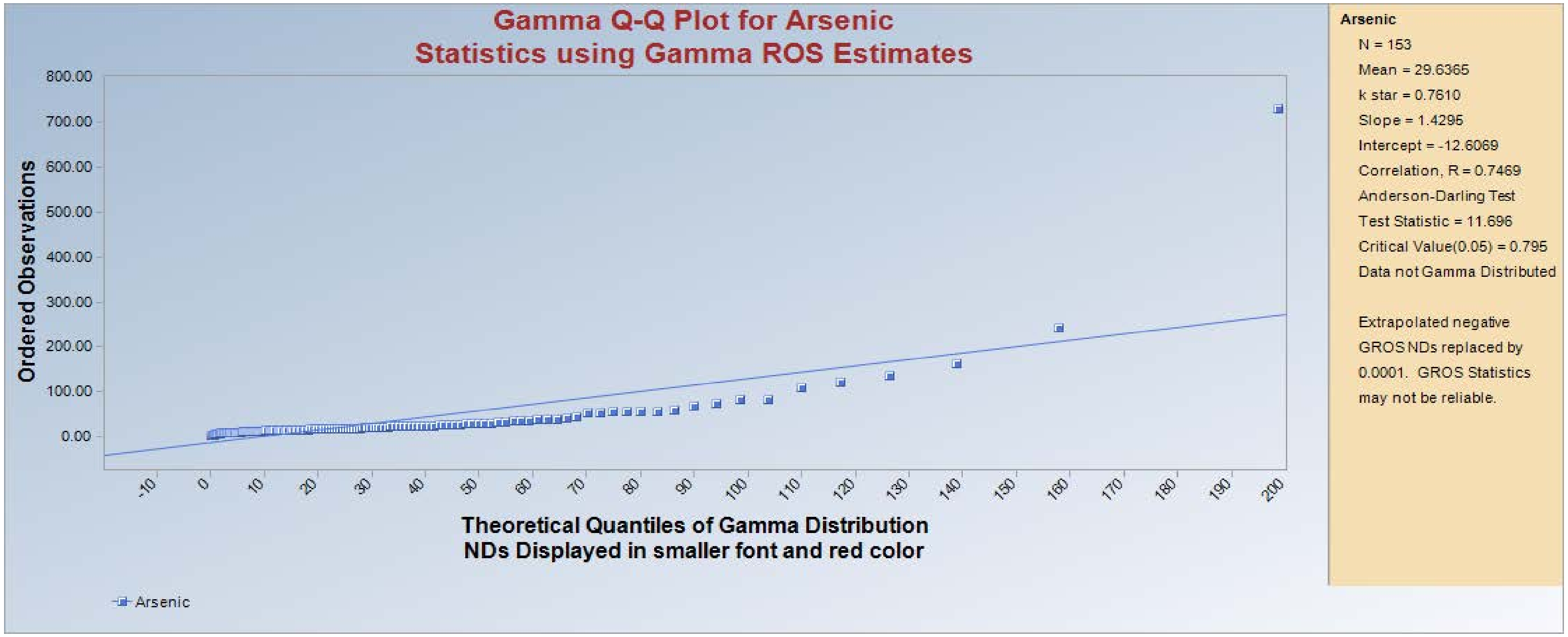
Gamma Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
21000.00
20000.00
19000.00
18000.00
17000.00
16000.00
15000.00
14000.00
13000.00
12000.00
11000.00
10000.00
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
Theoretical Quantiles of Gamma Distribution
Aluminum
Aluminum
Total Number of Data = 125
Number treated as ND = 0
Max DL = N/A
N = 10
Percent NDs = 0%
Mean = 13780.0000
k star = 12.4219
Slope = 0.9054
Intercept = 1342.9291
Correlation, R = 0.9413
Anderson-Darling Test
Test Statistic = 0.635
Critical Value(0.05) = 0.725
Data appear Gamma Distributed

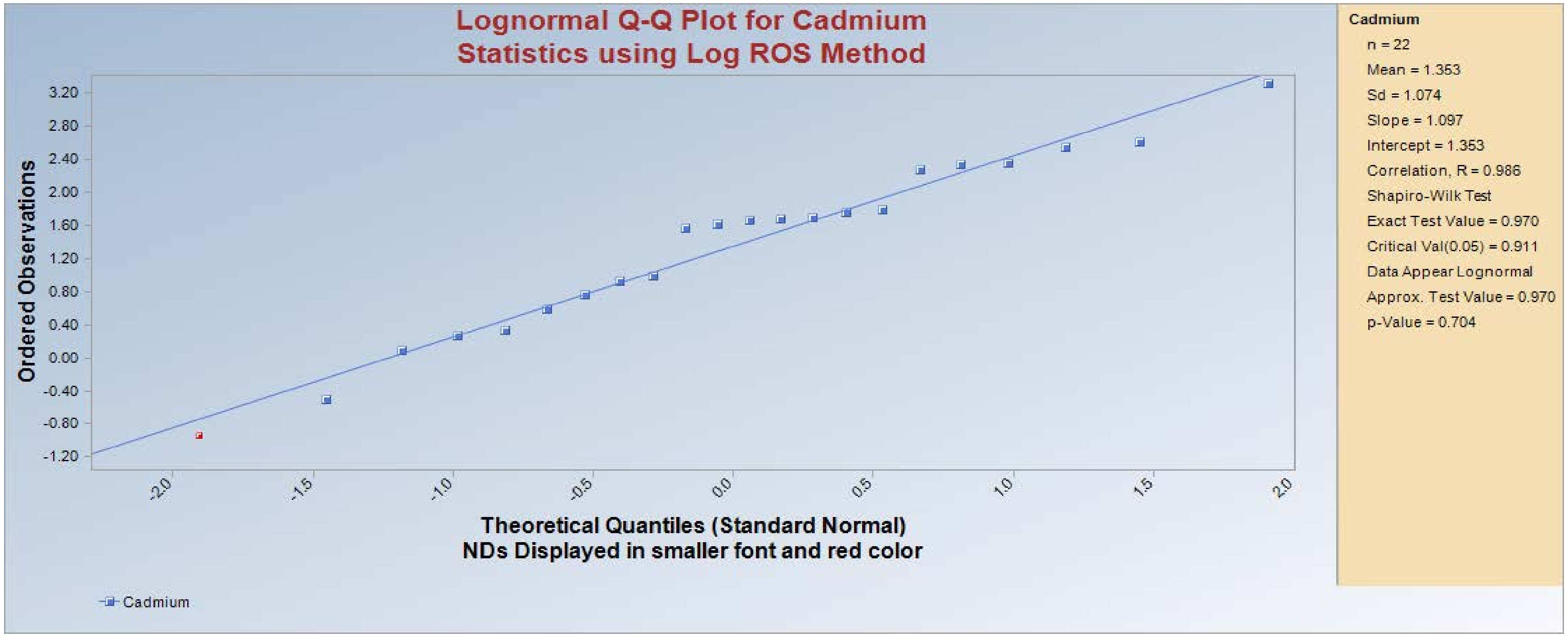


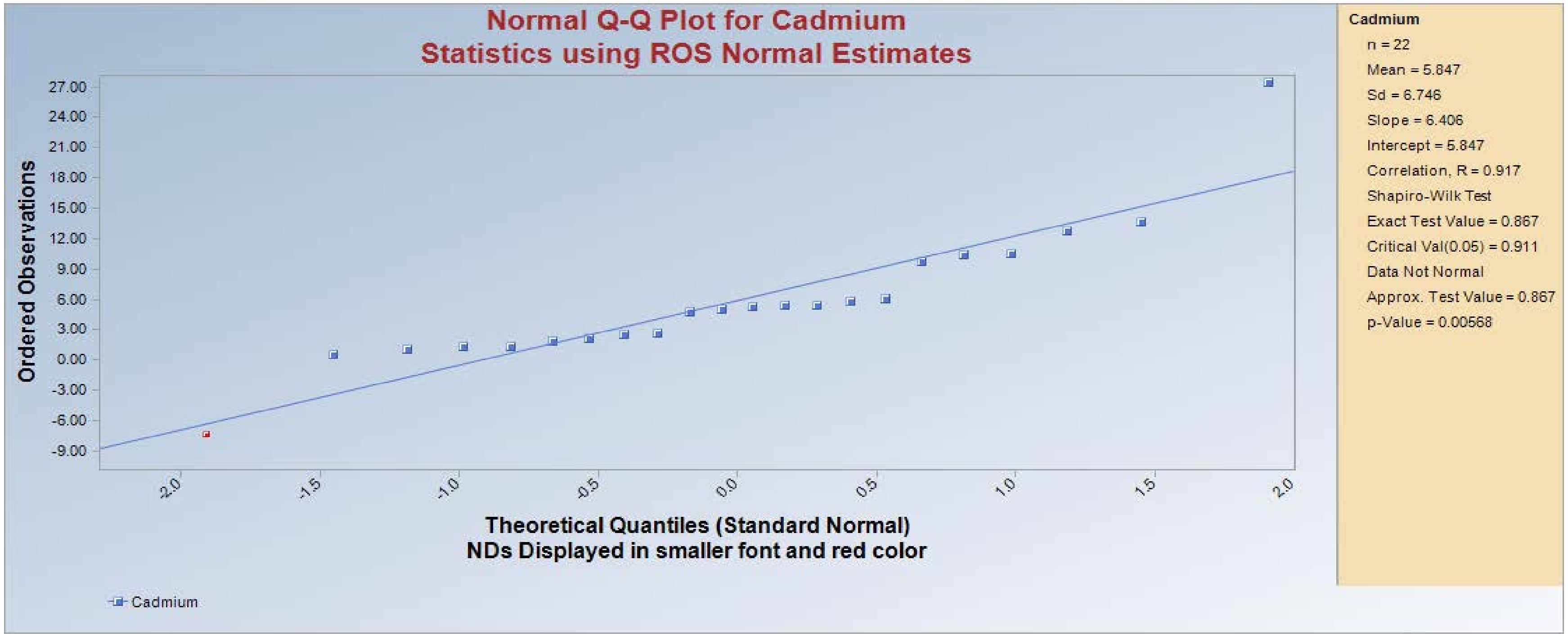
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
7.00
6.00
5.00
4.00
3.00
2.00
1.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 153
Mean = 2.907
Sd = 0.819
Slope = 0.8
Intercept = 2.907
Correlation, R = 0.969
Shapiro-Wilk Test
Approx. Test Value = 0.949
p-Value = 0.000

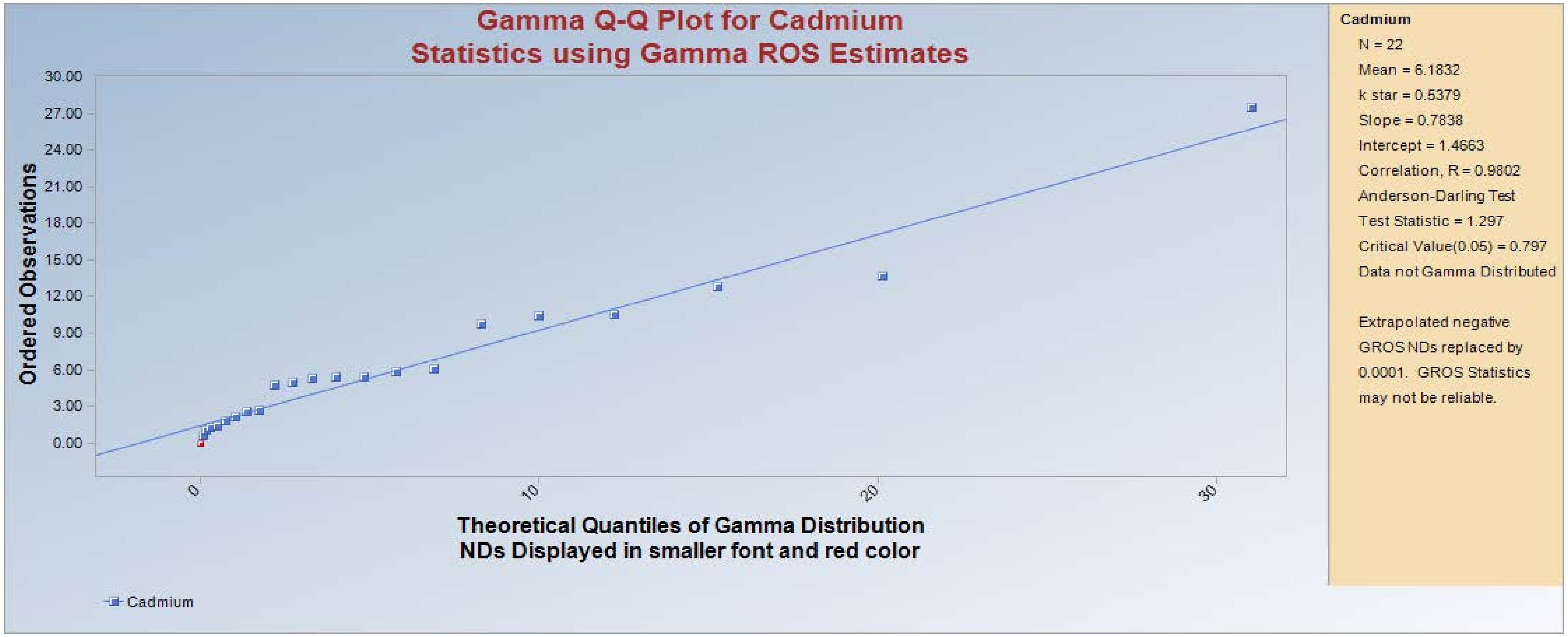


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 153
Mean = 28.56
Sd = 65.08
Slope = 36.06
Intercept = 28.56
Correlation, R = 0.55
Shapiro-Wilk Test
Approx. Test Value = 0.364
p-Value = 0.000

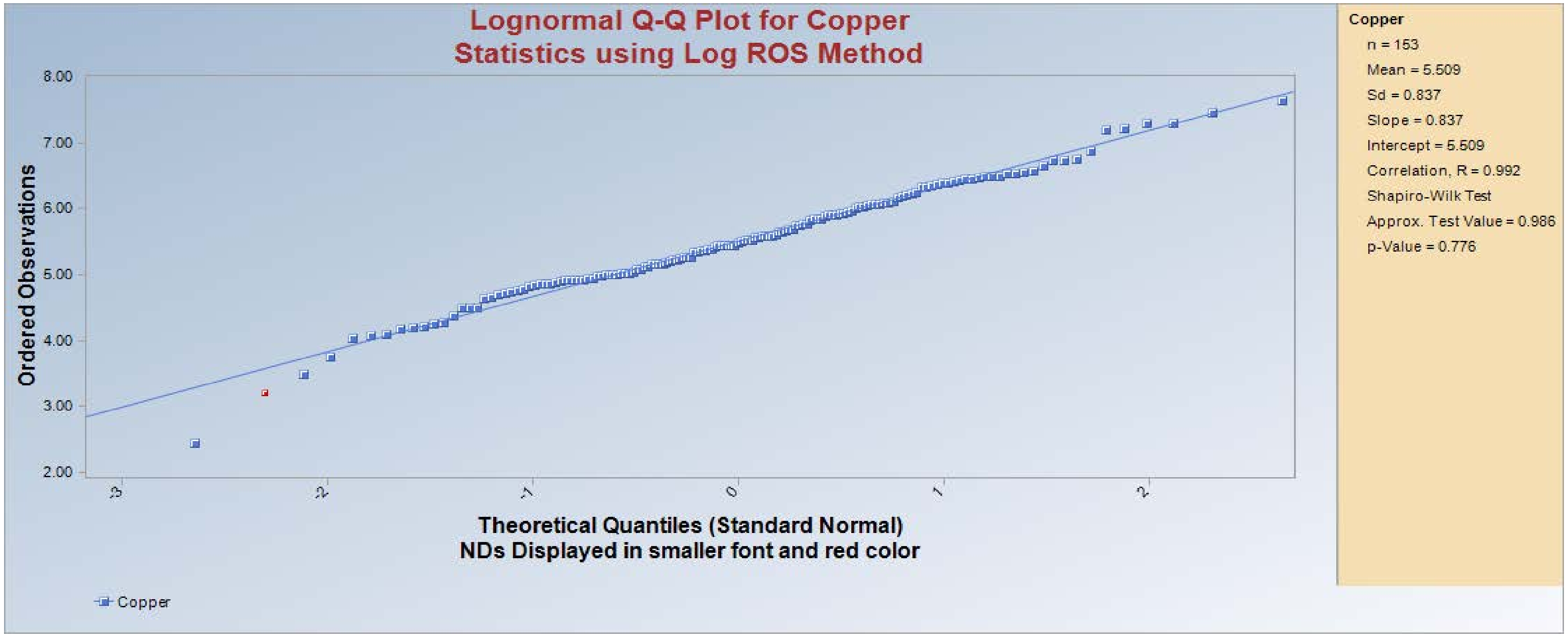

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 153
Mean = 29.6365
k star = 0.7610
Slope = 1.4296
Intercept = -12.6069
Correlation, R = 0.7469
Anderson-Darling Test
Test Statistic = 11.696
Critical Value(0.05) = 0.795
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.


Lognormal Q-Q Plot for Cadmium
Statistics using Log ROS Method
Ordered Observations
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
0.00
-0.40
-0.80
-1.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 22
Mean = 1.353
Sd = 1.074
Slope = 1.097
Intercept = 1.353
Correlation, R = 0.986
Shapiro-Wilk Test
Exact Test Value = 0.970
Critical Val(0.05) = 0.911
Data Appear Lognormal
Approx. Test Value = 0.970
p-Value = 0.704

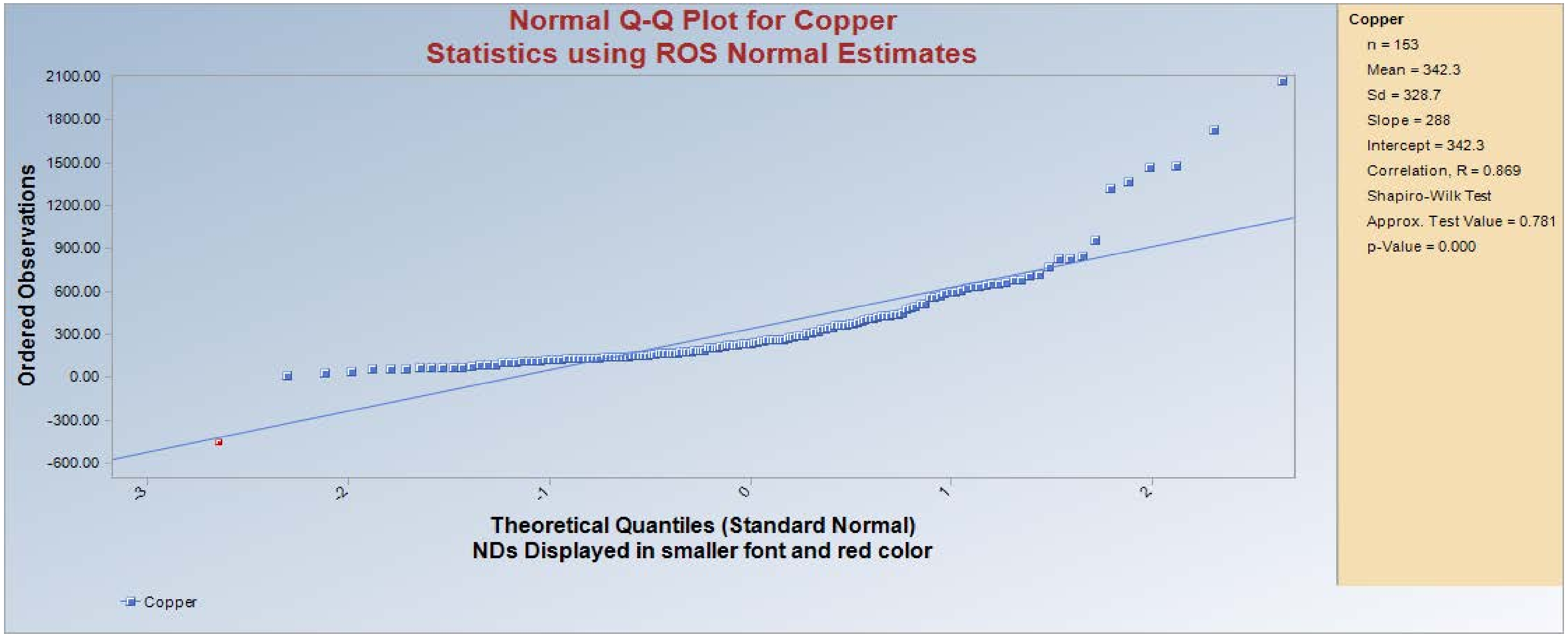

Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-6.00
-9.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 22
Mean = 5.847
Sd = 6.746
Slope = 6.406
Intercept = 5.847
Correlation, R = 0.917
Shapiro-Wilk Test
Exact Test Value = 0.867
Critical Val(0.05) = 0.911
Data Not Normal
Approx. Test Value = 0.867
p-Value = 0.00568



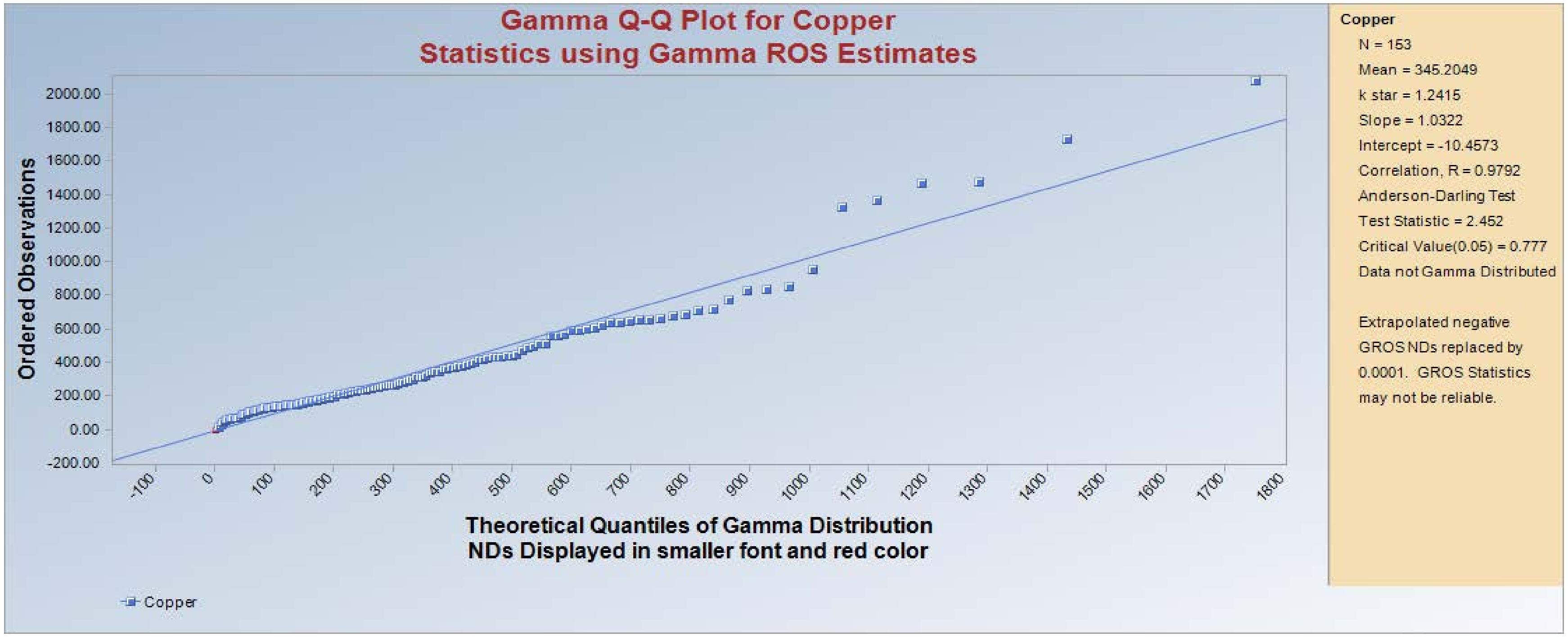
Gamma Q-Q Plot for Cadmium
Statistics using Gamma ROS Estimates
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
Ordered Observations
0
10
20
30
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Cadmium
Cadmium
N = 22
Mean = 6.1832
k star = 0.5379
Slope = 0.7838
Intercept = 1.4663
Correlation, R = 0.9802
Anderson-Darling Test
Test Statistic = 1.297
Critical Value(0.05) = 0.797
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

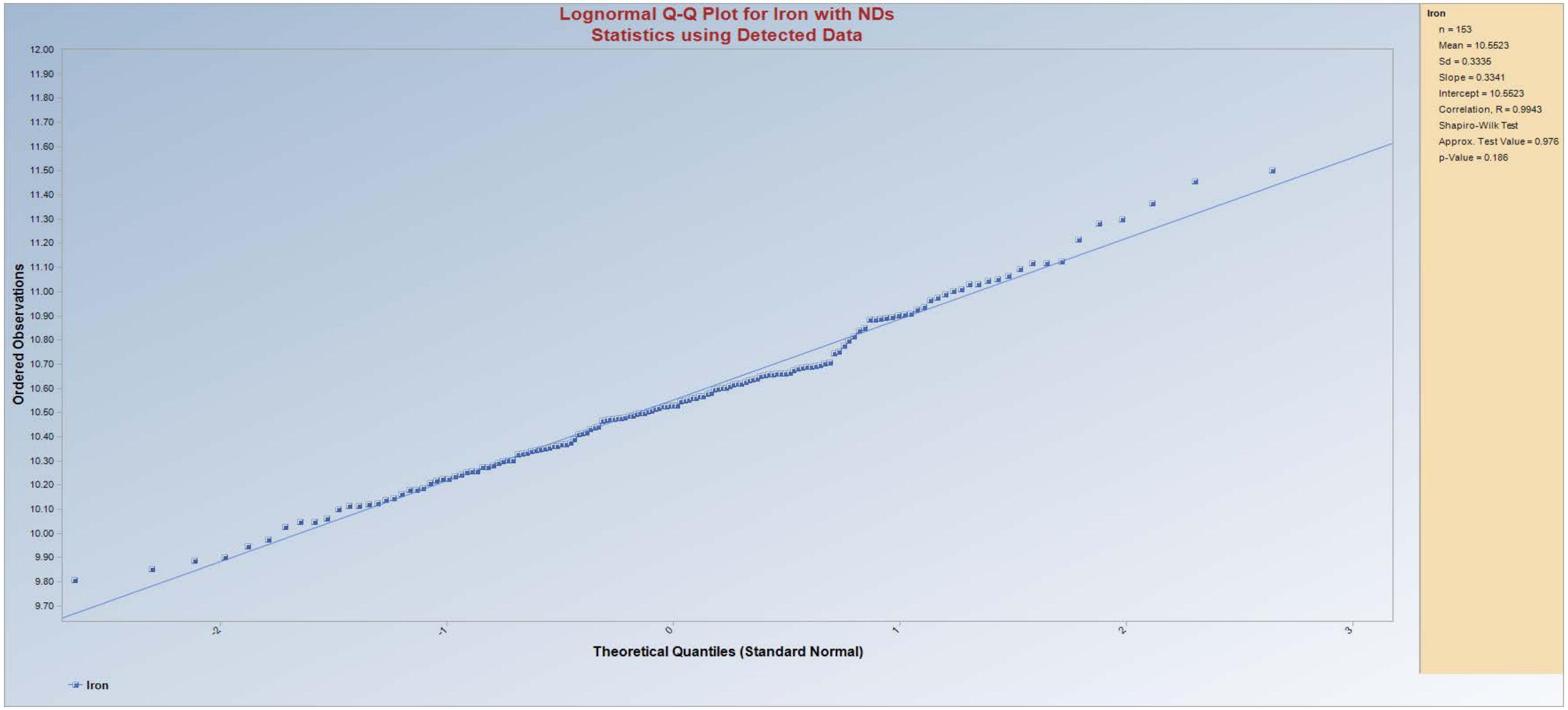


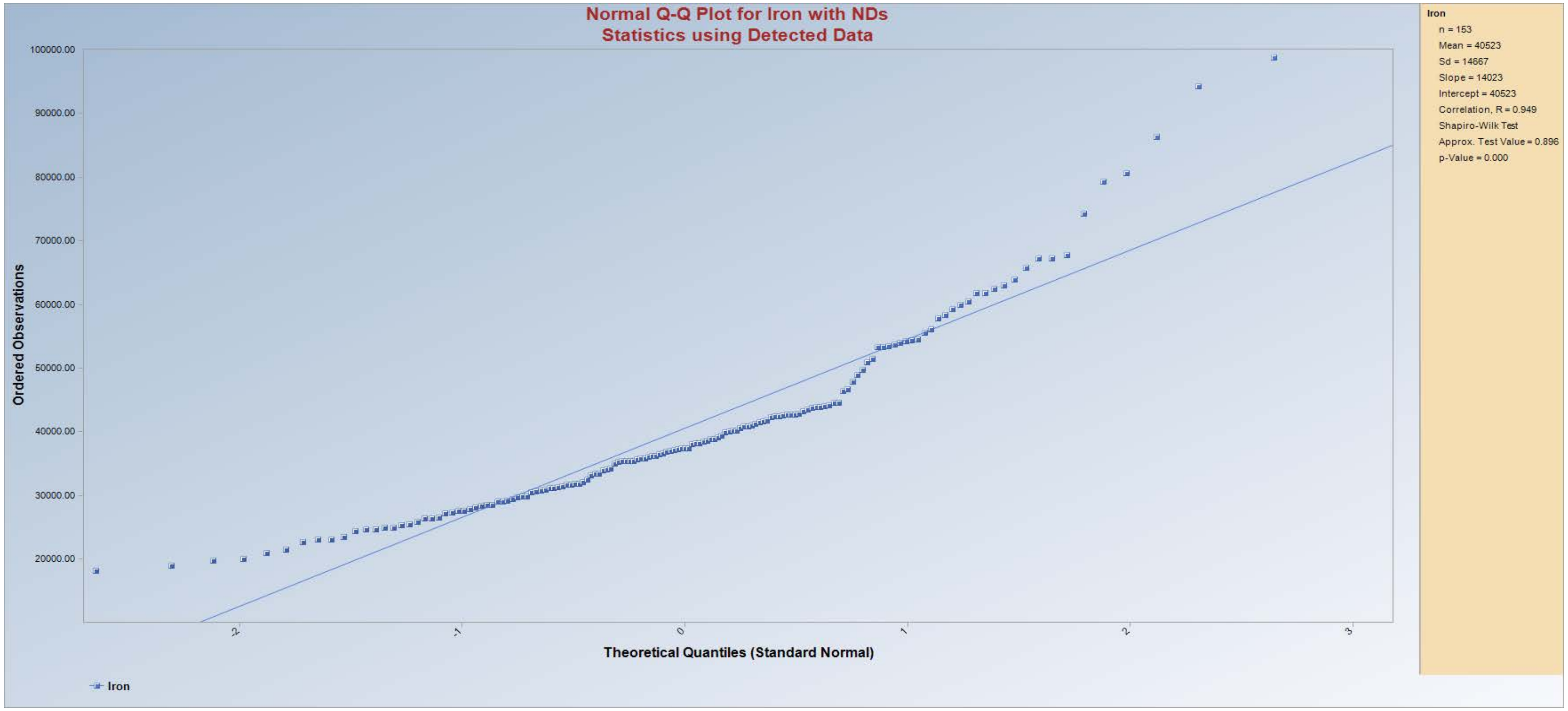
Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
Ordered Observations
8.00
7.00
6.00
5.00
4.00
3.00
2.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 153
Mean = 5.509
Sd = 0.837
Slope = 0.837
Intercept = 5.509
Correlation, R = 0.992
Shapiro-Wilk Test
Approx. Test Value = 0.986
p-Value = 0.776



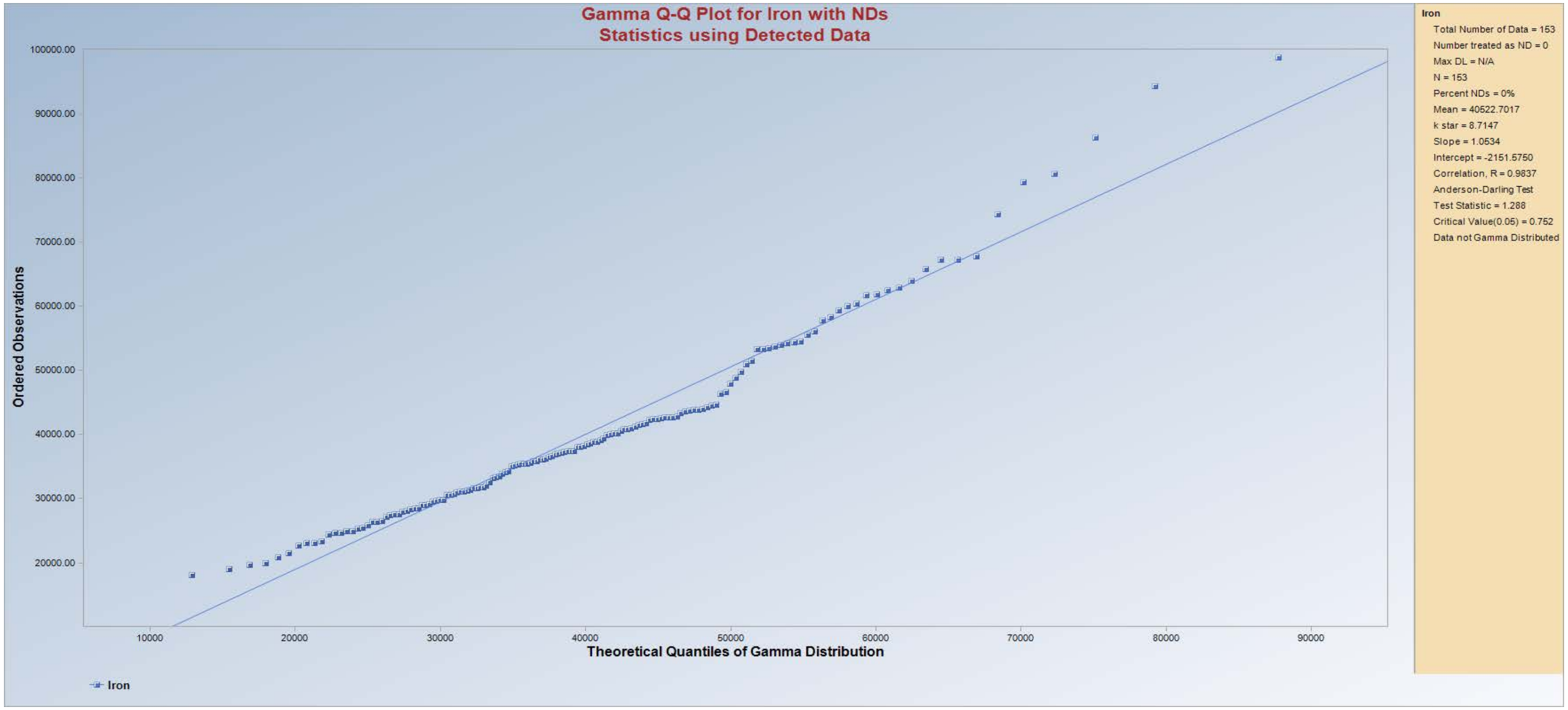
Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
-300.00
-600.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 153
Mean = 342.3
Sd = 328.7
Slope = 288
Intercept = 342.3
Correlation, R = 0.869
Shapiro-Wilk Test
Approx. Test Value = 0.781
p-Value = 0.000


Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
Ordered Observations
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 153
Mean = 345.2049
k star = 1.2415
Slope = 1.0322
Intercept = -10.4573
Correlation, R = 0.9792
Anderson-Darling Test
Test Statistic = 2.452
Critical Value(0.05) = 0.777
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

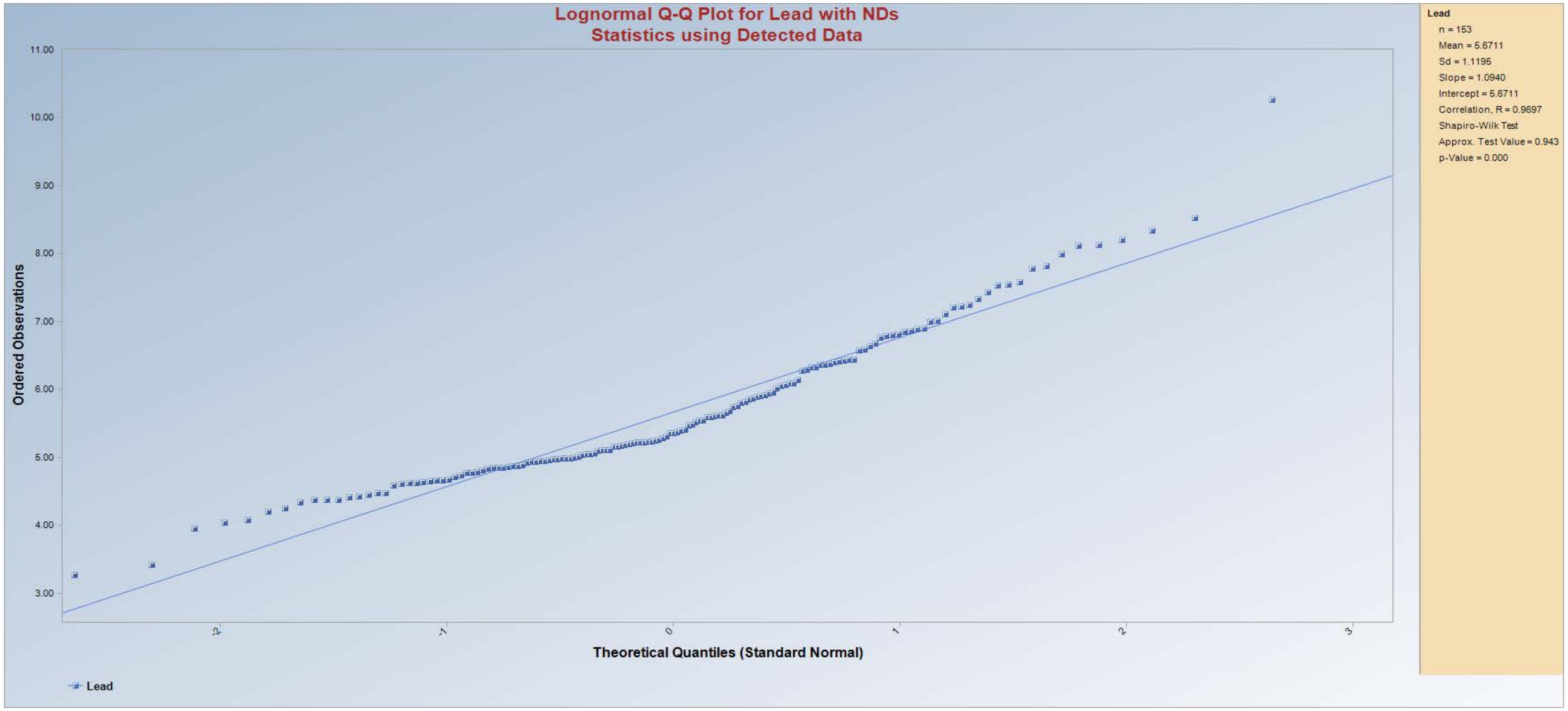

Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
12.00
11.90
11.80
11.70
11.60
11.50
11.40
11.30
11.20
11.10
11.00
10.90
10.80
10.70
10.60
10.50
10.40
10.30
10.20
10.10
10.00
9.90
9.80
9.70
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 153
Mean = 10.5523
Sd = 0.3335
Slope = 0.3341
Intercept = 10.5523
Correlation, R = 0.9943
Shapiro-Wilk Test
Approx. Test Value = 0.976
p-Value = 0.186



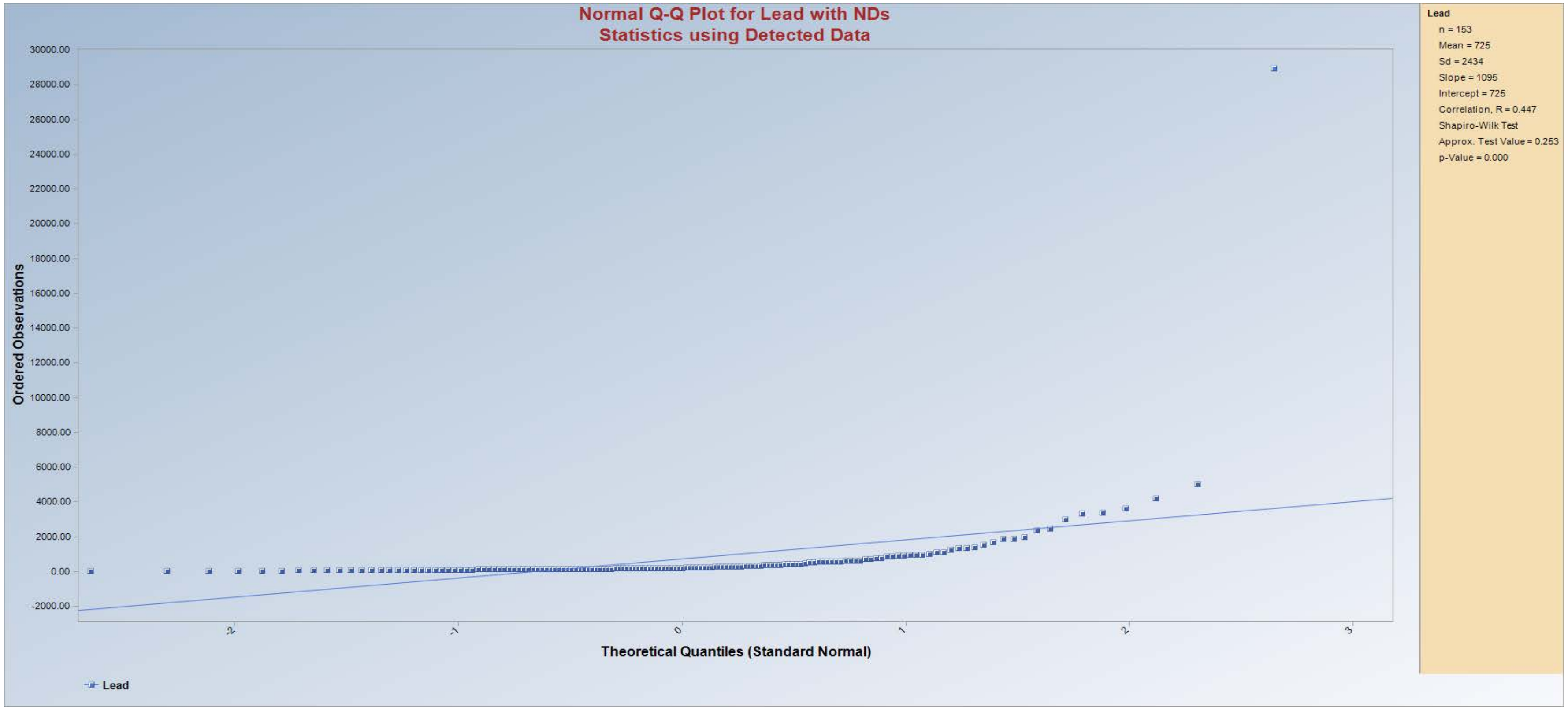
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 153
Mean = 40623
Sd = 14667
Slope = 14023
Intercept = 40623
Correlation, R = 0.949
Shapiro-Wilk Test
Approx. Test Value = 0.896
p-Value = 0.000

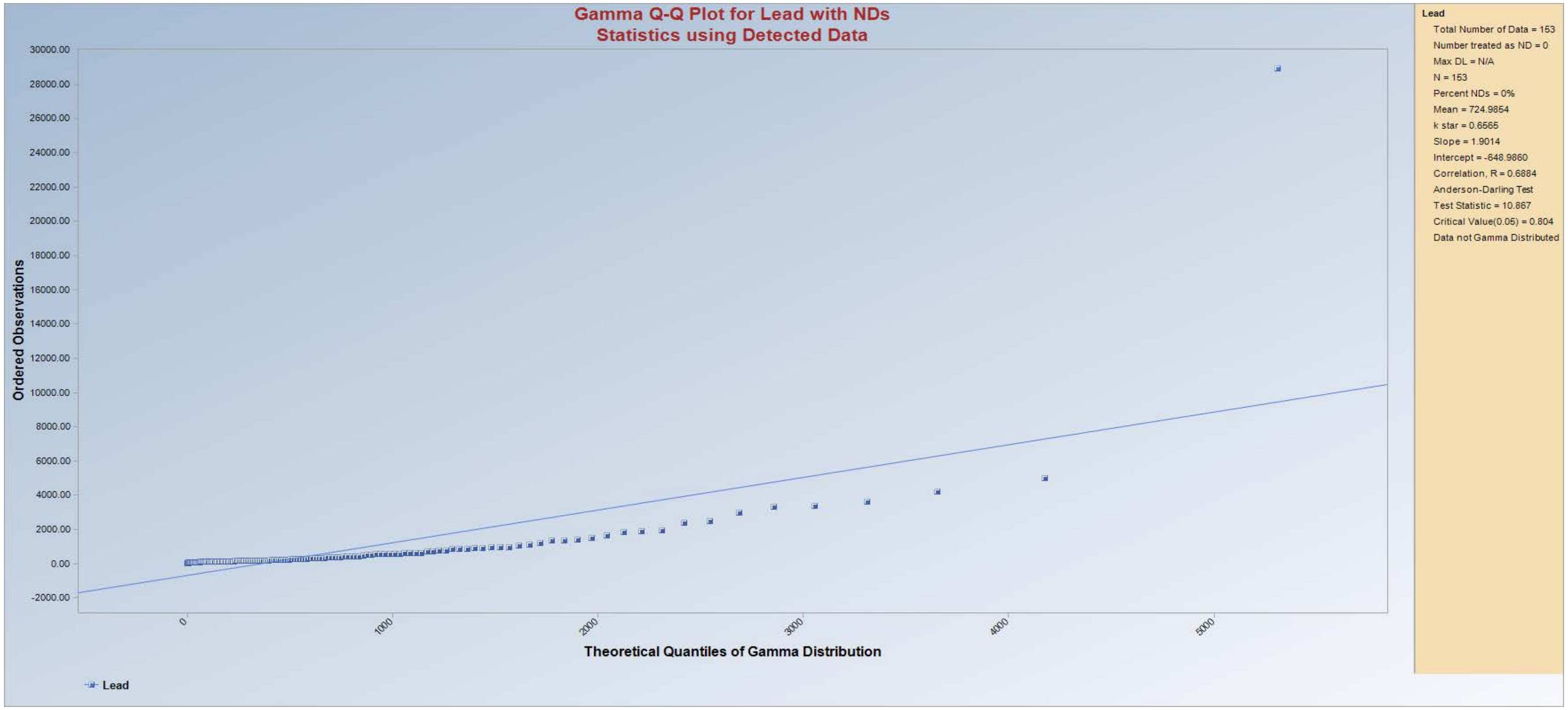


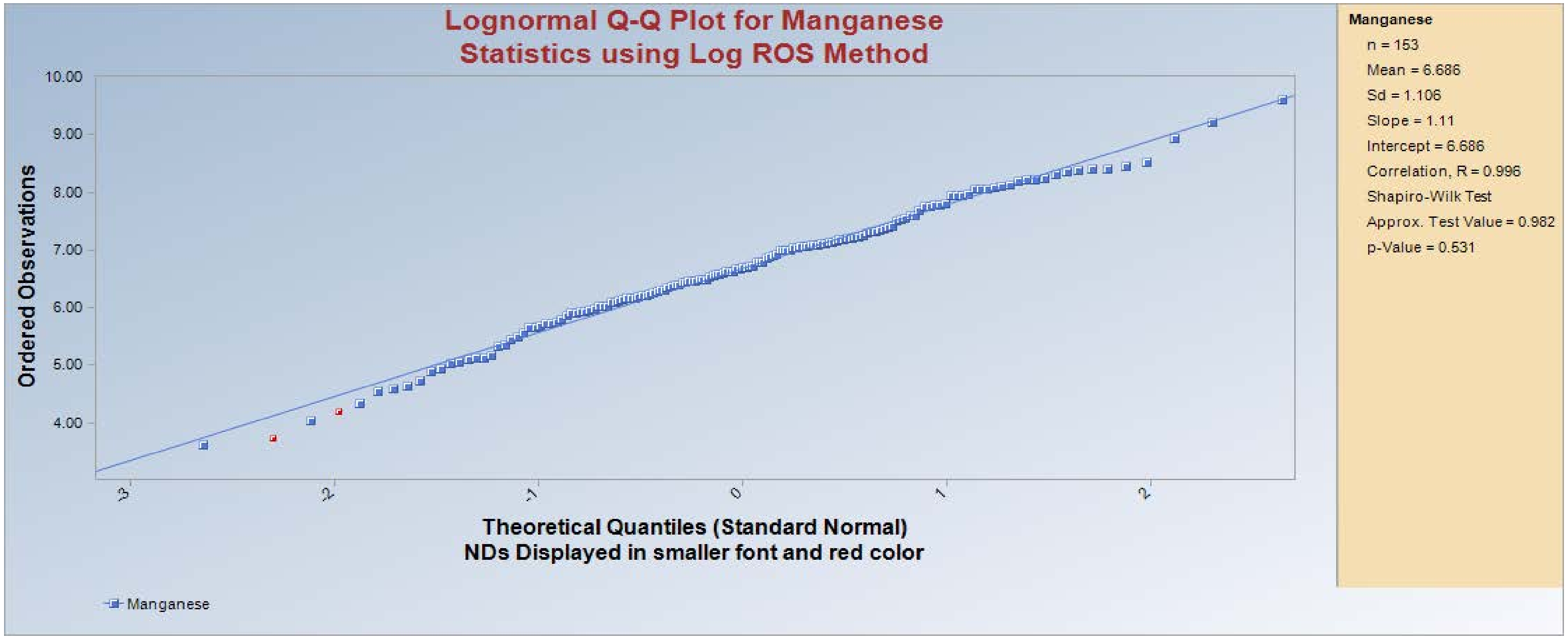
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 153
Number treated as ND = 0
Max DL = N/A
N = 153
Percent NDs = 0%
Mean = 40522.7017
k star = 8.7147
Slope = 1.0534
Intercept = -2151.5750
Correlation, R = 0.9837
Anderson-Darling Test
Test Statistic = 1.288
Critical Value(0.05) = 0.752
Data not Gamma Distributed



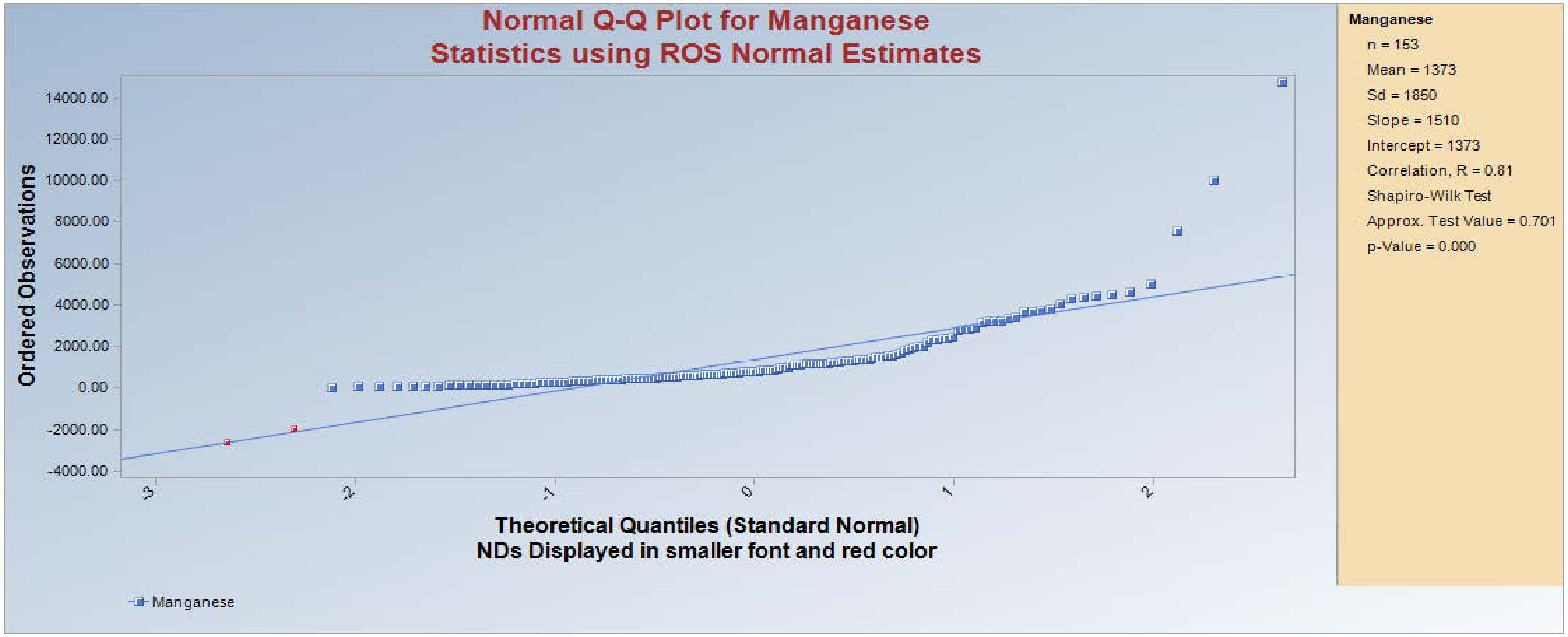
Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 153
Mean = 5.6711
Sd = 1.1195
Slope = 1.0940
Intercept = 5.6711
Correlation, R = 0.9697
Shapiro-Wilk Test
Approx. Test Value = 0.943
p-Value = 0.000


Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 153
Mean = 725
Sd = 2434
Slope = 1096
Intercept = 725
Correlation, R = 0.447
Shapiro-Wilk Test
Approx. Test Value = 0.253
p-Value = 0.000

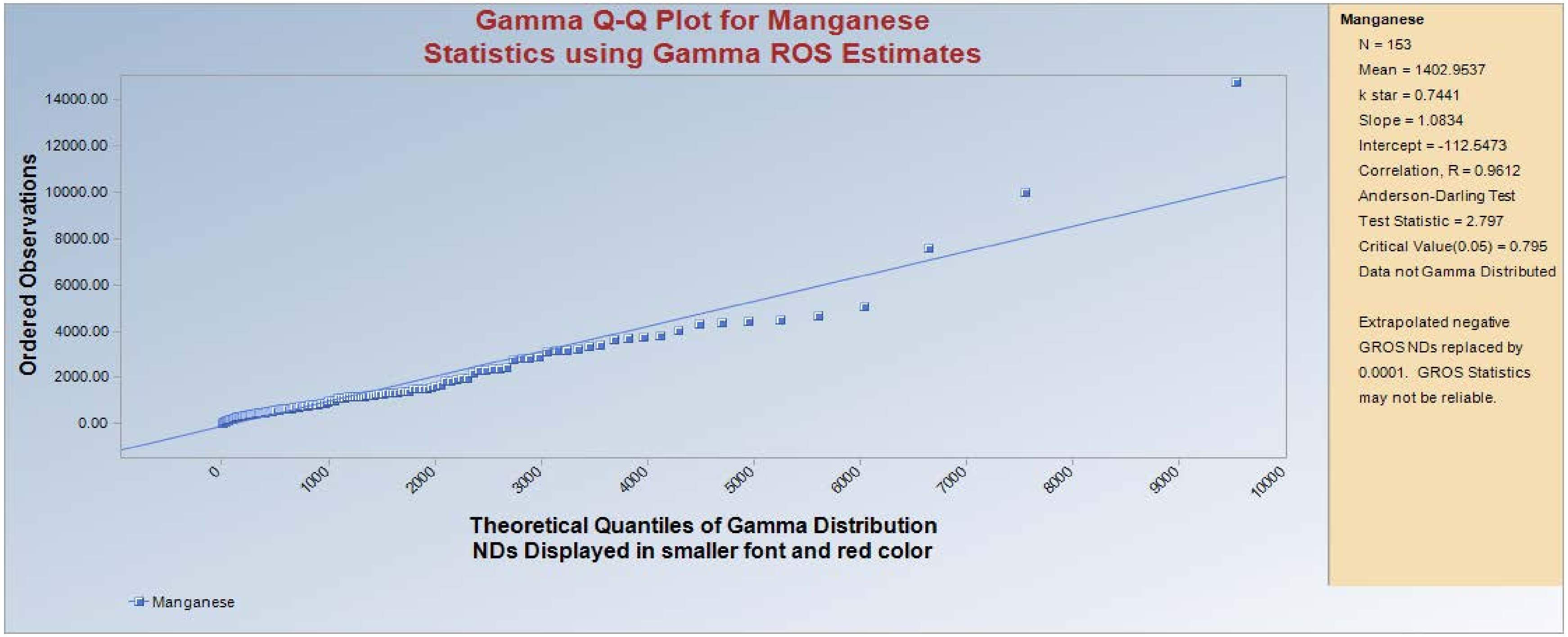

Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
Ordered Observations
0
1000
2000
3000
4000
5000
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 153
Number treated as ND = 0
Max DL = N/A
N = 153
Percent NDs = 0%
Mean = 724.9854
k star = 0.6565
Slope = 1.9014
Intercept = -648.9860
Correlation, R = 0.6884
Anderson-Darling Test
Test Statistic = 10.867
Critical Value(0.05) = 0.804
Data not Gamma Distributed



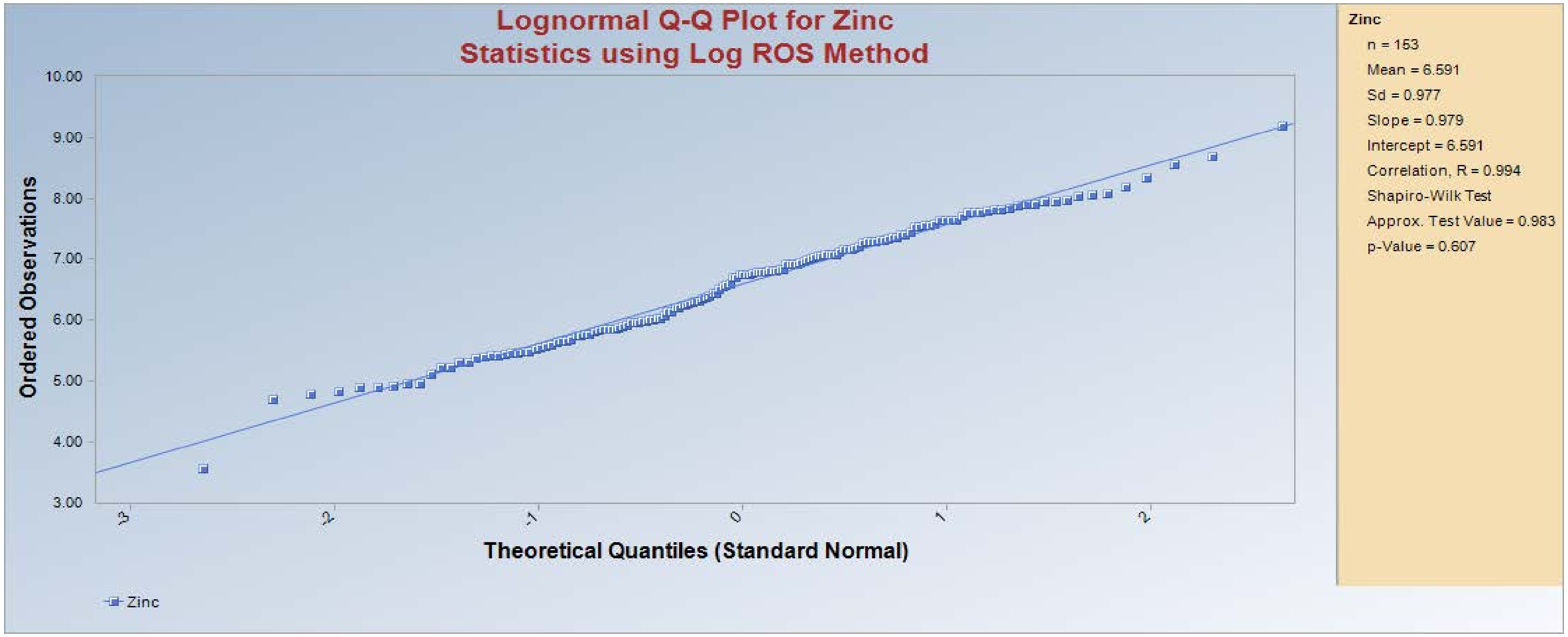
Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
10.00
9.00
8.00
7.00
6.00
5.00
4.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 153
Mean = 6.686
Sd = 1.106
Slope = 1.11
Intercept = 6.686
Correlation, R = 0.996
Shapiro-Wilk Test
Approx. Test Value = 0.982
p-Value = 0.531



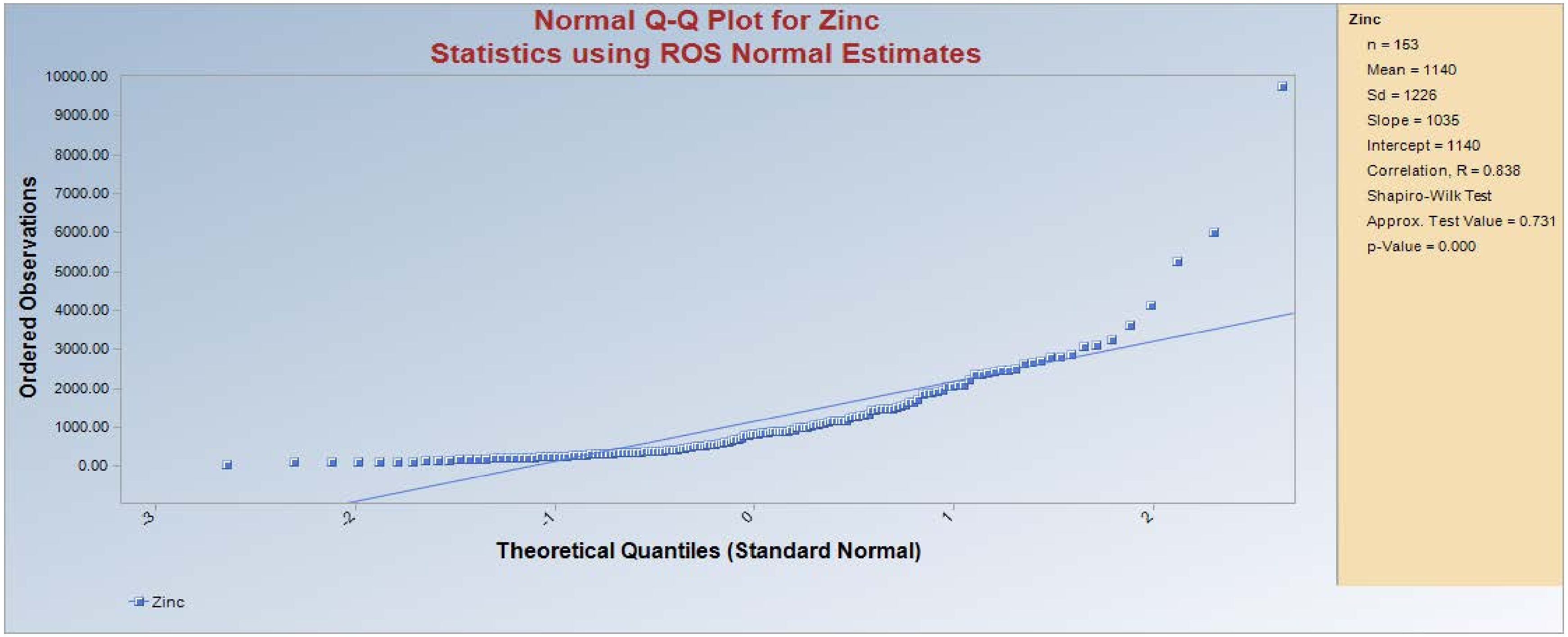
Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-4000.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 153
Mean = 1373
Sd = 1850
Slope = 1510
Intercept = 1373
Correlation, R = 0.81
Shapiro-Wilk Test
Approx. Test Value = 0.701
p-Value = 0.000



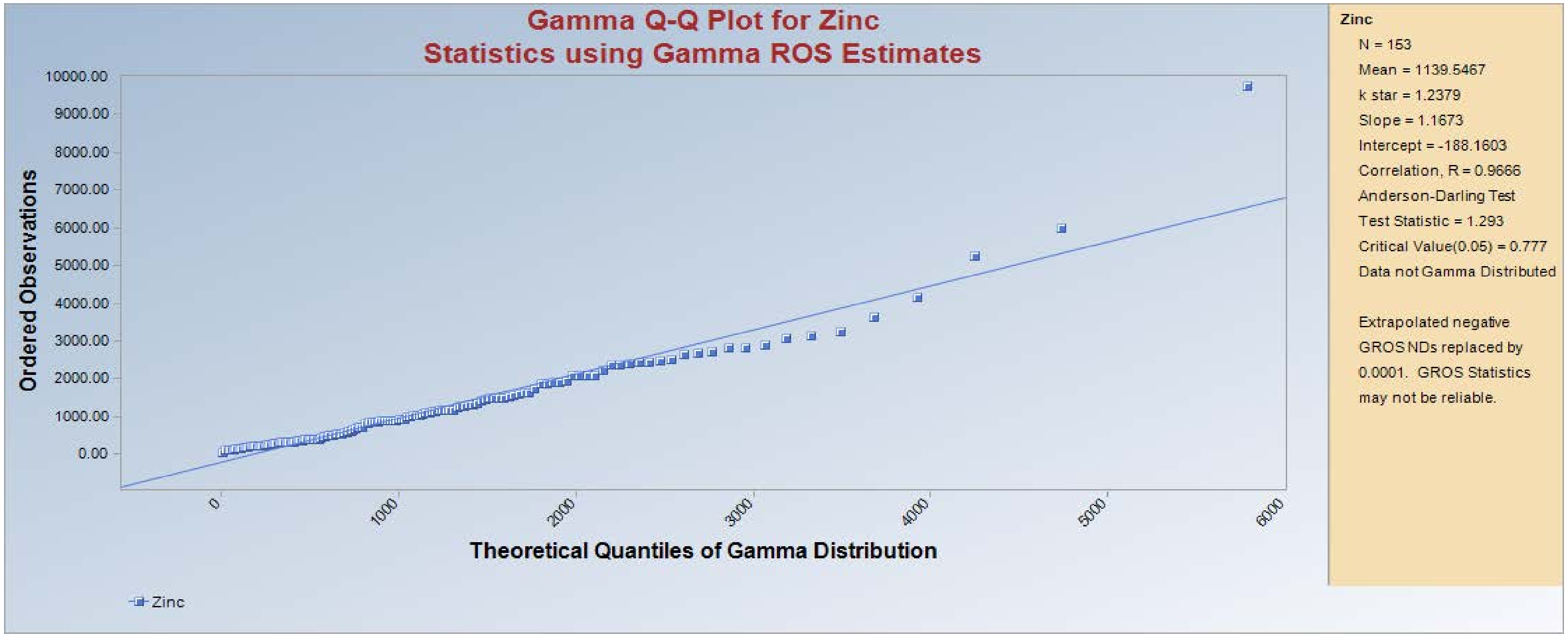
Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 153
Mean = 1402.9537
k star = 0.7441
Slope = 1.0834
Intercept = -112.5473
Correlation, R = 0.9612
Anderson-Darling Test
Test Statistic = 2.797
Critical Value(0.05) = 0.795
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 153
Mean = 6.591
Sd = 0.977
Slope = 0.979
Intercept = 6.591
Correlation, R = 0.994
Shapiro-Wilk Test
Approx. Test Value = 0.983
p-Value = 0.607



Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 153
Mean = 1140
Sd = 1226
Slope = 1035
Intercept = 1140
Correlation, R = 0.838
Shapiro-Wilk Test
Approx. Test Value = 0.731
p-Value = 0.000


Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
1000
2000
3000
4000
5000
6000
Theoretical Quantiles of Gamma Distribution
Zinc
Zinc
N = 153
Mean = 1139.5467
k star = 1.2379
Slope = 1.1673
Intercept = -188.1603
Correlation, R = 0.9666
Anderson-Darling Test
Test Statistic = 1.293
Critical Value(0.05) = 0.777
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

Attachment A4
ProUCL Output for EU 3 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	2
Number of Missing Values	1	Percent Non-Detects	11.76%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	14.17	Minimum Detected	2.651
Maximum Detected	1570	Maximum Detected	7.359
Mean of Detected	275.6	Mean of Detected	4.638
SD of Detected	431.7	SD of Detected	1.463
Minimum Non-Detect	11.73	Minimum Non-Detect	2.462
Maximum Non-Detect	35.18	Maximum Non-Detect	3.561

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	6
Number treated as Detected	11
Single DL Non-Detect Percentage	35.29%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.653	Shapiro Wilk Test Statistic	0.954
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	244.5	Mean	4.365
SD	413.2	SD	1.583
95% DL/2 (t) UCL	419.5	95% H-Stat (DL/2) UCL	1157
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	107.6	Mean in Log Scale	4.31
SD	540.2	SD in Log Scale	1.677
95% MLE (t) UCL	336.3	Mean in Original Scale	244.2
95% MLE (Tiku) UCL	355	SD in Original Scale	413.5
		95% t UCL	419.2
		95% Percentile Bootstrap UCL	416.3
		95% BCA Bootstrap UCL	472.9
		95% H UCL	1492

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.545	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	505.4		
nu star	16.36		
A-D Test Statistic	0.606	Nonparametric Statistics	
5% A-D Critical Value	0.784	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.784	Mean	245.1
5% K-S Critical Value	0.232	SD	400.6
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	100.6
		95% KM (t) UCL	420.7
Assuming Gamma Distribution		95% KM (z) UCL	410.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	419.7
Minimum	0.000001	95% KM (bootstrap t) UCL	774.9
Maximum	1570	95% KM (BCA) UCL	448.4
Mean	243.2	95% KM (Percentile Bootstrap) UCL	418.1
Median	58.4	95% KM (Chebyshev) UCL	683.5
SD	414.1	97.5% KM (Chebyshev) UCL	873.2
k star	0.234	99% KM (Chebyshev) UCL	1246
Theta star	1038		
Nu star	7.962	Potential UCLs to Use	
AppChi2	2.713	95% KM (Chebyshev) UCL	683.5
95% Gamma Approximate UCL (Use when n >= 40)	713.6		
95% Adjusted Gamma UCL (Use when n < 40)	806		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18

Raw Statistics		Log-transformed Statistics	
Minimum	56.72	Minimum of Log Data	4.038
Maximum	758.8	Maximum of Log Data	6.632
Mean	297.4	Mean of log Data	5.448
Geometric Mean	232.3	SD of log Data	0.76
Median	266.3		
SD	199		
Std. Error of Mean	46.91		
Coefficient of Variation	0.669		
Skewness	0.64		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.897	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	379	95% H-UCL	474.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	558.2
95% Adjusted-CLT UCL (Chen-1995)	382.1	97.5% Chebyshev (MVUE) UCL	668.2
95% Modified-t UCL (Johnson-1978)	380.2	99% Chebyshev (MVUE) UCL	884.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.851	Data appear Normal at 5% Significance Level	
Theta Star	160.7		
MLE of Mean	297.4		
MLE of Standard Deviation	218.6		
nu star	66.63		
Approximate Chi Square Value (.05)	48.85	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	374.6
Adjusted Chi Square Value	47.39	95% Jackknife UCL	379
		95% Standard Bootstrap UCL	371.6
Anderson-Darling Test Statistic	0.679	95% Bootstrap-t UCL	391.7
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	384.7
Kolmogorov-Smirnov Test Statistic	0.173	95% Percentile Bootstrap UCL	369
Kolmogorov-Smirnov 5% Critical Value	0.206	95% BCA Bootstrap UCL	381.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	501.9
		97.5% Chebyshev(Mean, Sd) UCL	590.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	764.1
95% Approximate Gamma UCL (Use when n >= 40)	405.7		
95% Adjusted Gamma UCL (Use when n < 40)	418.2		
Potential UCL to Use		Use 95% Student's-t UCL	379

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	21806	Minimum of Log Data	9.99
Maximum	224789	Maximum of Log Data	12.32
Mean	60412	Mean of log Data	10.73
Geometric Mean	45732	SD of log Data	0.692
Median	37750		
SD	57934		
Std. Error of Mean	13655		
Coefficient of Variation	0.959		
Skewness	2.22		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.657	Shapiro Wilk Test Statistic	0.863
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	84167	95% H-UCL	84508
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	100393
95% Adjusted-CLT UCL (Chen-1995)	90506	97.5% Chebyshev (MVUE) UCL	119081
95% Modified-t UCL (Johnson-1978)	85357	99% Chebyshev (MVUE) UCL	155791
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.659	Data do not follow a Discernable Distribution (0.05)	
Theta Star	36417		
MLE of Mean	60412		
MLE of Standard Deviation	46905		
nu star	59.72		
Approximate Chi Square Value (.05)	42.95	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	82873
Adjusted Chi Square Value	41.59	95% Jackknife UCL	84167
		95% Standard Bootstrap UCL	82236
Anderson-Darling Test Statistic	1.366	95% Bootstrap-t UCL	124048
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	190017
Kolmogorov-Smirnov Test Statistic	0.21	95% Percentile Bootstrap UCL	85047
Kolmogorov-Smirnov 5% Critical Value	0.206	95% BCA Bootstrap UCL	93500
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	119934
		97.5% Chebyshev(Mean, Sd) UCL	145689
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	196279
95% Approximate Gamma UCL (Use when n >= 40)	84000		
95% Adjusted Gamma UCL (Use when n < 40)	86756		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	119934

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	125.5	Minimum of Log Data	4.832
Maximum	2270	Maximum of Log Data	7.728
Mean	787.4	Mean of log Data	6.245
Geometric Mean	515.2	SD of log Data	0.955
Median	416		
SD	751.3		
Std. Error of Mean	177.1		
Coefficient of Variation	0.954		
Skewness	1.192		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1095	95% H-UCL	1476
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1635
95% Adjusted-CLT UCL (Chen-1995)	1132	97.5% Chebyshev (MVUE) UCL	2003
95% Modified-t UCL (Johnson-1978)	1104	99% Chebyshev (MVUE) UCL	2725

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.137	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	692.3		
MLE of Mean	787.4		
MLE of Standard Deviation	738.3		
nu star	40.95		
Approximate Chi Square Value (.05)	27.28	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	1079
Adjusted Chi Square Value	26.22	95% Jackknife UCL	1095
		95% Standard Bootstrap UCL	1068
Anderson-Darling Test Statistic	0.652	95% Bootstrap-t UCL	1183
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	1058
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL	1078
Kolmogorov-Smirnov 5% Critical Value	0.208	95% BCA Bootstrap UCL	1122
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1559
		97.5% Chebyshev(Mean, Sd) UCL	1893
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2549
95% Approximate Gamma UCL (Use when n >= 40)	1182		
95% Adjusted Gamma UCL (Use when n < 40)	1230		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1182

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.897	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	379	95% H-UCL	474.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	558.2
95% Adjusted-CLT UCL (Chen-1995)	382.1	97.5% Chebyshev (MVUE) UCL	668.2
95% Modified-t UCL (Johnson-1978)	380.2	99% Chebyshev (MVUE) UCL	884.2

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.851	Data appear Normal at 5% Significance Level	
Theta Star	160.7		
MLE of Mean	297.4		
MLE of Standard Deviation	218.6		
nu star	66.63		
Approximate Chi Square Value (.05)	48.85	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	374.6
Adjusted Chi Square Value	47.39	95% Jackknife UCL	379
		95% Standard Bootstrap UCL	371.6
Anderson-Darling Test Statistic	0.679	95% Bootstrap-t UCL	391.7
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	384.7
Kolmogorov-Smirnov Test Statistic	0.173	95% Percentile Bootstrap UCL	369
Kolmogorov-Smirnov 5% Critical Value	0.206	95% BCA Bootstrap UCL	381.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	501.9
		97.5% Chebyshev(Mean, Sd) UCL	590.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	764.1
95% Approximate Gamma UCL (Use when n >= 40)	405.7		
95% Adjusted Gamma UCL (Use when n < 40)	418.2		
Potential UCL to Use		Use 95% Student's-t UCL	379

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	21806	Minimum of Log Data	9.99
Maximum	224789	Maximum of Log Data	12.32
Mean	60412	Mean of log Data	10.73
Geometric Mean	45732	SD of log Data	0.692
Median	37750		
SD	57934		
Std. Error of Mean	13655		
Coefficient of Variation	0.959		
Skewness	2.22		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.657	Shapiro Wilk Test Statistic	0.863
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	84167	95% H-UCL	84508
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	100393
95% Adjusted-CLT UCL (Chen-1995)	90506	97.5% Chebyshev (MVUE) UCL	119081
95% Modified-t UCL (Johnson-1978)	85357	99% Chebyshev (MVUE) UCL	155791
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.659	Data do not follow a Discernable Distribution (0.05)	
Theta Star	36417		
MLE of Mean	60412		
MLE of Standard Deviation	46905		
nu star	59.72		
Approximate Chi Square Value (.05)	42.95	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	82873
Adjusted Chi Square Value	41.59	95% Jackknife UCL	84167
		95% Standard Bootstrap UCL	82236
Anderson-Darling Test Statistic	1.366	95% Bootstrap-t UCL	124048
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	190017
Kolmogorov-Smirnov Test Statistic	0.21	95% Percentile Bootstrap UCL	85047
Kolmogorov-Smirnov 5% Critical Value	0.206	95% BCA Bootstrap UCL	93500
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	119934
		97.5% Chebyshev(Mean, Sd) UCL	145689
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	196279
95% Approximate Gamma UCL (Use when n >= 40)	84000		
95% Adjusted Gamma UCL (Use when n < 40)	86756		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	119934

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	125.5	Minimum of Log Data	4.832
Maximum	2270	Maximum of Log Data	7.728
Mean	787.4	Mean of log Data	6.245
Geometric Mean	515.2	SD of log Data	0.955
Median	416		
SD	751.3		
Std. Error of Mean	177.1		
Coefficient of Variation	0.954		
Skewness	1.192		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1095	95% H-UCL	1476
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1635
95% Adjusted-CLT UCL (Chen-1995)	1132	97.5% Chebyshev (MVUE) UCL	2003
95% Modified-t UCL (Johnson-1978)	1104	99% Chebyshev (MVUE) UCL	2725
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.137	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	692.3		
MLE of Mean	787.4		
MLE of Standard Deviation	738.3		
nu star	40.95		
Approximate Chi Square Value (.05)	27.28	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	1079
Adjusted Chi Square Value	26.22	95% Jackknife UCL	1095
		95% Standard Bootstrap UCL	1068
Anderson-Darling Test Statistic	0.652	95% Bootstrap-t UCL	1183
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	1058
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL	1078
Kolmogorov-Smirnov 5% Critical Value	0.208	95% BCA Bootstrap UCL	1122
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1559
		97.5% Chebyshev(Mean, Sd) UCL	1893
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2549
95% Approximate Gamma UCL (Use when n >= 40)	1182		
95% Adjusted Gamma UCL (Use when n < 40)	1230		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1182

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	18	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	2
		Percent Non-Detects	11.11%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	178	Minimum Detected	5.182
Maximum Detected	1458	Maximum Detected	7.285
Mean of Detected	555	Mean of Detected	6.098
SD of Detected	374.9	SD of Detected	0.698
Minimum Non-Detect	170.7	Minimum Non-Detect	5.14
Maximum Non-Detect	242.1	Maximum Non-Detect	5.489

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	11
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	38.89%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.879	Shapiro Wilk Test Statistic	0.912
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	504.8	Mean	5.934
SD	381.3	SD	0.814
95% DL/2 (t) UCL	661.2	95% H-Stat (DL/2) UCL	840.7
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	391.5	Mean in Log Scale	5.957
SD	512.4	SD in Log Scale	0.787
95% MLE (t) UCL	601.6	Mean in Original Scale	508.5
95% MLE (Tiku) UCL	626.9	SD in Original Scale	377.8
		95% t UCL	663.4
		95% Percentile Bootstrap UCL	662.9
		95% BCA Bootstrap UCL	677.4
		95% H UCL	823.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.002	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	277.2		
nu star	64.08		
A-D Test Statistic	0.605	**Nonparametric Statistics**	
5% A-D Critical Value	0.748	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.748	Mean	514.3
5% K-S Critical Value	0.217	SD	361.2
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	87.93
		95% KM (t) UCL	667.3
Assuming Gamma Distribution		95% KM (z) UCL	658.9
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	666.4
Minimum	0.000001	95% KM (bootstrap t) UCL	687
Maximum	1458	95% KM (BCA) UCL	660.9
Mean	498.5	95% KM (Percentile Bootstrap) UCL	656
Median	343.7	95% KM (Chebyshev) UCL	897.6
SD	389	97.5% KM (Chebyshev) UCL	1063
k star	0.444	99% KM (Chebyshev) UCL	1389
Theta star	1124		
Nu star	15.97	Potential UCLs to Use	
AppChi2	7.939	95% KM (BCA) UCL	660.9
95% Gamma Approximate UCL (Use when n >= 40)	1003		
95% Adjusted Gamma UCL (Use when n < 40)	1076		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Data	18	Number of Detected Data	17
Number of Distinct Detected Data	17	Number of Non-Detect Data	1
		Percent Non-Detects	5.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	105.1	Minimum Detected	4.655
Maximum Detected	1875	Maximum Detected	7.536
Mean of Detected	548.1	Mean of Detected	5.936
SD of Detected	495.2	SD of Detected	0.9
Minimum Non-Detect	46.48	Minimum Non-Detect	3.839
Maximum Non-Detect	46.48	Maximum Non-Detect	3.839

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.829	Shapiro Wilk Test Statistic	0.949
5% Shapiro Wilk Critical Value	0.892	5% Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

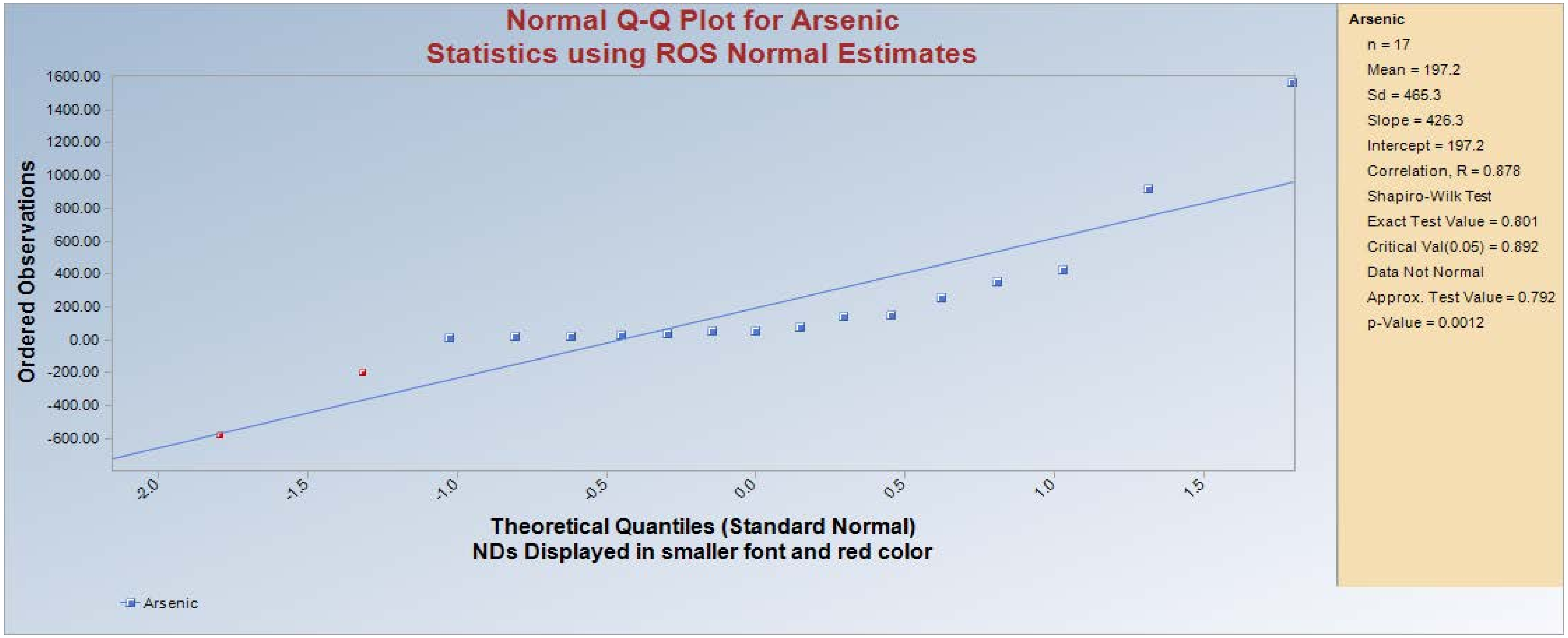
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	519	Mean	5.781
SD	496.1	SD	1.093
95% DL/2 (t) UCL	722.4	95% H-Stat (DL/2) UCL	1231
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	505.1	Mean in Log Scale	5.812
SD	502.4	SD in Log Scale	1.019
95% MLE (t) UCL	711.1	Mean in Original Scale	519.9
95% MLE (Tiku) UCL	701.9	SD in Original Scale	495.1
		95% t UCL	722.9
		95% Percentile Bootstrap UCL	724.4
		95% BCA Bootstrap UCL	761.9
		95% H UCL	1086

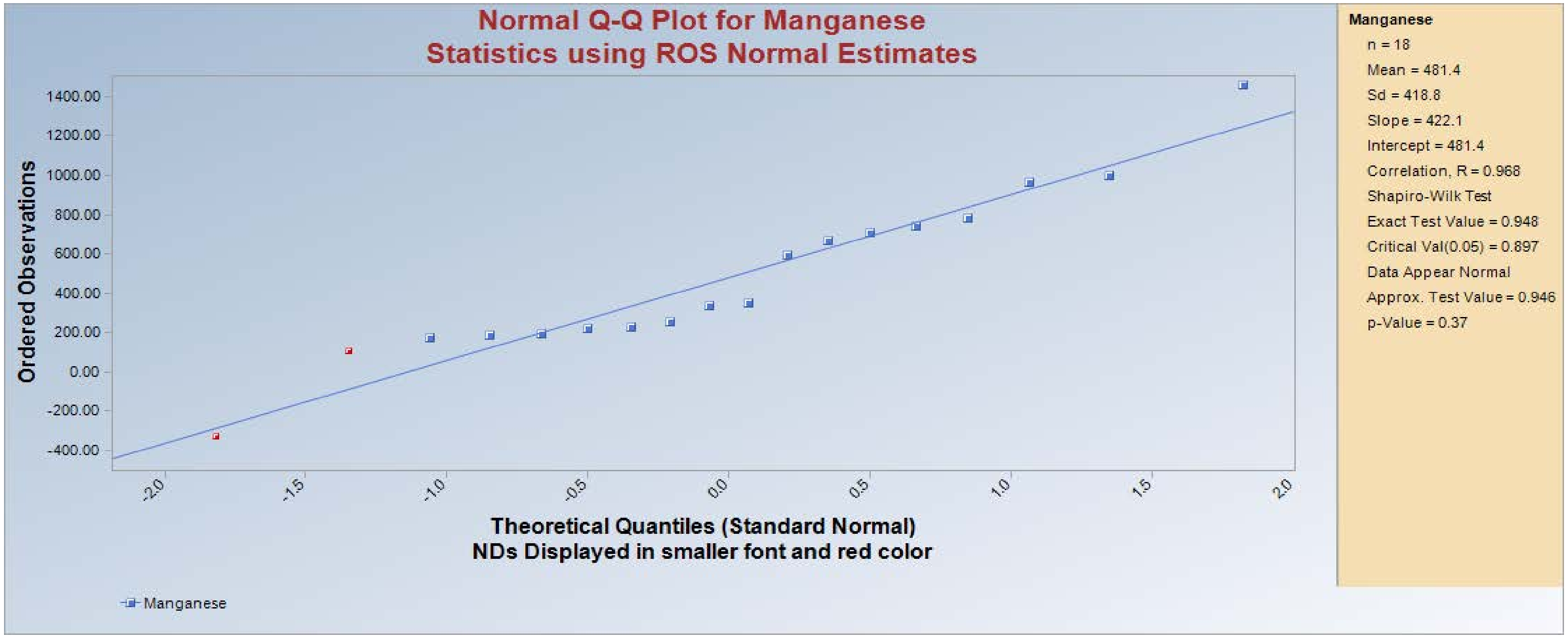
Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	1.27
Theta Star	431.5
nu star	43.19
A-D Test Statistic	0.392
5% A-D Critical Value	0.756
K-S Test Statistic	0.756
5% K-S Critical Value	0.213
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	1875
Mean	517.7
Median	346.7
SD	497.5
k star	0.418
Theta star	1239
Nu star	15.04
AppChi2	7.287
95% Gamma Approximate UCL (Use when n >= 40)	1068
95% Adjusted Gamma UCL (Use when n < 40)	1149

Note: DL/2 is not a recommended method.

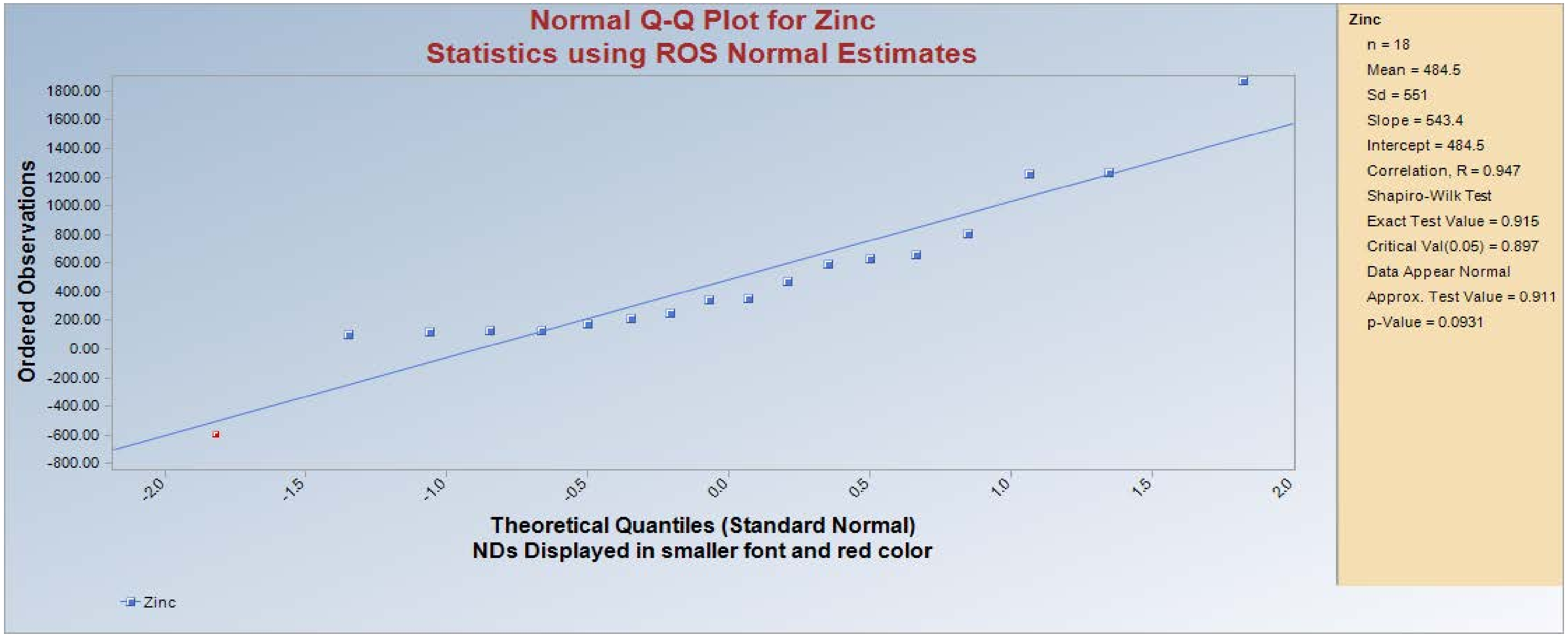
Data Distribution Test with Detected Values Only	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	523.5
SD	477.8
SE of Mean	116.1
95% KM (t) UCL	725.5
95% KM (z) UCL	714.5
95% KM (jackknife) UCL	724.4
95% KM (bootstrap t) UCL	812.6
95% KM (BCA) UCL	713.7
95% KM (Percentile Bootstrap) UCL	714.2
95% KM (Chebyshev) UCL	1030
97.5% KM (Chebyshev) UCL	1248
99% KM (Chebyshev) UCL	1679
Potential UCLs to Use	
95% KM (Chebyshev) UCL	1030

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

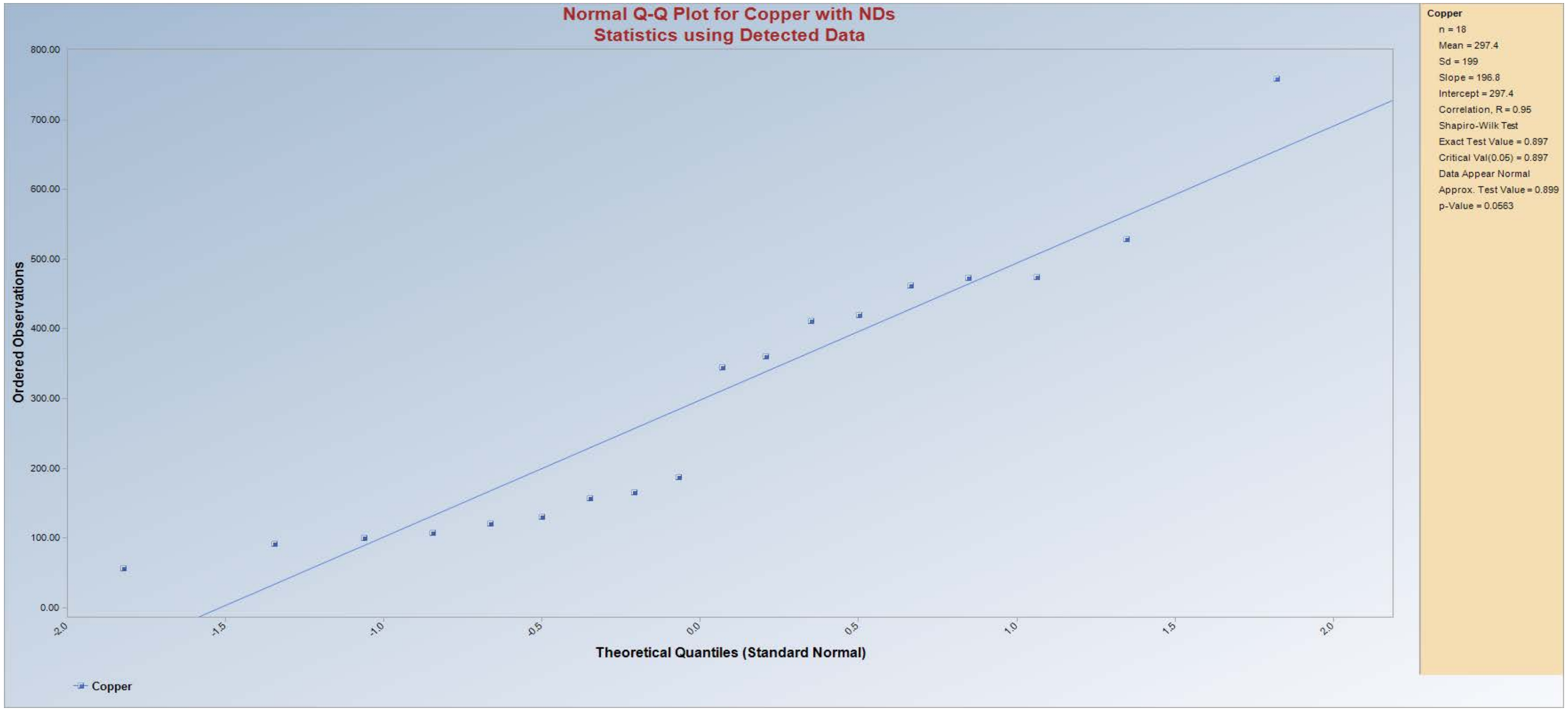

Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-600.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 17
Mean = 197.2
Sd = 465.3
Slope = 426.3
Intercept = 197.2
Correlation, R = 0.878
Shapiro-Wilk Test
Exact Test Value = 0.801
Critical Val(0.05) = 0.892
Data Not Normal
Approx. Test Value = 0.792
p-Value = 0.0012



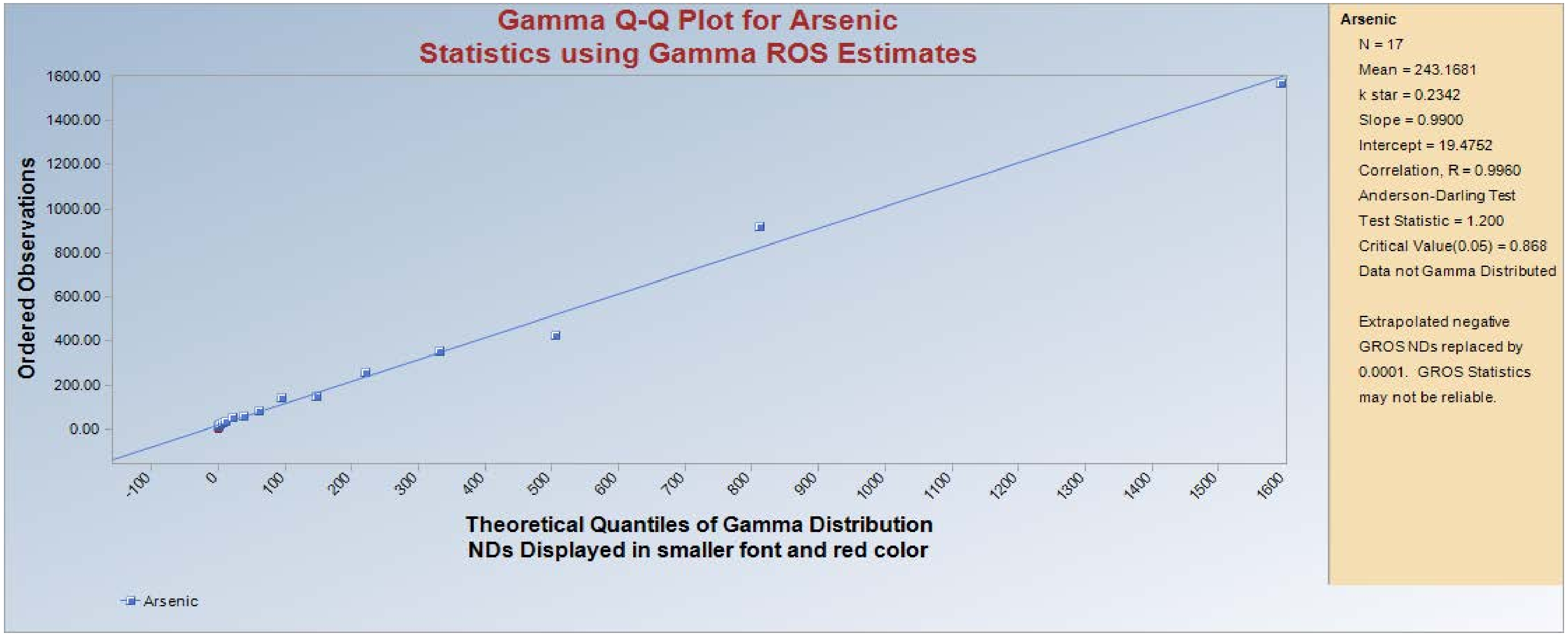
Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 18
Mean = 481.4
Sd = 418.8
Slope = 422.1
Intercept = 481.4
Correlation, R = 0.968
Shapiro-Wilk Test
Exact Test Value = 0.948
Critical Val(0.05) = 0.897
Data Appear Normal
Approx. Test Value = 0.946
p-Value = 0.37

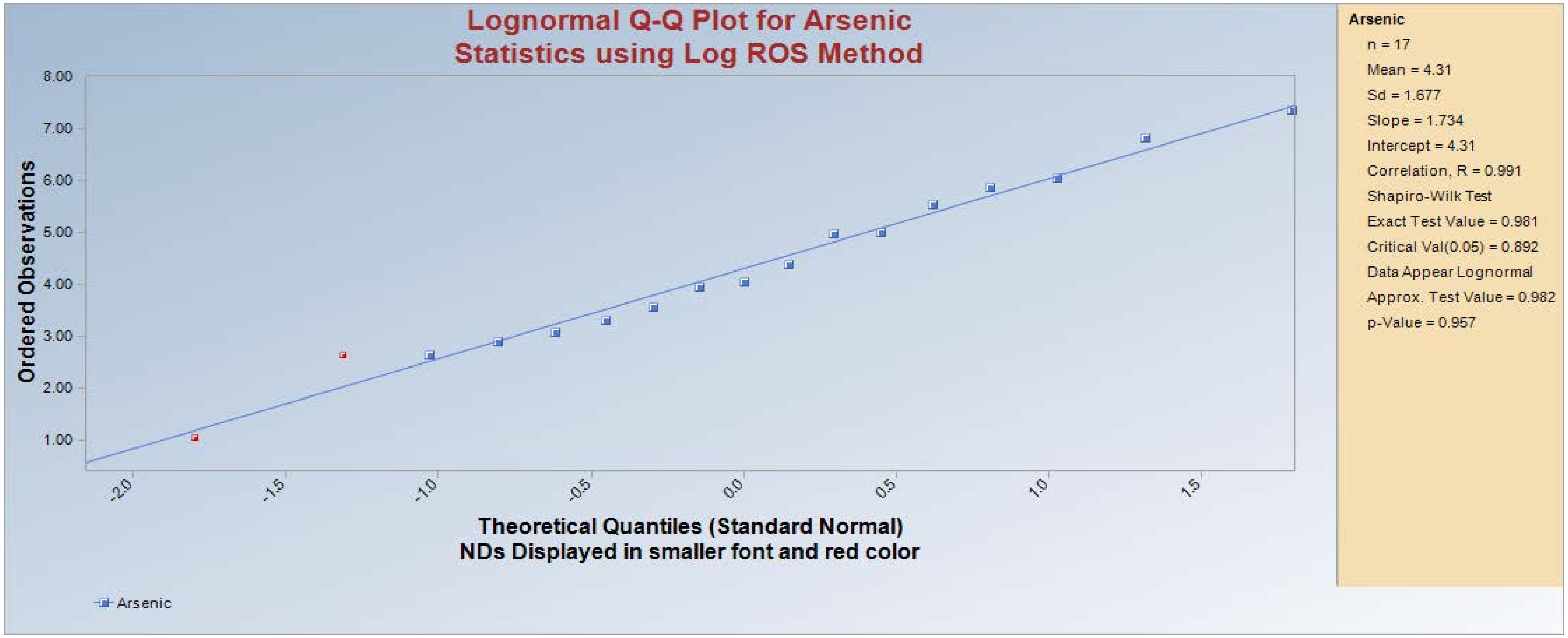


Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-600.00
-800.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 18
Mean = 484.5
Sd = 551
Slope = 543.4
Intercept = 484.5
Correlation, R = 0.947
Shapiro-Wilk Test
Exact Test Value = 0.915
Critical Val(0.05) = 0.897
Data Appear Normal
Approx. Test Value = 0.911
p-Value = 0.0931

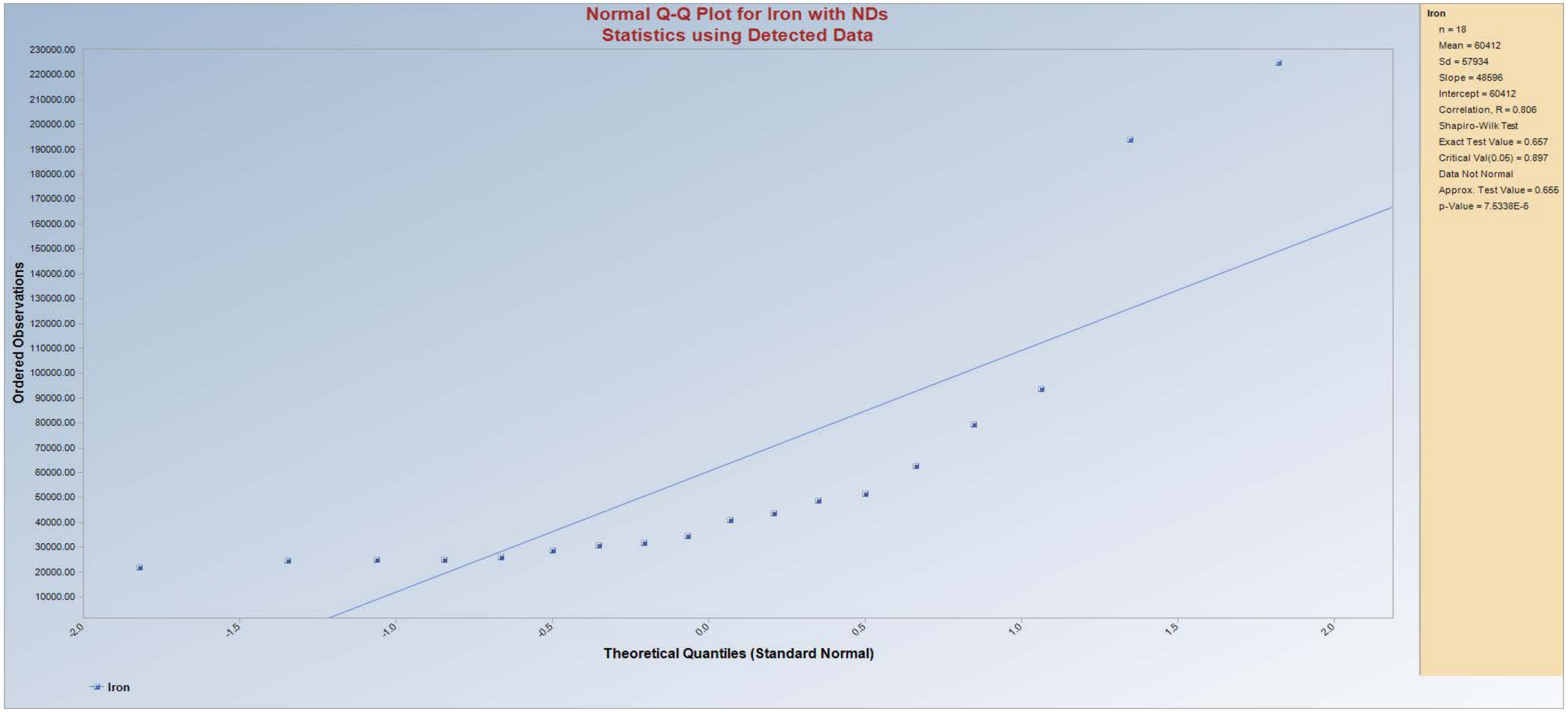


Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 18
Mean = 297.4
Sd = 199
Slope = 196.8
Intercept = 297.4
Correlation, R = 0.95
Shapiro-Wilk Test
Exact Test Value = 0.897
Critical Val(0.05) = 0.897
Data Appear Normal
Approx. Test Value = 0.899
p-Value = 0.0563

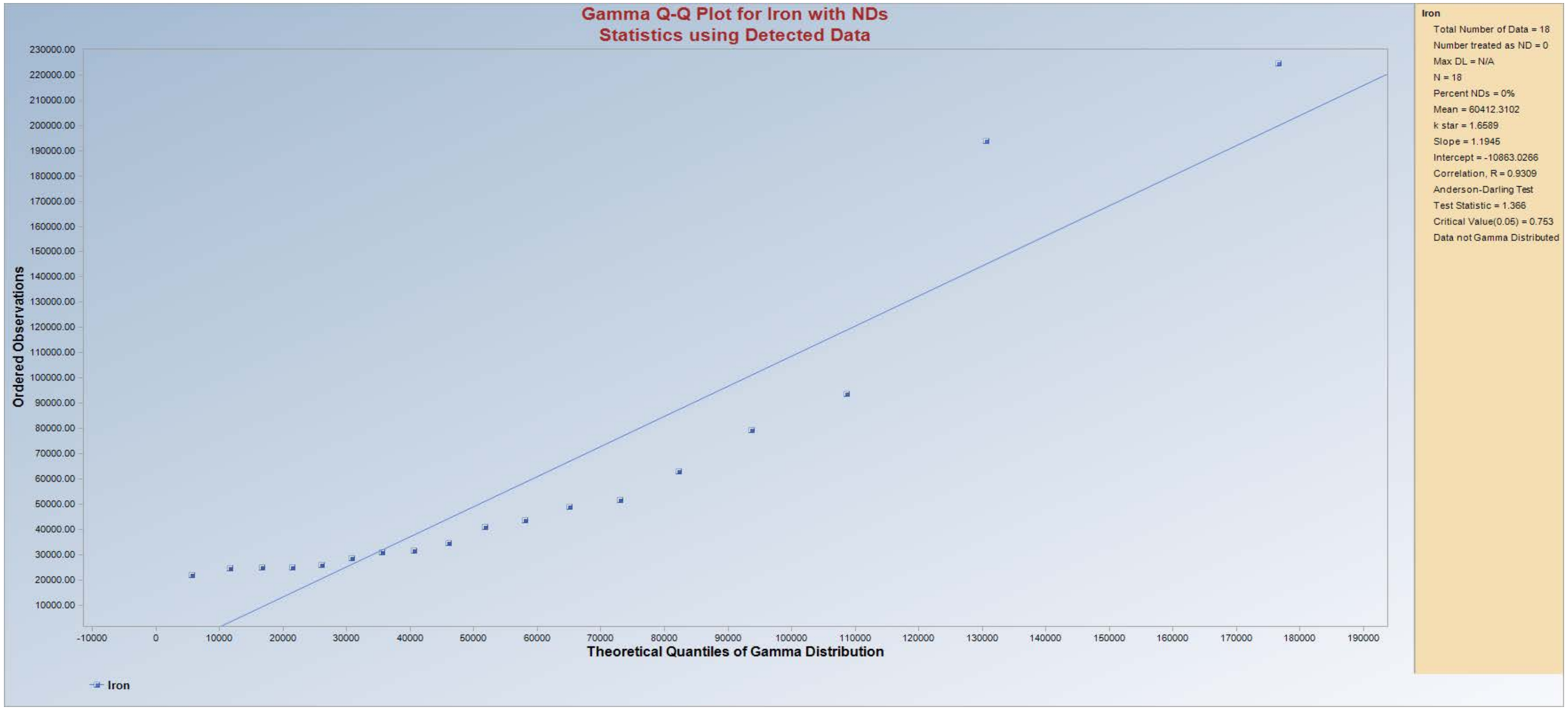

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 17
Mean = 243.1681
k star = 0.2342
Slope = 0.9900
Intercept = 19.4752
Correlation, R = 0.9960
Anderson-Darling Test
Test Statistic = 1.200
Critical Value(0.05) = 0.868
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



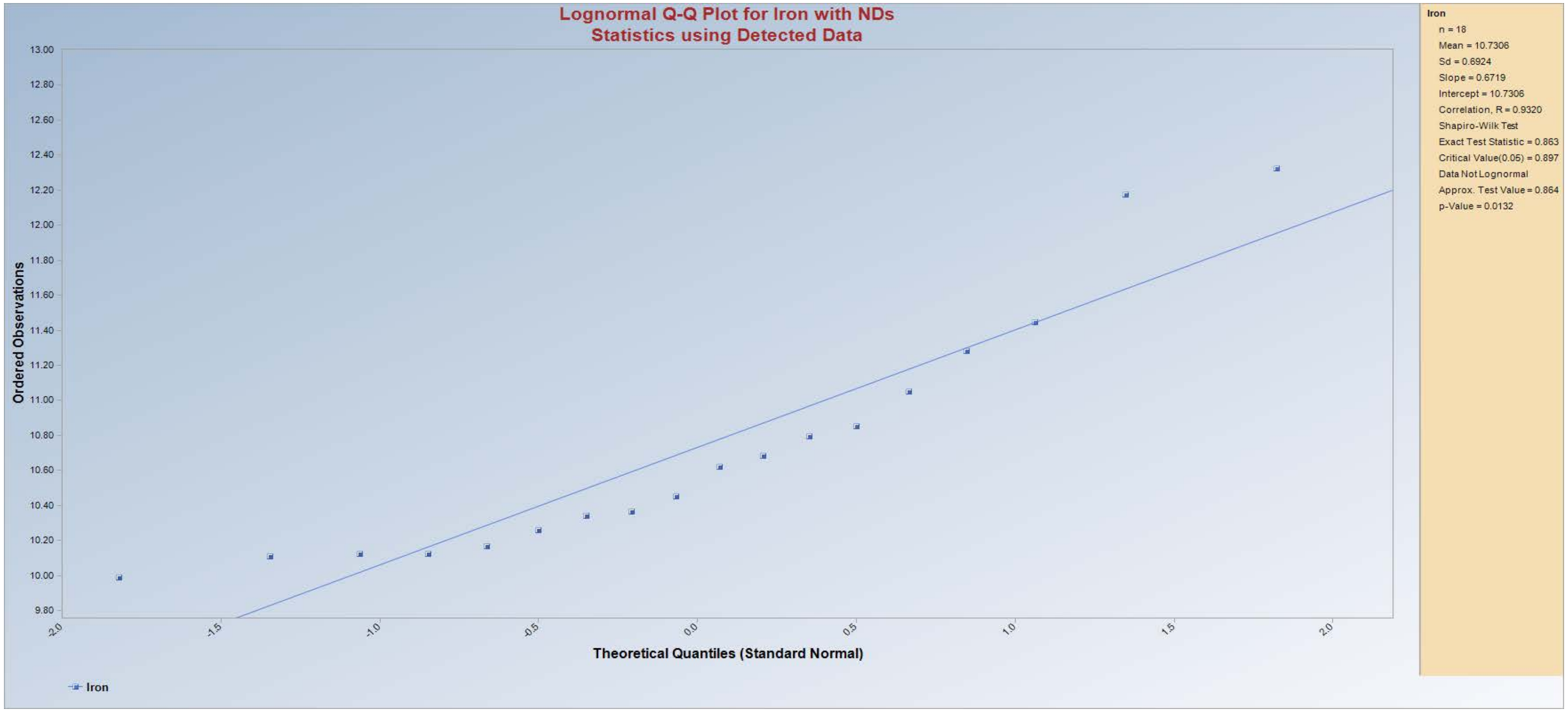
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 17
Mean = 4.31
Sd = 1.677
Slope = 1.734
Intercept = 4.31
Correlation, R = 0.991
Shapiro-Wilk Test
Exact Test Value = 0.981
Critical Val(0.05) = 0.892
Data Appear Lognormal
Approx. Test Value = 0.982
p-Value = 0.957



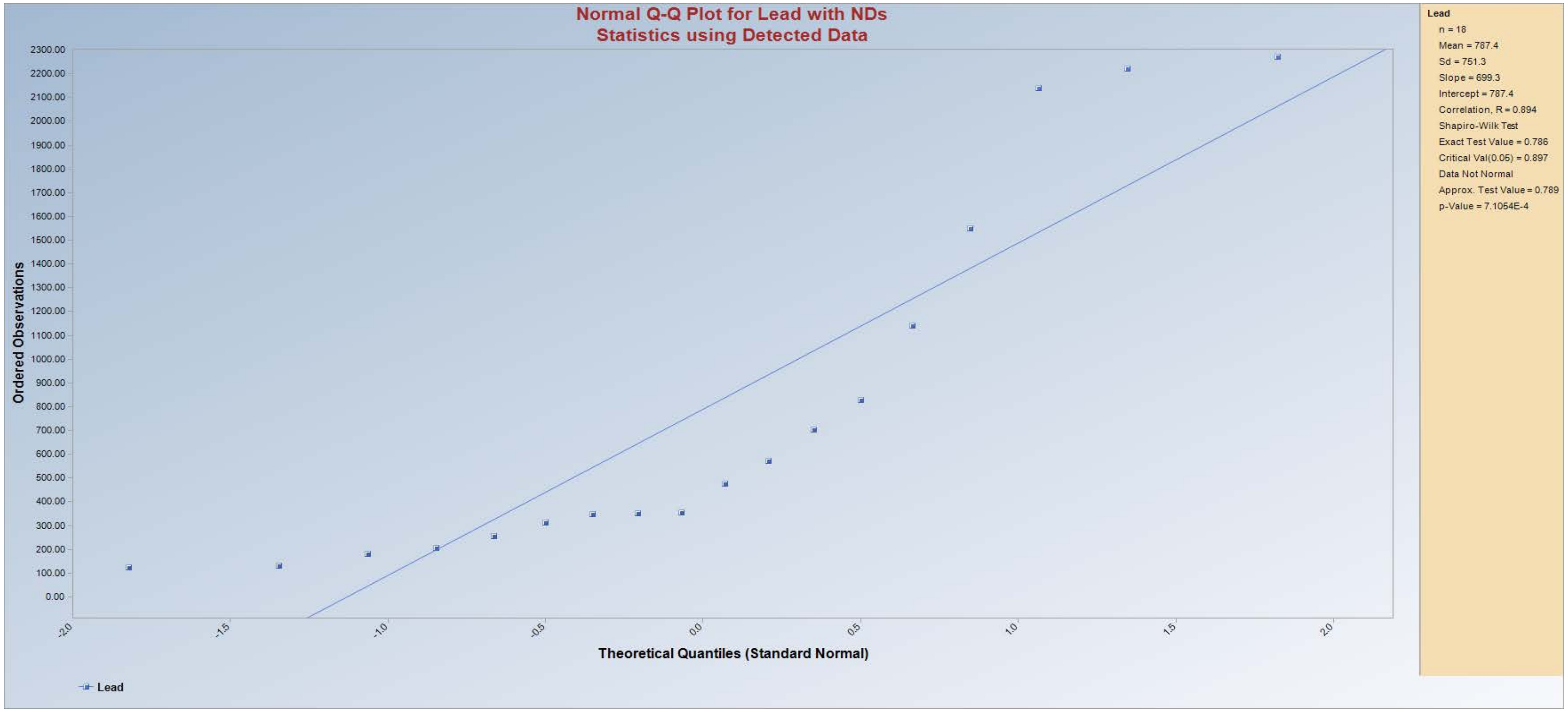
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 18
Mean = 60412
Sd = 57934
Slope = 48596
Intercept = 60412
Correlation, R = 0.806
Shapiro-Wilk Test
Exact Test Value = 0.657
Critical Val(0.05) = 0.897
Data Not Normal
Approx. Test Value = 0.655
p-Value = 7.5338E-6



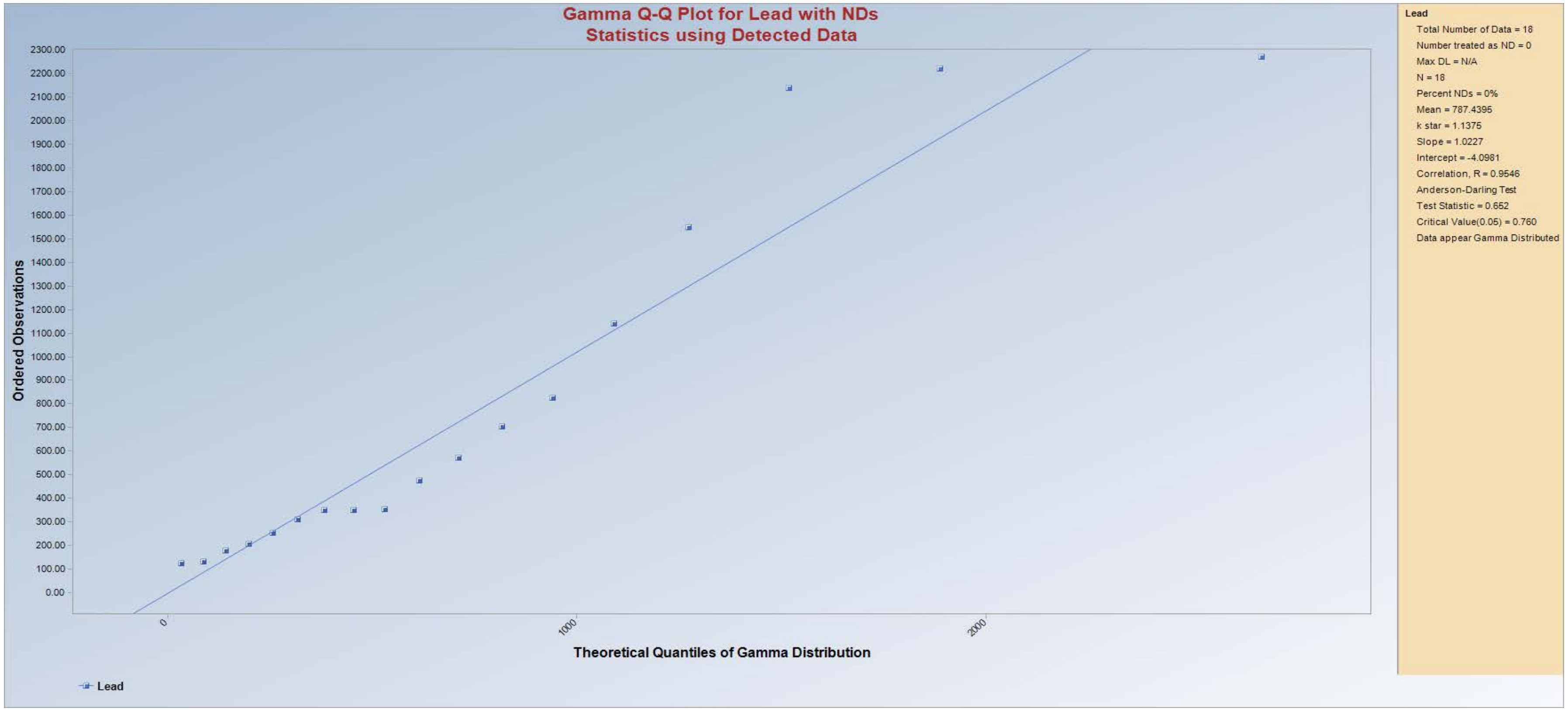
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
230000.00
220000.00
210000.00
200000.00
190000.00
180000.00
170000.00
160000.00
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
-10000
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
130000
140000
150000
160000
170000
180000
190000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 18
Number treated as ND = 0
Max DL = N/A
N = 18
Percent NDs = 0%
Mean = 60412.3102
k star = 1.6589
Slope = 1.1945
Intercept = -10863.0266
Correlation, R = 0.9309
Anderson-Darling Test
Test Statistic = 1.366
Critical Value(0.05) = 0.753
Data not Gamma Distributed



Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
13.00
12.80
12.60
12.40
12.20
12.00
11.80
11.60
11.40
11.20
11.00
10.80
10.60
10.40
10.20
10.00
9.80
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 18
Mean = 10.7306
Sd = 0.6924
Slope = 0.6719
Intercept = 10.7306
Correlation, R = 0.9320
Shapiro-Wilk Test
Exact Test Statistic = 0.863
Critical Value(0.05) = 0.897
Data Not Lognormal
Approx. Test Value = 0.864
p-Value = 0.0132



Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
2300.00
2200.00
2100.00
2000.00
1900.00
1800.00
1700.00
1600.00
1500.00
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 18
Mean = 787.4
Sd = 751.3
Slope = 699.3
Intercept = 787.4
Correlation, R = 0.894
Shapiro-Wilk Test
Exact Test Value = 0.786
Critical Val(0.05) = 0.897
Data Not Normal
Approx. Test Value = 0.789
p-Value = 7.1054E-4



Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
2300.00
2200.00
2100.00
2000.00
1900.00
1800.00
1700.00
1600.00
1500.00
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
1000
2000
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 18
Number treated as ND = 0
Max DL = N/A
N = 18
Percent NDs = 0%
Mean = 787.4395
k star = 1.1375
Slope = 1.0227
Intercept = -4.0981
Correlation, R = 0.9546
Anderson-Darling Test
Test Statistic = 0.652
Critical Value(0.05) = 0.760
Data appear Gamma Distributed

Attachment A5
ProUCL Output for EU 4 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6
Number of Missing Values	11		

Raw Statistics		Log-transformed Statistics	
Minimum	3.43	Minimum of Log Data	1.233
Maximum	11.1	Maximum of Log Data	2.407
Mean	8.14	Mean of log Data	2.037
Geometric Mean	7.669	SD of log Data	0.414
Median	8.55		
SD	2.591		
Std. Error of Mean	1.058		
Coefficient of Variation	0.318		
Skewness	-1.306		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Test Statistic	0.787
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	10.27	95% H-UCL	13.14
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.29
95% Adjusted-CLT UCL (Chen-1995)	9.277	97.5% Chebyshev (MVUE) UCL	16.91
95% Modified-t UCL (Johnson-1978)	10.18	99% Chebyshev (MVUE) UCL	22.06

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.392	Data appear Normal at 5% Significance Level	
Theta Star	1.854		
MLE of Mean	8.14		
MLE of Standard Deviation	3.884		
nu star	52.7		
Approximate Chi Square Value (.05)	37.02	Nonparametric Statistics	
Adjusted Level of Significance	0.0122	95% CLT UCL	9.88
Adjusted Chi Square Value	32.34	95% Jackknife UCL	10.27
		95% Standard Bootstrap UCL	9.744
Anderson-Darling Test Statistic	0.601	95% Bootstrap-t UCL	9.678
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL	9.429
Kolmogorov-Smirnov Test Statistic	0.316	95% Percentile Bootstrap UCL	9.555
Kolmogorov-Smirnov 5% Critical Value	0.333	95% BCA Bootstrap UCL	9.338
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	12.75
		97.5% Chebyshev(Mean, Sd) UCL	14.75
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	18.66
95% Approximate Gamma UCL (Use when n >= 40)	11.59		
95% Adjusted Gamma UCL (Use when n < 40)	13.26		
Potential UCL to Use		Use 95% Student's-t UCL	10.27

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Copper

General Statistics			
Number of Valid Data	29	Number of Detected Data	28
Number of Distinct Detected Data	28	Number of Non-Detect Data	1
		Percent Non-Detects	3.45%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	27.23	Minimum Detected	3.304
Maximum Detected	648.3	Maximum Detected	6.474
Mean of Detected	346.9	Mean of Detected	5.647
SD of Detected	174.4	SD of Detected	0.759
Minimum Non-Detect	33	Minimum Non-Detect	3.496
Maximum Non-Detect	33	Maximum Non-Detect	3.496

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk Test Statistic	0.844
5% Shapiro Wilk Critical Value	0.924	5% Shapiro Wilk Critical Value	0.924
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	335.5	Mean	5.549
SD	181.9	SD	0.914
95% DL/2 (t) UCL	393	95% H-Stat (DL/2) UCL	586.6
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	330.7	Mean in Log Scale	5.596
SD	188.8	SD in Log Scale	0.795
95% MLE (t) UCL	390.3	Mean in Original Scale	337.2
95% MLE (Tiku) UCL	391	SD in Original Scale	179.1
		95% t UCL	393.7
		95% Percentile Bootstrap UCL	392.1
		95% BCA Bootstrap UCL	387.4
		95% H UCL	516.1
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.376	Data appear Normal at 5% Significance Level	
Theta Star	146		
nu star	133		
A-D Test Statistic	1.105	**Nonparametric Statistics**	
5% A-D Critical Value	0.755	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.755	Mean	335.9
5% K-S Critical Value	0.167	SD	178.1
Data not Gamma Distributed at 5% Significance Level		SE of Mean	33.68
		95% KM (t) UCL	393.2
Assuming Gamma Distribution		95% KM (z) UCL	391.3
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	392.4
Minimum	0.000001	95% KM (bootstrap t) UCL	389.9
Maximum	648.3	95% KM (BCA) UCL	397.8
Mean	334.9	95% KM (Percentile Bootstrap) UCL	390.5
Median	381.3	95% KM (Chebyshev) UCL	482.7
SD	183	97.5% KM (Chebyshev) UCL	546.2
k star	0.667	99% KM (Chebyshev) UCL	671
Theta star	501.8		
Nu star	38.71	**Potential UCLs to Use**	
AppChi2	25.46	95% KM (t) UCL	393.2
95% Gamma Approximate UCL (Use when n >= 40)	509.2	95% KM (Percentile Bootstrap) UCL	390.5
95% Adjusted Gamma UCL (Use when n < 40)	522.4		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	29	Number of Distinct Observations	29

Raw Statistics		Log-transformed Statistics	
Minimum	6983	Minimum of Log Data	8.851
Maximum	144414	Maximum of Log Data	11.88
Mean	66886	Mean of log Data	10.88
Geometric Mean	53221	SD of log Data	0.777
Median	66651		
SD	38239		
Std. Error of Mean	7101		
Coefficient of Variation	0.572		
Skewness	0.168		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Test Statistic	0.903
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	78965	95% H-UCL	99507
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	119987
95% Adjusted-CLT UCL (Chen-1995)	78803	97.5% Chebyshev (MVUE) UCL	141175
95% Modified-t UCL (Johnson-1978)	79002	99% Chebyshev (MVUE) UCL	182795

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.122	Data appear Normal at 5% Significance Level	
Theta Star	31524		
MLE of Mean	66886		
MLE of Standard Deviation	45919		
nu star	123.1		
Approximate Chi Square Value (.05)	98.44	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0407	95% CLT UCL	78566
Adjusted Chi Square Value	97.13	95% Jackknife UCL	78965
		95% Standard Bootstrap UCL	77964
Anderson-Darling Test Statistic	0.651	95% Bootstrap-t UCL	79558
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	79016
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	78643
Kolmogorov-Smirnov 5% Critical Value	0.164	95% BCA Bootstrap UCL	78265
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	97838
		97.5% Chebyshev(Mean, Sd) UCL	111230
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	137538
95% Approximate Gamma UCL (Use when n >= 40)	83613		
95% Adjusted Gamma UCL (Use when n < 40)	84745		

Potential UCL to Use		Use 95% Student's-t UCL	78965

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	29	Number of Distinct Observations	29

Raw Statistics		Log-transformed Statistics	
Minimum	23.84	Minimum of Log Data	3.171
Maximum	2223	Maximum of Log Data	7.706
Mean	323.4	Mean of log Data	5.335
Geometric Mean	207.4	SD of log Data	0.993
Median	271.4		
SD	397.4		
Std. Error of Mean	73.8		
Coefficient of Variation	1.229		
Skewness	4.105		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.555	Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	449	95% H-UCL	539.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	637
95% Adjusted-CLT UCL (Chen-1995)	504.9	97.5% Chebyshev (MVUE) UCL	769.1
95% Modified-t UCL (Johnson-1978)	458.3	99% Chebyshev (MVUE) UCL	1029

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.159	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	279.1		
MLE of Mean	323.4		
MLE of Standard Deviation	300.5		
nu star	67.2		
Approximate Chi Square Value (.05)	49.33	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0407	95% CLT UCL	444.8
Adjusted Chi Square Value	48.42	95% Jackknife UCL	449
		95% Standard Bootstrap UCL	445.5
Anderson-Darling Test Statistic	0.711	95% Bootstrap-t UCL	575.5
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	950.7
Kolmogorov-Smirnov Test Statistic	0.146	95% Percentile Bootstrap UCL	454.2
Kolmogorov-Smirnov 5% Critical Value	0.166	95% BCA Bootstrap UCL	516.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	645.1
		97.5% Chebyshev(Mean, Sd) UCL	784.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1058
95% Approximate Gamma UCL (Use when n >= 40)	440.5		
95% Adjusted Gamma UCL (Use when n < 40)	448.9		

Potential UCL to Use		Use 95% Approximate Gamma UCL	440.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

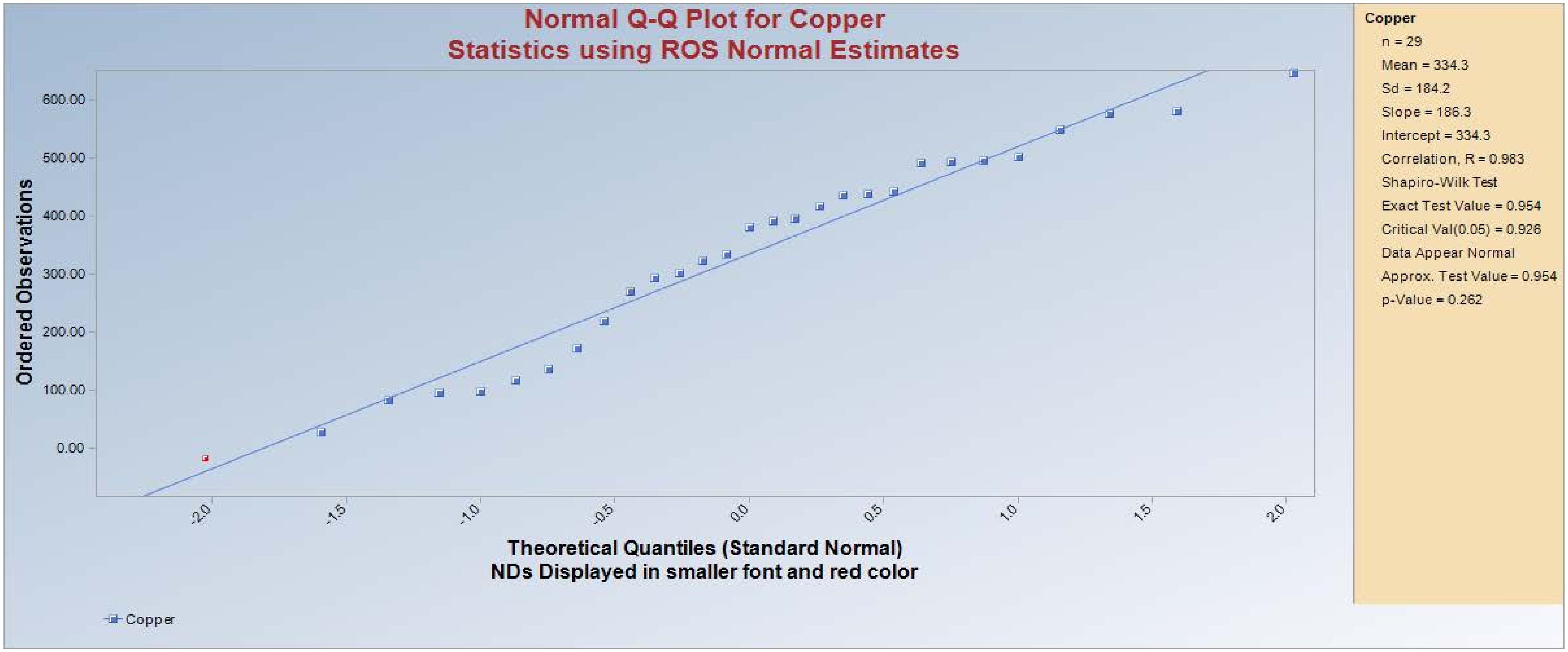
Number of Valid Observations	29	Number of Distinct Observations	29

Raw Statistics		Log-transformed Statistics	
Minimum	105.4	Minimum of Log Data	4.658
Maximum	14145	Maximum of Log Data	9.557
Mean	1711	Mean of log Data	6.798
Geometric Mean	895.8	SD of log Data	1.008
Median	1011		
SD	3126		
Std. Error of Mean	580.5		
Coefficient of Variation	1.827		
Skewness	3.55		

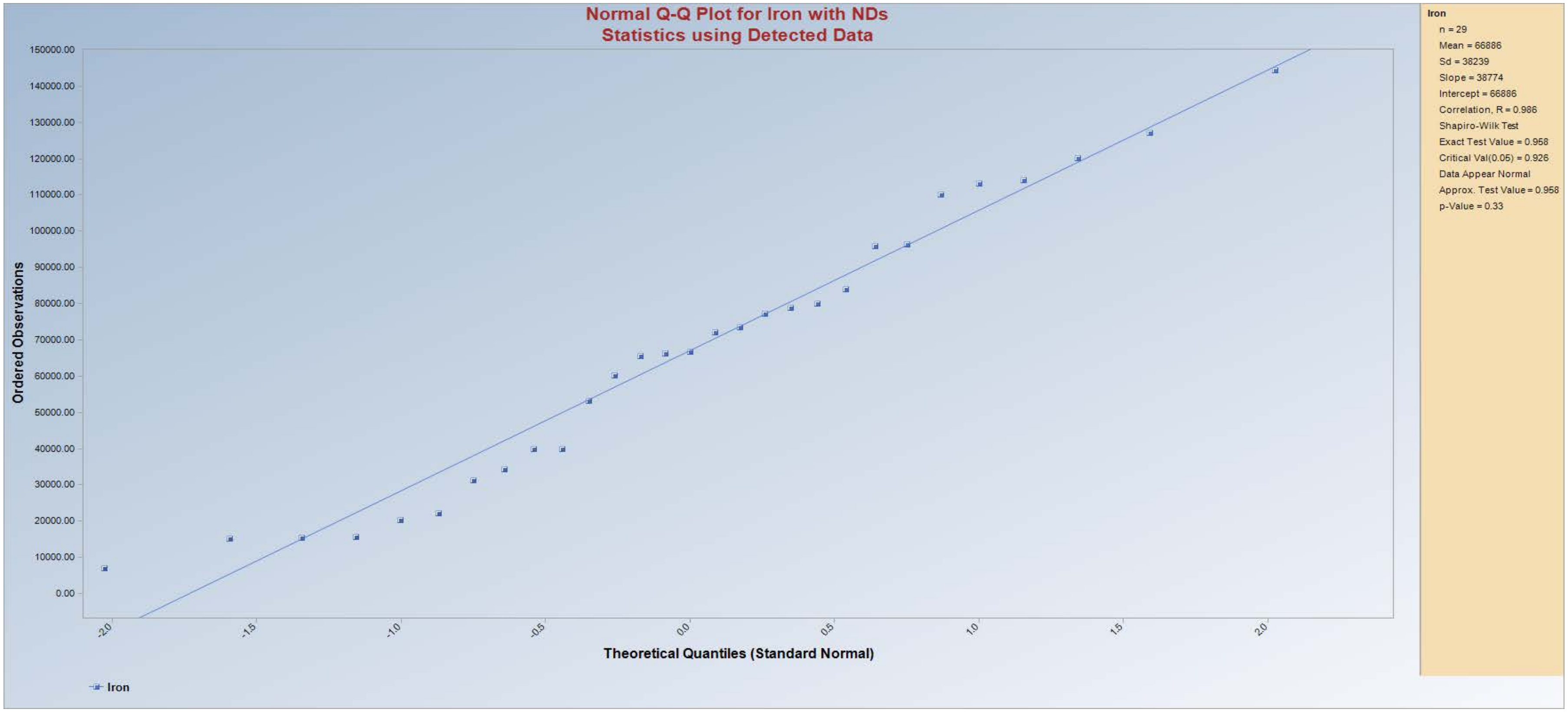
Relevant UCL Statistics

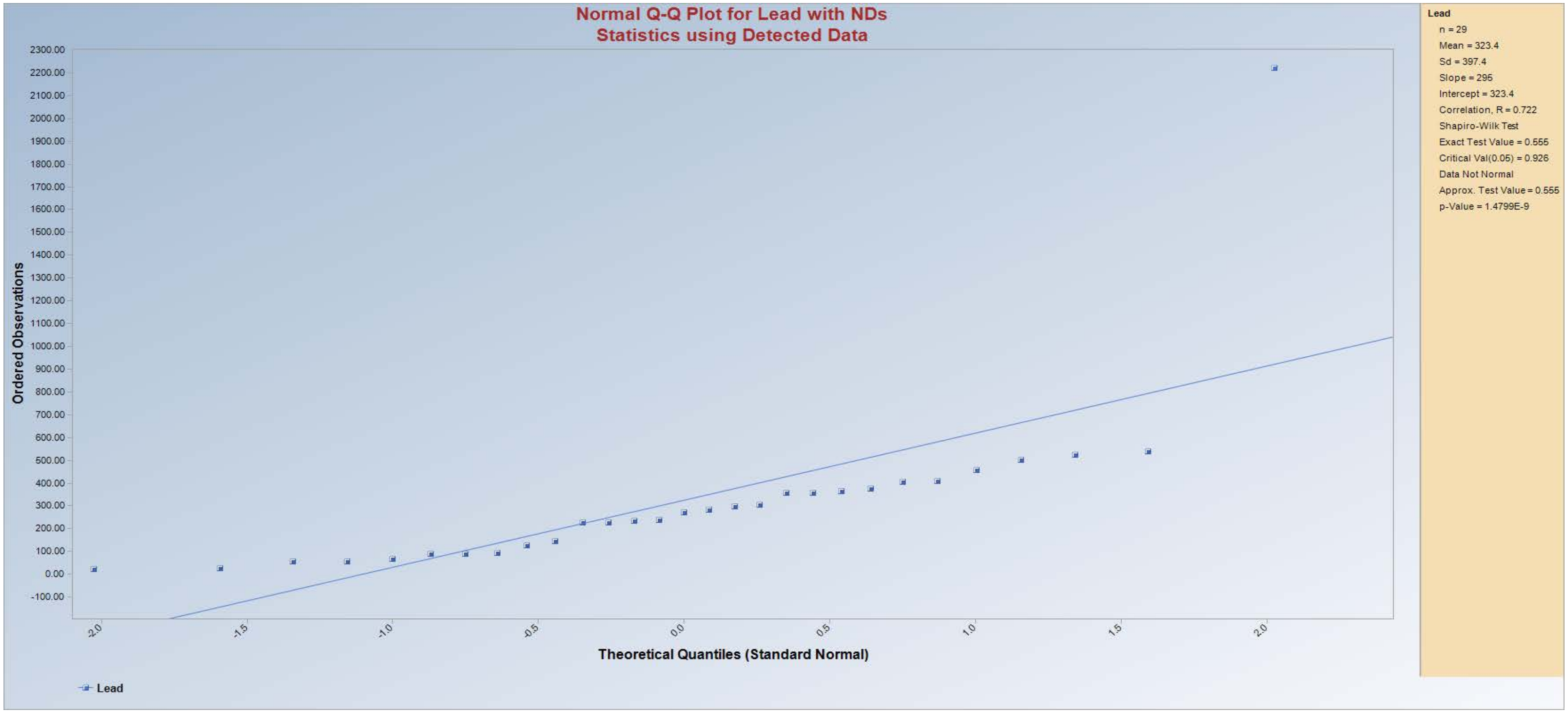
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.42	Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2699	95% H-UCL	2388
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2814
95% Adjusted-CLT UCL (Chen-1995)	3075	97.5% Chebyshev (MVUE) UCL	3403
95% Modified-t UCL (Johnson-1978)	2763	99% Chebyshev (MVUE) UCL	4561
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.833	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2055		
MLE of Mean	1711		
MLE of Standard Deviation	1875		
nu star	48.29		
Approximate Chi Square Value (.05)	33.34	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0407	95% CLT UCL	2666
Adjusted Chi Square Value	32.59	95% Jackknife UCL	2699
		95% Standard Bootstrap UCL	2607
Anderson-Darling Test Statistic	2.872	95% Bootstrap-t UCL	7758
Anderson-Darling 5% Critical Value	0.778	95% Hall's Bootstrap UCL	9365
Kolmogorov-Smirnov Test Statistic	0.313	95% Percentile Bootstrap UCL	2687
Kolmogorov-Smirnov 5% Critical Value	0.168	95% BCA Bootstrap UCL	3273
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4242
		97.5% Chebyshev(Mean, Sd) UCL	5337
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7488
95% Approximate Gamma UCL (Use when n >= 40)	2479		
95% Adjusted Gamma UCL (Use when n < 40)	2535		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	4242

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

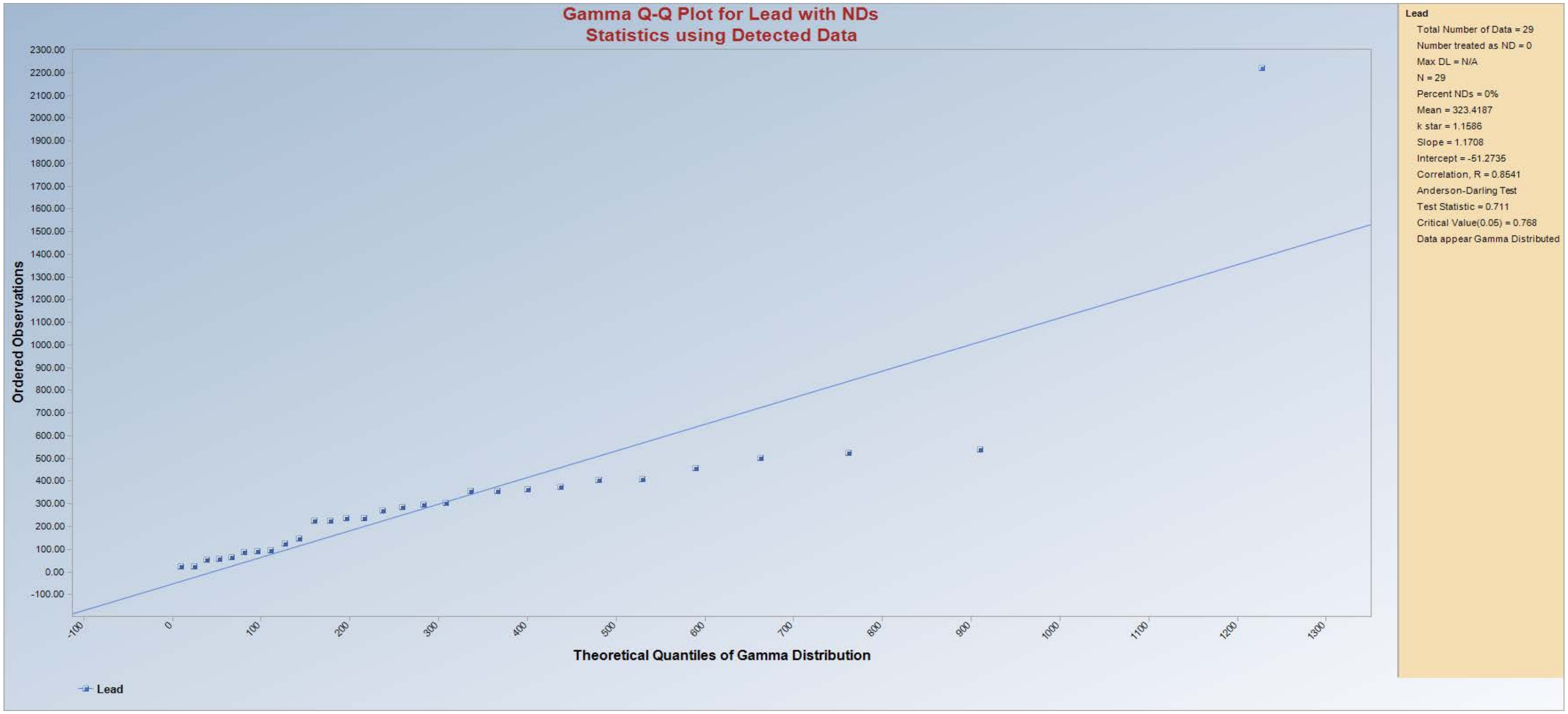


Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
Ordered Observations
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 29
Mean = 334.3
Sd = 184.2
Slope = 186.3
Intercept = 334.3
Correlation, R = 0.983
Shapiro-Wilk Test
Exact Test Value = 0.954
Critical Val(0.05) = 0.926
Data Appear Normal
Approx. Test Value = 0.954
p-Value = 0.262

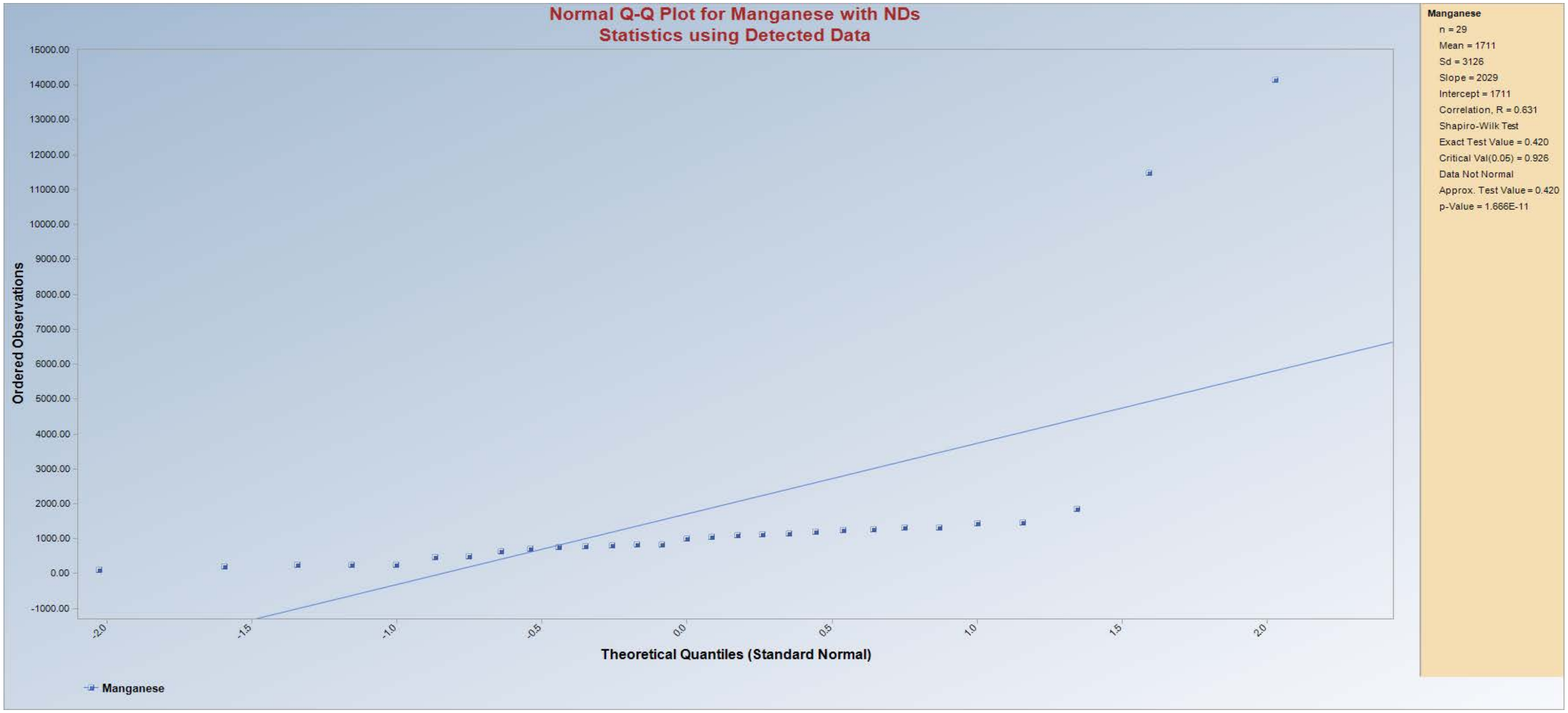

Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 29
Mean = 66886
Sd = 38239
Slope = 38774
Intercept = 66886
Correlation, R = 0.986
Shapiro-Wilk Test
Exact Test Value = 0.958
Critical Val(0.05) = 0.926
Data Appear Normal
Approx. Test Value = 0.958
p-Value = 0.33



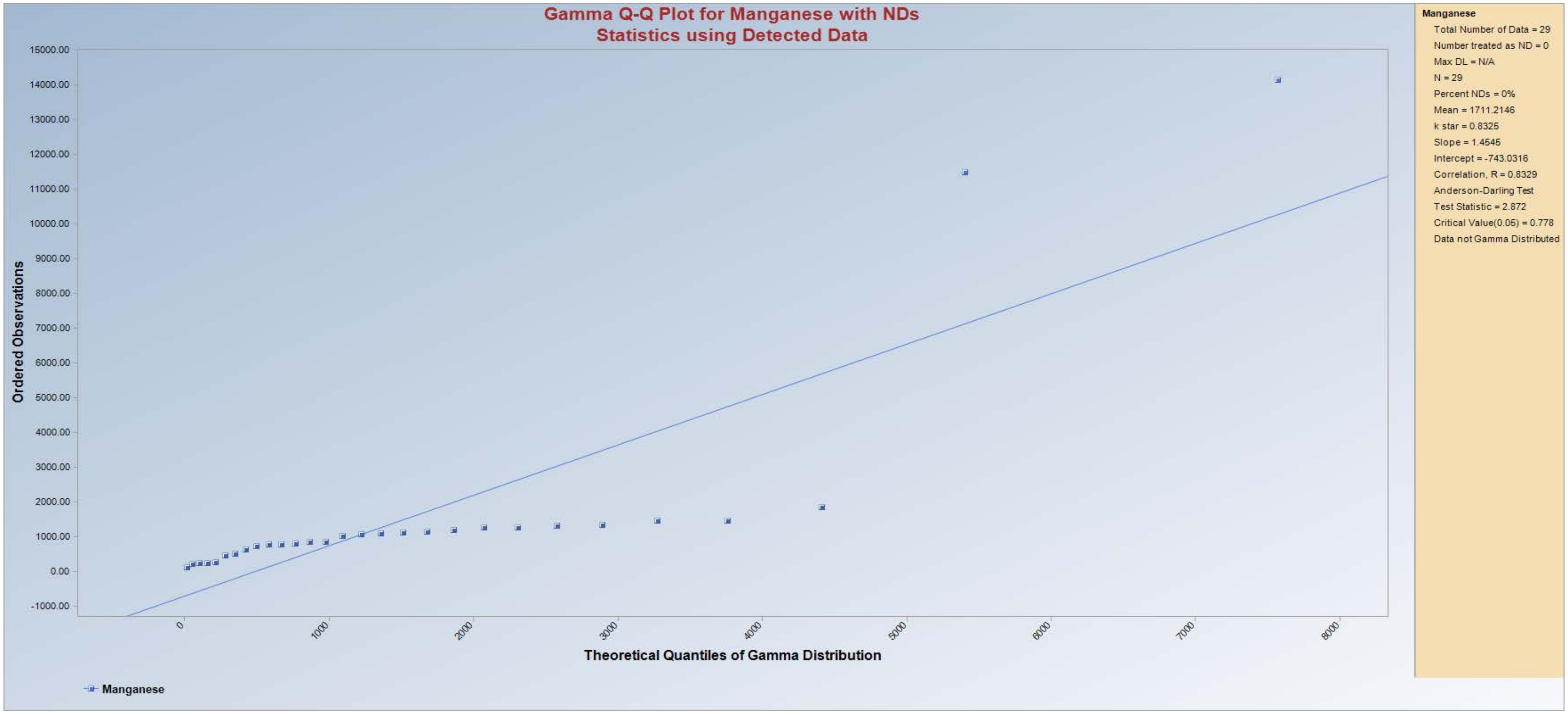
Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 29
Mean = 323.4
Sd = 397.4
Slope = 296
Intercept = 323.4
Correlation, R = 0.722
Shapiro-Wilk Test
Exact Test Value = 0.555
Critical Val(0.05) = 0.926
Data Not Normal
Approx. Test Value = 0.555
p-Value = 1.4799E-9



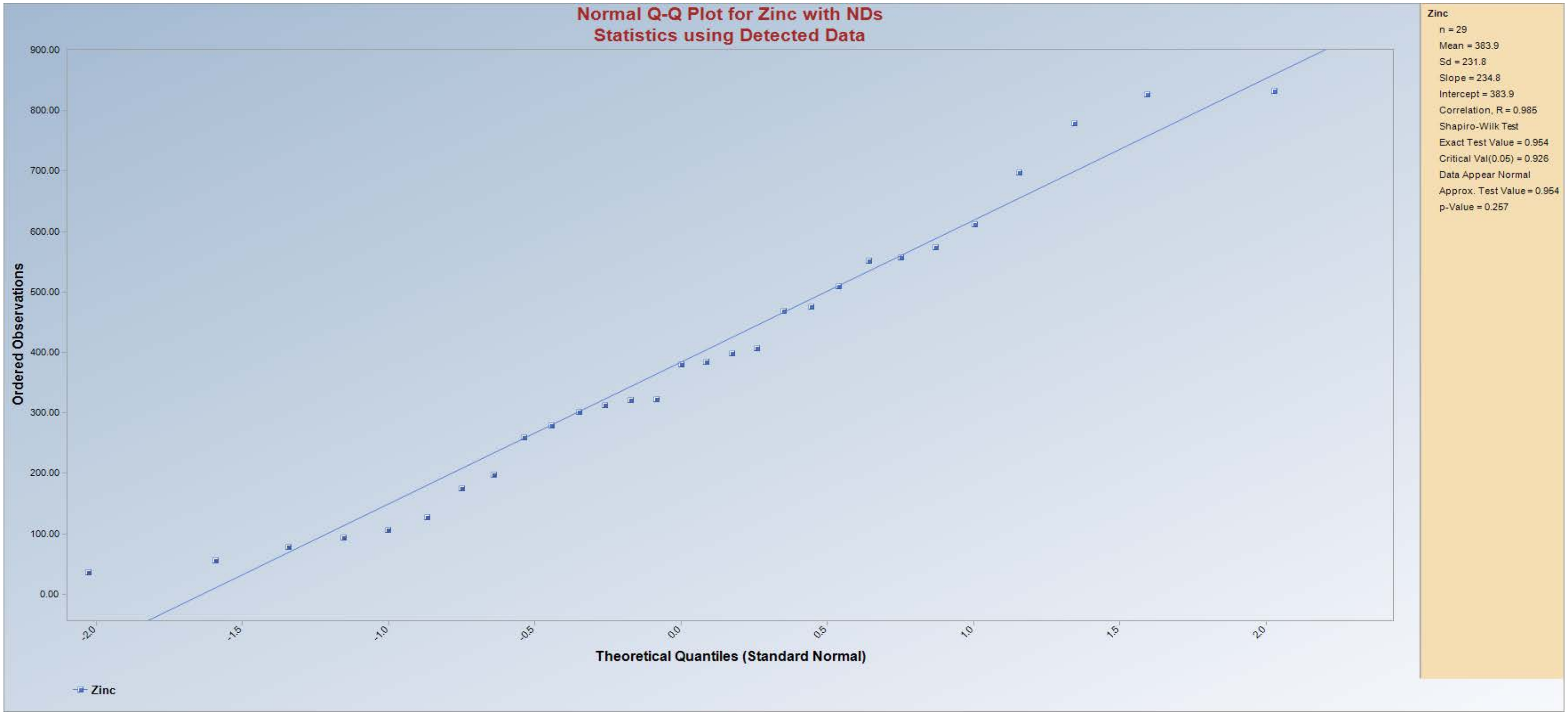
Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 29
Number treated as ND = 0
Max DL = N/A
N = 29
Percent NDs = 0%
Mean = 323.4187
k star = 1.1586
Slope = 1.1708
Intercept = -51.2735
Correlation, R = 0.8541
Anderson-Darling Test
Test Statistic = 0.711
Critical Value(0.05) = 0.768
Data appear Gamma Distributed



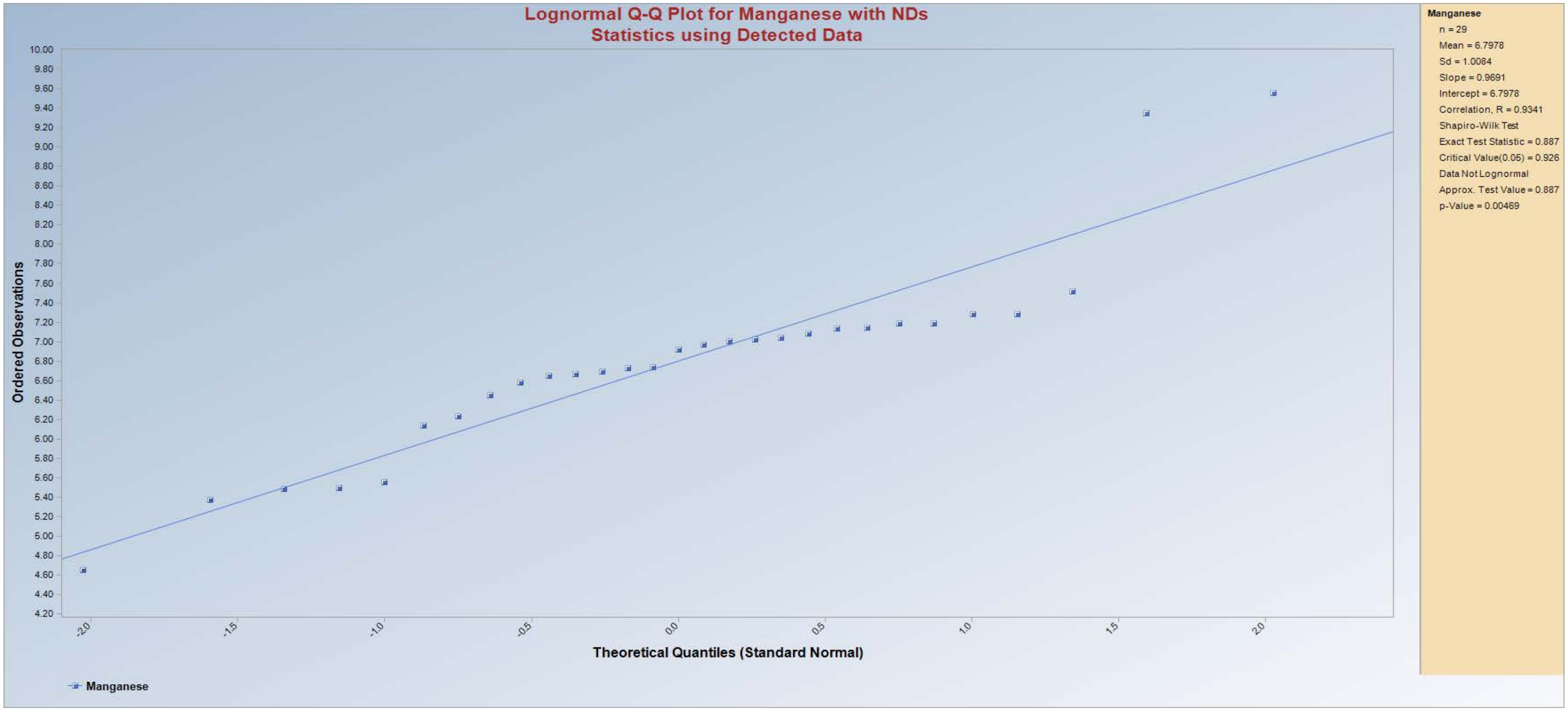
Normal Q-Q Plot for Manganese with NDs
Statistics using Detected Data
Ordered Observations
15000.00
14000.00
13000.00
12000.00
11000.00
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Manganese
Manganese
n = 29
Mean = 1711
Sd = 3126
Slope = 2029
Intercept = 1711
Correlation, R = 0.631
Shapiro-Wilk Test
Exact Test Value = 0.420
Critical Val(0.05) = 0.926
Data Not Normal
Approx. Test Value = 0.420
p-Value = 1.666E-11



Gamma Q-Q Plot for Manganese with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Manganese
Manganese
Total Number of Data = 29
Number treated as ND = 0
Max DL = N/A
N = 29
Percent NDs = 0%
Mean = 1711.2146
k star = 0.8325
Slope = 1.4545
Intercept = -743.0316
Correlation, R = 0.8329
Anderson-Darling Test
Test Statistic = 2.872
Critical Value(0.05) = 0.778
Data not Gamma Distributed



Normal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 29
Mean = 383.9
Sd = 231.8
Slope = 234.8
Intercept = 383.9
Correlation, R = 0.985
Shapiro-Wilk Test
Exact Test Value = 0.954
Critical Val(0.05) = 0.926
Data Appear Normal
Approx. Test Value = 0.954
p-Value = 0.257


Lognormal Q-Q Plot for Manganese with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Manganese
Manganese
n = 29
Mean = 6.7978
Sd = 1.0084
Slope = 0.9691
Intercept = 6.7978
Correlation, R = 0.9341
Shapiro-Wilk Test
Exact Test Statistic = 0.887
Critical Value(0.05) = 0.926
Data Not Lognormal
Approx. Test Value = 0.887
p-Value = 0.00469

Attachment A6
ProUCL Output for EU 5 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	58	Number of Detected Data	37
Number of Distinct Detected Data	37	Number of Non-Detect Data	21
		Percent Non-Detects	36.21%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	8.065	Minimum Detected	2.088
Maximum Detected	84.5	Maximum Detected	4.437
Mean of Detected	19.48	Mean of Detected	2.868
SD of Detected	12.22	SD of Detected	0.411
Minimum Non-Detect	7.468	Minimum Non-Detect	2.011
Maximum Non-Detect	21.84	Maximum Non-Detect	3.084

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	51
Number treated as Detected	7
Single DL Non-Detect Percentage	87.93%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.573	Shapiro Wilk Test Statistic	0.91
5% Shapiro Wilk Critical Value	0.936	5% Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	14.93	Mean	2.517
SD	11.51	SD	0.596
95% DL/2 (t) UCL	17.46	95% H-Stat (DL/2) UCL	17.28
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	2.641
		SD in Log Scale	0.459
		Mean in Original Scale	15.89
		SD in Original Scale	10.88
		95% t UCL	18.28
		95% Percentile Bootstrap UCL	18.37
		95% BCA Bootstrap UCL	19.38
		95% H-UCL	17.47

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	4.69	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4.153		
nu star	347		
A-D Test Statistic	1.311	Nonparametric Statistics	
5% A-D Critical Value	0.75	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.75	Mean	16.12
5% K-S Critical Value	0.145	SD	10.72
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.443
		95% KM (t) UCL	18.53
Assuming Gamma Distribution		95% KM (z) UCL	18.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	18.35
Minimum	0.000001	95% KM (bootstrap t) UCL	20.18
Maximum	84.5	95% KM (BCA) UCL	19.88
Mean	14.59	95% KM (Percentile Bootstrap) UCL	18.81
Median	13.16	95% KM (Chebyshev) UCL	22.41
SD	11.95	97.5% KM (Chebyshev) UCL	25.13
k star	0.491	99% KM (Chebyshev) UCL	30.48
Theta star	29.7		
Nu star	57	Potential UCLs to Use	
AppChi2	40.64	95% KM (BCA) UCL	19.88
95% Gamma Approximate UCL (Use when n >= 40)	20.46		
95% Adjusted Gamma UCL (Use when n < 40)	20.64		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	58	Number of Detected Data	57
Number of Distinct Detected Data	57	Number of Non-Detect Data	1
		Percent Non-Detects	1.72%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	37.27	Minimum Detected	3.618
Maximum Detected	1354	Maximum Detected	7.211
Mean of Detected	184.9	Mean of Detected	4.871
SD of Detected	232.2	SD of Detected	0.734
Minimum Non-Detect	31.16	Minimum Non-Detect	3.439
Maximum Non-Detect	31.16	Maximum Non-Detect	3.439

UCL Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.301
5% Lilliefors Critical Value	0.117

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	182
SD	231.2
95% DL/2 (t) UCL	232.7
Maximum Likelihood Estimate(MLE) Method	
Mean	179.8
SD	231.8
95% MLE (t) UCL	230.7
95% MLE (Tiku) UCL	226.2

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.51
Theta Star	122.5
nu star	172.1
A-D Test Statistic	3.299
5% A-D Critical Value	0.768
K-S Test Statistic	0.768
5% K-S Critical Value	0.12

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	1354
Mean	181.7
Median	113.9
SD	231.4
k star	0.861
Theta star	211.1
Nu star	99.84
AppChi2	77.79
95% Gamma Approximate UCL (Use when n >= 40)	233.2
95% Adjusted Gamma UCL (Use when n < 40)	234.7

Note: DL/2 is not a recommended method.

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.139
5% Lilliefors Critical Value	0.117

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	4.835
SD	0.779
95% H-Stat (DL/2) UCL	211.9
Log ROS Method	
Mean in Log Scale	4.839
SD in Log Scale	0.768
Mean in Original Scale	182
SD in Original Scale	231.1
95% t UCL	232.8
95% Percentile Bootstrap UCL	233.8
95% BCA Bootstrap UCL	248.1
95% H UCL	210.1

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	182.3
SD	228.9
SE of Mean	30.33
95% KM (t) UCL	233
95% KM (z) UCL	232.2
95% KM (jackknife) UCL	233
95% KM (bootstrap t) UCL	285.7
95% KM (BCA) UCL	239.5
95% KM (Percentile Bootstrap) UCL	234
95% KM (Chebyshev) UCL	314.5
97.5% KM (Chebyshev) UCL	371.7
99% KM (Chebyshev) UCL	484.1

Potential UCLs to Use

95% KM (Chebyshev) UCL	314.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	58	Number of Distinct Observations	58

Raw Statistics		Log-transformed Statistics	
Minimum	15424	Minimum of Log Data	9.644
Maximum	170776	Maximum of Log Data	12.05
Mean	33243	Mean of log Data	10.26
Geometric Mean	28502	SD of log Data	0.477
Median	26412		
SD	27823		
Std. Error of Mean	3653		
Coefficient of Variation	0.837		
Skewness	4.137		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.278	Lilliefors Test Statistic	0.149
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	39351	95% H-UCL	35948
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	40964
95% Adjusted-CLT UCL (Chen-1995)	41372	97.5% Chebyshev (MVUE) UCL	44903
95% Modified-t UCL (Johnson-1978)	39682	99% Chebyshev (MVUE) UCL	52639

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.243	Data do not follow a Discernable Distribution (0.05)	
Theta Star	10251		
MLE of Mean	33243		
MLE of Standard Deviation	18460		
nu star	376.2		
Approximate Chi Square Value (.05)	332.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0459	95% CLT UCL	39252
Adjusted Chi Square Value	331.2	95% Jackknife UCL	39351
		95% Standard Bootstrap UCL	39079
Anderson-Darling Test Statistic	3.791	95% Bootstrap-t UCL	47445
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	69953
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL	39474
Kolmogorov-Smirnov 5% Critical Value	0.118	95% BCA Bootstrap UCL	41976
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	49167
		97.5% Chebyshev(Mean, Sd) UCL	56058
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	69593
95% Approximate Gamma UCL (Use when n >= 40)	37641		
95% Adjusted Gamma UCL (Use when n < 40)	37759		

Potential UCL to Use			
		Use 95% Student's-t UCL	39351
		or 95% Modified-t UCL	39682

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	58	Number of Distinct Observations	58

Raw Statistics		Log-transformed Statistics	
Minimum	21.2	Minimum of Log Data	3.054
Maximum	1380	Maximum of Log Data	7.23
Mean	144.6	Mean of log Data	4.682
Geometric Mean	108	SD of log Data	0.71
Median	106		
SD	180.1		
Std. Error of Mean	23.64		
Coefficient of Variation	1.245		
Skewness	5.891		

Relevant UCL Statistics

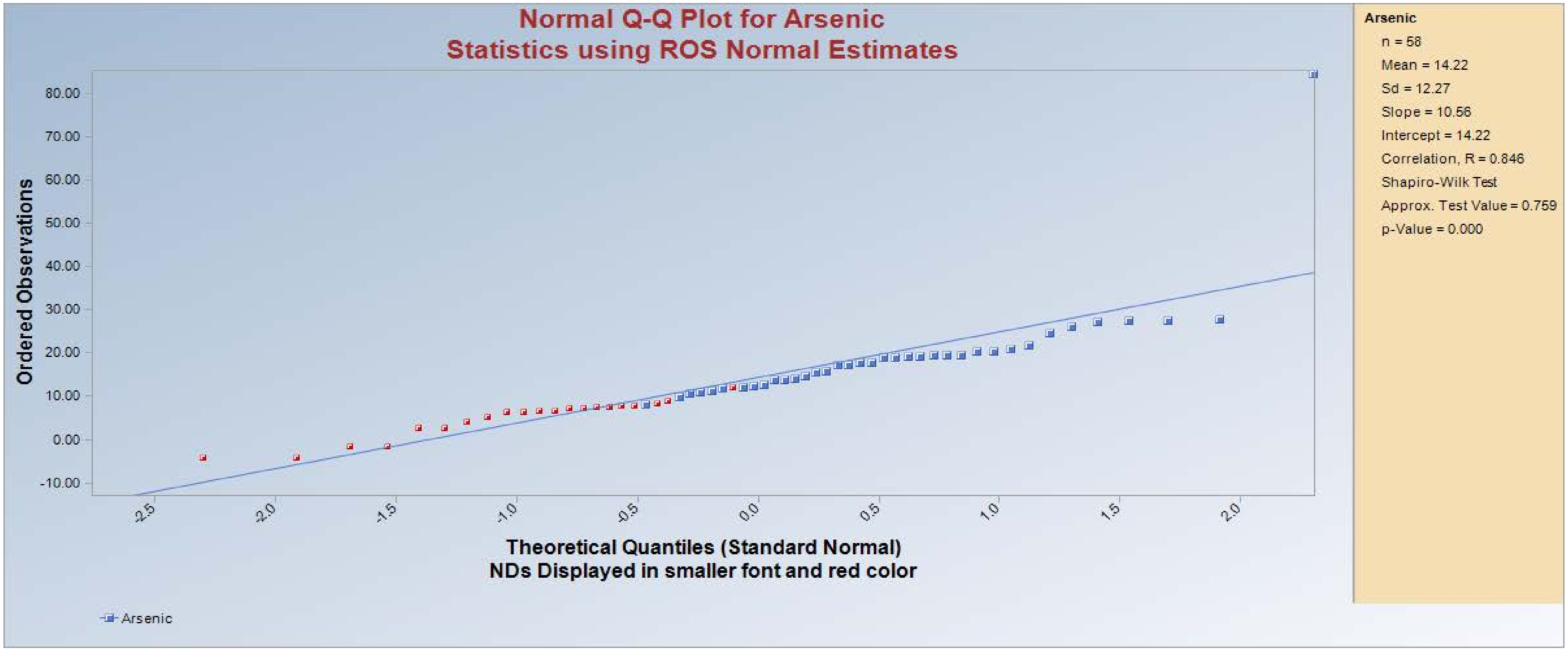
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.264	Lilliefors Test Statistic	0.148
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

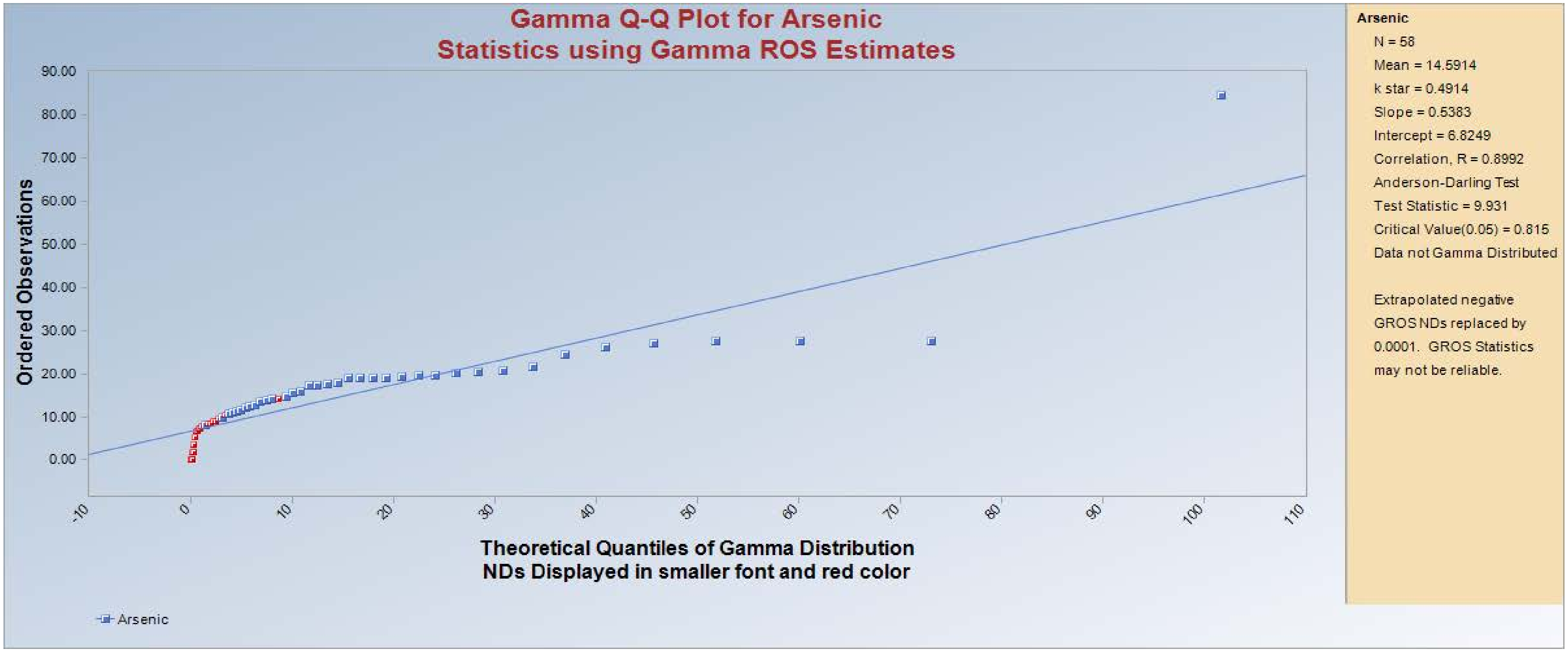
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	184.2	95% H-UCL	168.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	199.8
95% Adjusted-CLT UCL (Chen-1995)	203.1	97.5% Chebyshev (MVUE) UCL	226.5
95% Modified-t UCL (Johnson-1978)	187.2	99% Chebyshev (MVUE) UCL	279

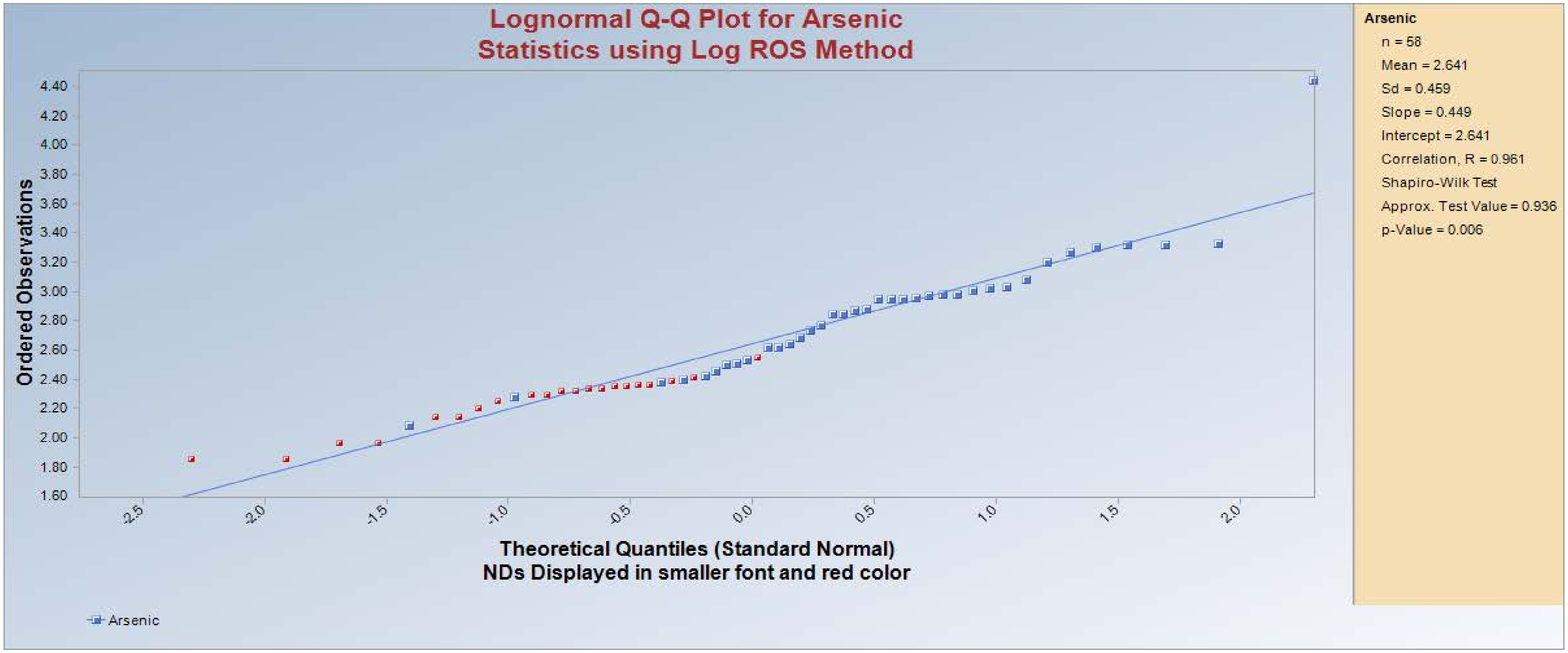
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.775	Data do not follow a Discernable Distribution (0.05)	
Theta Star	81.47		
MLE of Mean	144.6		
MLE of Standard Deviation	108.6		
nu star	205.9		
Approximate Chi Square Value (.05)	173.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0459	95% CLT UCL	183.5
Adjusted Chi Square Value	173	95% Jackknife UCL	184.2
		95% Standard Bootstrap UCL	183.4
Anderson-Darling Test Statistic	1.959	95% Bootstrap-t UCL	231.8
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	341.2
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	188.5
Kolmogorov-Smirnov 5% Critical Value	0.118	95% BCA Bootstrap UCL	211.7
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	247.7
		97.5% Chebyshev(Mean, Sd) UCL	292.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	379.9
95% Approximate Gamma UCL (Use when n >= 40)	171.4		
95% Adjusted Gamma UCL (Use when n < 40)	172.2		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	247.7

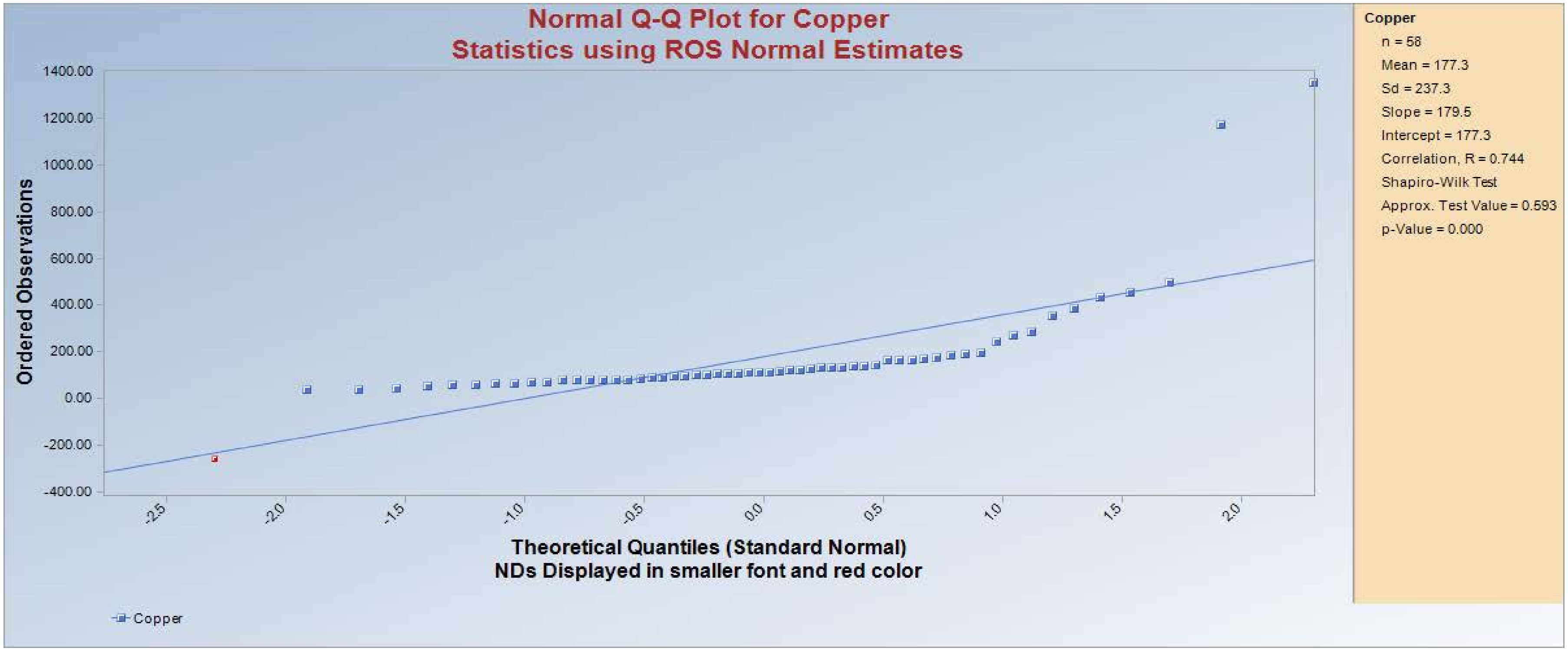
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 58
Mean = 14.22
Sd = 12.27
Slope = 10.56
Intercept = 14.22
Correlation, R = 0.846
Shapiro-Wilk Test
Approx. Test Value = 0.759
p-Value = 0.000

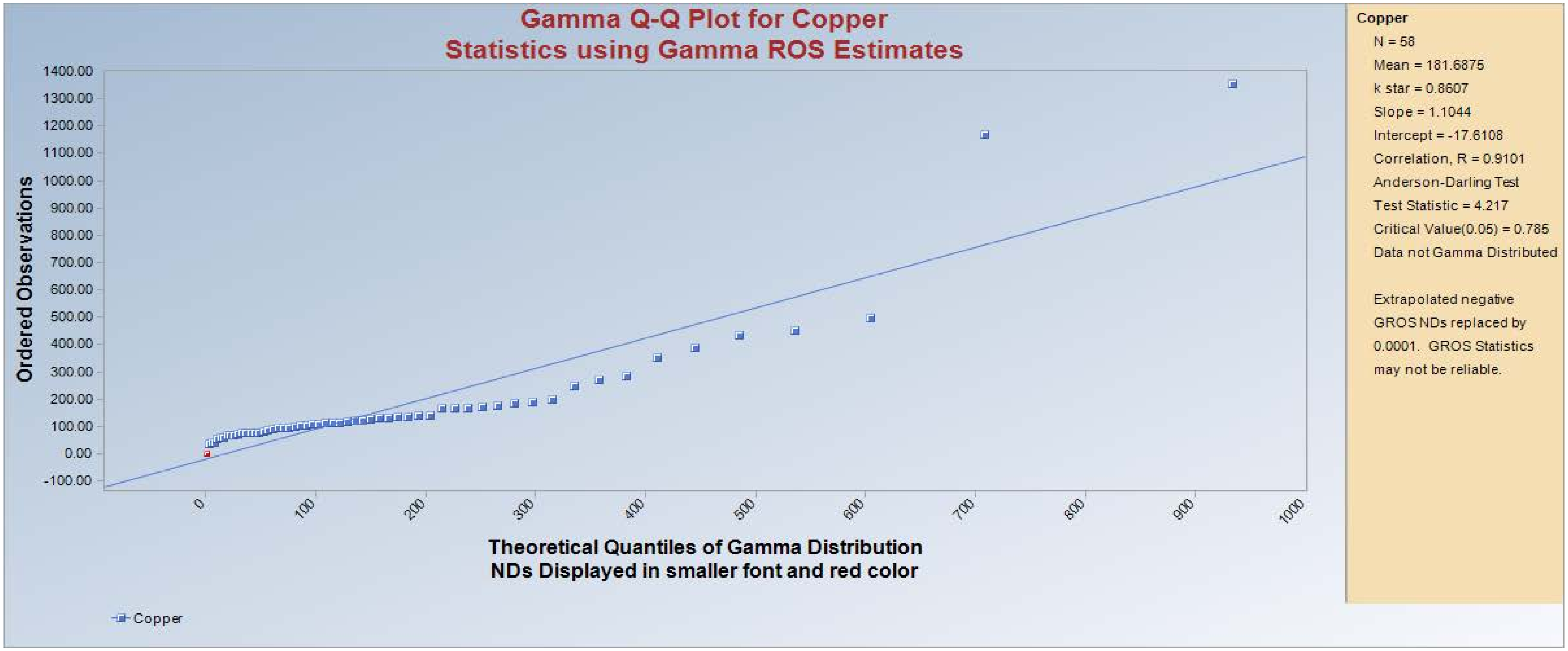

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10
0
10
20
30
40
50
60
70
80
90
100
110
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 58
Mean = 14.5914
k star = 0.4914
Slope = 0.5383
Intercept = 6.8249
Correlation, R = 0.8992
Anderson-Darling Test
Test Statistic = 9.931
Critical Value(0.05) = 0.815
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

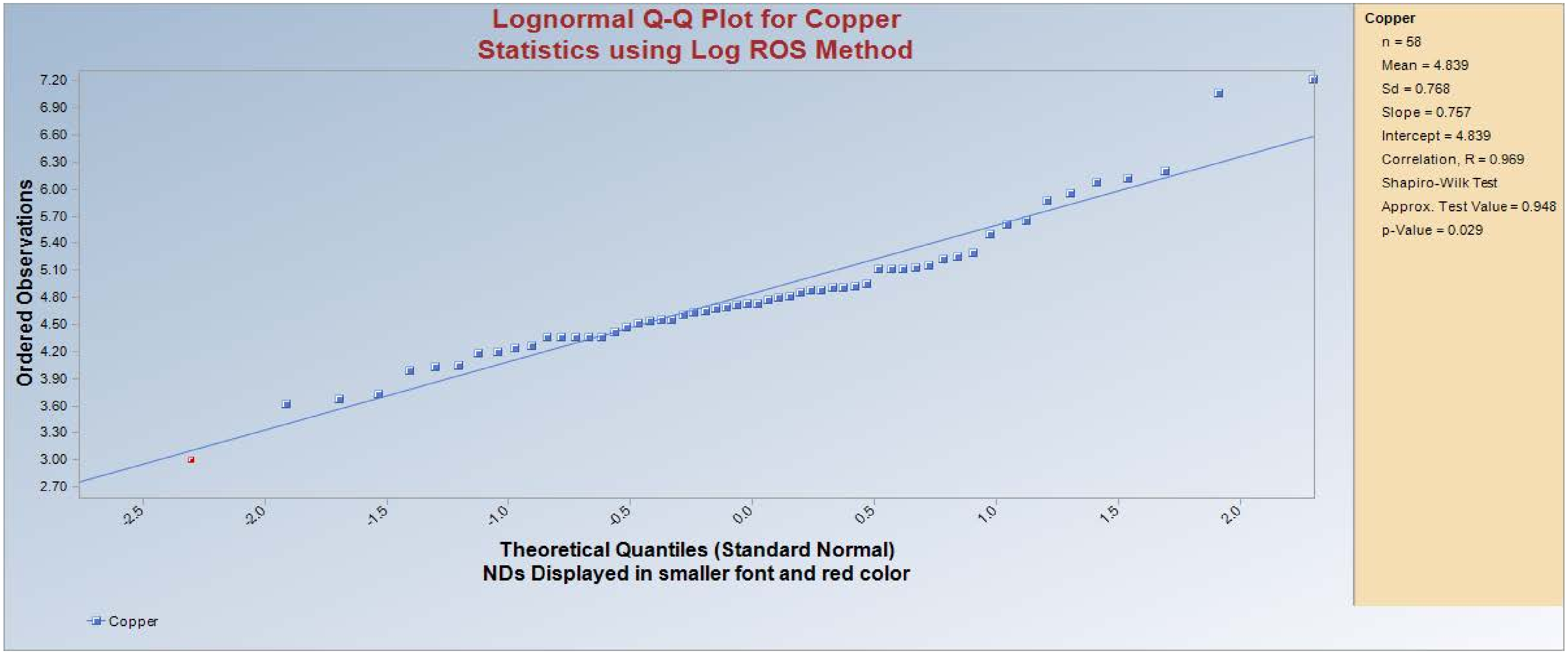


Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 58
Mean = 2.641
Sd = 0.459
Slope = 0.449
Intercept = 2.641
Correlation, R = 0.961
Shapiro-Wilk Test
Approx. Test Value = 0.936
p-Value = 0.006

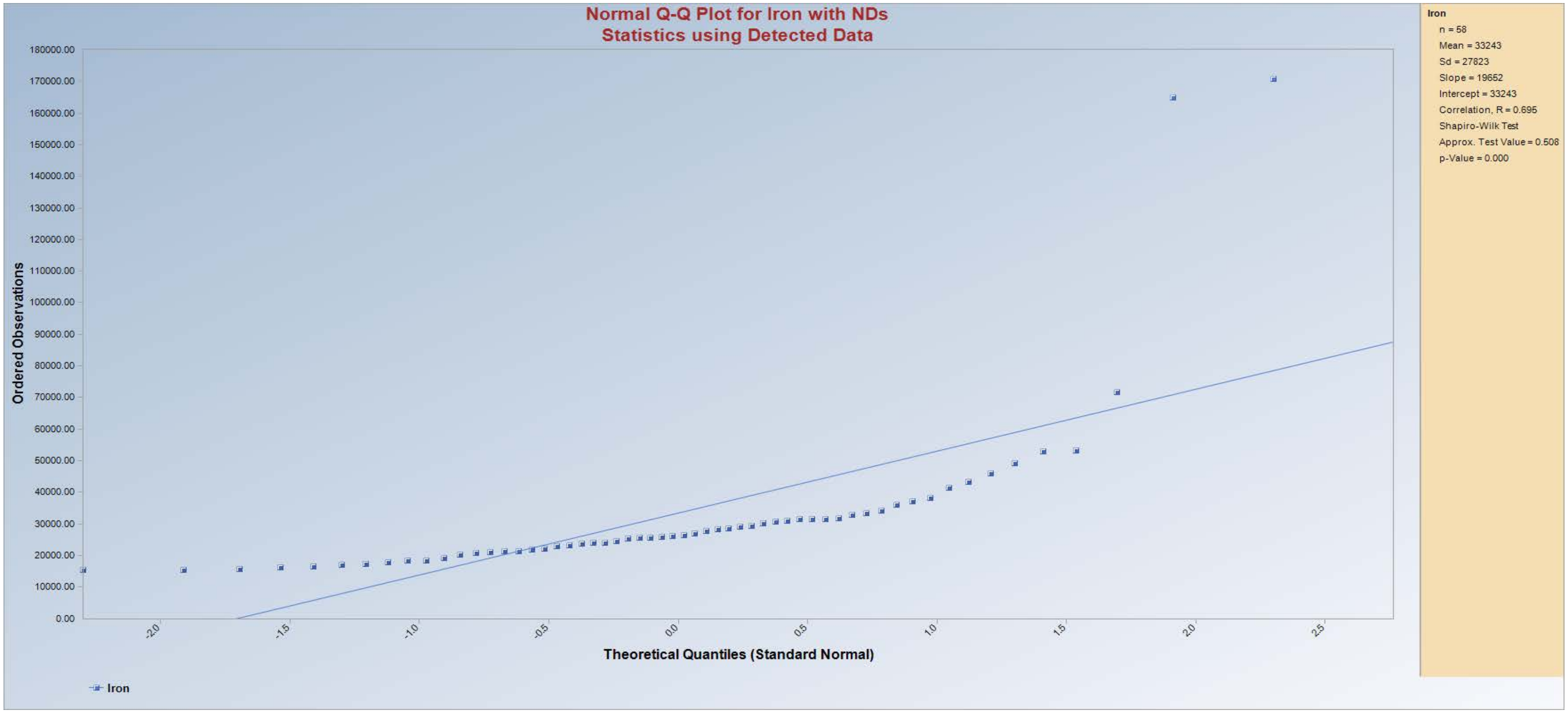


Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
Ordered Observations
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 58
Mean = 177.3
Sd = 237.3
Slope = 179.5
Intercept = 177.3
Correlation, R = 0.744
Shapiro-Wilk Test
Approx. Test Value = 0.593
p-Value = 0.000

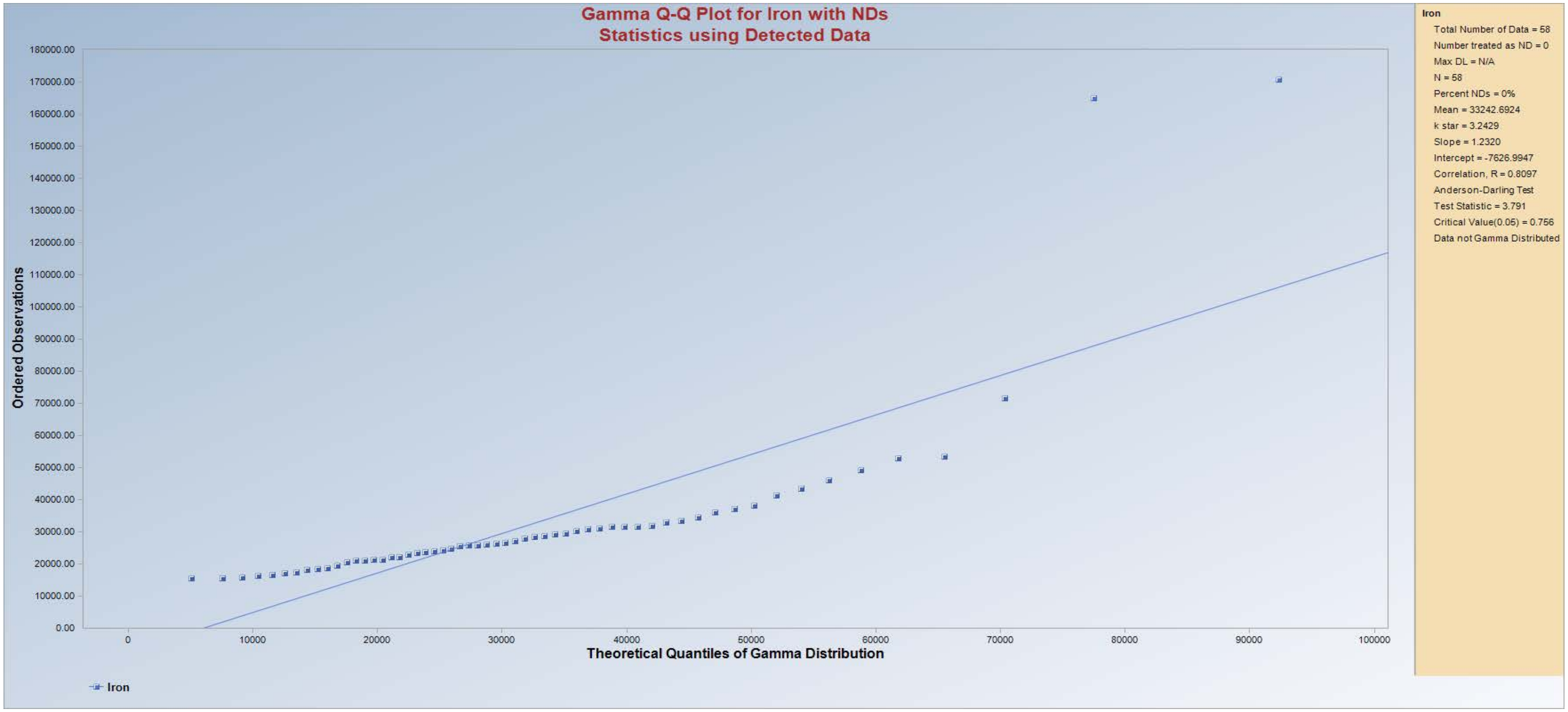

Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
Ordered Observations
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
0
100
200
300
400
500
600
700
800
900
1000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 58
Mean = 181.6875
k star = 0.8607
Slope = 1.1044
Intercept = -17.6108
Correlation, R = 0.9101
Anderson-Darling Test
Test Statistic = 4.217
Critical Value(0.05) = 0.785
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



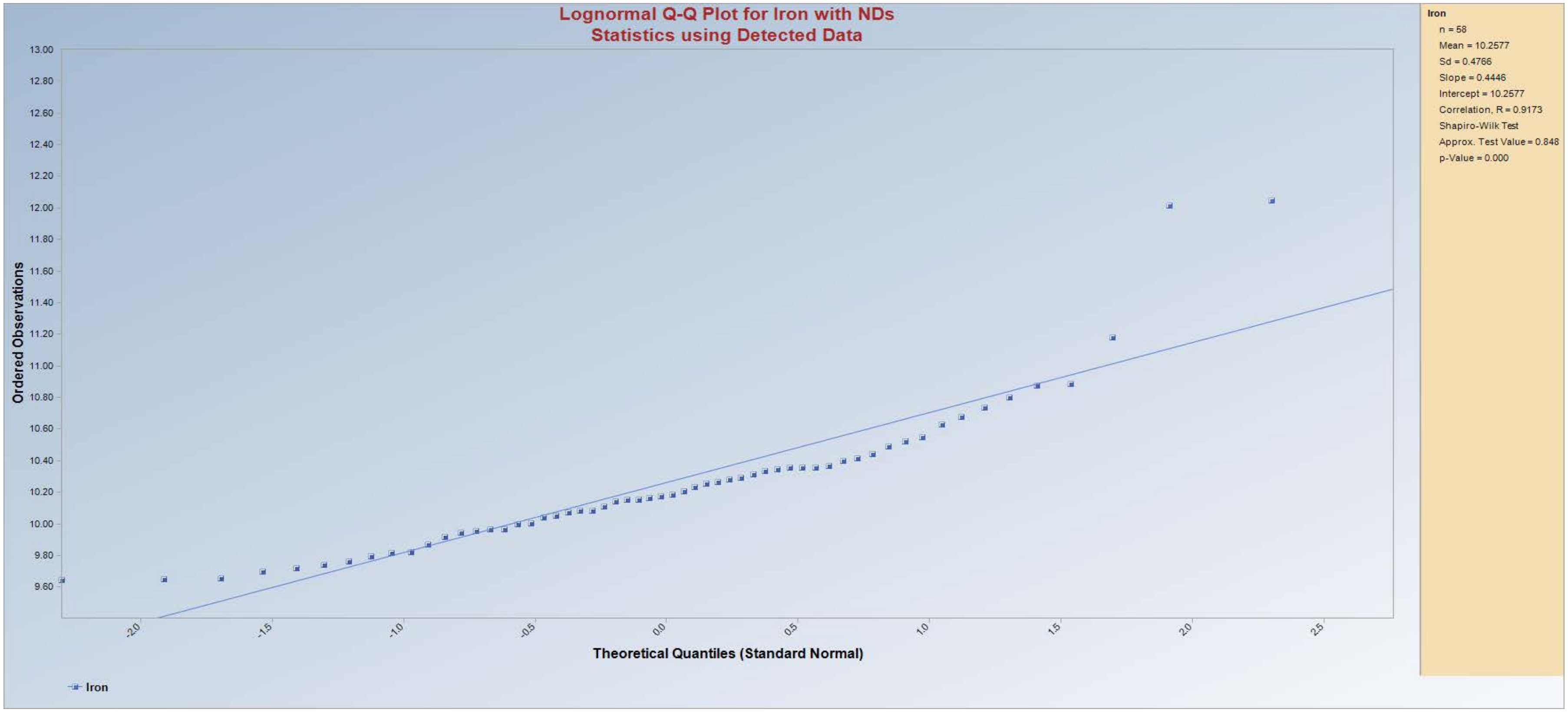
Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
Ordered Observations
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
4.20
3.90
3.60
3.30
3.00
2.70
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 58
Mean = 4.839
Sd = 0.768
Slope = 0.757
Intercept = 4.839
Correlation, R = 0.969
Shapiro-Wilk Test
Approx. Test Value = 0.948
p-Value = 0.029



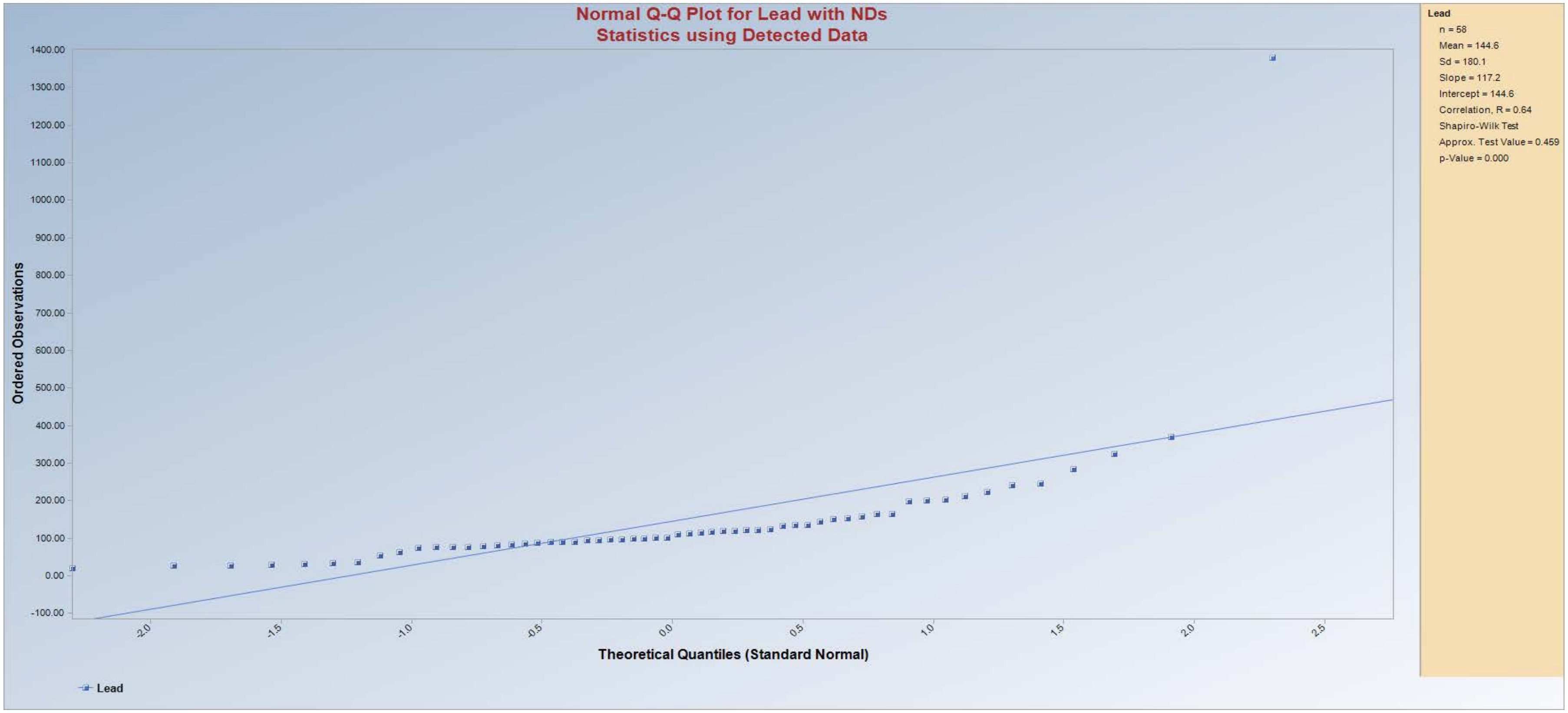
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Iron
n = 58
Mean = 33243
Sd = 27823
Slope = 19652
Intercept = 33243
Correlation, R = 0.695
Shapiro-Wilk Test
Approx. Test Value = 0.508
p-Value = 0.000



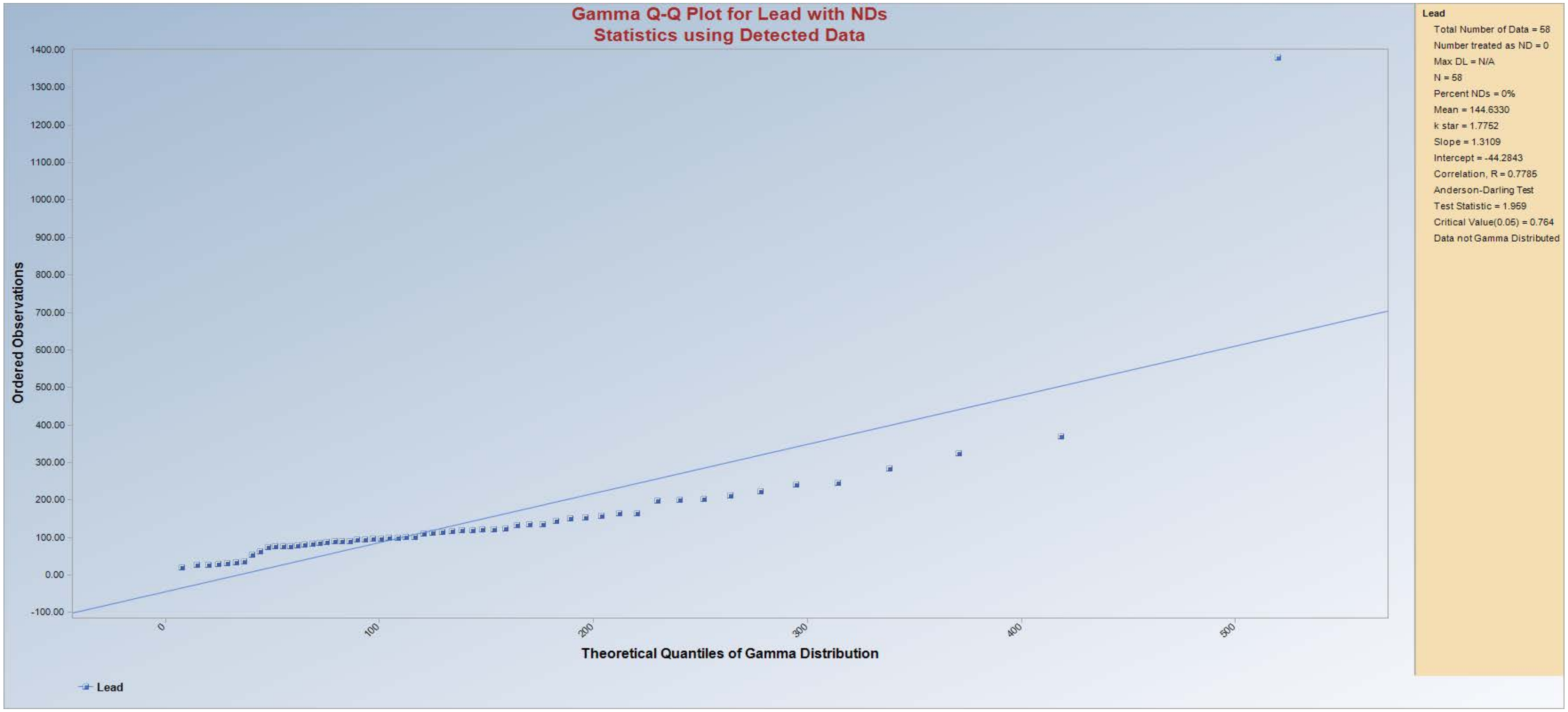
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
180000.00
170000.00
160000.00
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 58
Number treated as ND = 0
Max DL = N/A
N = 58
Percent NDs = 0%
Mean = 33242.6924
k star = 3.2429
Slope = 1.2320
Intercept = -7626.9947
Correlation, R = 0.8097
Anderson-Darling Test
Test Statistic = 3.791
Critical Value(0.05) = 0.756
Data not Gamma Distributed

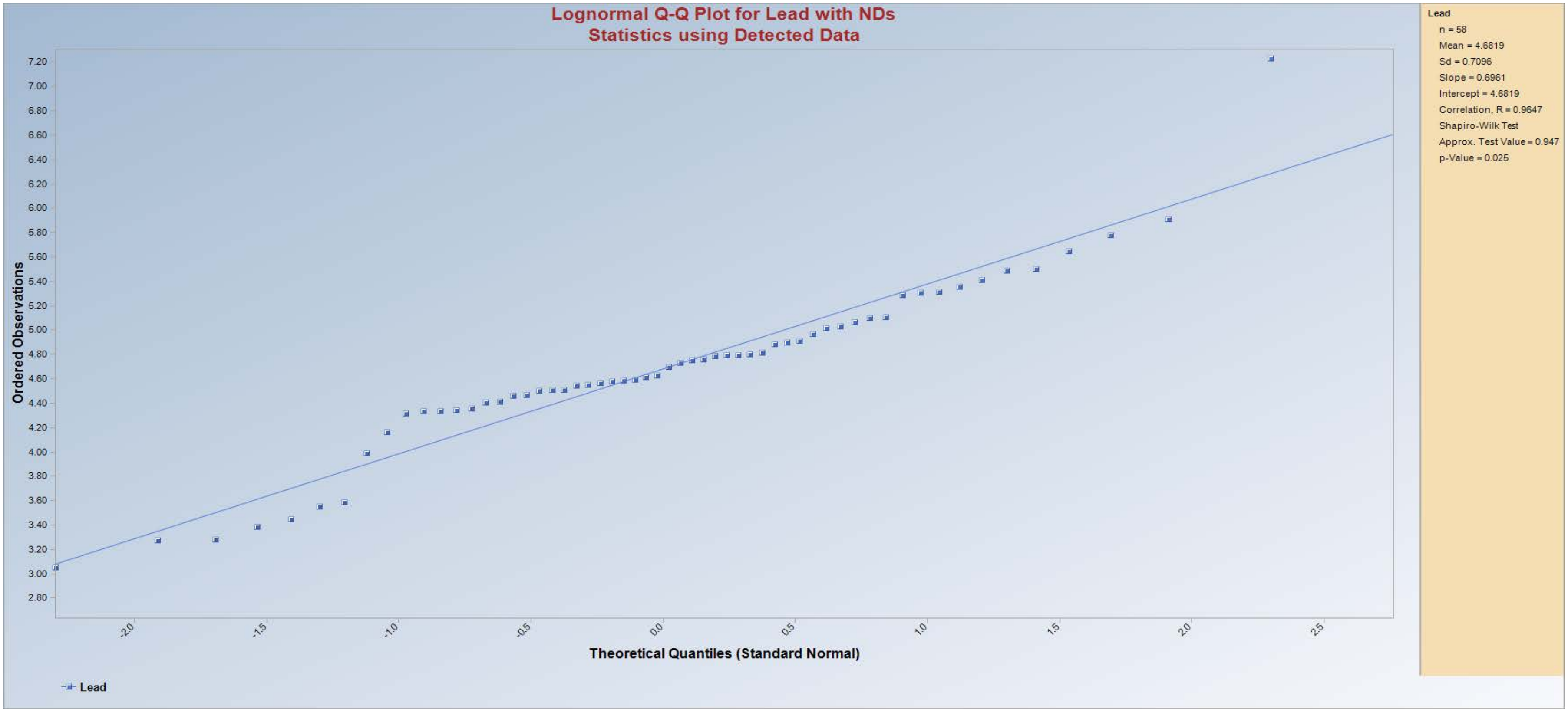


Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 58
Mean = 10.2577
Sd = 0.4766
Slope = 0.4446
Intercept = 10.2577
Correlation, R = 0.9173
Shapiro-Wilk Test
Approx. Test Value = 0.848
p-Value = 0.000



Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Lead
n = 58
Mean = 144.6
Sd = 180.1
Slope = 117.2
Intercept = 144.6
Correlation, R = 0.64
Shapiro-Wilk Test
Approx. Test Value = 0.459
p-Value = 0.000


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
Ordered Observations
0
100
200
300
400
500
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 58
Number treated as ND = 0
Max DL = N/A
N = 58
Percent NDs = 0%
Mean = 144.6330
k star = 1.7752
Slope = 1.3109
Intercept = -44.2843
Correlation, R = 0.7785
Anderson-Darling Test
Test Statistic = 1.959
Critical Value(0.05) = 0.764
Data not Gamma Distributed


Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 58
Mean = 4.6819
Sd = 0.7096
Slope = 0.6961
Intercept = 4.6819
Correlation, R = 0.9647
Shapiro-Wilk Test
Approx. Test Value = 0.947
p-Value = 0.025

Attachment A7
ProUCL Output for EU 6 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Sheet3.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	36	Number of Detected Data	28
Number of Distinct Detected Data	27	Number of Non-Detect Data	8
		Percent Non-Detects	22.22%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	11.07	Minimum Detected	2.404
Maximum Detected	1010	Maximum Detected	6.918
Mean of Detected	115.2	Mean of Detected	3.773
SD of Detected	226.7	SD of Detected	1.201
Minimum Non-Detect	15.42	Minimum Non-Detect	2.736
Maximum Non-Detect	67.48	Maximum Non-Detect	4.212

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	29
Number treated as Detected	7
Single DL Non-Detect Percentage	80.56%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.503	Shapiro Wilk Test Statistic	0.813
5% Shapiro Wilk Critical Value	0.924	5% Shapiro Wilk Critical Value	0.924
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	92.93	Mean	3.509
SD	203.6	SD	1.189
95% DL/2 (t) UCL	150.3	95% H-Stat (DL/2) UCL	114.3
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	3.484
		SD in Log Scale	1.229
		Mean in Original Scale	92.77
		SD in Original Scale	203.7
		95% t UCL	150.1
		95% Percentile Bootstrap UCL	153.1
		95% BCA Bootstrap UCL	177.2
		95% H-UCL	120.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.586	Data do not follow a Discernable Distribution (0.05)	
Theta Star	196.6		
nu star	32.83		
A-D Test Statistic	3.555	Nonparametric Statistics	
5% A-D Critical Value	0.797	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.797	Mean	93.41
5% K-S Critical Value	0.173	SD	200.6
Data not Gamma Distributed at 5% Significance Level		SE of Mean	34.04
		95% KM (t) UCL	150.9
Assuming Gamma Distribution		95% KM (z) UCL	149.4
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	150.3
Minimum	0.000001	95% KM (bootstrap t) UCL	225.6
Maximum	1010	95% KM (BCA) UCL	156.2
Mean	89.69	95% KM (Percentile Bootstrap) UCL	150.2
Median	21.99	95% KM (Chebyshev) UCL	241.8
SD	204.9	97.5% KM (Chebyshev) UCL	306
k star	0.181	99% KM (Chebyshev) UCL	432.1
Theta star	495.3		
Nu star	13.04	Potential UCLs to Use	
AppChi2	5.919	97.5% KM (Chebyshev) UCL	306
95% Gamma Approximate UCL (Use when n >= 40)	197.6		
95% Adjusted Gamma UCL (Use when n < 40)	205.1		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics			
Number of Valid Data	36	Number of Detected Data	35
Number of Distinct Detected Data	35	Number of Non-Detect Data	1
		Percent Non-Detects	2.78%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.046	Minimum Detected	1.398
Maximum Detected	410	Maximum Detected	6.016
Mean of Detected	155.6	Mean of Detected	4.753
SD of Detected	107.9	SD of Detected	0.902
Minimum Non-Detect	26.92	Minimum Non-Detect	3.293
Maximum Non-Detect	26.92	Maximum Non-Detect	3.293

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Test Statistic	0.897
5% Shapiro Wilk Critical Value	0.934	5% Shapiro Wilk Critical Value	0.934
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	151.7	Mean	4.693
SD	109	SD	0.958
95% DL/2 (t) UCL	182.3	95% H-Stat (DL/2) UCL	252.3
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	149.5	Mean in Log Scale	4.701
SD	111.2	SD in Log Scale	0.941
95% MLE (t) UCL	180.8	Mean in Original Scale	151.8
95% MLE (Tiku) UCL	180	SD in Original Scale	108.8
		95% t UCL	182.4
		95% Percentile Bootstrap UCL	181.6
		95% BCA Bootstrap UCL	182.8
		95% H UCL	247.8
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.707	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	91.18		
nu star	119.5		
A-D Test Statistic	0.327	Nonparametric Statistics	
5% A-D Critical Value	0.762	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.762	Mean	151.4
5% K-S Critical Value	0.151	SD	107.8
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	18.23
		95% KM (t) UCL	182.2
Assuming Gamma Distribution		95% KM (z) UCL	181.4
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	181.6
Minimum	0.000001	95% KM (bootstrap t) UCL	187.3
Maximum	410	95% KM (BCA) UCL	183.7
Mean	151.3	95% KM (Percentile Bootstrap) UCL	181.9
Median	120.5	95% KM (Chebyshev) UCL	230.9
SD	109.5	97.5% KM (Chebyshev) UCL	265.3
k star	0.718	99% KM (Chebyshev) UCL	332.8
Theta star	210.6		
Nu star	51.72	Potential UCLs to Use	
AppChi2	36.2	95% KM (Chebyshev) UCL	230.9
95% Gamma Approximate UCL (Use when n >= 40)	216.1		
95% Adjusted Gamma UCL (Use when n < 40)	219.7		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	36	Number of Distinct Observations	36
Raw Statistics		**Log-transformed Statistics**	
Minimum	11792	Minimum of Log Data	9.375
Maximum	77437	Maximum of Log Data	11.26
Mean	33338	Mean of log Data	10.3
Geometric Mean	29724	SD of log Data	0.482
Median	28778		
SD	16826		
Std. Error of Mean	2804		
Coefficient of Variation	0.505		
Skewness	1.059		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	38076	95% H-UCL	38954
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	45406
95% Adjusted-CLT UCL (Chen-1995)	38479	97.5% Chebyshev (MVUE) UCL	50661
95% Modified-t UCL (Johnson-1978)	38158	99% Chebyshev (MVUE) UCL	60984
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.16	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	8014		
MLE of Mean	33338		
MLE of Standard Deviation	16345		
nu star	299.5		
Approximate Chi Square Value (.05)	260.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	37950
Adjusted Chi Square Value	258.8	95% Jackknife UCL	38076
		95% Standard Bootstrap UCL	37836
Anderson-Darling Test Statistic	0.63	95% Bootstrap-t UCL	38678
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	38657
Kolmogorov-Smirnov Test Statistic	0.115	95% Percentile Bootstrap UCL	37849
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	38288
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	45561
		97.5% Chebyshev(Mean, Sd) UCL	50850
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	61240
95% Approximate Gamma UCL (Use when n >= 40)	38342		
95% Adjusted Gamma UCL (Use when n < 40)	38586		
Potential UCL to Use		Use 95% Approximate Gamma UCL	38342

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	36	Number of Distinct Observations	36

Raw Statistics		Log-transformed Statistics	
Minimum	108.8	Minimum of Log Data	4.69
Maximum	6780	Maximum of Log Data	8.822
Mean	919.3	Mean of log Data	6.191
Geometric Mean	488.4	SD of log Data	1.023
Median	357		
SD	1407		
Std. Error of Mean	234.5		
Coefficient of Variation	1.531		
Skewness	3.014		

Relevant UCL Statistics

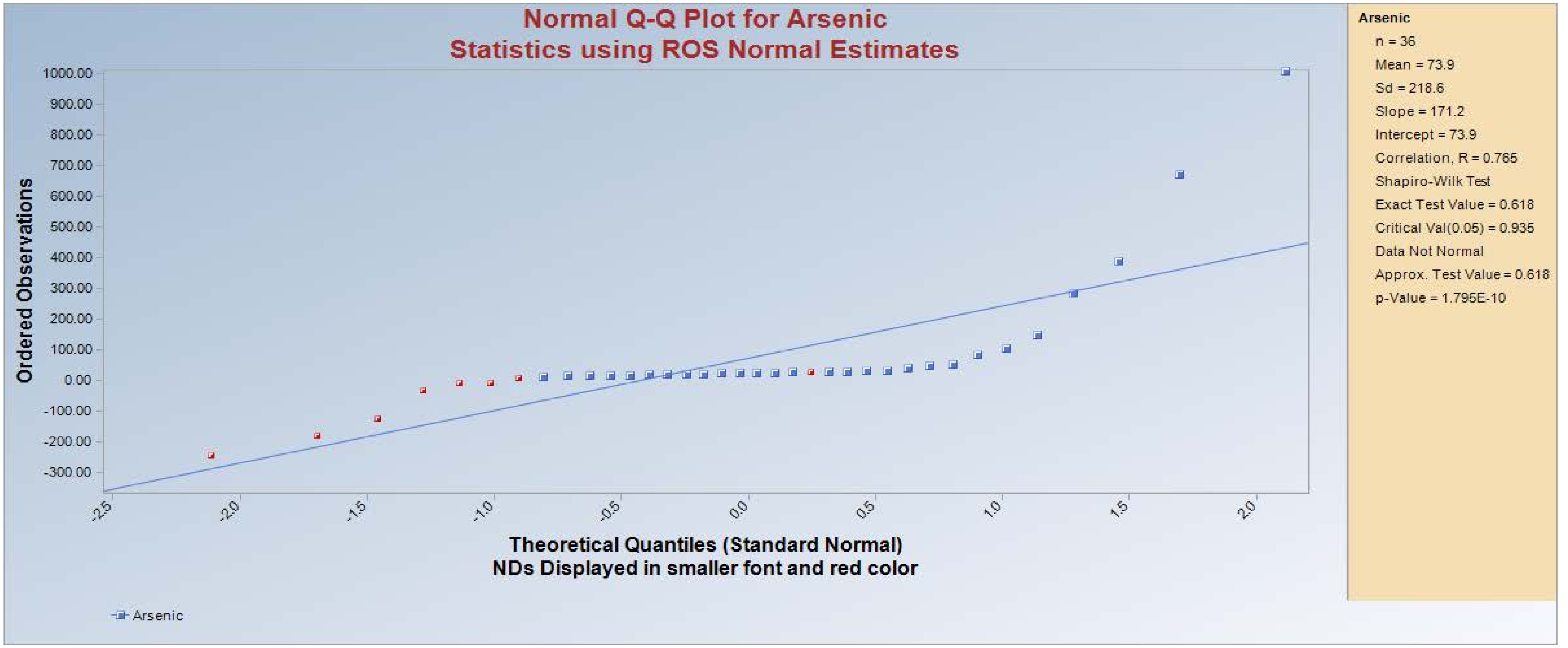
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.577	Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

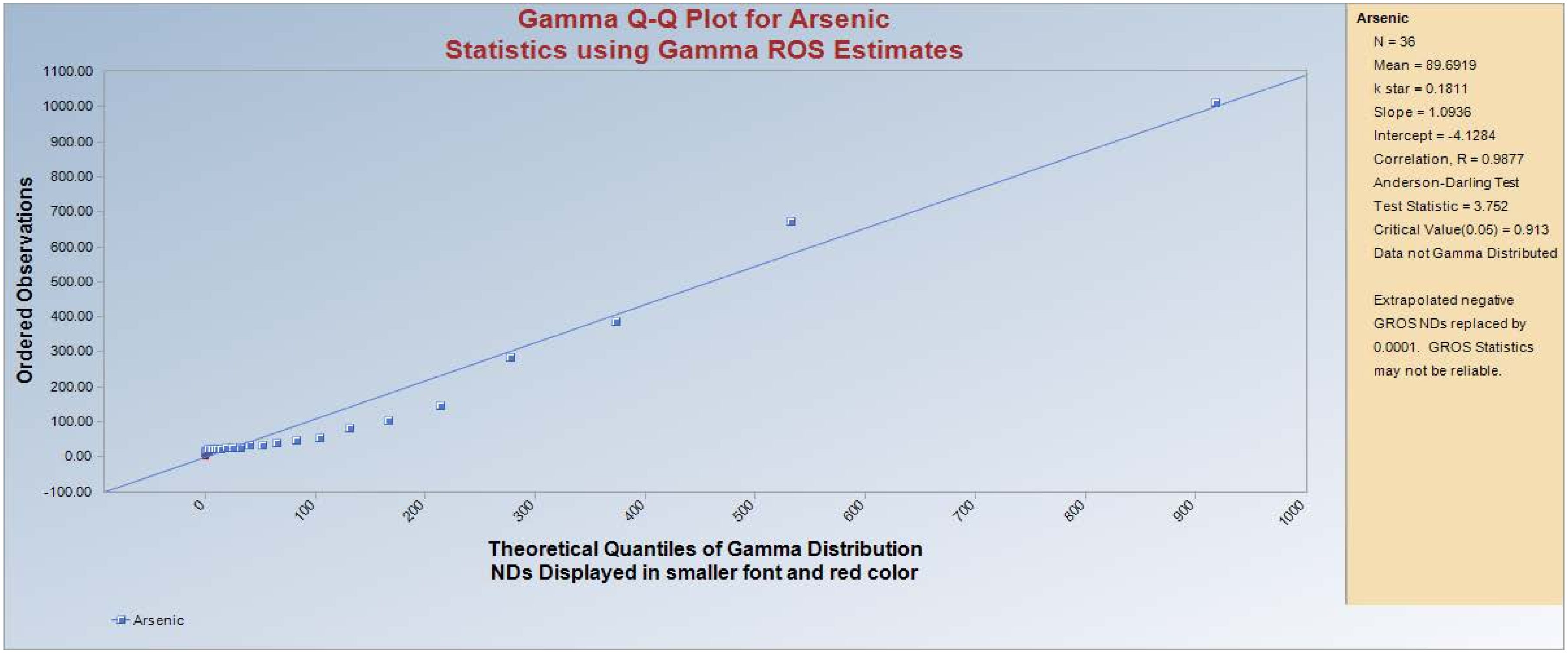
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1316	95% H-UCL	1250
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1506
95% Adjusted-CLT UCL (Chen-1995)	1431	97.5% Chebyshev (MVUE) UCL	1808
95% Modified-t UCL (Johnson-1978)	1335	99% Chebyshev (MVUE) UCL	2402

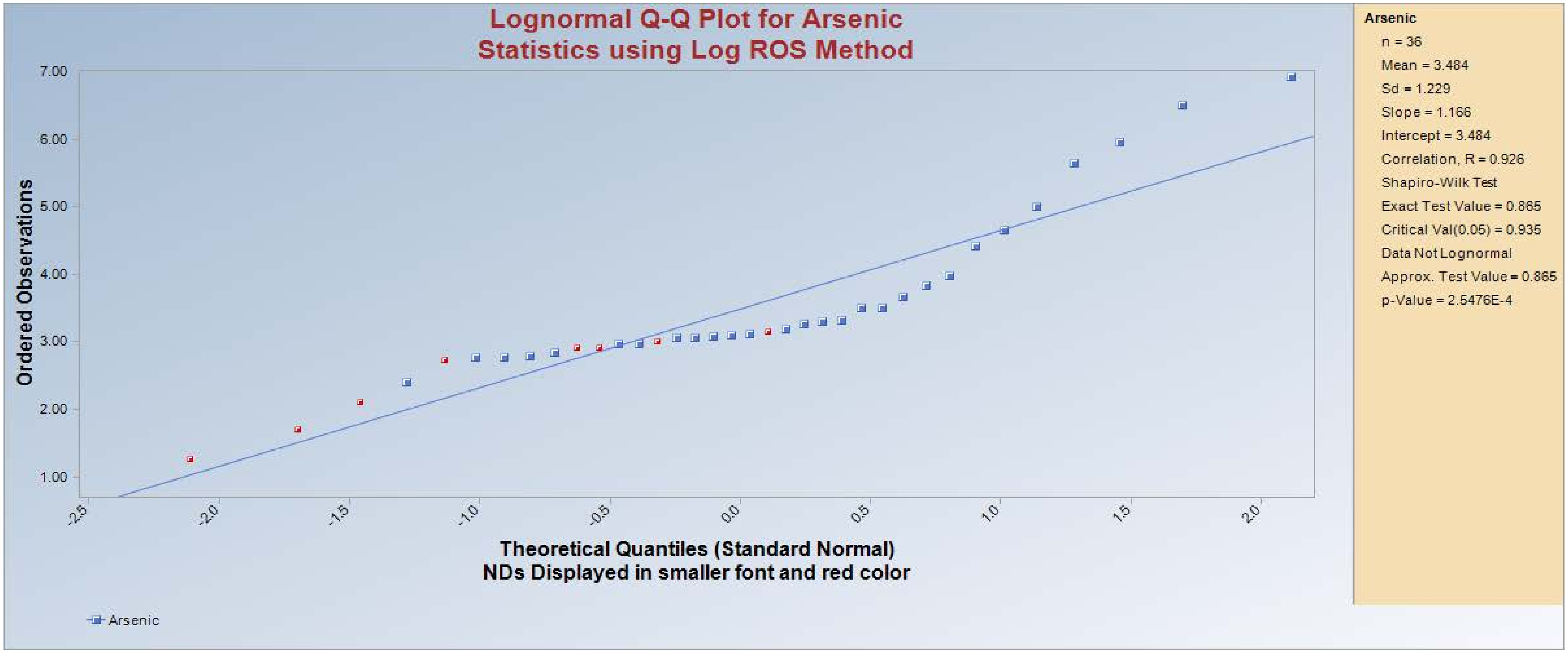
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.863	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1065		
MLE of Mean	919.3		
MLE of Standard Deviation	989.3		
nu star	62.16		
Approximate Chi Square Value (.05)	45.03	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	1305
Adjusted Chi Square Value	44.37	95% Jackknife UCL	1316
		95% Standard Bootstrap UCL	1310
Anderson-Darling Test Statistic	2.406	95% Bootstrap-t UCL	1698
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL	1803
Kolmogorov-Smirnov Test Statistic	0.237	95% Percentile Bootstrap UCL	1344
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL	1463
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1942
		97.5% Chebyshev(Mean, Sd) UCL	2384
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3253
95% Approximate Gamma UCL (Use when n >= 40)	1269		
95% Adjusted Gamma UCL (Use when n < 40)	1288		

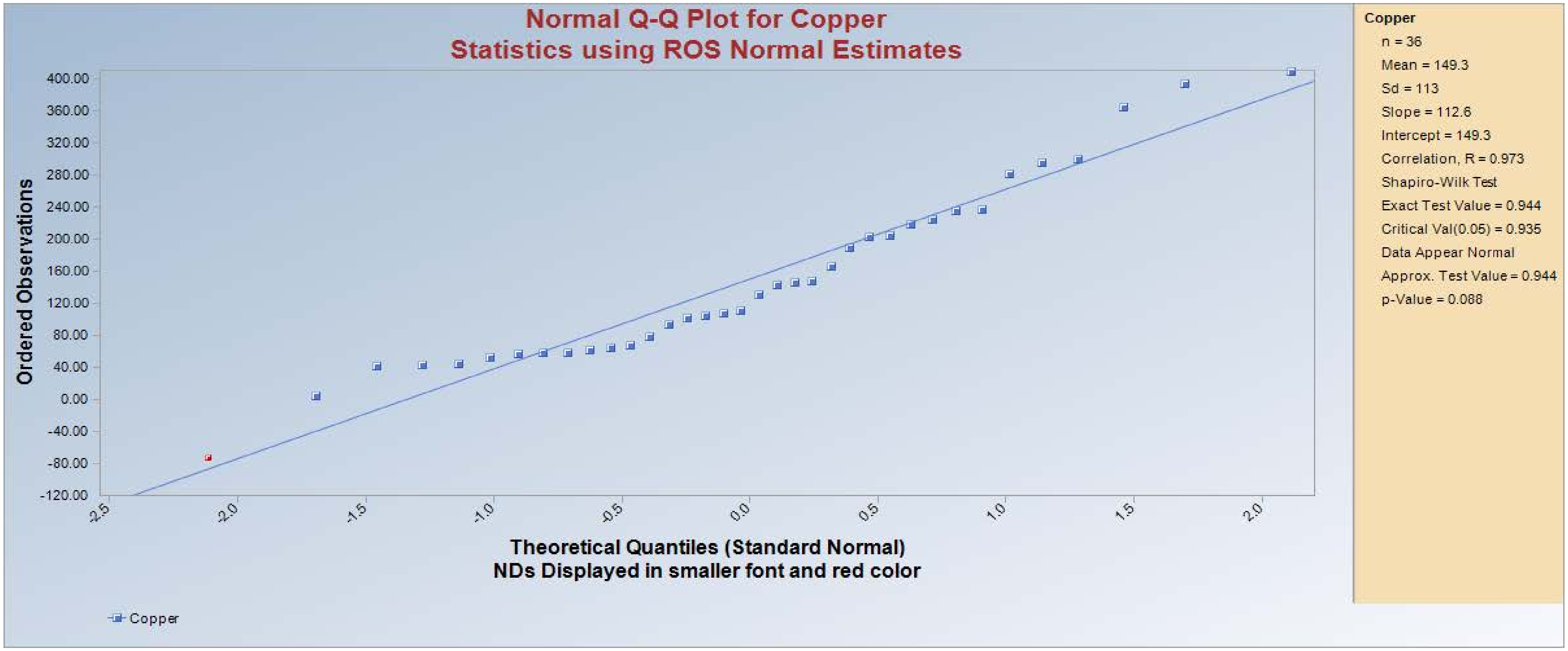
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	1942

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

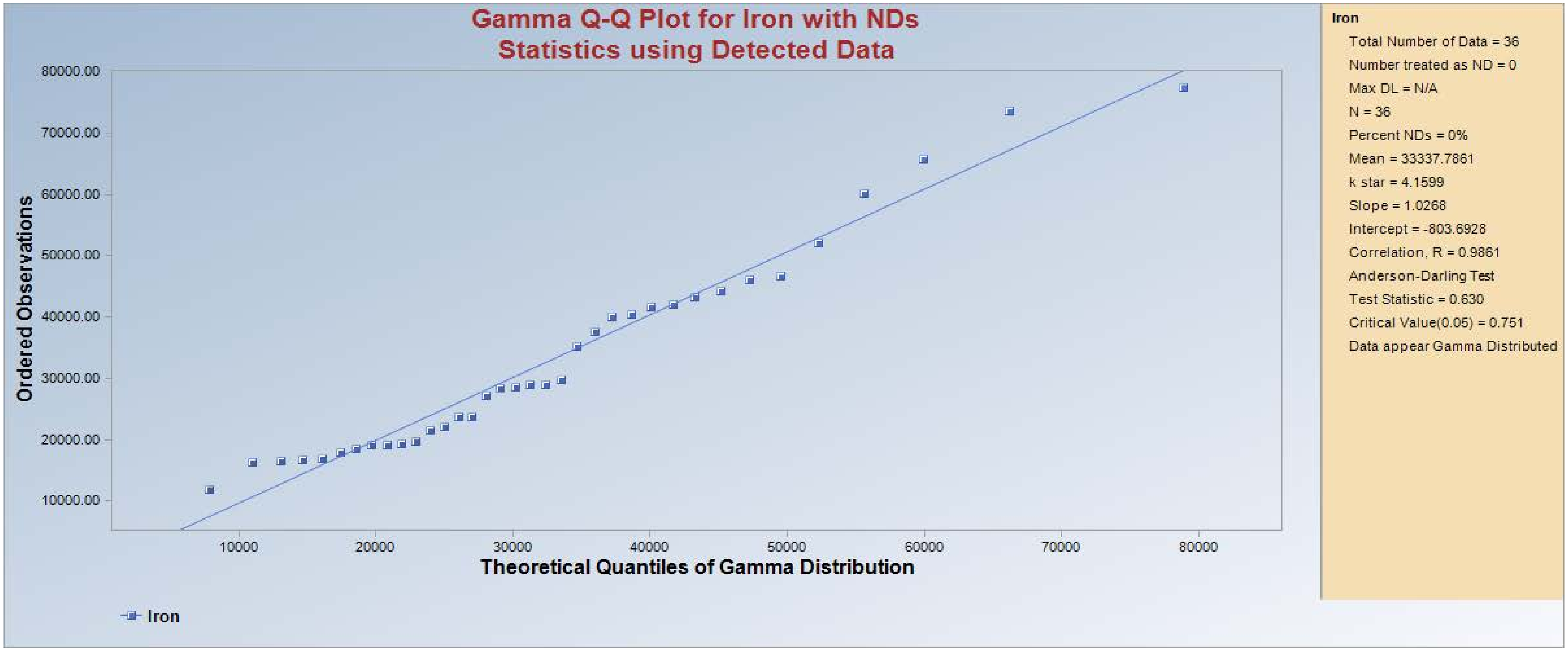

Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-200.00
-300.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 36
Mean = 73.9
Sd = 218.6
Slope = 171.2
Intercept = 73.9
Correlation, R = 0.765
Shapiro-Wilk Test
Exact Test Value = 0.618
Critical Val(0.05) = 0.935
Data Not Normal
Approx. Test Value = 0.618
p-Value = 1.795E-10

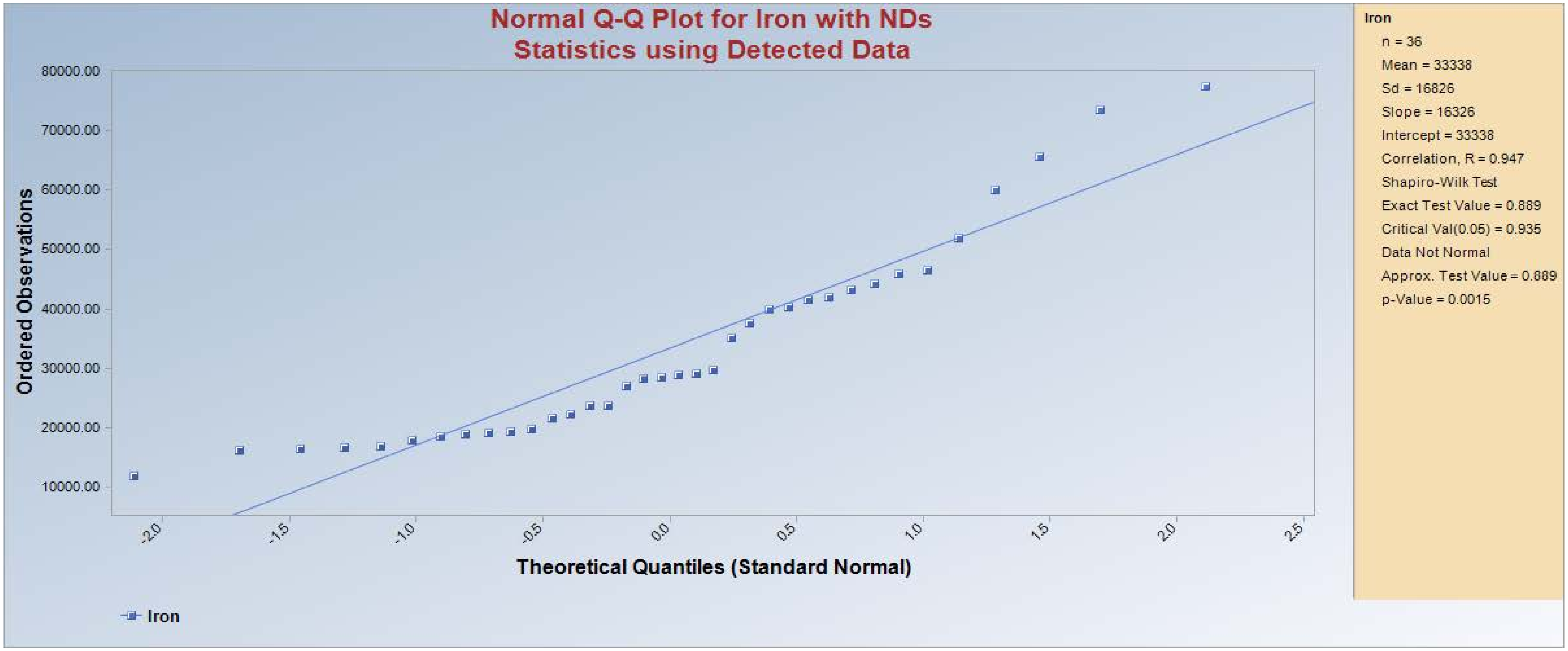

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
0
100
200
300
400
500
600
700
800
900
1000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 36
Mean = 89.6919
k star = 0.1811
Slope = 1.0936
Intercept = -4.1284
Correlation, R = 0.9877
Anderson-Darling Test
Test Statistic = 3.752
Critical Value(0.05) = 0.913
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

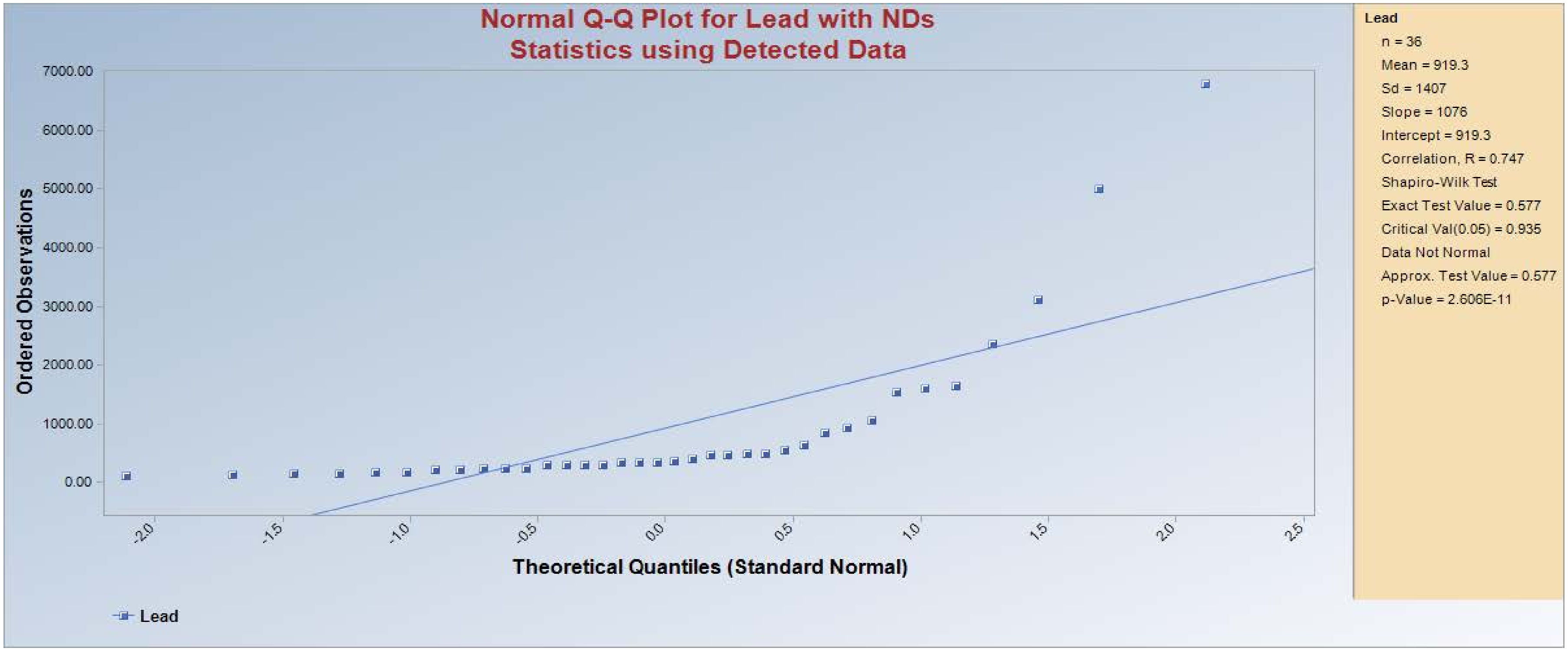

Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
7.00
6.00
5.00
4.00
3.00
2.00
1.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 36
Mean = 3.484
Sd = 1.229
Slope = 1.166
Intercept = 3.484
Correlation, R = 0.926
Shapiro-Wilk Test
Exact Test Value = 0.865
Critical Val(0.05) = 0.935
Data Not Lognormal
Approx. Test Value = 0.865
p-Value = 2.5476E-4



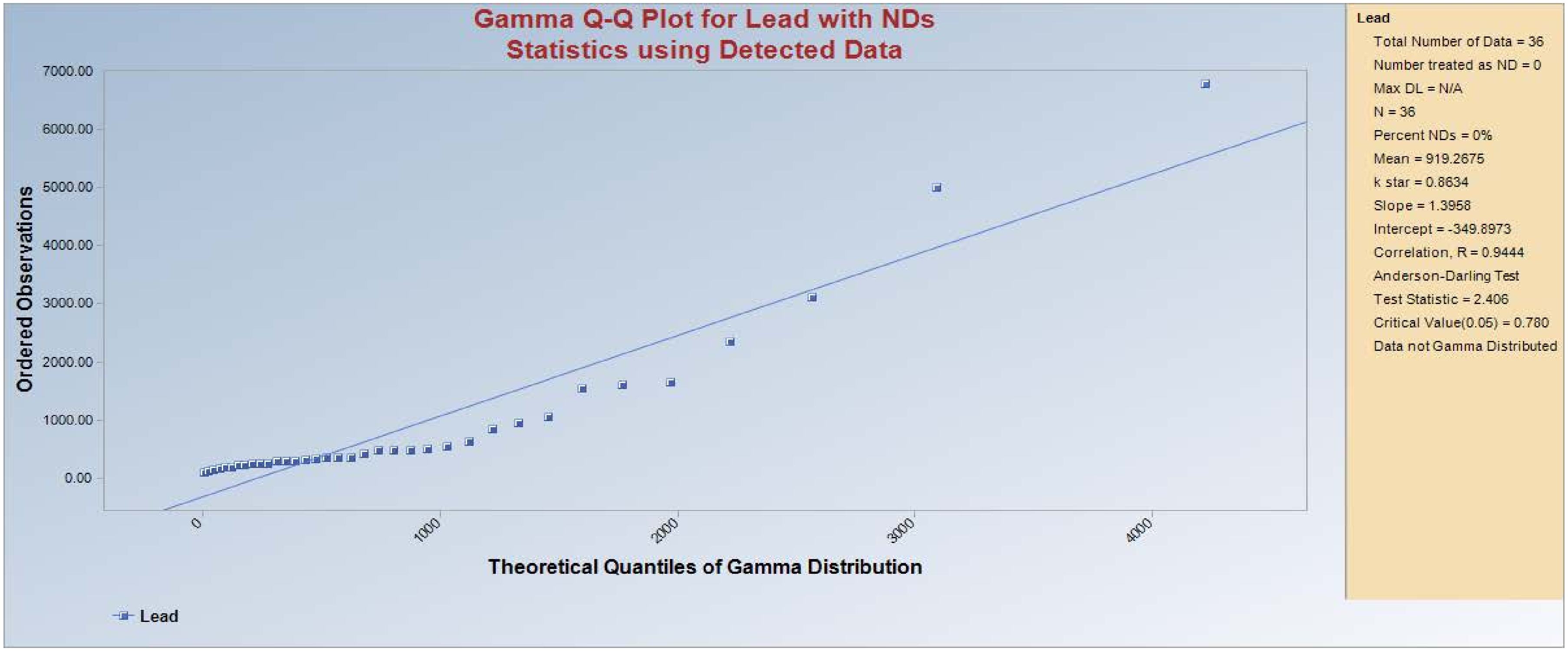
Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
Ordered Observations
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
40.00
0.00
-40.00
-80.00
-120.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 36
Mean = 149.3
Sd = 113
Slope = 112.6
Intercept = 149.3
Correlation, R = 0.973
Shapiro-Wilk Test
Exact Test Value = 0.944
Critical Val(0.05) = 0.935
Data Appear Normal
Approx. Test Value = 0.944
p-Value = 0.088

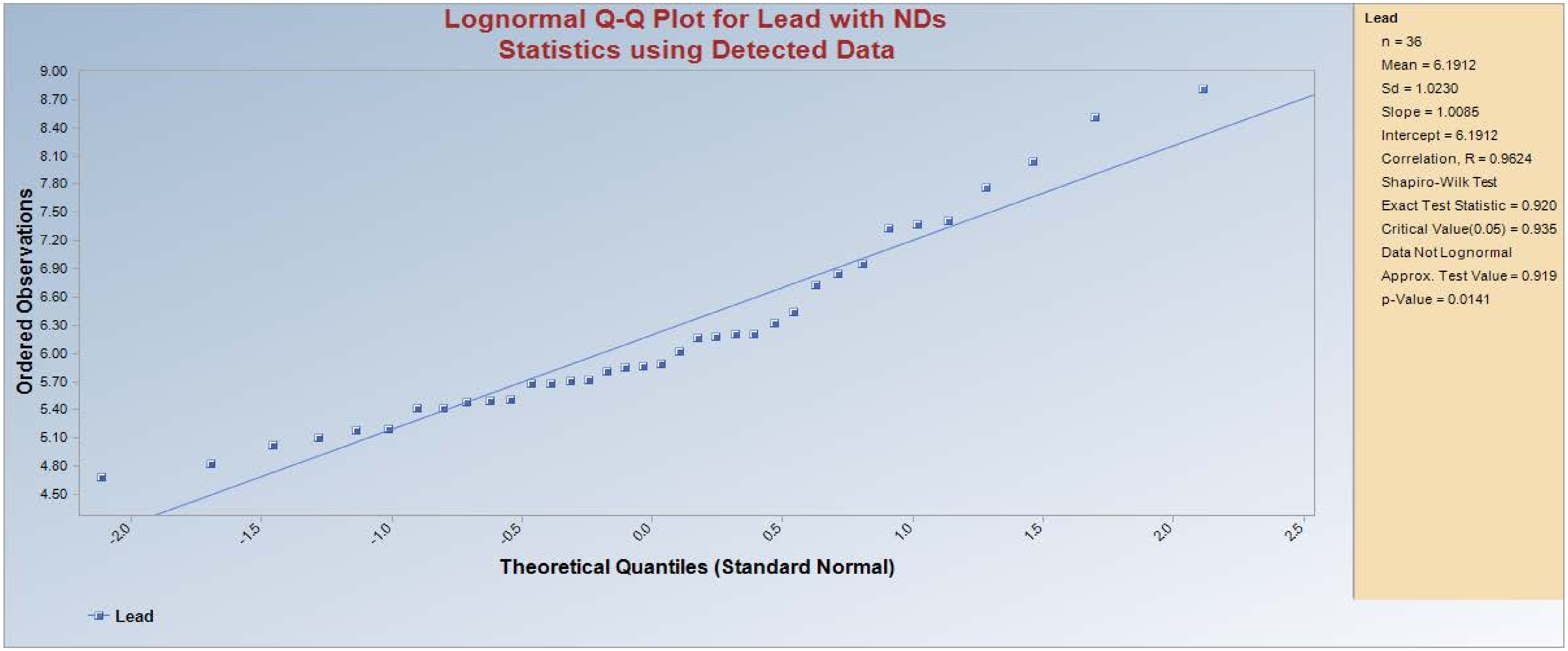

Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
10000
20000
30000
40000
50000
60000
70000
80000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 36
Number treated as ND = 0
Max DL = N/A
N = 36
Percent NDs = 0%
Mean = 33337.7861
k star = 4.1599
Slope = 1.0268
Intercept = -803.6928
Correlation, R = 0.9861
Anderson-Darling Test
Test Statistic = 0.630
Critical Value(0.05) = 0.751
Data appear Gamma Distributed


Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 36
Mean = 33338
Sd = 16826
Slope = 16326
Intercept = 33338
Correlation, R = 0.947
Shapiro-Wilk Test
Exact Test Value = 0.889
Critical Val(0.05) = 0.935
Data Not Normal
Approx. Test Value = 0.889
p-Value = 0.0015



Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 36
Mean = 919.3
Sd = 1407
Slope = 1076
Intercept = 919.3
Correlation, R = 0.747
Shapiro-Wilk Test
Exact Test Value = 0.577
Critical Val(0.05) = 0.935
Data Not Normal
Approx. Test Value = 0.577
p-Value = 2.606E-11


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
0
1000
2000
3000
4000
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 36
Number treated as ND = 0
Max DL = N/A
N = 36
Percent NDs = 0%
Mean = 919.2675
k star = 0.8634
Slope = 1.3958
Intercept = -349.8973
Correlation, R = 0.9444
Anderson-Darling Test
Test Statistic = 2.406
Critical Value(0.05) = 0.780
Data not Gamma Distributed


Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
9.00
8.70
8.40
8.10
7.80
7.50
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 36
Mean = 6.1912
Sd = 1.0230
Slope = 1.0086
Intercept = 6.1912
Correlation, R = 0.9624
Shapiro-Wilk Test
Exact Test Statistic = 0.920
Critical Value(0.05) = 0.935
Data Not Lognormal
Approx. Test Value = 0.919
p-Value = 0.0141

Attachment A8
ProUCL Output for EU 7 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Sheet3.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	8	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	3
		Percent Non-Detects	37.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	26.53	Minimum Detected	3.278
Maximum Detected	115.6	Maximum Detected	4.75
Mean of Detected	49.71	Mean of Detected	3.738
SD of Detected	37.4	SD of Detected	0.596
Minimum Non-Detect	14.23	Minimum Non-Detect	2.655
Maximum Non-Detect	60.82	Maximum Non-Detect	4.108

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	7
Number treated as Detected	1
Single DL Non-Detect Percentage	87.50%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.702	Shapiro Wilk Test Statistic	0.812
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	36.84	Mean	3.278
SD	34.11	SD	0.886
95% DL/2 (t) UCL	59.69	95% H-Stat (DL/2) UCL	112.9
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.342
		SD in Log Scale	0.747
		Mean in Original Scale	36.94
		SD in Original Scale	33.56
		95% t UCL	59.41
		95% Percentile Bootstrap UCL	57.74
		95% BCA Bootstrap UCL	68.04
		95% H-UCL	83.25

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.388	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	35.82		
nu star	13.88		
A-D Test Statistic	0.668	Nonparametric Statistics	
5% A-D Critical Value	0.682	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.682	Mean	41.58
5% K-S Critical Value	0.359	SD	28.57
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	11.33
		95% KM (t) UCL	63.05
Assuming Gamma Distribution		95% KM (z) UCL	60.22
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	61.67
Minimum	0.000001	95% KM (bootstrap t) UCL	168.8
Maximum	115.6	95% KM (BCA) UCL	63.56
Mean	33.01	95% KM (Percentile Bootstrap) UCL	62.47
Median	28.01	95% KM (Chebyshev) UCL	90.98
SD	36.79	97.5% KM (Chebyshev) UCL	112.4
k star	0.193	99% KM (Chebyshev) UCL	154.3
Theta star	170.9		
Nu star	3.091	Potential UCLs to Use	
AppChi2	0.4	95% KM (Percentile Bootstrap) UCL	62.47
95% Gamma Approximate UCL (Use when n >= 40)	255.2		
95% Adjusted Gamma UCL (Use when n < 40)	442.6		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		Log-transformed Statistics	
Minimum	88.34	Minimum of Log Data	4.481
Maximum	579.5	Maximum of Log Data	6.362
Mean	348.6	Mean of log Data	5.707
Geometric Mean	300.9	SD of log Data	0.646
Median	387		
SD	166.5		
Std. Error of Mean	58.88		
Coefficient of Variation	0.478		
Skewness	-0.425		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Test Statistic	0.866
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	460.2	95% H-UCL	703
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	723.1
95% Adjusted-CLT UCL (Chen-1995)	436	97.5% Chebyshev (MVUE) UCL	880.3
95% Modified-t UCL (Johnson-1978)	458.7	99% Chebyshev (MVUE) UCL	1189

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.305	Data appear Normal at 5% Significance Level	
Theta Star	151.2		
MLE of Mean	348.6		
MLE of Standard Deviation	229.6		
nu star	36.89		
Approximate Chi Square Value (.05)	23.98	Nonparametric Statistics	
Adjusted Level of Significance	0.0195	95% CLT UCL	445.5
Adjusted Chi Square Value	21.39	95% Jackknife UCL	460.2
		95% Standard Bootstrap UCL	442.1
Anderson-Darling Test Statistic	0.452	95% Bootstrap-t UCL	450.3
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL	430.1
Kolmogorov-Smirnov Test Statistic	0.253	95% Percentile Bootstrap UCL	434.5
Kolmogorov-Smirnov 5% Critical Value	0.296	95% BCA Bootstrap UCL	435
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	605.3
		97.5% Chebyshev(Mean, Sd) UCL	716.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	934.5
95% Approximate Gamma UCL (Use when n >= 40)	536.2		
95% Adjusted Gamma UCL (Use when n < 40)	601.2		

Potential UCL to Use		Use 95% Student's-t UCL	460.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Iron

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	28400	Minimum of Log Data	10.25
Maximum	95905	Maximum of Log Data	11.47
Mean	56829	Mean of log Data	10.89
Geometric Mean	53408	SD of log Data	0.38
Median	51484		
SD	21332		
Std. Error of Mean	7542		
Coefficient of Variation	0.375		
Skewness	0.695		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.818

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	71118

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	71215
95% Modified-t UCL (Johnson-1978)	71427

Gamma Distribution Test

k star (bias corrected)	5.218
Theta Star	10890
MLE of Mean	56829
MLE of Standard Deviation	24878
nu star	83.49
Approximate Chi Square Value (.05)	63.43
Adjusted Level of Significance	0.0195
Adjusted Chi Square Value	59.03
Anderson-Darling Test Statistic	0.158
Anderson-Darling 5% Critical Value	0.716
Kolmogorov-Smirnov Test Statistic	0.131
Kolmogorov-Smirnov 5% Critical Value	0.295

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL (Use when n >= 40)	74800
95% Adjusted Gamma UCL (Use when n < 40)	80382

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.989
Shapiro Wilk Critical Value	0.818

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	78407
95% Chebyshev (MVUE) UCL	90435
97.5% Chebyshev (MVUE) UCL	104956
99% Chebyshev (MVUE) UCL	133480

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	69235
95% Jackknife UCL	71118
95% Standard Bootstrap UCL	68595
95% Bootstrap-t UCL	75691
95% Hall's Bootstrap UCL	77790
95% Percentile Bootstrap UCL	68153
95% BCA Bootstrap UCL	69986
95% Chebyshev(Mean, Sd) UCL	89704
97.5% Chebyshev(Mean, Sd) UCL	103929
99% Chebyshev(Mean, Sd) UCL	131871

Potential UCL to Use — Use 95% Student's-t UCL 71118

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	123.4	Minimum of Log Data	4.816
Maximum	3480	Maximum of Log Data	8.155
Mean	708.7	Mean of log Data	5.962
Geometric Mean	388.4	SD of log Data	0.995
Median	286.6		
SD	1128		
Std. Error of Mean	398.7		
Coefficient of Variation	1.591		
Skewness	2.751		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.527	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1464	95% H-UCL	2304
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1509
95% Adjusted-CLT UCL (Chen-1995)	1779	97.5% Chebyshev (MVUE) UCL	1907
95% Modified-t UCL (Johnson-1978)	1529	99% Chebyshev (MVUE) UCL	2690
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.686	Data appear Lognormal at 5% Significance Level	
Theta Star	1034		
MLE of Mean	708.7		
MLE of Standard Deviation	855.9		
nu star	10.97		
Approximate Chi Square Value (.05)	4.557	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0195	95% CLT UCL	1365
Adjusted Chi Square Value	3.571	95% Jackknife UCL	1464
		95% Standard Bootstrap UCL	1325
Anderson-Darling Test Statistic	1.124	95% Bootstrap-t UCL	5357
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	4546
Kolmogorov-Smirnov Test Statistic	0.354	95% Percentile Bootstrap UCL	1484
Kolmogorov-Smirnov 5% Critical Value	0.302	95% BCA Bootstrap UCL	1874
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2447
		97.5% Chebyshev(Mean, Sd) UCL	3199
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4676
95% Approximate Gamma UCL (Use when n >= 40)	1706		
95% Adjusted Gamma UCL (Use when n < 40)	2178		
Potential UCL to Use		Use 95% H-UCL	2304

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Attachment A9
ProUCL Output for EU 8 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	180	Number of Detected Data	158
Number of Distinct Detected Data	158	Number of Non-Detect Data	22
		Percent Non-Detects	12.22%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	13.65	Minimum Detected	2.614
Maximum Detected	952	Maximum Detected	6.859
Mean of Detected	196.4	Mean of Detected	4.788
SD of Detected	185.1	SD of Detected	1.081
Minimum Non-Detect	13.13	Minimum Non-Detect	2.575
Maximum Non-Detect	68.4	Maximum Non-Detect	4.225

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	68
Number treated as Detected	112
Single DL Non-Detect Percentage	37.78%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.162	Lilliefors Test Statistic	0.0804
5% Lilliefors Critical Value	0.0705	5% Lilliefors Critical Value	0.0705
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	174	Mean	4.508
SD	183.5	SD	1.272
95% DL/2 (t) UCL	196.7	95% H-Stat (DL/2) UCL	256.3
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	123.2	Mean in Log Scale	4.545
SD	244.6	SD in Log Scale	1.215
95% MLE (t) UCL	153.3	Mean in Original Scale	174.6
95% MLE (Tiku) UCL	156.5	SD in Original Scale	183
		95% t UCL	197.1
		95% Percentile Bootstrap UCL	198.1
		95% BCA Bootstrap UCL	198
		95% H UCL	244

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.136	Data do not follow a Discernable Distribution (0.05)	
Theta Star	172.9		
nu star	358.9		
A-D Test Statistic	0.928	Nonparametric Statistics	
5% A-D Critical Value	0.78	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.78	Mean	174.6
5% K-S Critical Value	0.0764	SD	182.5
Data not Gamma Distributed at 5% Significance Level		SE of Mean	13.65
		95% KM (t) UCL	197.1
Assuming Gamma Distribution		95% KM (z) UCL	197
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	197.1
Minimum	0.000001	95% KM (bootstrap t) UCL	199.9
Maximum	952	95% KM (BCA) UCL	196.4
Mean	172.4	95% KM (Percentile Bootstrap) UCL	197
Median	108.5	95% KM (Chebyshev) UCL	234
SD	185	97.5% KM (Chebyshev) UCL	259.8
k star	0.266	99% KM (Chebyshev) UCL	310.4
Theta star	648.2		
Nu star	95.74	Potential UCLs to Use	
AppChi2	74.17	95% KM (Chebyshev) UCL	234
95% Gamma Approximate UCL (Use when n >= 40)	222.5		
95% Adjusted Gamma UCL (Use when n < 40)	223		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Data	28	Number of Detected Data	25
Number of Distinct Detected Data	24	Number of Non-Detect Data	3
Number of Missing Values	152	Percent Non-Detects	10.71%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.347	Minimum Detected	-1.058
Maximum Detected	33.4	Maximum Detected	3.509
Mean of Detected	5.422	Mean of Detected	1.026
SD of Detected	7.137	SD of Detected	1.216
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.679	Shapiro Wilk Test Statistic	0.976
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	4.894
SD	6.905
95% DL/2 (t) UCL	7.117
Maximum Likelihood Estimate(MLE) Method	
Mean	2.98
SD	8.846
95% MLE (t) UCL	5.827
95% MLE (Tiku) UCL	5.996

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	0.842
SD	1.268
95% H-Stat (DL/2) UCL	10.27
Log ROS Method	
Mean in Log Scale	0.857
SD in Log Scale	1.256
Mean in Original Scale	4.907
SD in Original Scale	6.897
95% t UCL	7.127
95% Percentile Bootstrap UCL	7.099
95% BCA Bootstrap UCL	7.969
95% H UCL	10.17

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.803
Theta Star	6.754
nu star	40.14
A-D Test Statistic	0.412
5% A-D Critical Value	0.778
K-S Test Statistic	0.778
5% K-S Critical Value	0.18

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	33.4
Mean	4.841
Median	2.05
SD	6.942
k star	0.308
Theta star	15.69
Nu star	17.28
AppChi2	8.869
95% Gamma Approximate UCL (Use when n >= 40)	9.429
95% Adjusted Gamma UCL (Use when n < 40)	9.841

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	4.906
SD	6.774
SE of Mean	1.307
95% KM (t) UCL	7.132
95% KM (z) UCL	7.055
95% KM (jackknife) UCL	7.127
95% KM (bootstrap t) UCL	8.817
95% KM (BCA) UCL	7.334
95% KM (Percentile Bootstrap) UCL	7.297
95% KM (Chebyshev) UCL	10.6
97.5% KM (Chebyshev) UCL	13.07
99% KM (Chebyshev) UCL	17.91

Potential UCLs to Use

95% KM (Chebyshev) UCL	10.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	180	Number of Detected Data	174
Number of Distinct Detected Data	174	Number of Non-Detect Data	6
		Percent Non-Detects	3.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	19.2	Minimum Detected	2.955
Maximum Detected	4940	Maximum Detected	8.505
Mean of Detected	762.2	Mean of Detected	5.84
SD of Detected	843.2	SD of Detected	1.443
Minimum Non-Detect	22.73	Minimum Non-Detect	3.124
Maximum Non-Detect	34.78	Maximum Non-Detect	3.549

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	165
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	8.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.189	Lilliefors Test Statistic	0.119
5% Lilliefors Critical Value	0.0672	5% Lilliefors Critical Value	0.0672
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	737.2	Mean	5.734
SD	839.8	SD	1.531
95% DL/2 (t) UCL	840.7	95% H-Stat (DL/2) UCL	1357
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	694.9	Mean in Log Scale	5.736
SD	892.7	SD in Log Scale	1.528
95% MLE (t) UCL	804.9	Mean in Original Scale	737.3
95% MLE (Tiku) UCL	799.7	SD in Original Scale	839.8
		95% t UCL	840.8
		95% Percentile Bootstrap UCL	843.2
		95% BCA Bootstrap UCL	848.2
		95% H UCL	1351

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.743	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1026		
nu star	258.5		
A-D Test Statistic	2.638	Nonparametric Statistics	
5% A-D Critical Value	0.796	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.796	Mean	737.5
5% K-S Critical Value	0.0732	SD	837.2
Data not Gamma Distributed at 5% Significance Level		SE of Mean	62.58
		95% KM (t) UCL	841
Assuming Gamma Distribution		95% KM (z) UCL	840.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	840.8
Minimum	0.000001	95% KM (bootstrap t) UCL	851.3
Maximum	4940	95% KM (BCA) UCL	850.2
Mean	736.8	95% KM (Percentile Bootstrap) UCL	844.7
Median	470.9	95% KM (Chebyshev) UCL	1010
SD	840.2	97.5% KM (Chebyshev) UCL	1128
k star	0.451	99% KM (Chebyshev) UCL	1360
Theta star	1633		
Nu star	162.4	Potential UCLs to Use	
AppChi2	133.9	95% KM (Chebyshev) UCL	1010
95% Gamma Approximate UCL (Use when n >= 40)	893.3		
95% Adjusted Gamma UCL (Use when n < 40)	894.7		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	106	Number of Distinct Observations	106
Raw Statistics		Log-transformed Statistics	
Minimum	6928	Minimum of Log Data	8.843
Maximum	221158	Maximum of Log Data	12.31
Mean	29799	Mean of log Data	10.14
Geometric Mean	25416	SD of log Data	0.494
Median	22582		
SD	26016		
Std. Error of Mean	2527		
Coefficient of Variation	0.873		
Skewness	5.361		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.239	Lilliefors Test Statistic	0.101
Lilliefors Critical Value	0.0861	Lilliefors Critical Value	0.0861
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	33992	95% H-UCL	31371
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	35016
95% Adjusted-CLT UCL (Chen-1995)	35361	97.5% Chebyshev (MVUE) UCL	37755
95% Modified-t UCL (Johnson-1978)	34211	99% Chebyshev (MVUE) UCL	43137
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.214	Data do not follow a Discernable Distribution (0.05)	
Theta Star	9273		
MLE of Mean	29799		
MLE of Standard Deviation	16623		
nu star	681.3		
Approximate Chi Square Value (.05)	621.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0477	95% CLT UCL	33955
Adjusted Chi Square Value	620.9	95% Jackknife UCL	33992
		95% Standard Bootstrap UCL	33911
Anderson-Darling Test Statistic	4.349	95% Bootstrap-t UCL	37633
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL	56118
Kolmogorov-Smirnov Test Statistic	0.135	95% Percentile Bootstrap UCL	34203
Kolmogorov-Smirnov 5% Critical Value	0.0884	95% BCA Bootstrap UCL	35821
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	40813
		97.5% Chebyshev(Mean, Sd) UCL	45579
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	54941
95% Approximate Gamma UCL (Use when n >= 40)	32653		
95% Adjusted Gamma UCL (Use when n < 40)	32694		
Potential UCL to Use		Use 95% Student's-t UCL	33992
		or 95% Modified-t UCL	34211

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	179	Number of Distinct Observations	178
Number of Missing Values	1		
Raw Statistics		Log-transformed Statistics	
Minimum	43.05	Minimum of Log Data	3.762
Maximum	30700	Maximum of Log Data	10.33
Mean	3741	Mean of log Data	7.387
Geometric Mean	1614	SD of log Data	1.549
Median	2636		
SD	4401		
Std. Error of Mean	328.9		
Coefficient of Variation	1.176		
Skewness	2.606		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.2	Lilliefors Test Statistic	0.137
Lilliefors Critical Value	0.0662	Lilliefors Critical Value	0.0662
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4285	95% H-UCL	7329
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9108
95% Adjusted-CLT UCL (Chen-1995)	4350	97.5% Chebyshev (MVUE) UCL	10765
95% Modified-t UCL (Johnson-1978)	4295	99% Chebyshev (MVUE) UCL	14020
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.709	Data do not follow a Discernable Distribution (0.05)	
Theta Star	5280		
MLE of Mean	3741		
MLE of Standard Deviation	4444		
nu star	253.6		
Approximate Chi Square Value (.05)	217.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0487	95% CLT UCL	4282
Adjusted Chi Square Value	217.5	95% Jackknife UCL	4285
		95% Standard Bootstrap UCL	4289
Anderson-Darling Test Statistic	1.647	95% Bootstrap-t UCL	4347
Anderson-Darling 5% Critical Value	0.799	95% Hall's Bootstrap UCL	4362
Kolmogorov-Smirnov Test Statistic	0.0751	95% Percentile Bootstrap UCL	4296
Kolmogorov-Smirnov 5% Critical Value	0.072	95% BCA Bootstrap UCL	4370
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5175
		97.5% Chebyshev(Mean, Sd) UCL	5795
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7014
95% Approximate Gamma UCL (Use when n >= 40)	4357		
95% Adjusted Gamma UCL (Use when n < 40)	4363		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	5175

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Observations	180	Number of Distinct Observations	180
Raw Statistics		**Log-transformed Statistics**	
Minimum	186	Minimum of Log Data	5.226
Maximum	9626	Maximum of Log Data	9.172
Mean	1968	Mean of log Data	7.309
Geometric Mean	1494	SD of log Data	0.749
Median	1437		
SD	1615		
Std. Error of Mean	120.4		
Coefficient of Variation	0.821		
Skewness	1.961		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.213	Lilliefors Test Statistic	0.0749
Lilliefors Critical Value	0.066	Lilliefors Critical Value	0.066
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2167	95% H-UCL	2207
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2513
95% Adjusted-CLT UCL (Chen-1995)	2185	97.5% Chebyshev (MVUE) UCL	2746
95% Modified-t UCL (Johnson-1978)	2170	99% Chebyshev (MVUE) UCL	3205
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.935	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1017		
MLE of Mean	1968		
MLE of Standard Deviation	1414		
nu star	696.7		
Approximate Chi Square Value (.05)	636.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0487	95% CLT UCL	2166
Adjusted Chi Square Value	636	95% Jackknife UCL	2167
		95% Standard Bootstrap UCL	2165
Anderson-Darling Test Statistic	2.621	95% Bootstrap-t UCL	2188
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	2181
Kolmogorov-Smirnov Test Statistic	0.117	95% Percentile Bootstrap UCL	2159
Kolmogorov-Smirnov 5% Critical Value	0.0697	95% BCA Bootstrap UCL	2173
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2493
		97.5% Chebyshev(Mean, Sd) UCL	2720
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3166
95% Approximate Gamma UCL (Use when n >= 40)	2154		
95% Adjusted Gamma UCL (Use when n < 40)	2156		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	2493

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc

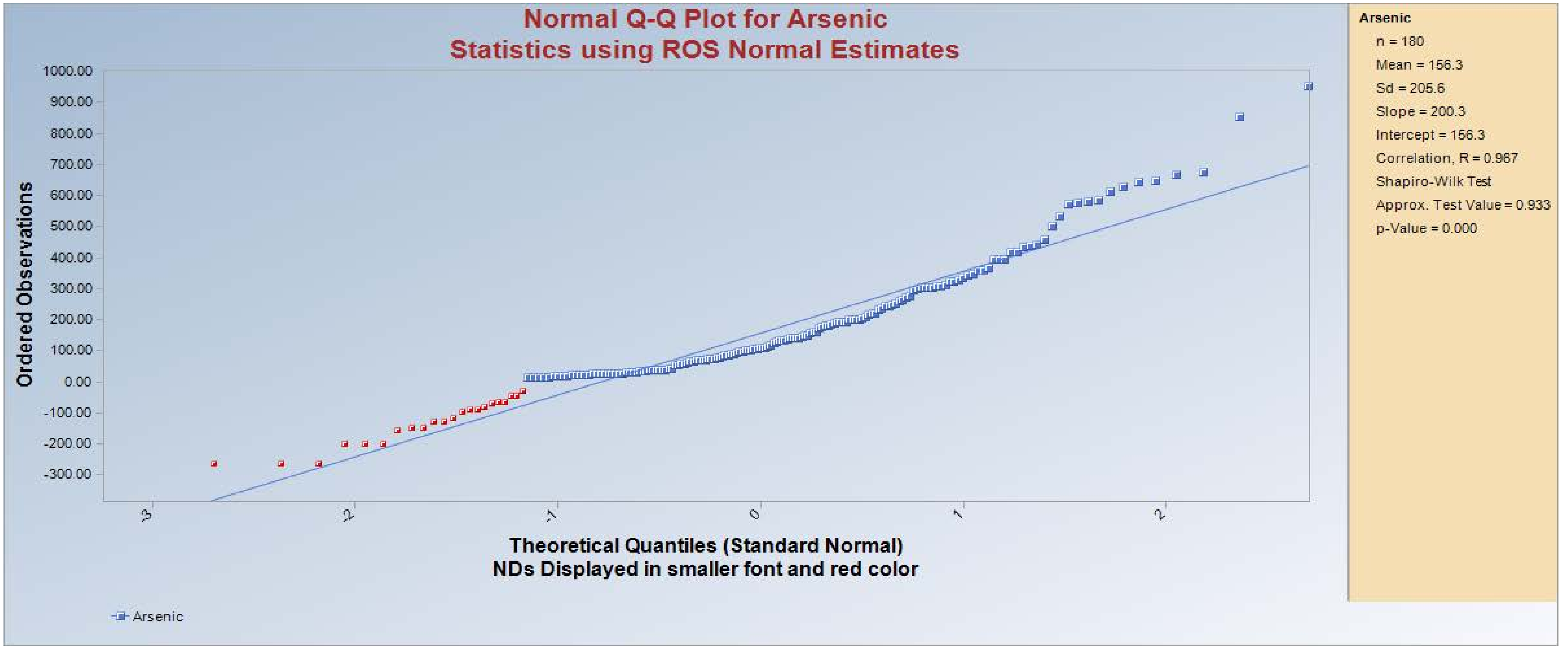
General Statistics

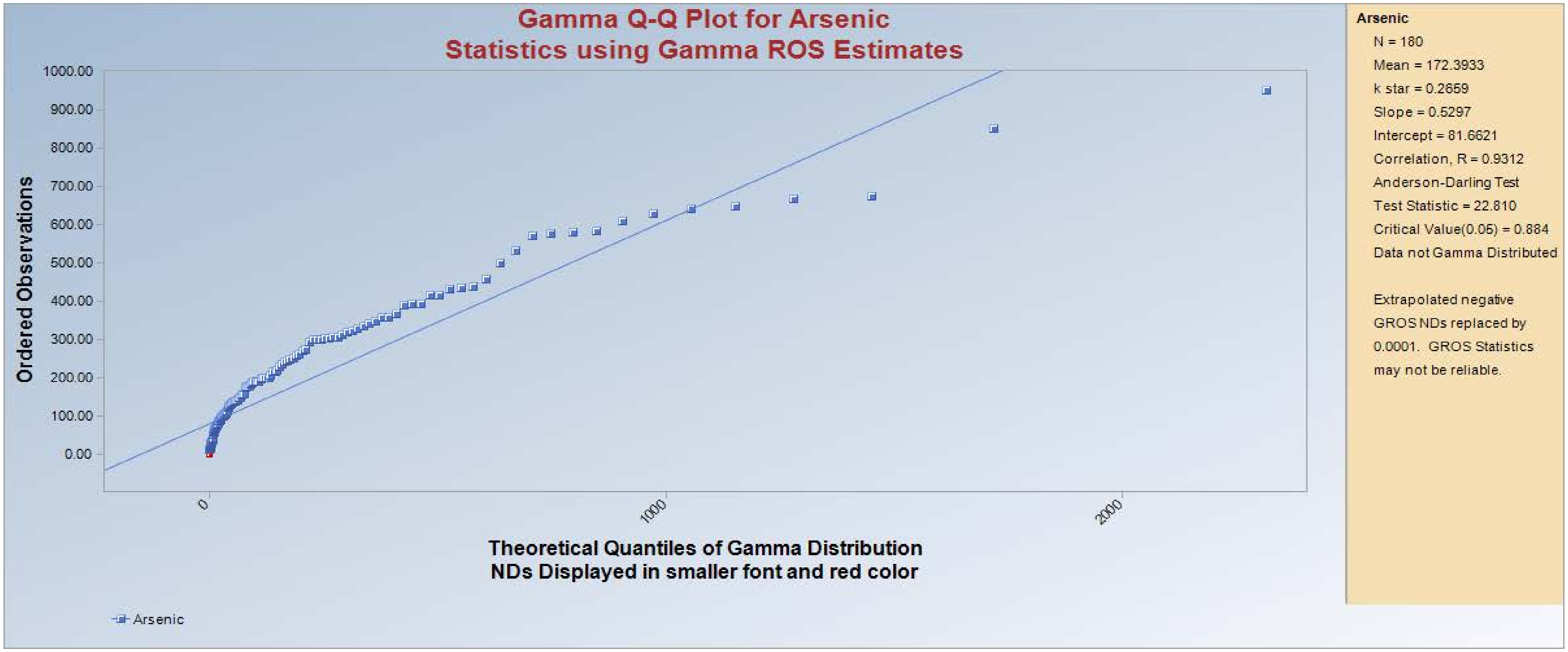
Number of Valid Observations	180	Number of Distinct Observations	180
Raw Statistics		**Log-transformed Statistics**	
Minimum	104	Minimum of Log Data	4.644
Maximum	7824	Maximum of Log Data	8.965
Mean	1251	Mean of log Data	6.737
Geometric Mean	843	SD of log Data	0.906
Median	924.9		
SD	1257		
Std. Error of Mean	93.66		
Coefficient of Variation	1.004		
Skewness	2.62		

Relevant UCL Statistics

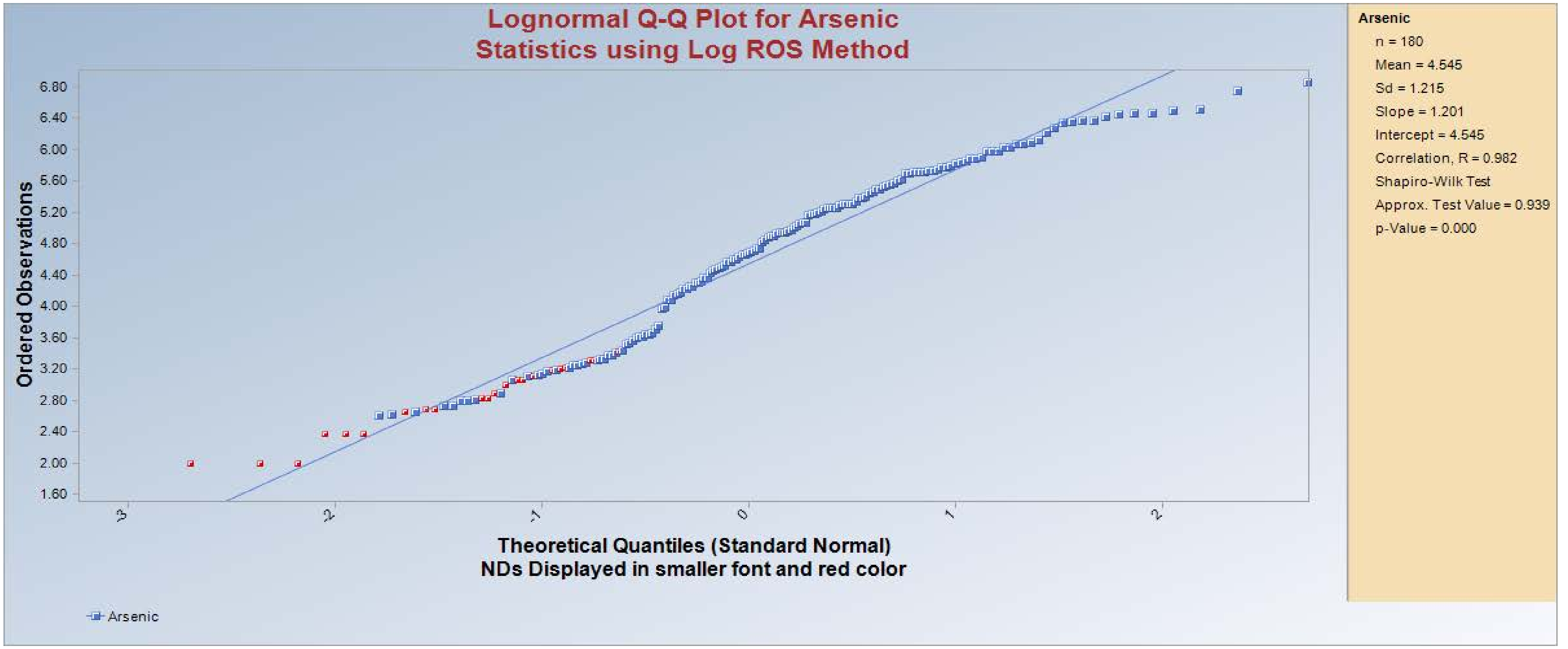
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.181	Lilliefors Test Statistic	0.0489
Lilliefors Critical Value	0.066	Lilliefors Critical Value	0.066
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1406	95% H-UCL	1463
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1705
95% Adjusted-CLT UCL (Chen-1995)	1425	97.5% Chebyshev (MVUE) UCL	1894
95% Modified-t UCL (Johnson-1978)	1409	99% Chebyshev (MVUE) UCL	2267
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.389	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	900.6		
MLE of Mean	1251		
MLE of Standard Deviation	1062		
nu star	500.2		
Approximate Chi Square Value (.05)	449.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0487	95% CLT UCL	1405
Adjusted Chi Square Value	448.9	95% Jackknife UCL	1406
		95% Standard Bootstrap UCL	1406
Anderson-Darling Test Statistic	1.209	95% Bootstrap-t UCL	1431
Anderson-Darling 5% Critical Value	0.773	95% Hall's Bootstrap UCL	1433
Kolmogorov-Smirnov Test Statistic	0.0628	95% Percentile Bootstrap UCL	1416
Kolmogorov-Smirnov 5% Critical Value	0.0702	95% BCA Bootstrap UCL	1419
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1660
		97.5% Chebyshev(Mean, Sd) UCL	1836
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2183
95% Approximate Gamma UCL (Use when n >= 40)	1393		
95% Adjusted Gamma UCL (Use when n < 40)	1394		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1393

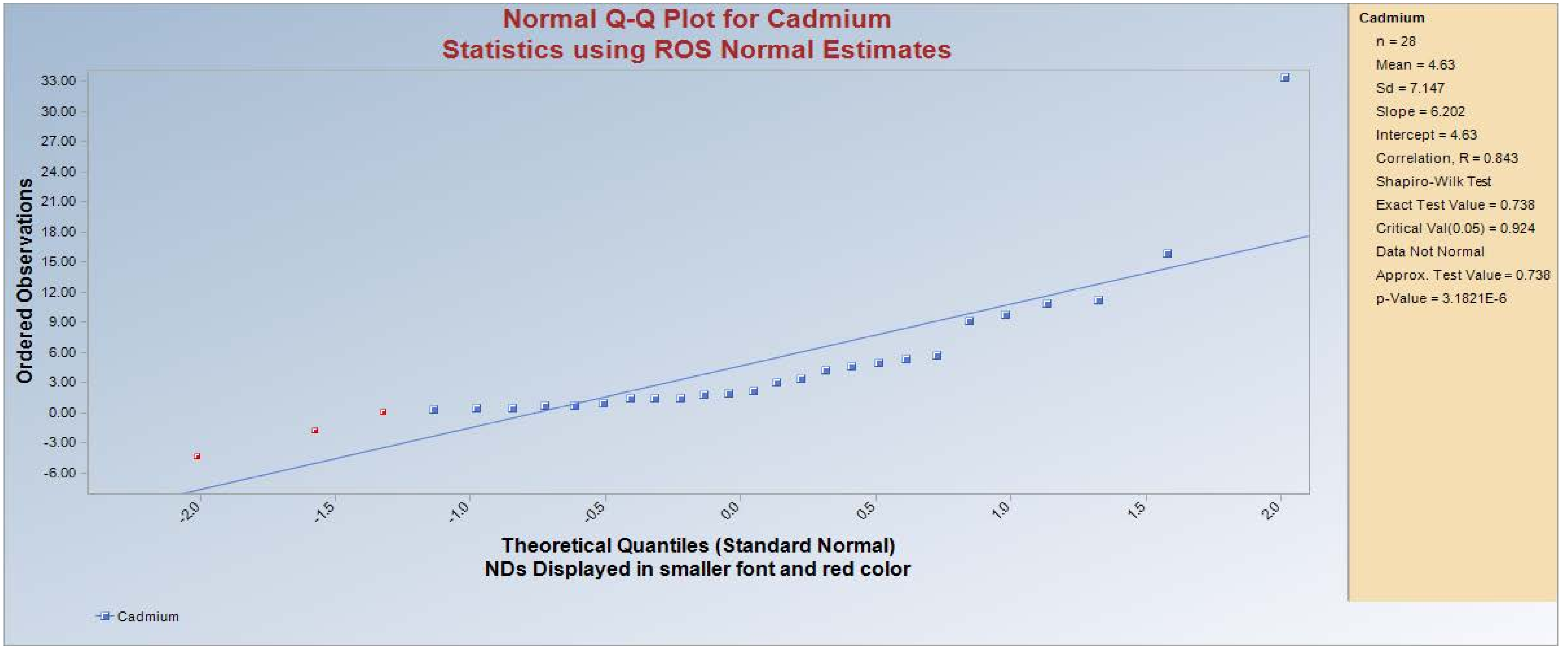
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

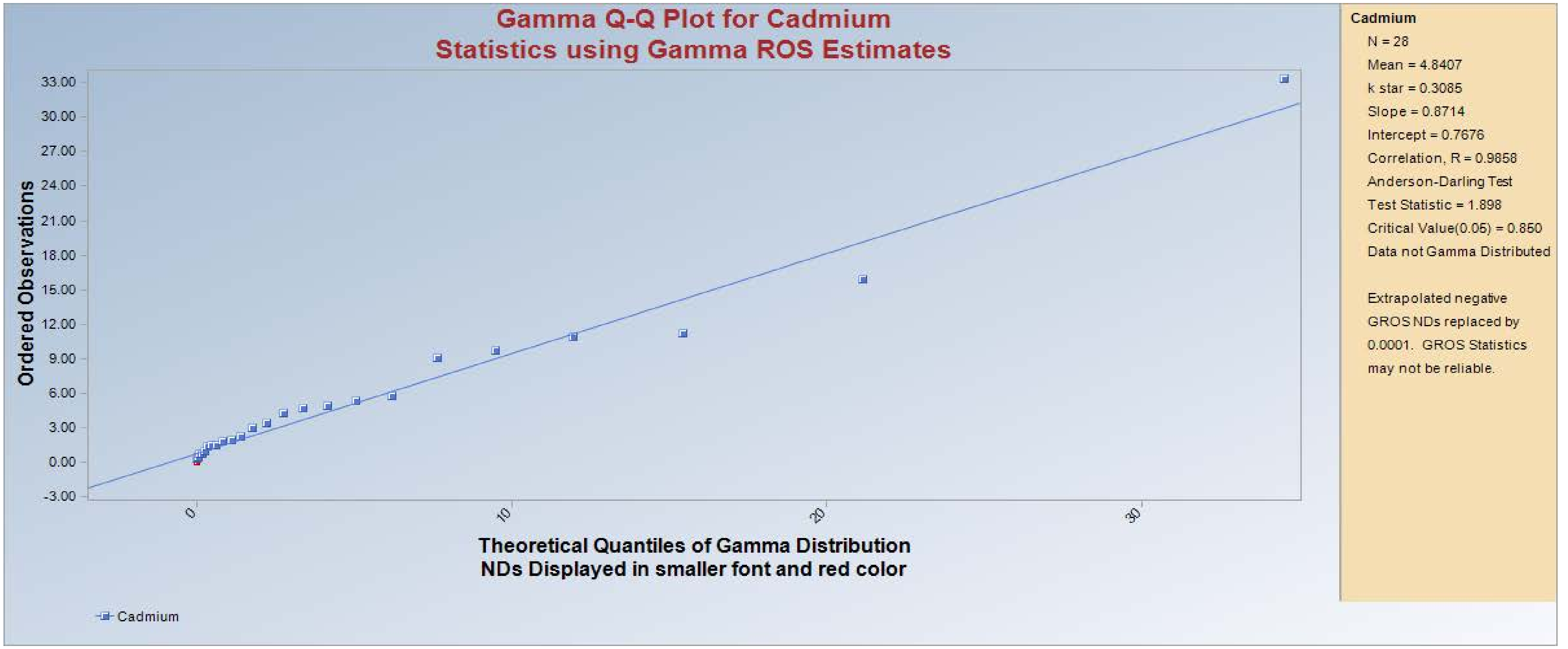

Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-200.00
-300.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 180
Mean = 156.3
Sd = 205.6
Slope = 200.3
Intercept = 156.3
Correlation, R = 0.967
Shapiro-Wilk Test
Approx. Test Value = 0.933
p-Value = 0.000



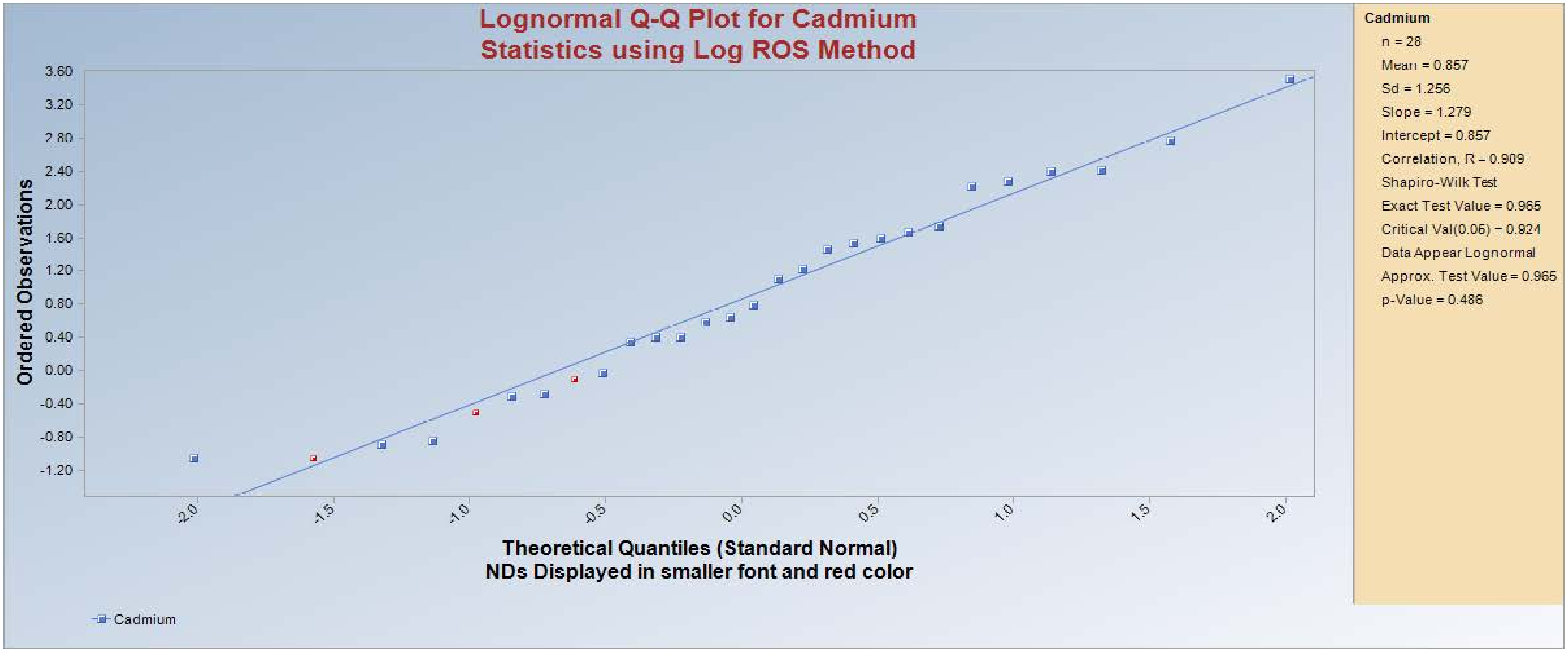
Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
1000
2000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 180
Mean = 172.3933
k star = 0.2659
Slope = 0.5297
Intercept = 81.6621
Correlation, R = 0.9312
Anderson-Darling Test
Test Statistic = 22.810
Critical Value(0.05) = 0.884
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

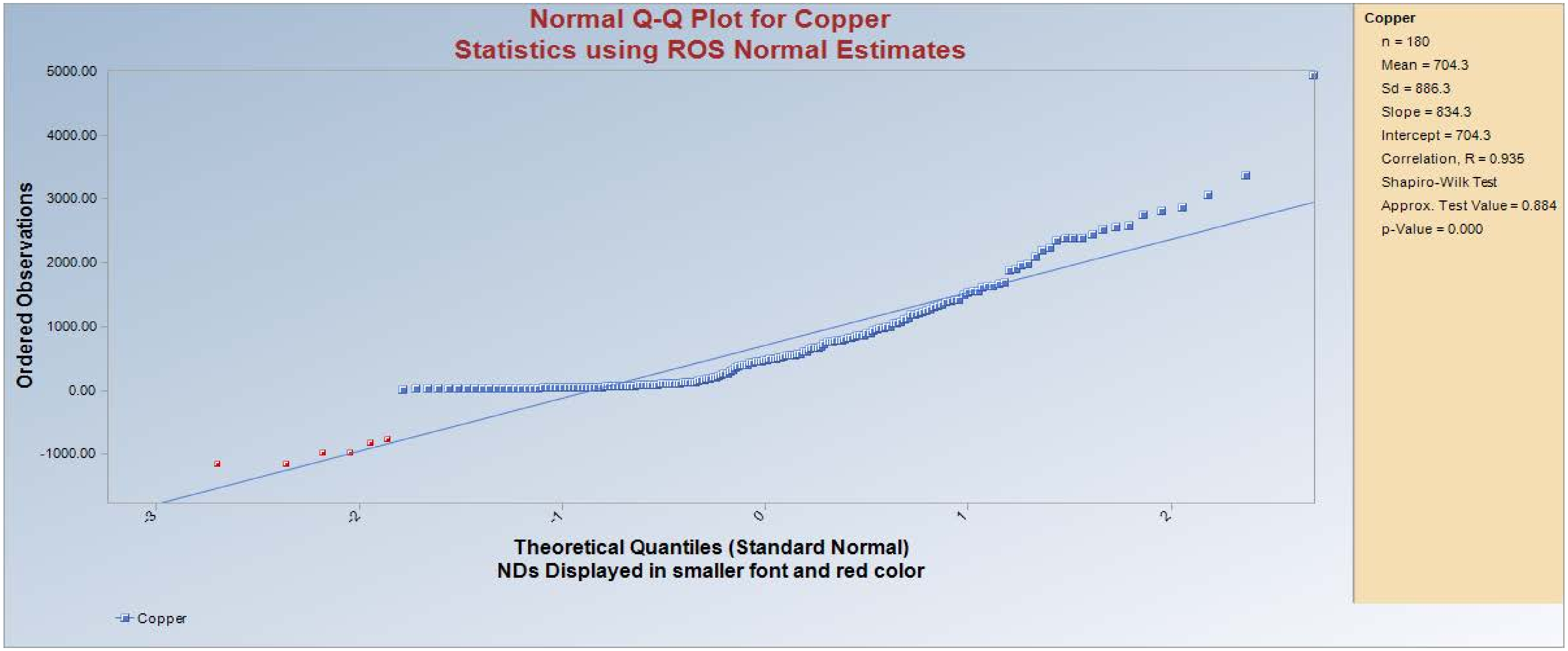

Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 180
Mean = 4.545
Sd = 1.215
Slope = 1.201
Intercept = 4.545
Correlation, R = 0.982
Shapiro-Wilk Test
Approx. Test Value = 0.939
p-Value = 0.000


Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
33.00
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-6.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 28
Mean = 4.63
Sd = 7.147
Slope = 6.202
Intercept = 4.63
Correlation, R = 0.843
Shapiro-Wilk Test
Exact Test Value = 0.738
Critical Val(0.05) = 0.924
Data Not Normal
Approx. Test Value = 0.738
p-Value = 3.1821E-6

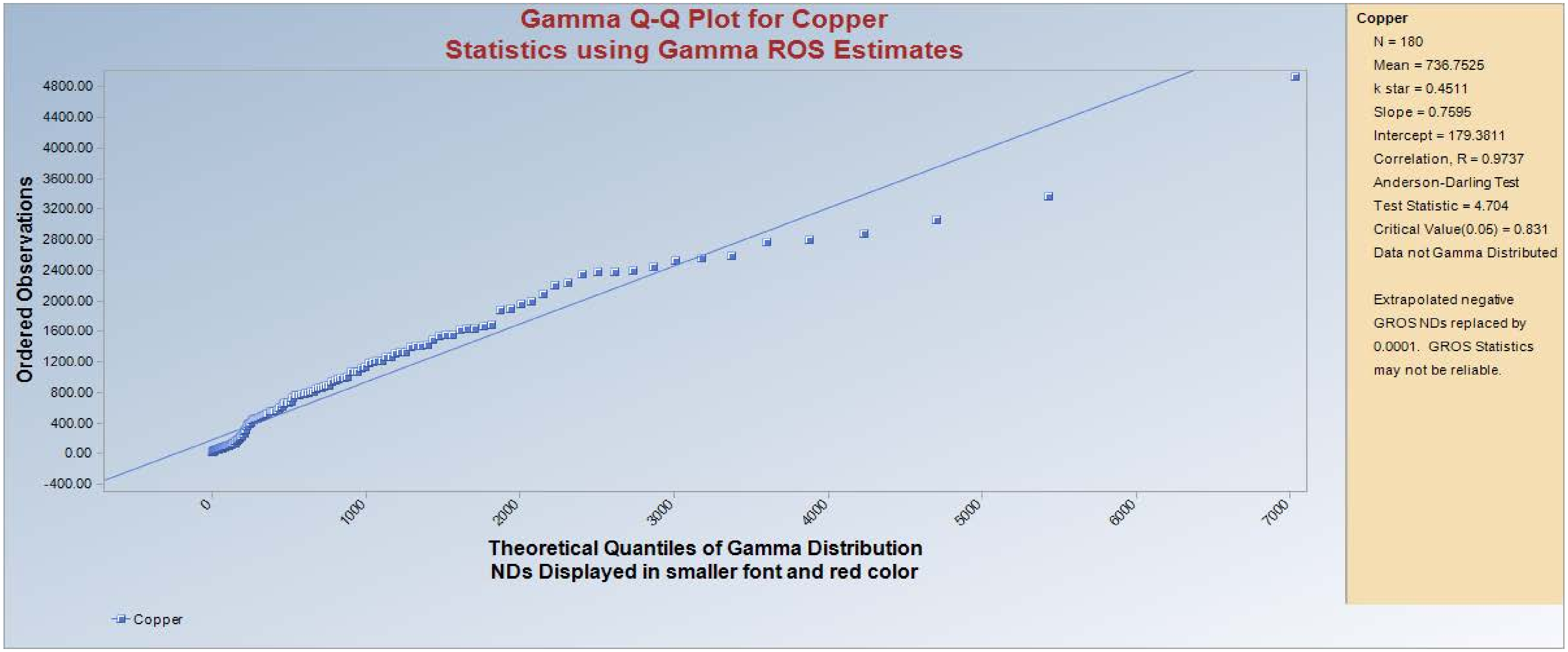


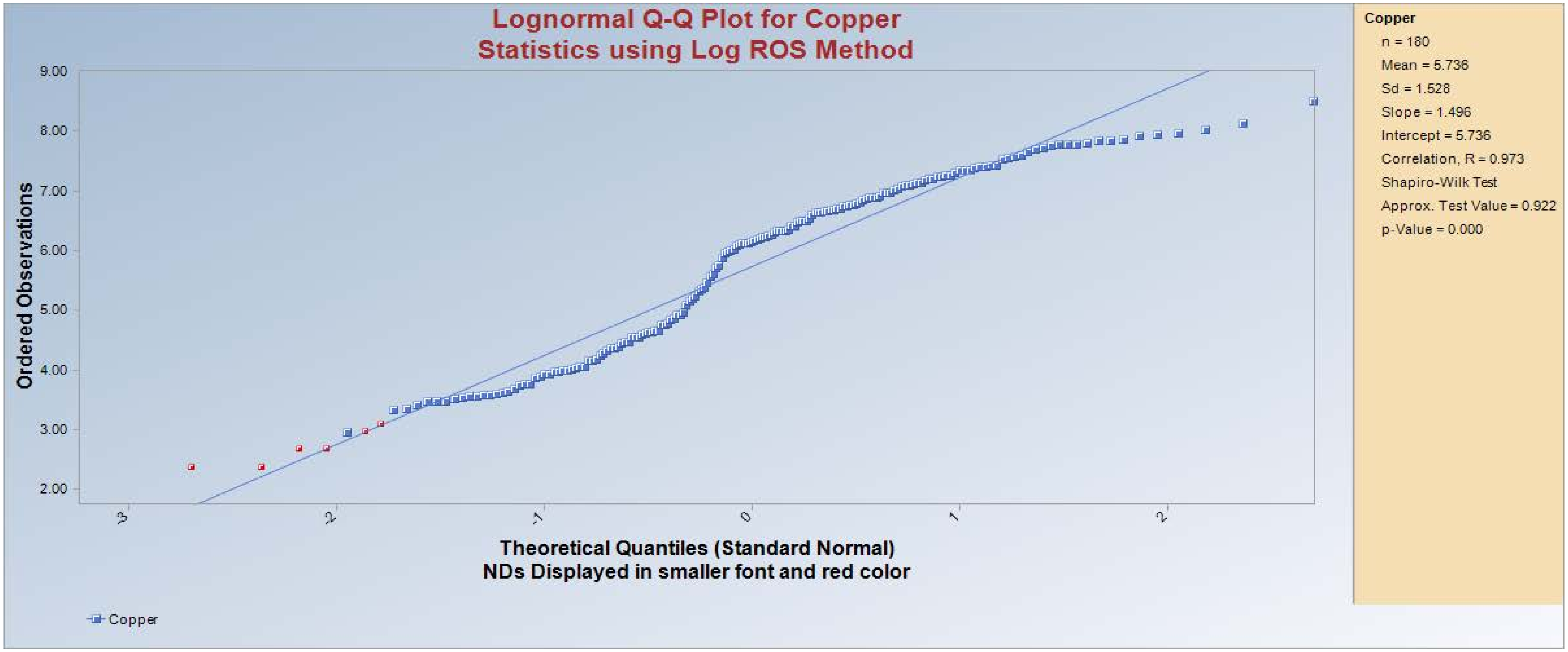
Gamma Q-Q Plot for Cadmium
Statistics using Gamma ROS Estimates
33.00
30.00
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
Ordered Observations
0
10
20
30
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Cadmium
Cadmium
N = 28
Mean = 4.8407
k star = 0.3085
Slope = 0.8714
Intercept = 0.7676
Correlation, R = 0.9858
Anderson-Darling Test
Test Statistic = 1.898
Critical Value(0.05) = 0.850
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

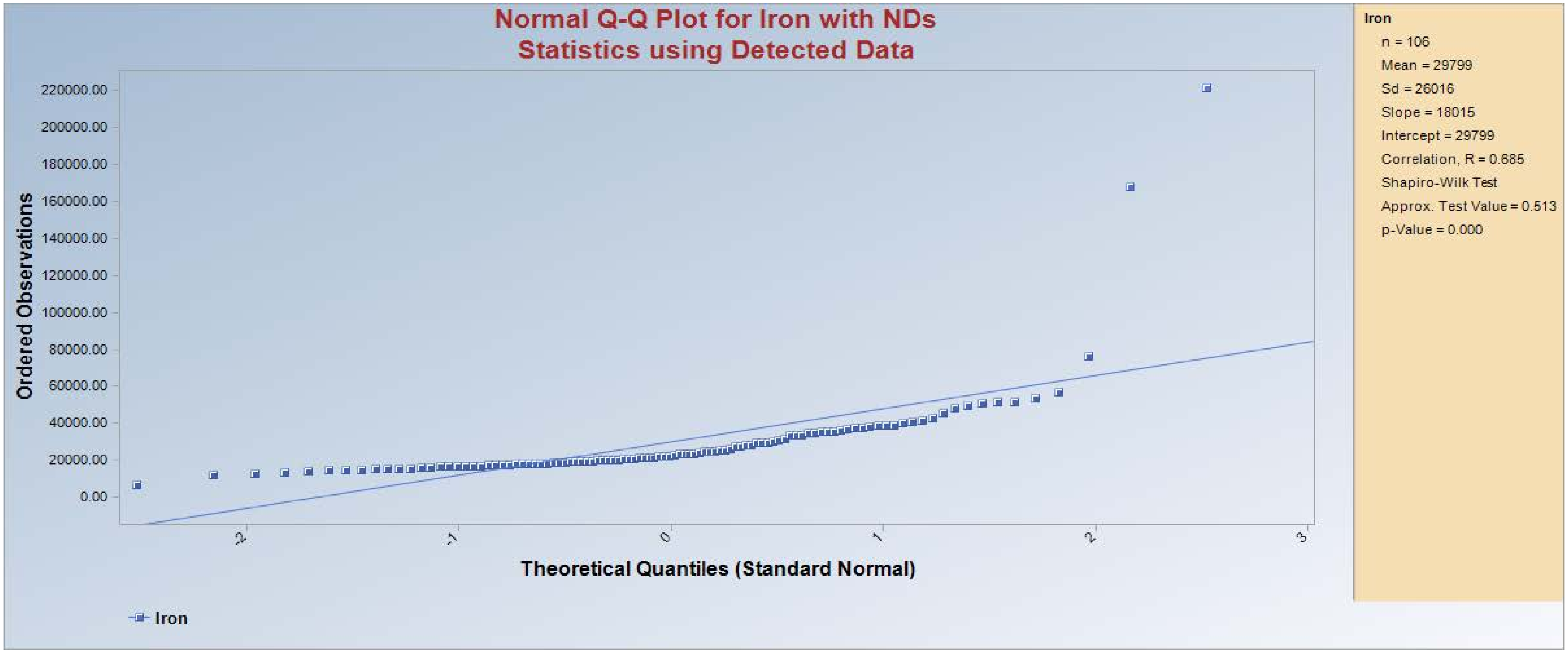

Lognormal Q-Q Plot for Cadmium
Statistics using Log ROS Method
Ordered Observations
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
0.00
-0.40
-0.80
-1.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 28
Mean = 0.857
Sd = 1.256
Slope = 1.279
Intercept = 0.857
Correlation, R = 0.989
Shapiro-Wilk Test
Exact Test Value = 0.965
Critical Val(0.05) = 0.924
Data Appear Lognormal
Approx. Test Value = 0.965
p-Value = 0.486



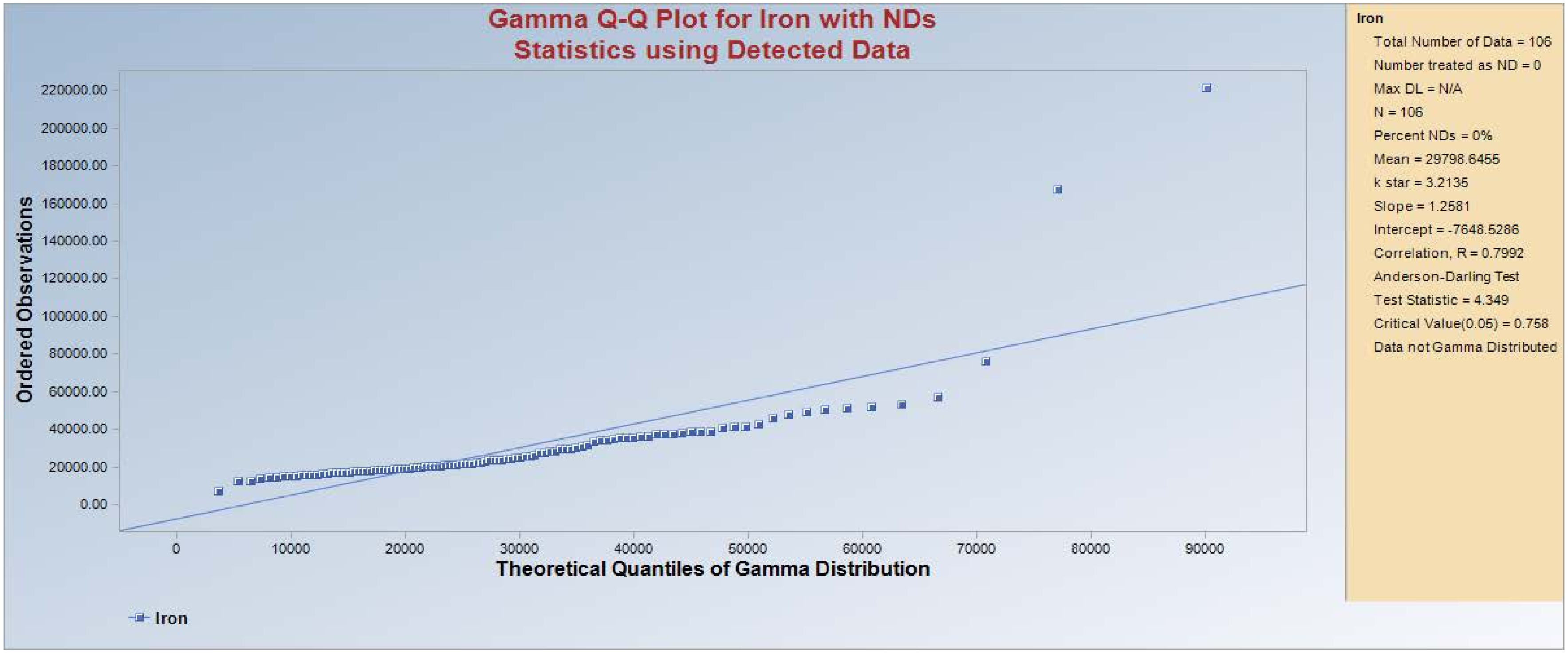
Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 180
Mean = 704.3
Sd = 886.3
Slope = 834.3
Intercept = 704.3
Correlation, R = 0.935
Shapiro-Wilk Test
Approx. Test Value = 0.884
p-Value = 0.000


Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
Ordered Observations
4800.00
4400.00
4000.00
3600.00
3200.00
2800.00
2400.00
2000.00
1600.00
1200.00
800.00
400.00
0.00
-400.00
0
1000
2000
3000
4000
5000
6000
7000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 180
Mean = 736.7525
k star = 0.4511
Slope = 0.7595
Intercept = 179.3811
Correlation, R = 0.9737
Anderson-Darling Test
Test Statistic = 4.704
Critical Value(0.05) = 0.831
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

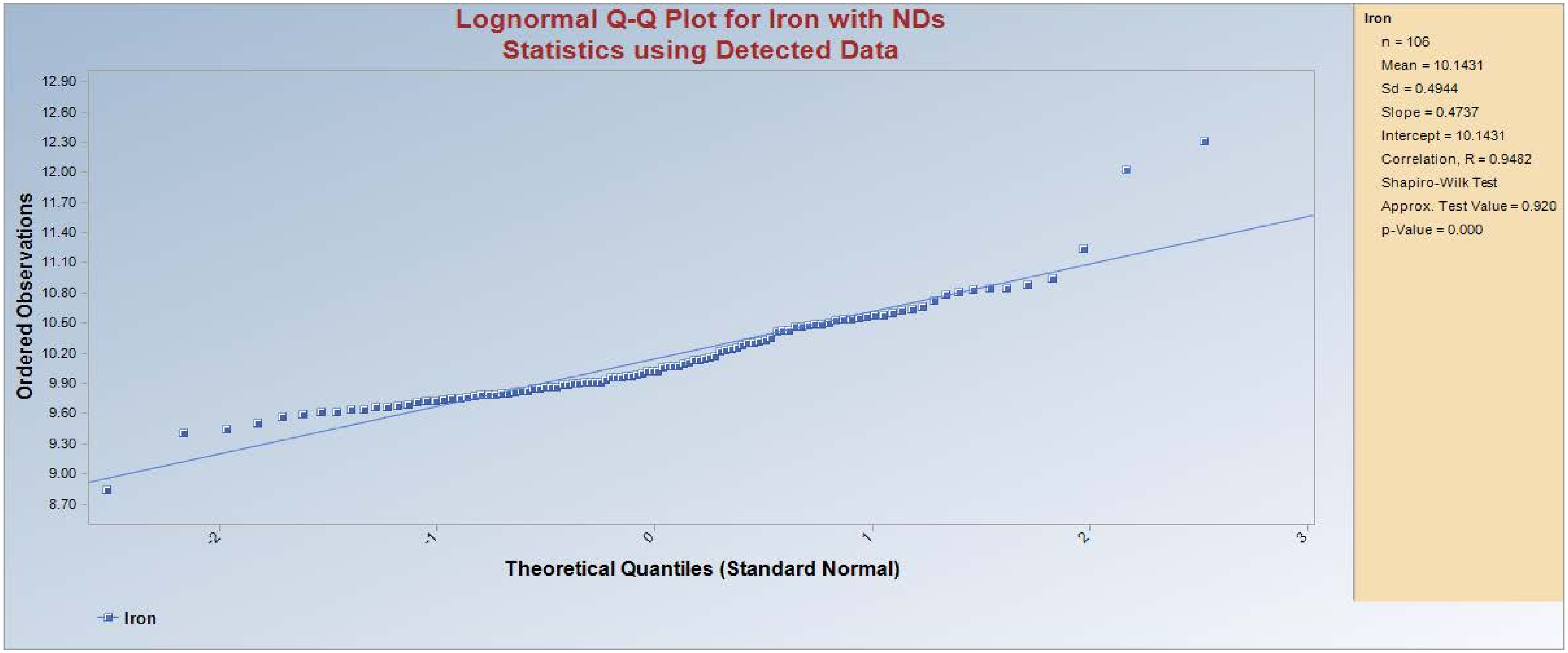

Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 180
Mean = 5.736
Sd = 1.528
Slope = 1.496
Intercept = 5.736
Correlation, R = 0.973
Shapiro-Wilk Test
Approx. Test Value = 0.922
p-Value = 0.000



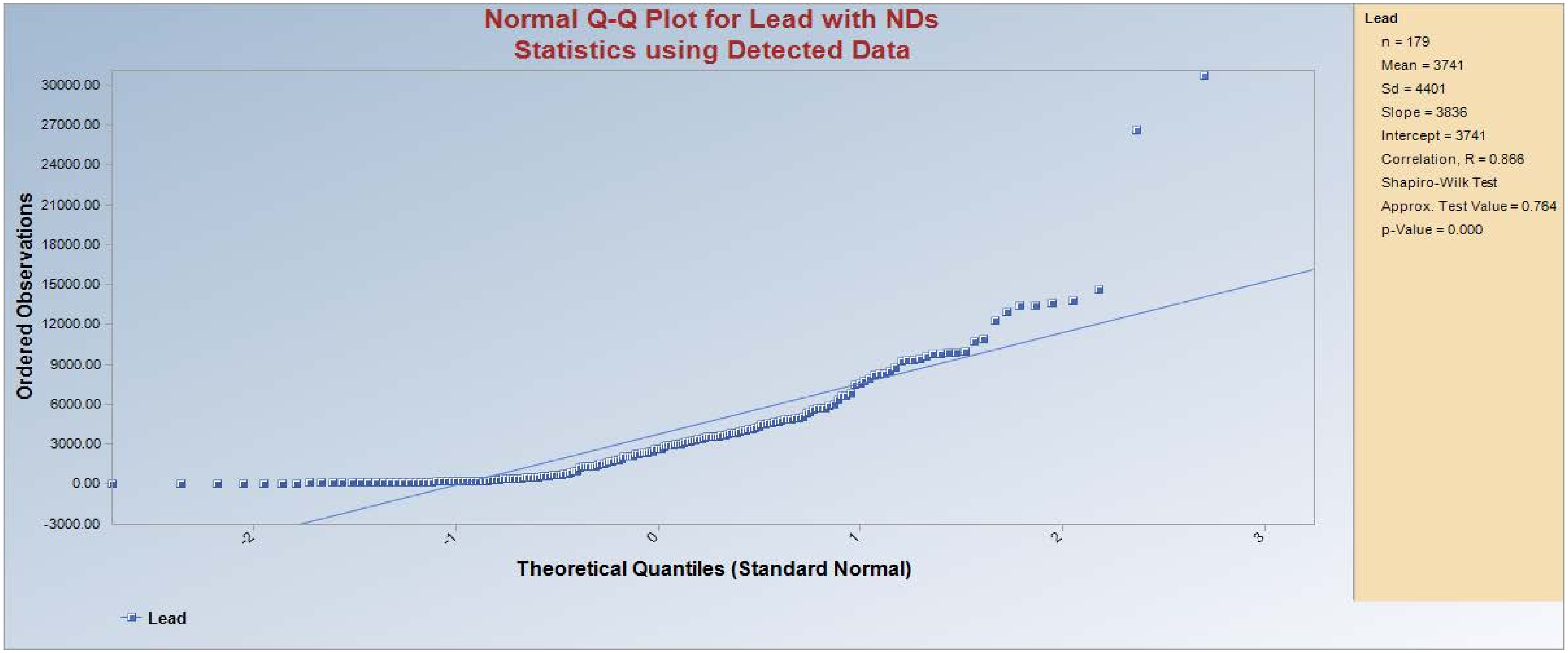
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
220000.00
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 106
Mean = 29799
Sd = 26016
Slope = 18015
Intercept = 29799
Correlation, R = 0.685
Shapiro-Wilk Test
Approx. Test Value = 0.513
p-Value = 0.000



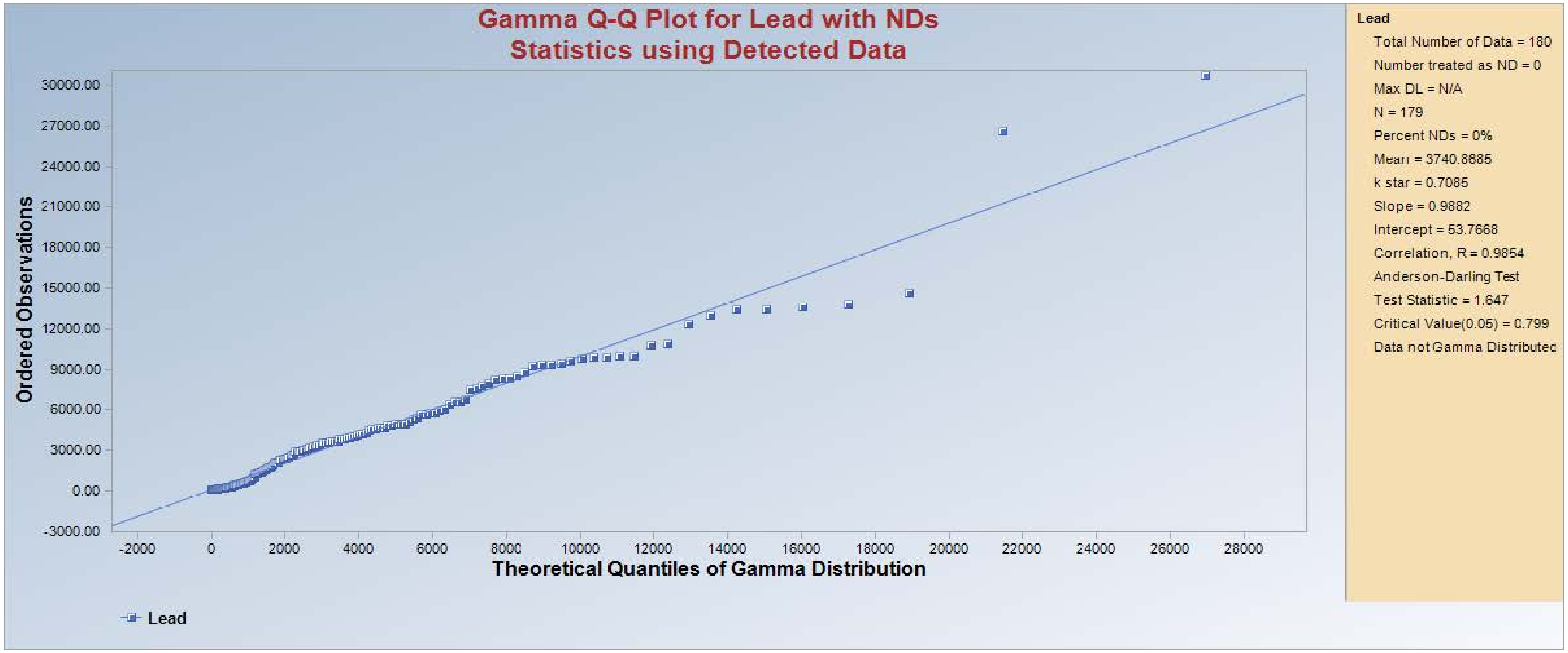
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
220000.00
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 106
Number treated as ND = 0
Max DL = N/A
N = 106
Percent NDs = 0%
Mean = 29798.6455
k star = 3.2135
Slope = 1.2581
Intercept = -7648.5286
Correlation, R = 0.7992
Anderson-Darling Test
Test Statistic = 4.349
Critical Value(0.05) = 0.758
Data not Gamma Distributed



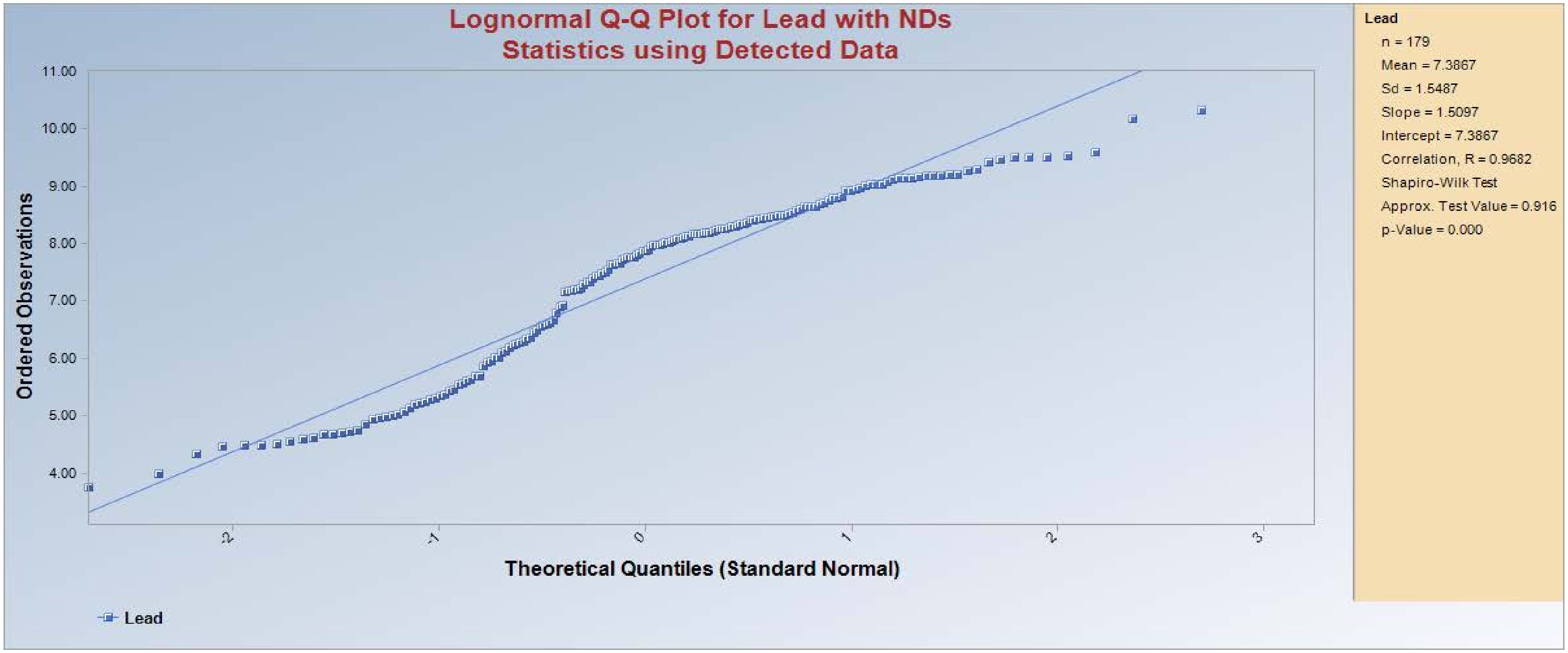
Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
12.90
12.60
12.30
12.00
11.70
11.40
11.10
10.80
10.50
10.20
9.90
9.60
9.30
9.00
8.70
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 106
Mean = 10.1431
Sd = 0.4944
Slope = 0.4737
Intercept = 10.1431
Correlation, R = 0.9482
Shapiro-Wilk Test
Approx. Test Value = 0.920
p-Value = 0.000

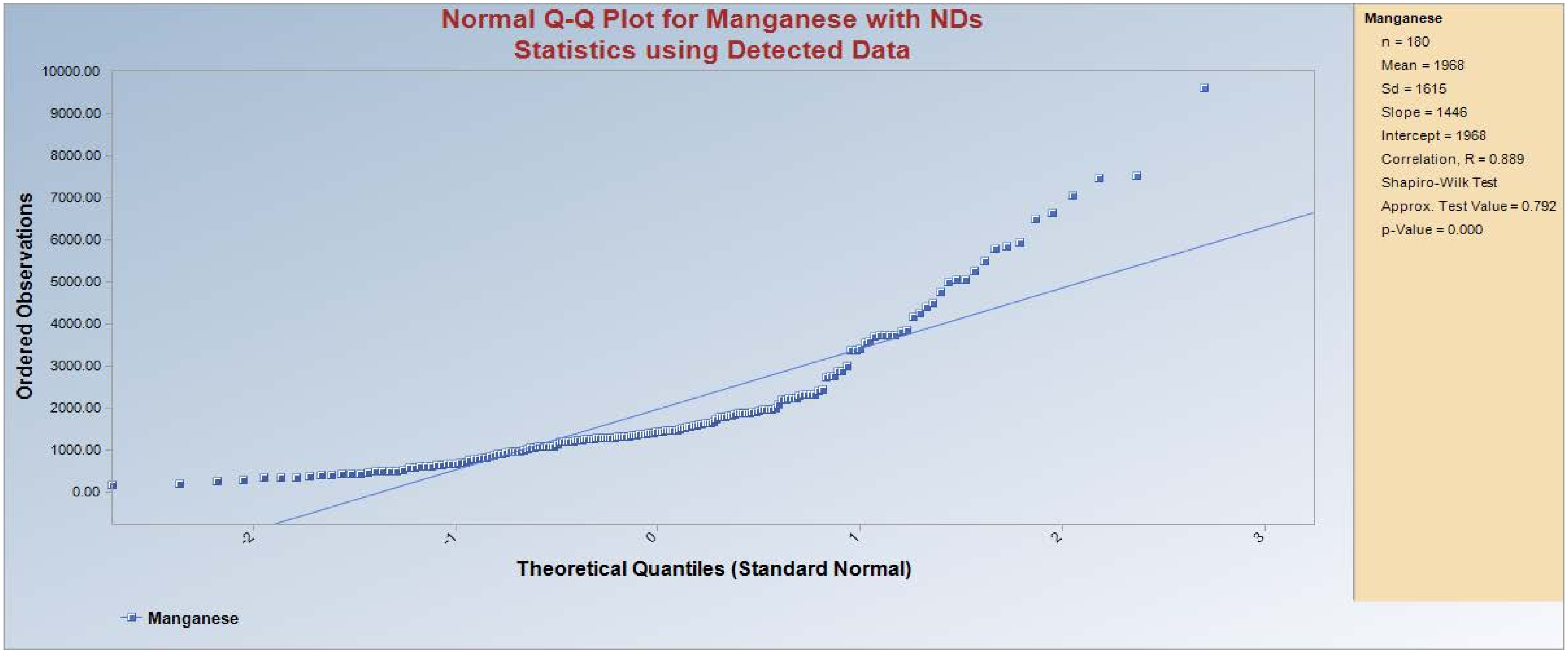


Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 179
Mean = 3741
Sd = 4401
Slope = 3836
Intercept = 3741
Correlation, R = 0.866
Shapiro-Wilk Test
Approx. Test Value = 0.764
p-Value = 0.000

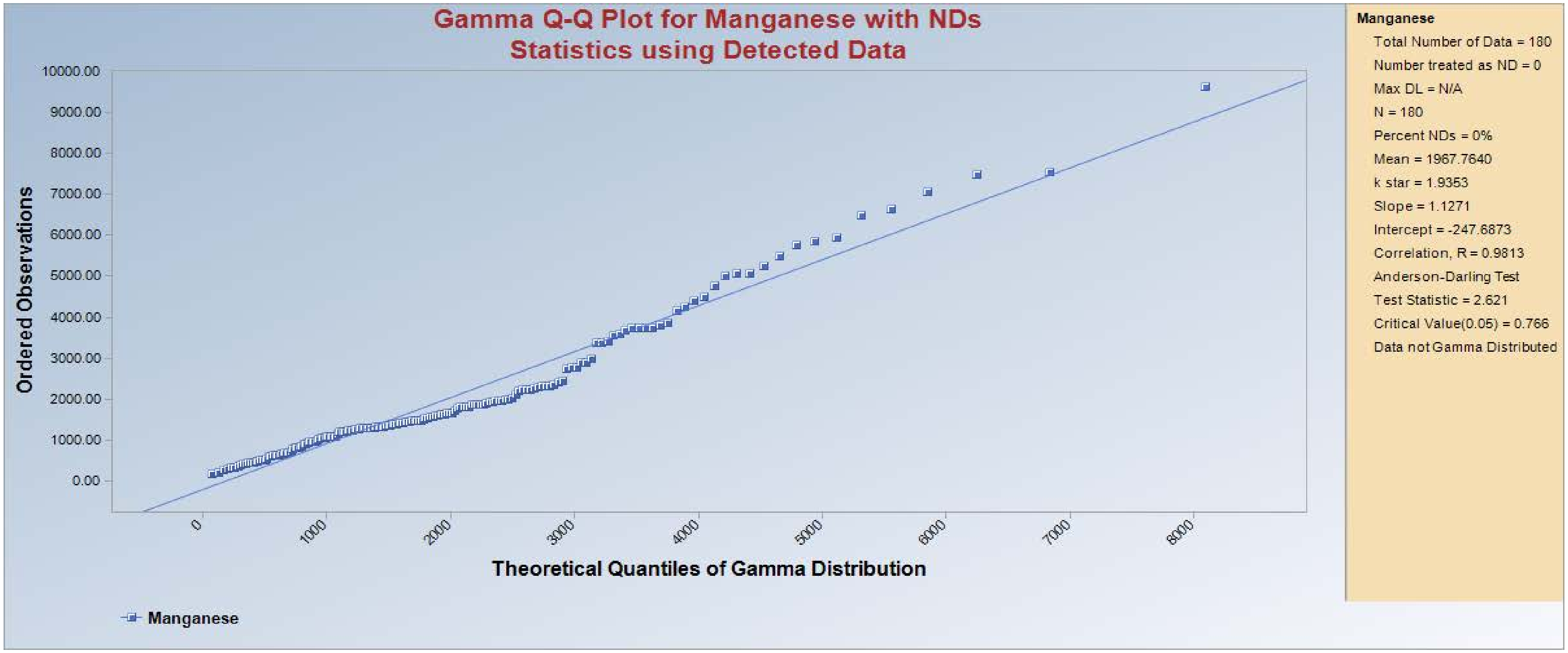


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 180
Number treated as ND = 0
Max DL = N/A
N = 179
Percent NDs = 0%
Mean = 3740.8685
k star = 0.7085
Slope = 0.9882
Intercept = 53.7668
Correlation, R = 0.9854
Anderson-Darling Test
Test Statistic = 1.647
Critical Value(0.05) = 0.799
Data not Gamma Distributed

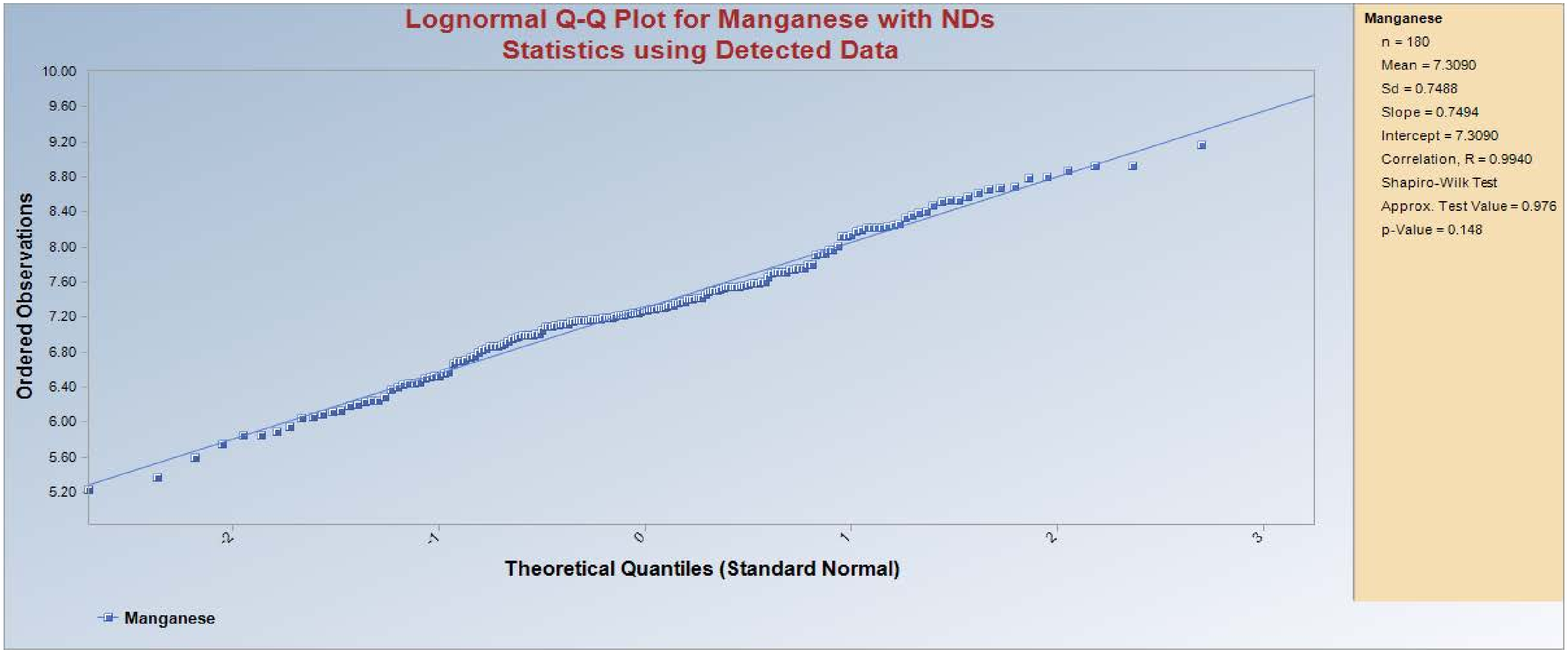

Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 179
Mean = 7.3867
Sd = 1.5487
Slope = 1.5097
Intercept = 7.3867
Correlation, R = 0.9682
Shapiro-Wilk Test
Approx. Test Value = 0.916
p-Value = 0.000



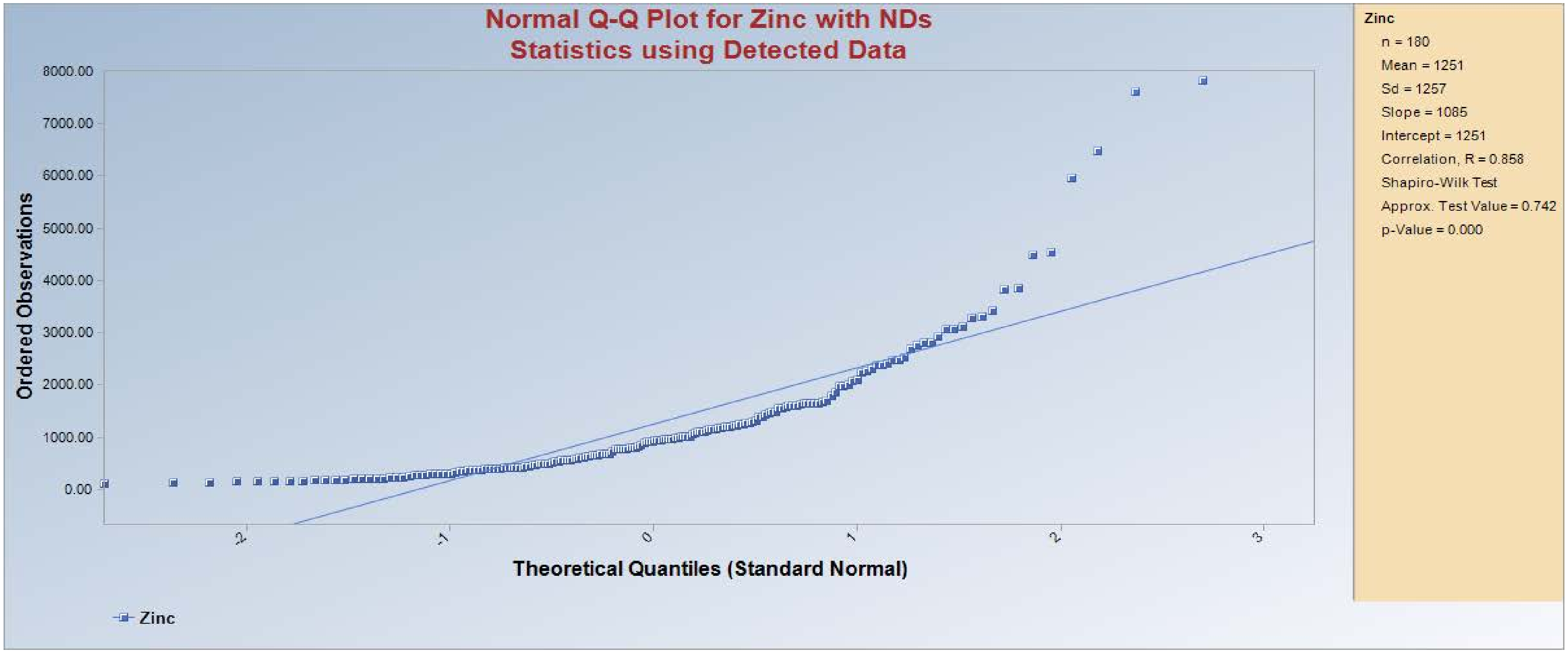
Normal Q-Q Plot for Manganese with NDs
Statistics using Detected Data
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Manganese
Manganese
n = 180
Mean = 1968
Sd = 1615
Slope = 1446
Intercept = 1968
Correlation, R = 0.889
Shapiro-Wilk Test
Approx. Test Value = 0.792
p-Value = 0.000

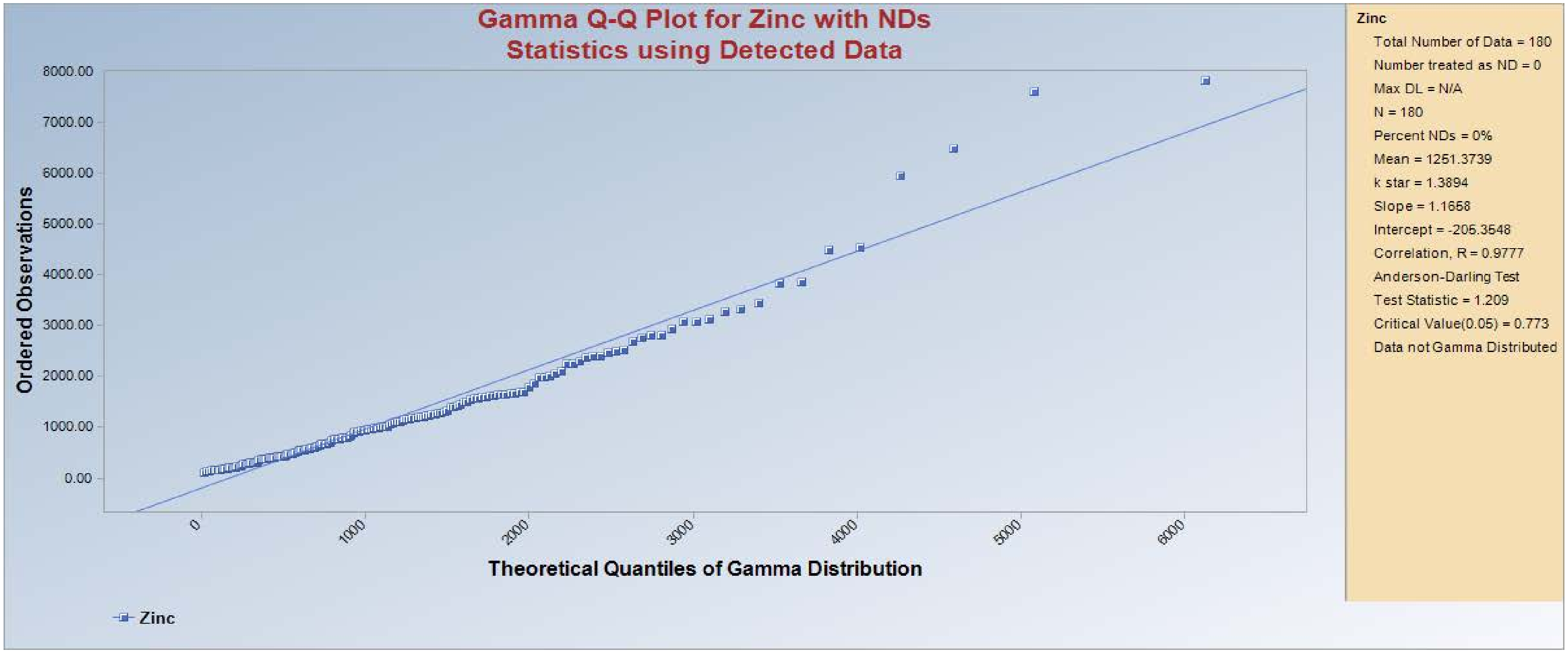


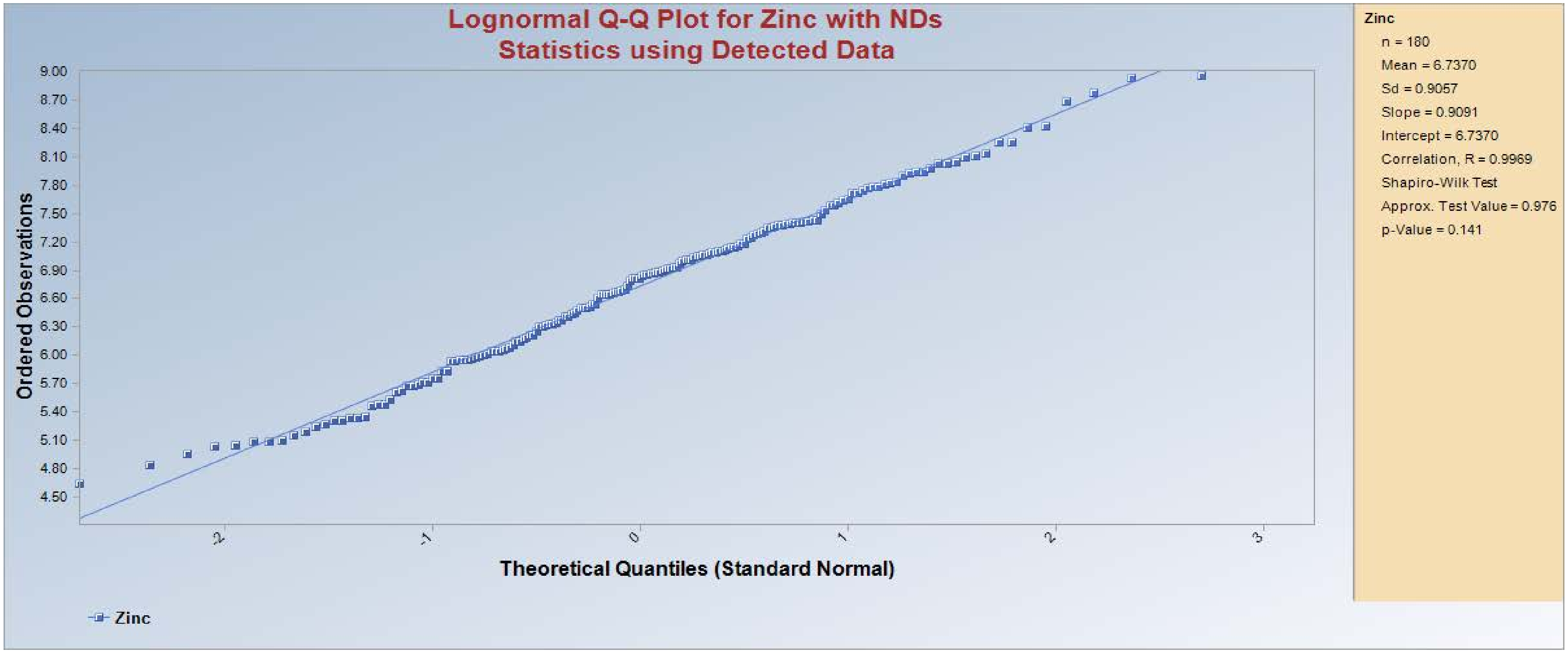
Gamma Q-Q Plot for Manganese with NDs
Statistics using Detected Data
Ordered Observations
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
1000
2000
3000
4000
5000
6000
7000
8000
Theoretical Quantiles of Gamma Distribution
Manganese
Manganese
Total Number of Data = 180
Number treated as ND = 0
Max DL = N/A
N = 180
Percent NDs = 0%
Mean = 1967.7640
k star = 1.9353
Slope = 1.1271
Intercept = -247.6873
Correlation, R = 0.9813
Anderson-Darling Test
Test Statistic = 2.621
Critical Value(0.05) = 0.766
Data not Gamma Distributed



Lognormal Q-Q Plot for Manganese with NDs
Statistics using Detected Data
10.00
9.60
9.20
8.80
8.40
8.00
7.60
7.20
6.80
6.40
6.00
5.60
5.20
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Manganese
Manganese
n = 180
Mean = 7.3090
Sd = 0.7488
Slope = 0.7494
Intercept = 7.3090
Correlation, R = 0.9940
Shapiro-Wilk Test
Approx. Test Value = 0.976
p-Value = 0.148


Normal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 180
Mean = 1251
Sd = 1257
Slope = 1085
Intercept = 1251
Correlation, R = 0.858
Shapiro-Wilk Test
Approx. Test Value = 0.742
p-Value = 0.000


Gamma Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
1000
2000
3000
4000
5000
6000
Theoretical Quantiles of Gamma Distribution
Zinc
Zinc
Total Number of Data = 180
Number treated as ND = 0
Max DL = N/A
N = 180
Percent NDs = 0%
Mean = 1251.3739
k star = 1.3894
Slope = 1.1658
Intercept = -205.3548
Correlation, R = 0.9777
Anderson-Darling Test
Test Statistic = 1.209
Critical Value(0.05) = 0.773
Data not Gamma Distributed



Lognormal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
9.00
8.70
8.40
8.10
7.80
7.50
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 180
Mean = 6.7370
Sd = 0.9057
Slope = 0.9091
Intercept = 6.7370
Correlation, R = 0.9969
Shapiro-Wilk Test
Approx. Test Value = 0.976
p-Value = 0.141

Attachment A10
ProUCL Output for EU 9 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Copper

General Statistics

Number of Valid Observations	14	Number of Distinct Observations	14
Number of Missing Values	4		

Raw Statistics		Log-transformed Statistics	
Minimum	89.87	Minimum of Log Data	4.498
Maximum	608.1	Maximum of Log Data	6.41
Mean	328.3	Mean of log Data	5.716
Geometric Mean	303.6	SD of log Data	0.449
Median	333.5		
SD	119.3		
Std. Error of Mean	31.87		
Coefficient of Variation	0.363		
Skewness	0.275		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.93	Shapiro Wilk Test Statistic	0.843
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	384.7	95% H-UCL	431.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	511.8
95% Adjusted-CLT UCL (Chen-1995)	383.2	97.5% Chebyshev (MVUE) UCL	589
95% Modified-t UCL (Johnson-1978)	385.1	99% Chebyshev (MVUE) UCL	740.7

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.216	Data appear Normal at 5% Significance Level	
Theta Star	62.94		
MLE of Mean	328.3		
MLE of Standard Deviation	143.7		
nu star	146		
Approximate Chi Square Value (.05)	119.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0312	95% CLT UCL	380.7
Adjusted Chi Square Value	115.9	95% Jackknife UCL	384.7
		95% Standard Bootstrap UCL	378.3
Anderson-Darling Test Statistic	0.724	95% Bootstrap-t UCL	386.6
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	401.1
Kolmogorov-Smirnov Test Statistic	0.227	95% Percentile Bootstrap UCL	380
Kolmogorov-Smirnov 5% Critical Value	0.229	95% BCA Bootstrap UCL	380.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	467.2
		97.5% Chebyshev(Mean, Sd) UCL	527.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	645.4
95% Approximate Gamma UCL (Use when n >= 40)	402.5		
95% Adjusted Gamma UCL (Use when n < 40)	413.7		

Potential UCL to Use	Use 95% Student's-t UCL 384.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

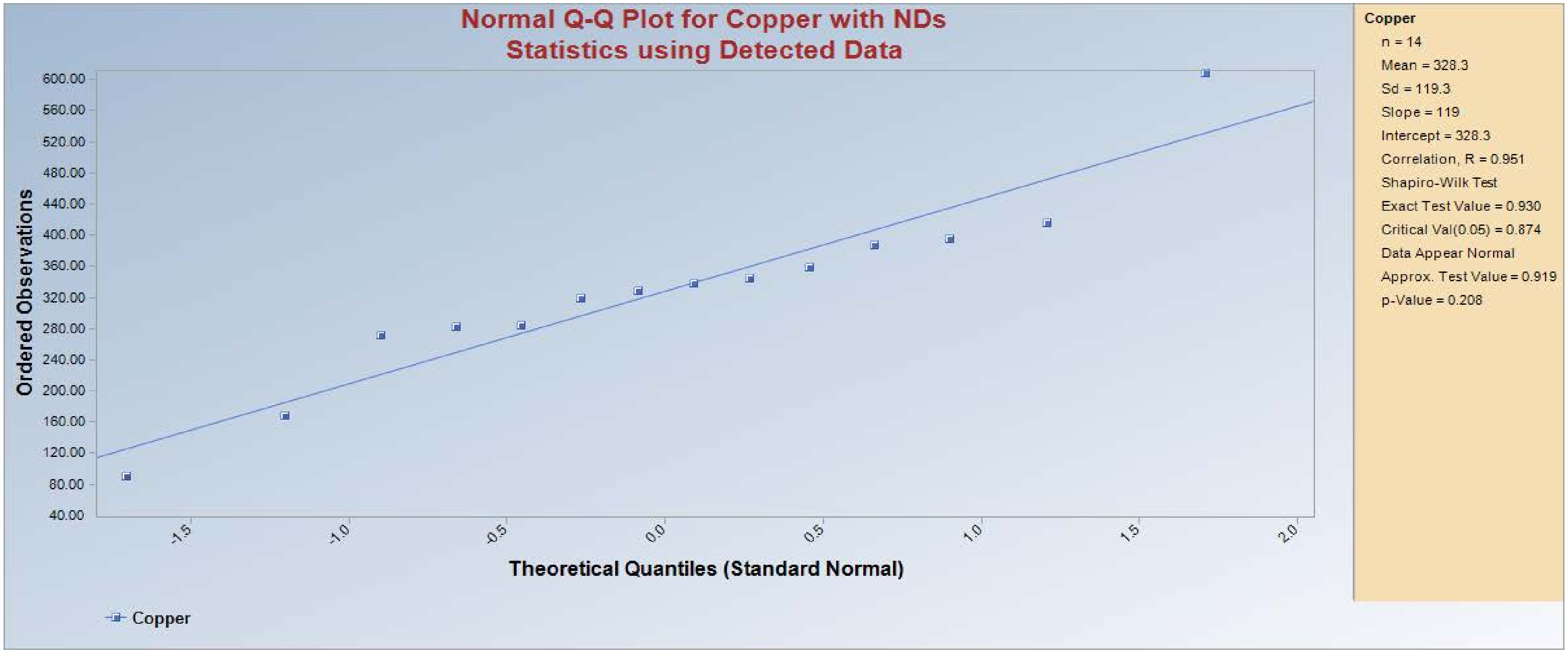
Number of Valid Observations	14	Number of Distinct Observations	14
Number of Missing Values	4		
Raw Statistics		**Log-transformed Statistics**	
Minimum	23977	Minimum of Log Data	10.08
Maximum	73228	Maximum of Log Data	11.2
Mean	51939	Mean of log Data	10.82
Geometric Mean	50193	SD of log Data	0.287
Median	54165		
SD	12796		
Std. Error of Mean	3420		
Coefficient of Variation	0.246		
Skewness	-0.634		

Relevant UCL Statistics

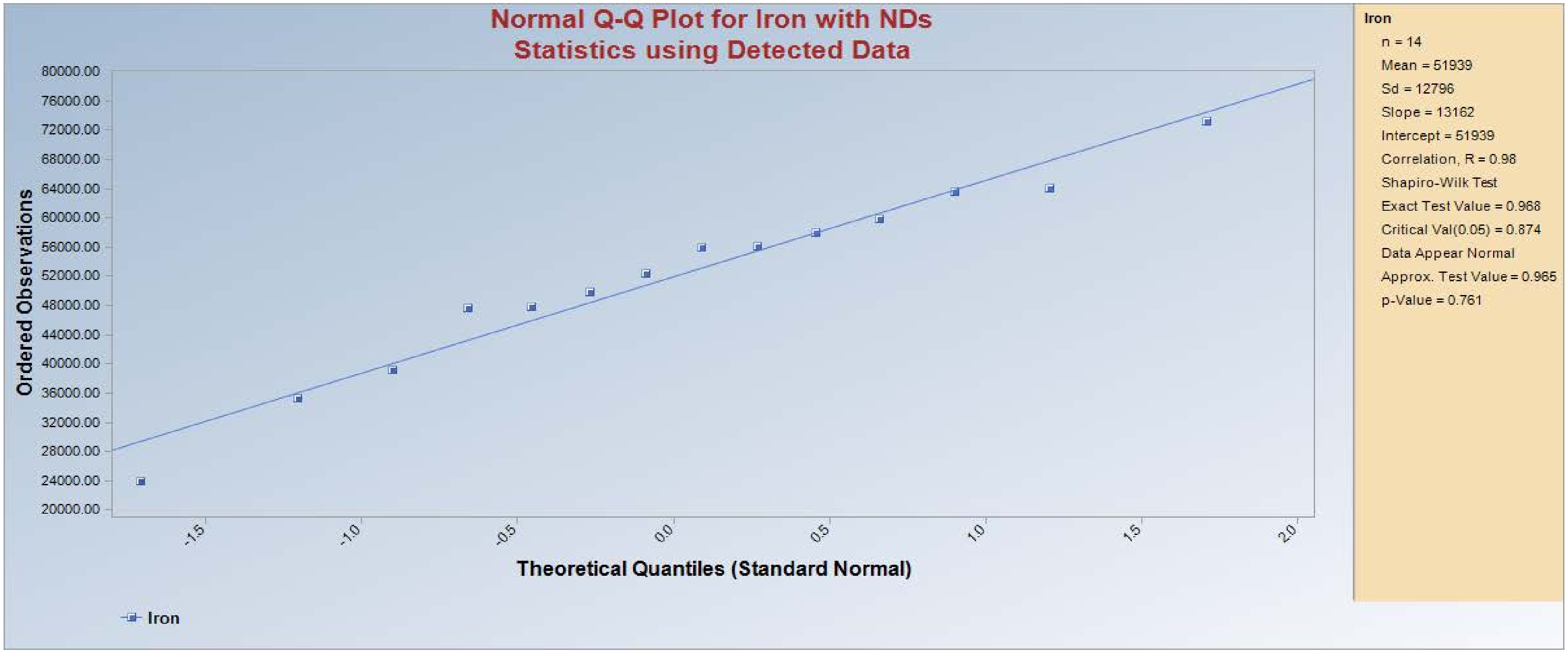
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.892
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	57996	95% H-UCL	60768
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	69760
95% Adjusted-CLT UCL (Chen-1995)	56945	97.5% Chebyshev (MVUE) UCL	77381
95% Modified-t UCL (Johnson-1978)	57899	99% Chebyshev (MVUE) UCL	92352
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	11.66	Data appear Normal at 5% Significance Level	
Theta Star	4453		
MLE of Mean	51939		
MLE of Standard Deviation	15208		
nu star	326.6		
Approximate Chi Square Value (.05)	285.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0312	95% CLT UCL	57564
Adjusted Chi Square Value	280.6	95% Jackknife UCL	57996
		95% Standard Bootstrap UCL	57511
Anderson-Darling Test Statistic	0.454	95% Bootstrap-t UCL	57429
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	56915
Kolmogorov-Smirnov Test Statistic	0.194	95% Percentile Bootstrap UCL	57082
Kolmogorov-Smirnov 5% Critical Value	0.228	95% BCA Bootstrap UCL	56765
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	66846
		97.5% Chebyshev(Mean, Sd) UCL	73296
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	85967
95% Approximate Gamma UCL (Use when n >= 40)	59369		
95% Adjusted Gamma UCL (Use when n < 40)	60442		
Potential UCL to Use		Use 95% Student's-t UCL	57996

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.



Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
600.00
560.00
520.00
480.00
440.00
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
40.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 14
Mean = 328.3
Sd = 119.3
Slope = 119
Intercept = 328.3
Correlation, R = 0.951
Shapiro-Wilk Test
Exact Test Value = 0.930
Critical Val(0.05) = 0.874
Data Appear Normal
Approx. Test Value = 0.919
p-Value = 0.208


Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
80000.00
76000.00
72000.00
68000.00
64000.00
60000.00
56000.00
52000.00
48000.00
44000.00
40000.00
36000.00
32000.00
28000.00
24000.00
20000.00
Ordered Observations
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 14
Mean = 51939
Sd = 12796
Slope = 13162
Intercept = 51939
Correlation, R = 0.98
Shapiro-Wilk Test
Exact Test Value = 0.968
Critical Val(0.05) = 0.874
Data Appear Normal
Approx. Test Value = 0.965
p-Value = 0.761

Attachment A11
ProUCL Output for EU 9 Subsurface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	13

Raw Statistics		Log-transformed Statistics	
Minimum	18.6	Minimum of Log Data	2.923
Maximum	1370	Maximum of Log Data	7.223
Mean	540.3	Mean of log Data	5.894
Geometric Mean	362.9	SD of log Data	1.125
Median	468		
SD	417		
Std. Error of Mean	115.6		
Coefficient of Variation	0.772		
Skewness	0.819		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk Test Statistic	0.874
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	746.4	95% H-UCL	1853
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1581
95% Adjusted-CLT UCL (Chen-1995)	758.6	97.5% Chebyshev (MVUE) UCL	1989
95% Modified-t UCL (Johnson-1978)	750.8	99% Chebyshev (MVUE) UCL	2791

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.128	Data appear Normal at 5% Significance Level	
Theta Star	479		
MLE of Mean	540.3		
MLE of Standard Deviation	508.7		
nu star	29.33		
Approximate Chi Square Value (.05)	17.97	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	730.5
Adjusted Chi Square Value	16.71	95% Jackknife UCL	746.4
		95% Standard Bootstrap UCL	724.4
Anderson-Darling Test Statistic	0.249	95% Bootstrap-t UCL	779.3
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	745.2
Kolmogorov-Smirnov Test Statistic	0.137	95% Percentile Bootstrap UCL	731.2
Kolmogorov-Smirnov 5% Critical Value	0.241	95% BCA Bootstrap UCL	763.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1044
		97.5% Chebyshev(Mean, Sd) UCL	1263
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1691
95% Approximate Gamma UCL (Use when n >= 40)	882		
95% Adjusted Gamma UCL (Use when n < 40)	948.4		

Potential UCL to Use		Use 95% Student's-t UCL	746.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	13

Raw Statistics		Log-transformed Statistics	
Minimum	45900	Minimum of Log Data	10.73
Maximum	218000	Maximum of Log Data	12.29
Mean	125023	Mean of log Data	11.59
Geometric Mean	108221	SD of log Data	0.584
Median	140000		
SD	63866		
Std. Error of Mean	17713		
Coefficient of Variation	0.511		
Skewness	0.0708		

Relevant UCL Statistics

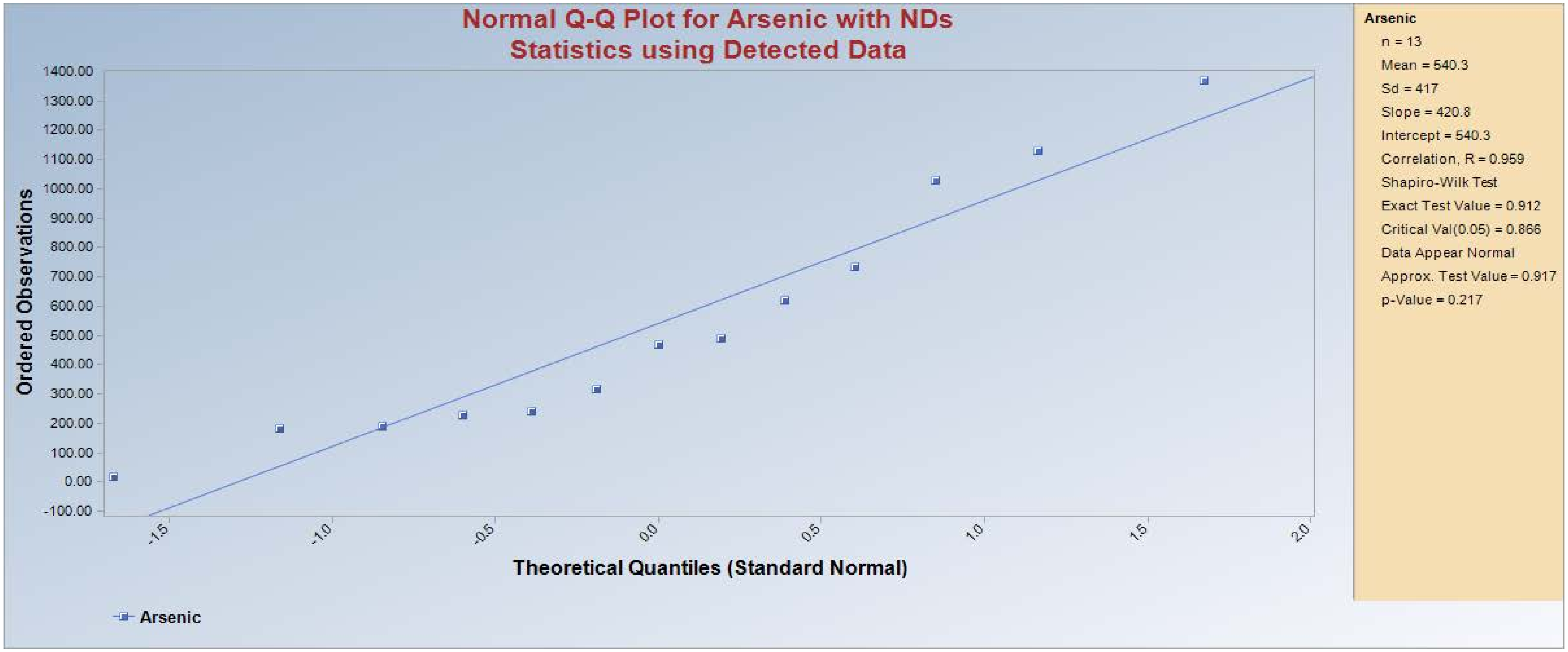
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.89	Shapiro Wilk Test Statistic	0.869
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	156593	95% H-UCL	186546
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	218917
95% Adjusted-CLT UCL (Chen-1995)	154530	97.5% Chebyshev (MVUE) UCL	258913
95% Modified-t UCL (Johnson-1978)	156651	99% Chebyshev (MVUE) UCL	337479

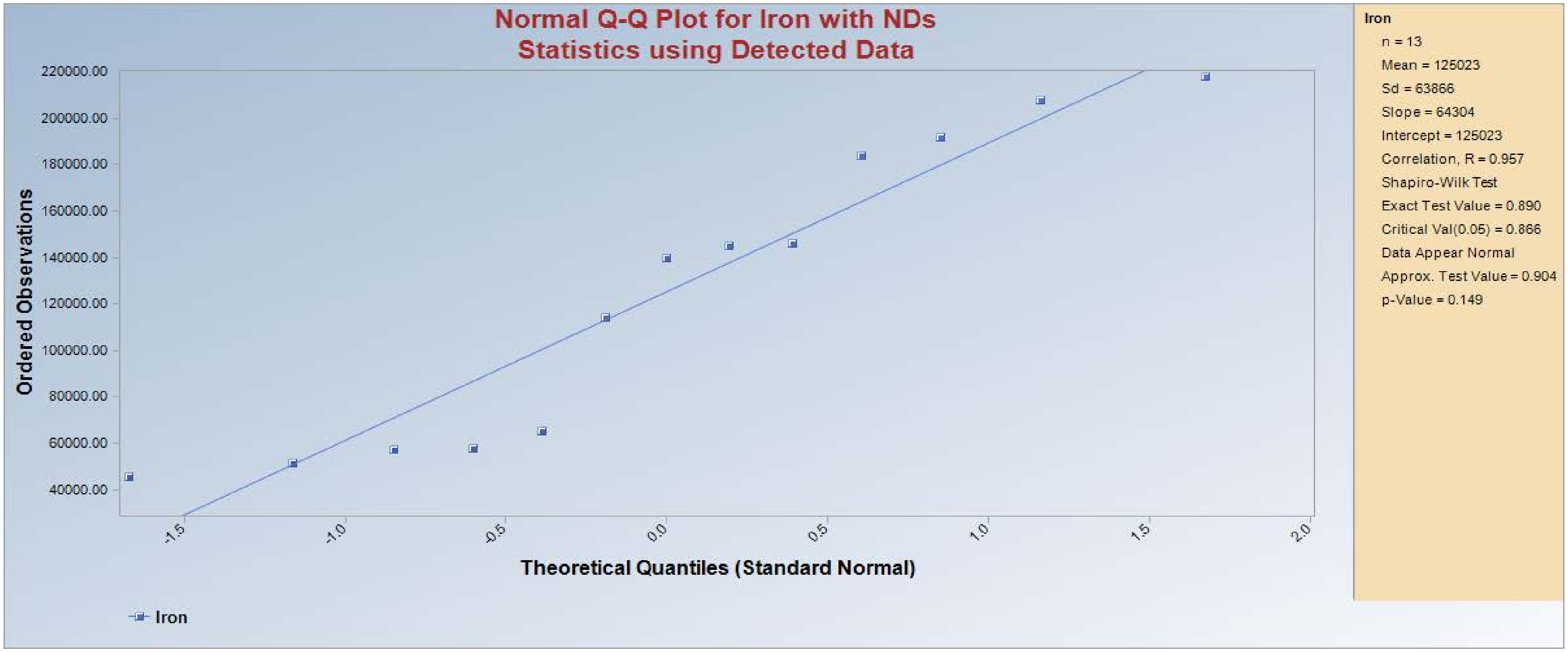
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.838	Data appear Normal at 5% Significance Level	
Theta Star	44055		
MLE of Mean	125023		
MLE of Standard Deviation	74215		
nu star	73.79		
Approximate Chi Square Value (.05)	55	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	154159
Adjusted Chi Square Value	52.7	95% Jackknife UCL	156593
		95% Standard Bootstrap UCL	152924
Anderson-Darling Test Statistic	0.705	95% Bootstrap-t UCL	156749
Anderson-Darling 5% Critical Value	0.738	95% Hall's Bootstrap UCL	152510
Kolmogorov-Smirnov Test Statistic	0.209	95% Percentile Bootstrap UCL	152985
Kolmogorov-Smirnov 5% Critical Value	0.238	95% BCA Bootstrap UCL	152423
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	202233
		97.5% Chebyshev(Mean, Sd) UCL	235642
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	301267
95% Approximate Gamma UCL (Use when n >= 40)	167714		
95% Adjusted Gamma UCL (Use when n < 40)	175051		

Potential UCL to Use		Use 95% Student's-t UCL	156593

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.



Normal Q-Q Plot for Arsenic with NDs
Statistics using Detected Data
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
Ordered Observations
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Arsenic
Arsenic
n = 13
Mean = 540.3
Sd = 417
Slope = 420.8
Intercept = 540.3
Correlation, R = 0.959
Shapiro-Wilk Test
Exact Test Value = 0.912
Critical Val(0.05) = 0.866
Data Appear Normal
Approx. Test Value = 0.917
p-Value = 0.217



Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
220000.00
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
Ordered Observations
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 13
Mean = 125023
Sd = 63866
Slope = 64304
Intercept = 125023
Correlation, R = 0.957
Shapiro-Wilk Test
Exact Test Value = 0.890
Critical Val(0.05) = 0.866
Data Appear Normal
Approx. Test Value = 0.904
p-Value = 0.149

Attachment A12
ProUCL Output for EU 10 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	30	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	15
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	11	Minimum Detected	2.398
Maximum Detected	52.73	Maximum Detected	3.965
Mean of Detected	22.34	Mean of Detected	2.989
SD of Detected	12.84	SD of Detected	0.471
Minimum Non-Detect	8.921	Minimum Non-Detect	2.188
Maximum Non-Detect	47.55	Maximum Non-Detect	3.862

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	28
Number treated as Detected	2
Single DL Non-Detect Percentage	93.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.748	Shapiro Wilk Test Statistic	0.889
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	15.59	Mean	2.543
SD	11.69	SD	0.623
95% DL/2 (t) UCL	19.22	95% H-Stat (DL/2) UCL	19.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.609
		SD in Log Scale	0.53
		Mean in Original Scale	15.92
		SD in Original Scale	11.15
		95% t UCL	19.38
		95% Percentile Bootstrap UCL	19.55
		95% BCA Bootstrap UCL	20.54
		95% H-UCL	18.99

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.583	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	6.236		
nu star	107.5		
A-D Test Statistic	0.93	Nonparametric Statistics	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.739	Mean	17.27
5% K-S Critical Value	0.222	SD	10.28
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	1.968
		95% KM (t) UCL	20.61
Assuming Gamma Distribution		95% KM (z) UCL	20.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	20.49
Minimum	0.000001	95% KM (bootstrap t) UCL	22.87
Maximum	52.73	95% KM (BCA) UCL	21.37
Mean	13.27	95% KM (Percentile Bootstrap) UCL	20.89
Median	11.17	95% KM (Chebyshev) UCL	25.84
SD	13.22	97.5% KM (Chebyshev) UCL	29.55
k star	0.198	99% KM (Chebyshev) UCL	36.84
Theta star	67.1		
Nu star	11.87	Potential UCLs to Use	
AppChi2	5.14	95% KM (t) UCL	20.61
95% Gamma Approximate UCL (Use when n >= 40)	30.64		
95% Adjusted Gamma UCL (Use when n < 40)	32.23		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	30	Number of Distinct Observations	30
Raw Statistics		**Log-transformed Statistics**	
Minimum	75.9	Minimum of Log Data	4.329
Maximum	1001	Maximum of Log Data	6.909
Mean	256	Mean of log Data	5.27
Geometric Mean	194.3	SD of log Data	0.674
Median	176.4		
SD	247.9		
Std. Error of Mean	45.26		
Coefficient of Variation	0.968		
Skewness	2.268		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.622	Shapiro Wilk Test Statistic	0.868
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	332.9	95% H-UCL	317.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	381.3
95% Adjusted-CLT UCL (Chen-1995)	350.4	97.5% Chebyshev (MVUE) UCL	441.7
95% Modified-t UCL (Johnson-1978)	336	99% Chebyshev (MVUE) UCL	560.4

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.791	Data do not follow a Discernable Distribution (0.05)	
Theta Star	142.9		
MLE of Mean	256		
MLE of Standard Deviation	191.3		
nu star	107.5		
Approximate Chi Square Value (.05)	84.53	**Nonparametric Statistics**	
Adjusted Level of Significance	0.041	95% CLT UCL	330.4
Adjusted Chi Square Value	83.36	95% Jackknife UCL	332.9
		95% Standard Bootstrap UCL	329.6
Anderson-Darling Test Statistic	2.482	95% Bootstrap-t UCL	368.3
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL	337.8
Kolmogorov-Smirnov Test Statistic	0.267	95% Percentile Bootstrap UCL	336
Kolmogorov-Smirnov 5% Critical Value	0.162	95% BCA Bootstrap UCL	343.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	453.2
		97.5% Chebyshev(Mean, Sd) UCL	538.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	706.3
95% Approximate Gamma UCL (Use when n >= 40)	325.4		
95% Adjusted Gamma UCL (Use when n < 40)	330		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	453.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	30	Number of Distinct Observations	30
Raw Statistics		**Log-transformed Statistics**	
Minimum	17139	Minimum of Log Data	9.749
Maximum	83328	Maximum of Log Data	11.33
Mean	33574	Mean of log Data	10.35
Geometric Mean	31126	SD of log Data	0.377
Median	32518		
SD	15304		
Std. Error of Mean	2794		
Coefficient of Variation	0.456		
Skewness	2.222		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.746	Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	38322	95% H-UCL	38047
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	43572
95% Adjusted-CLT UCL (Chen-1995)	39381	97.5% Chebyshev (MVUE) UCL	48004
95% Modified-t UCL (Johnson-1978)	38511	99% Chebyshev (MVUE) UCL	56710

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.112	Data do not follow a Discernable Distribution (0.05)	
Theta Star	5493		
MLE of Mean	33574		
MLE of Standard Deviation	13580		
nu star	366.7		
Approximate Chi Square Value (.05)	323.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.041	95% CLT UCL	38170
Adjusted Chi Square Value	321	95% Jackknife UCL	38322
		95% Standard Bootstrap UCL	38063
Anderson-Darling Test Statistic	1.111	95% Bootstrap-t UCL	41213
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	64527
Kolmogorov-Smirnov Test Statistic	0.221	95% Percentile Bootstrap UCL	38684
Kolmogorov-Smirnov 5% Critical Value	0.16	95% BCA Bootstrap UCL	39562
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	45754
		97.5% Chebyshev(Mean, Sd) UCL	51024
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	61376
95% Approximate Gamma UCL (Use when n >= 40)	38079		
95% Adjusted Gamma UCL (Use when n < 40)	38357		

Potential UCL to Use		Use 95% Student's-t UCL	38322
		or 95% Modified-t UCL	38511

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	30	Number of Detected Data	12
Number of Distinct Detected Data	12	Number of Non-Detect Data	18
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	167.2	Minimum Detected	5.119
Maximum Detected	5152	Maximum Detected	8.547
Mean of Detected	1289	Mean of Detected	6.43
SD of Detected	1632	SD of Detected	1.26
Minimum Non-Detect	98.25	Minimum Non-Detect	4.588
Maximum Non-Detect	216.1	Maximum Non-Detect	5.376

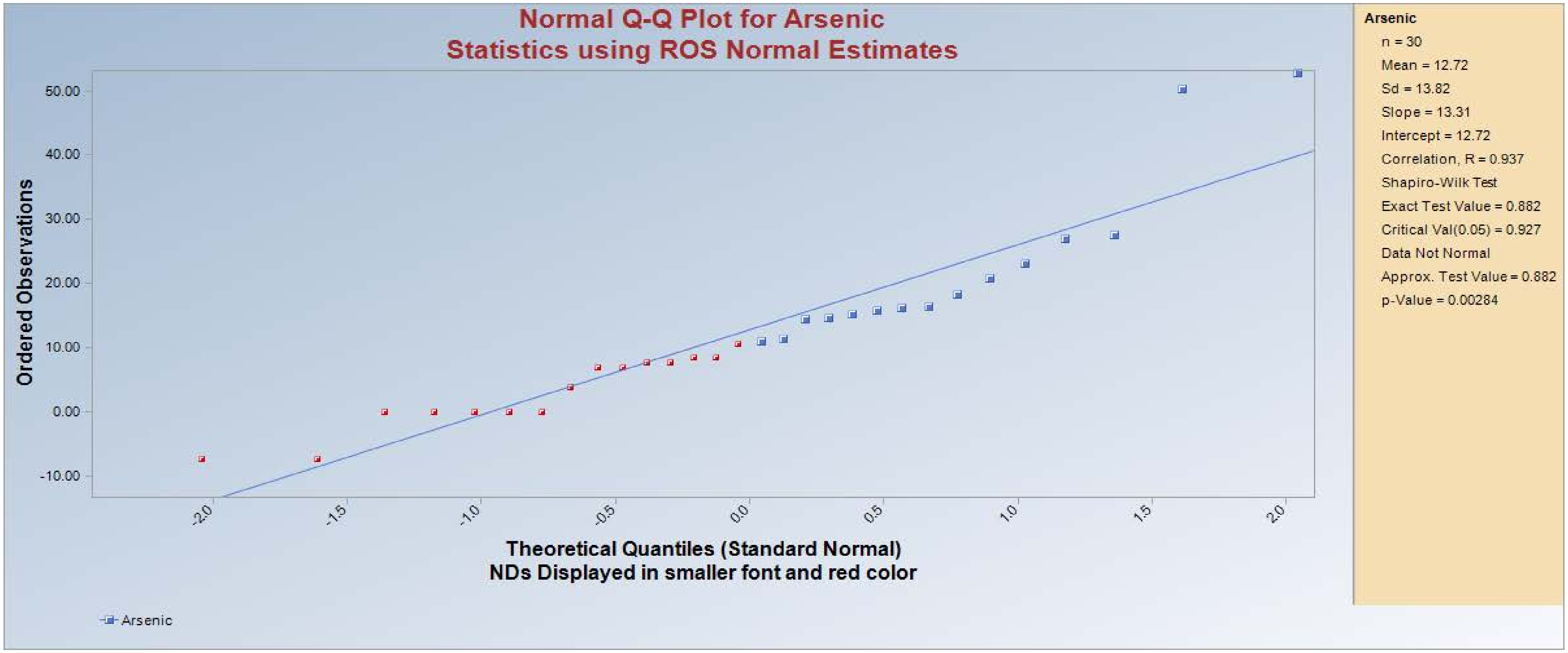
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	73.33%

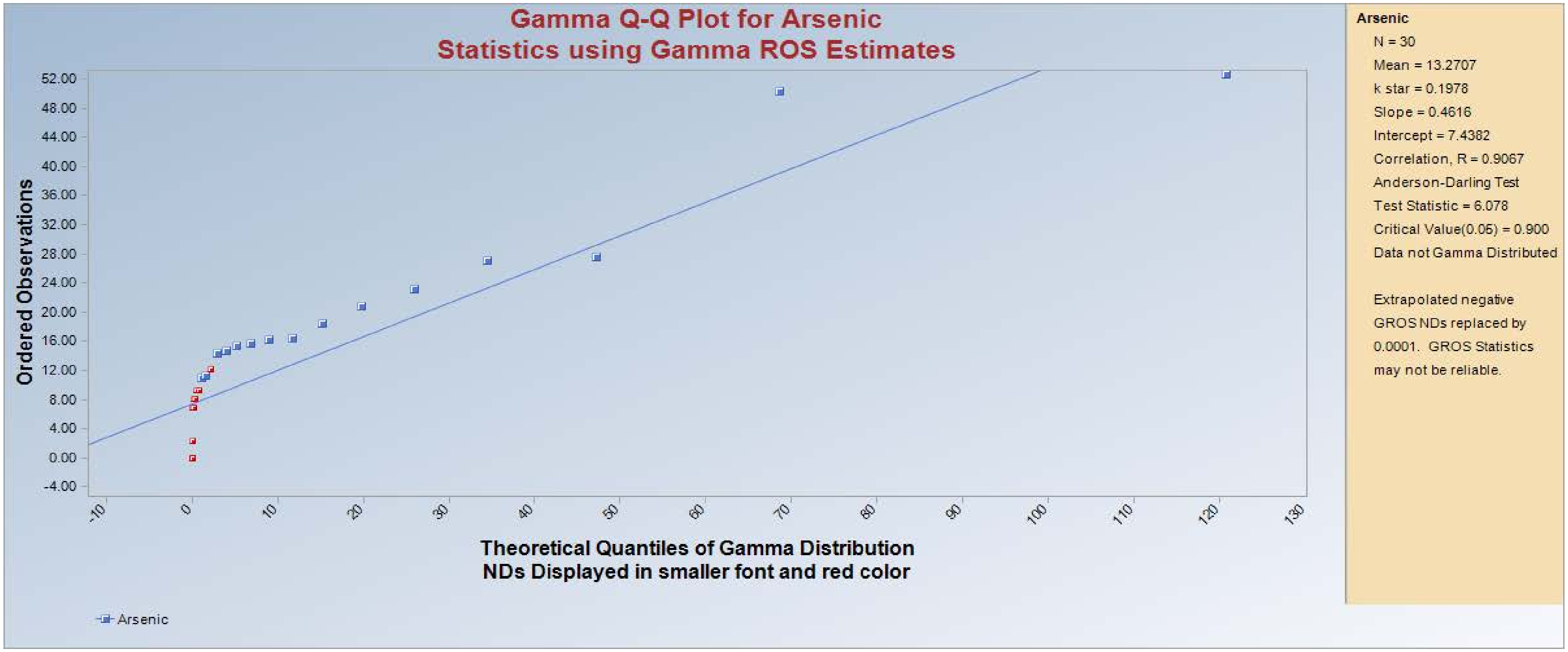
UCL Statistics

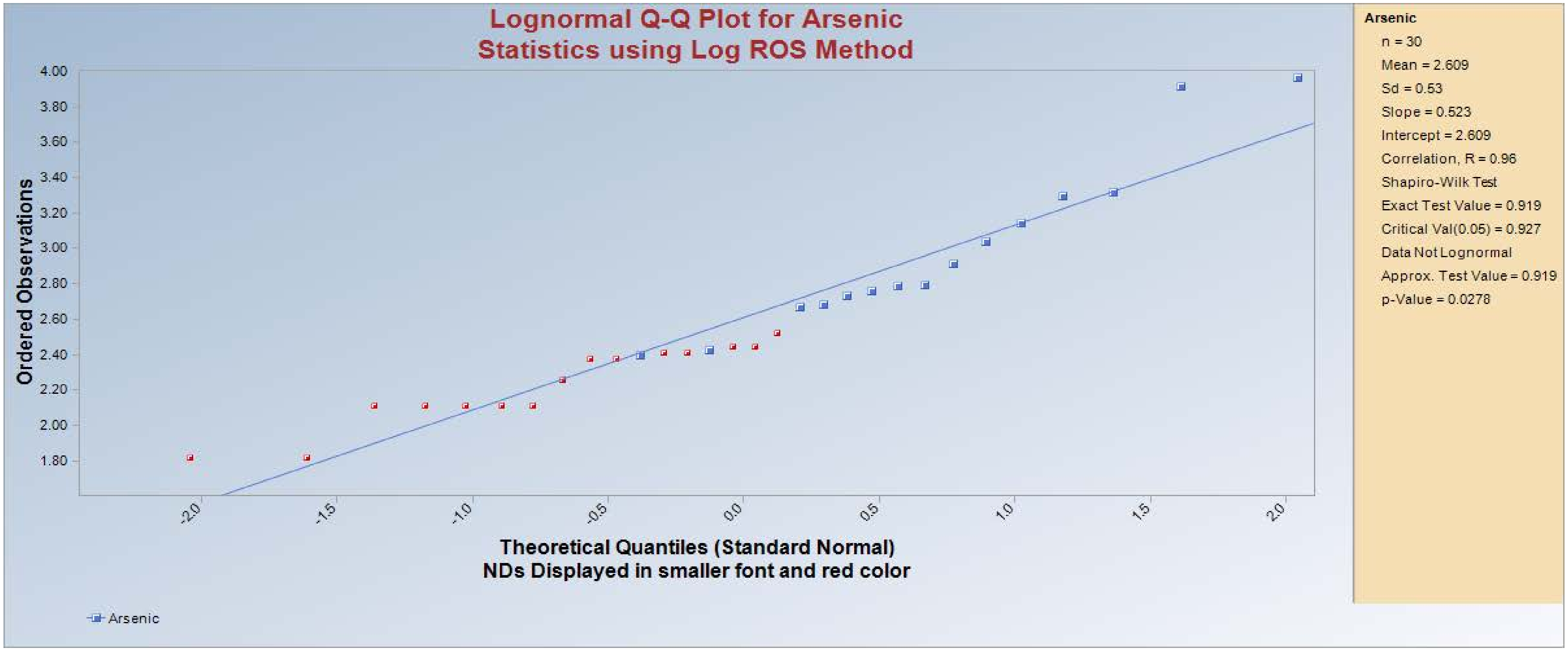
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.743	Shapiro Wilk Test Statistic	0.875
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	554	Mean	5.049
SD	1176	SD	1.395
95% DL/2 (t) UCL	918.8	95% H-Stat (DL/2) UCL	900.1
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	4.266
		SD in Log Scale	1.961
		Mean in Original Scale	525.9
		SD in Original Scale	1188
		95% t UCL	894.6
		95% Percentile Bootstrap UCL	914.7
		95% BCA Bootstrap UCL	1015
		95% H-UCL	1993
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.663	Data appear Lognormal at 5% Significance Level	
Theta Star	1945		
nu star	15.91		
A-D Test Statistic	0.799	**Nonparametric Statistics**	
5% A-D Critical Value	0.763	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.763	Mean	616.2
5% K-S Critical Value	0.254	SD	1131
Data not Gamma Distributed at 5% Significance Level		SE of Mean	215.6
		95% KM (t) UCL	982.6
Assuming Gamma Distribution		95% KM (z) UCL	970.9
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	969.1
Minimum	0.000001	95% KM (bootstrap t) UCL	1424
Maximum	5152	95% KM (BCA) UCL	1009
Mean	515.8	95% KM (Percentile Bootstrap) UCL	1004
Median	0.000001	95% KM (Chebyshev) UCL	1556
SD	1193	97.5% KM (Chebyshev) UCL	1963
k star	0.0858	99% KM (Chebyshev) UCL	2762
Theta star	6008		
Nu star	5.151	**Potential UCLs to Use**	
AppChi2	1.222	95% KM (BCA) UCL	1009
95% Gamma Approximate UCL (Use when n >= 40)	2173		
95% Adjusted Gamma UCL (Use when n < 40)	2377		

Note: DL/2 is not a recommended method.

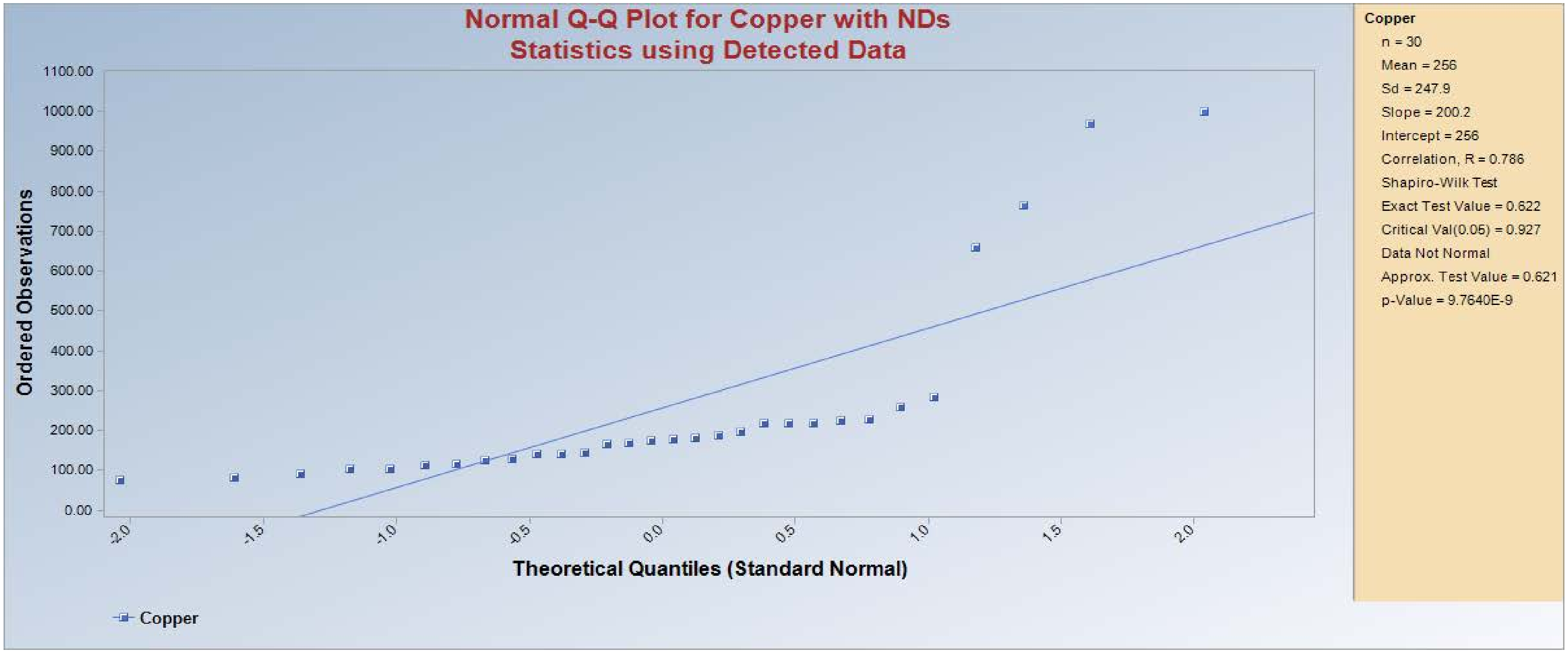
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 30
Mean = 12.72
Sd = 13.82
Slope = 13.31
Intercept = 12.72
Correlation, R = 0.937
Shapiro-Wilk Test
Exact Test Value = 0.882
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.882
p-Value = 0.00284

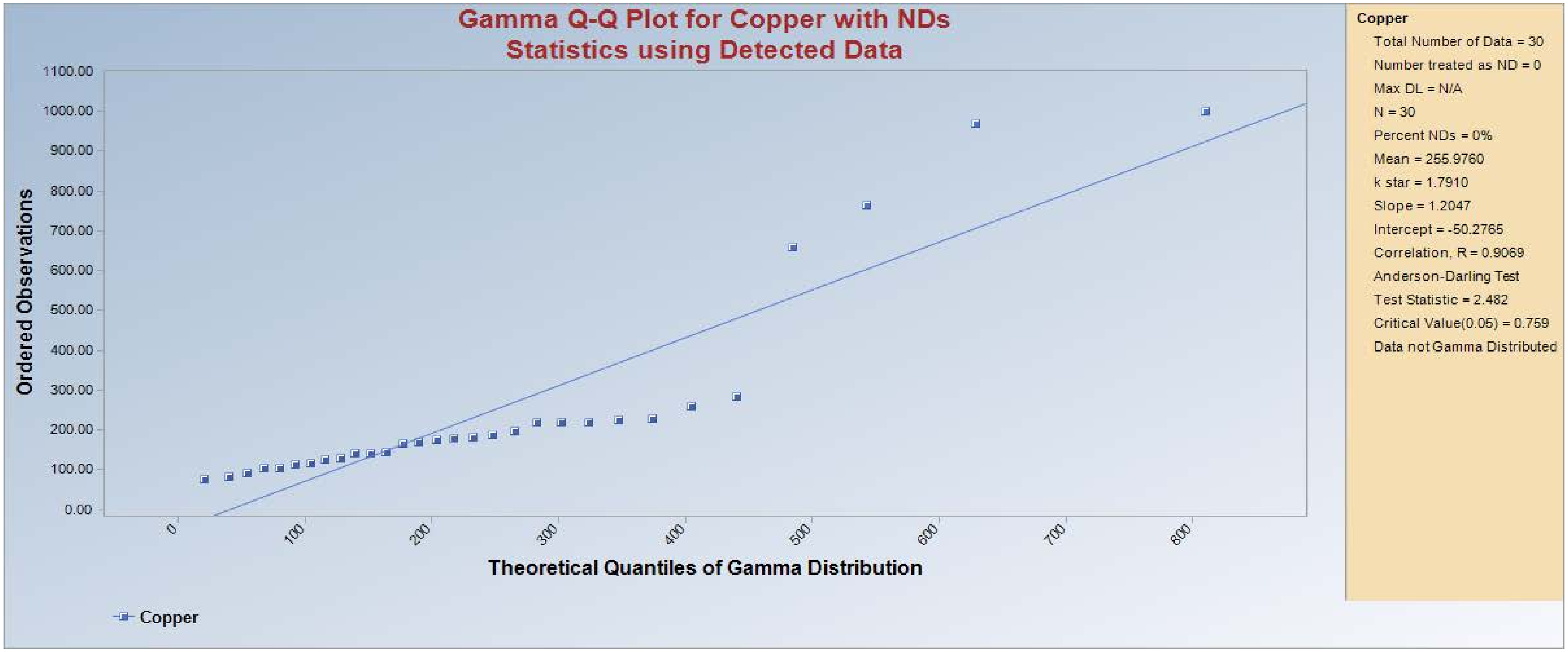

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
52.00
48.00
44.00
40.00
36.00
32.00
28.00
24.00
20.00
16.00
12.00
8.00
4.00
0.00
-4.00
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 30
Mean = 13.2707
k star = 0.1978
Slope = 0.4616
Intercept = 7.4382
Correlation, R = 0.9067
Anderson-Darling Test
Test Statistic = 6.078
Critical Value(0.05) = 0.900
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



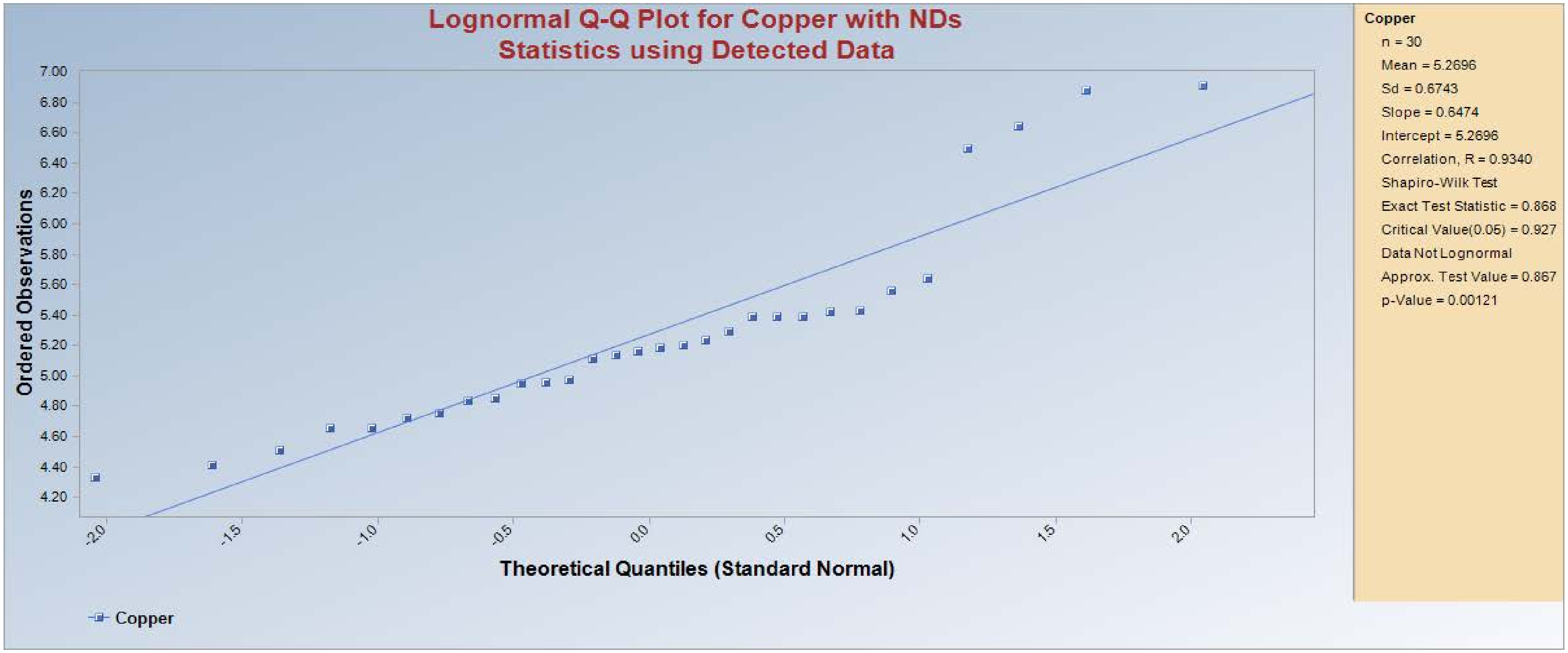
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 30
Mean = 2.609
Sd = 0.53
Slope = 0.523
Intercept = 2.609
Correlation, R = 0.96
Shapiro-Wilk Test
Exact Test Value = 0.919
Critical Val(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.919
p-Value = 0.0278



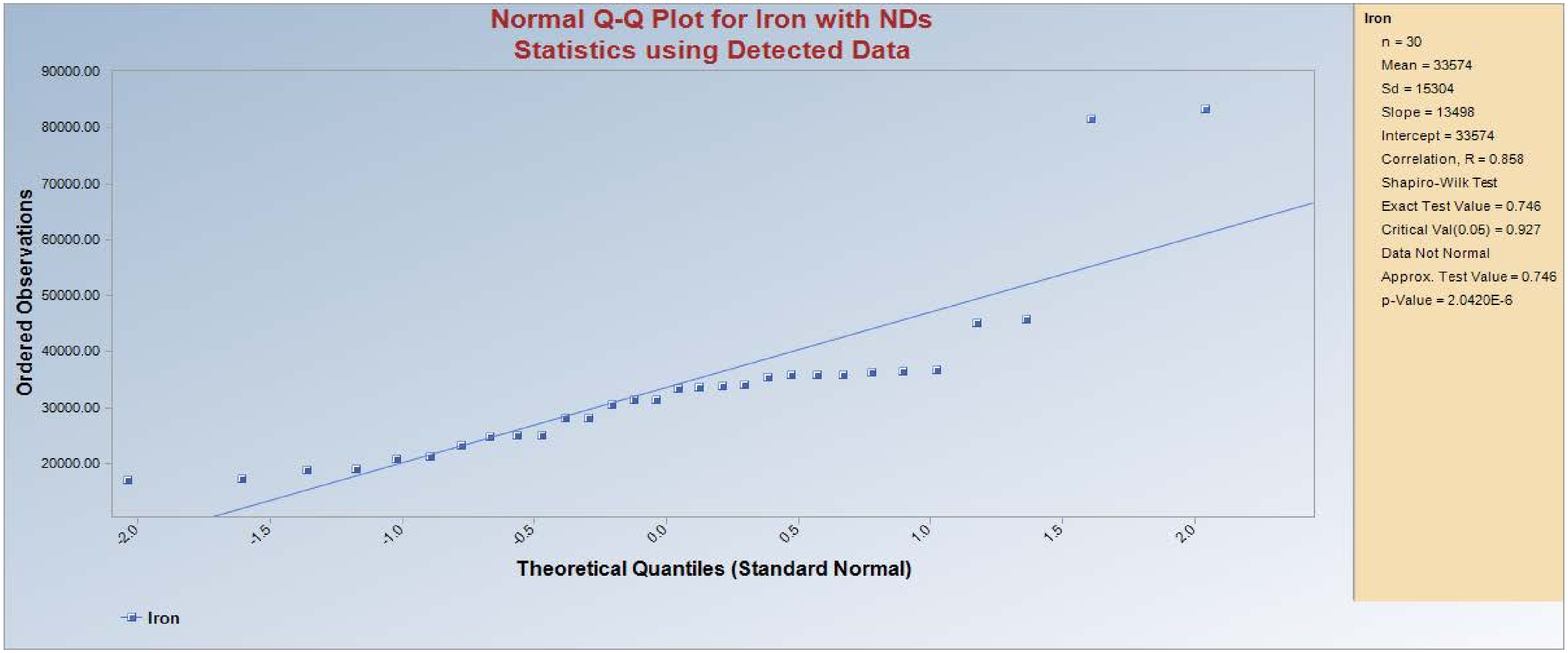
Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 30
Mean = 256
Sd = 247.9
Slope = 200.2
Intercept = 256
Correlation, R = 0.786
Shapiro-Wilk Test
Exact Test Value = 0.622
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.621
p-Value = 9.7640E-9

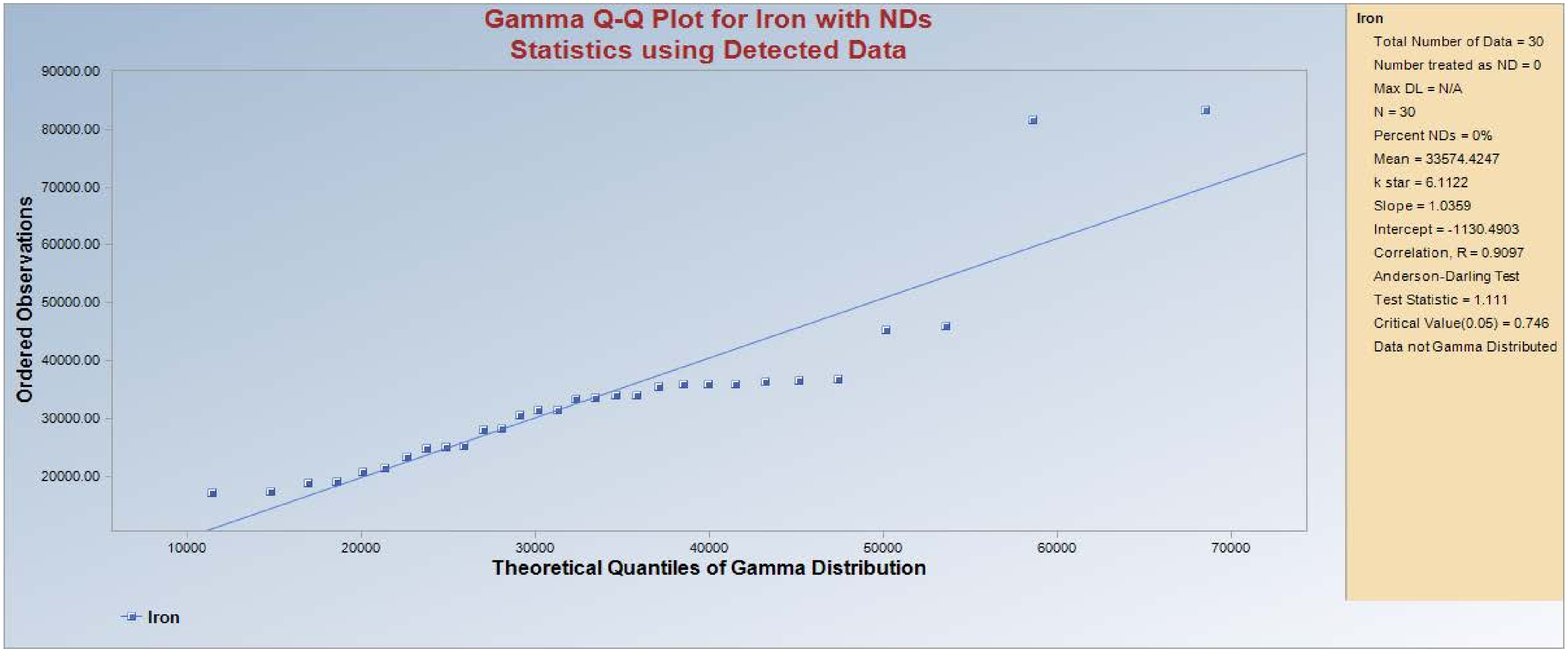


Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
100
200
300
400
500
600
700
800
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 30
Number treated as ND = 0
Max DL = N/A
N = 30
Percent NDs = 0%
Mean = 255.9760
k star = 1.7910
Slope = 1.2047
Intercept = -50.2765
Correlation, R = 0.9069
Anderson-Darling Test
Test Statistic = 2.482
Critical Value(0.05) = 0.759
Data not Gamma Distributed

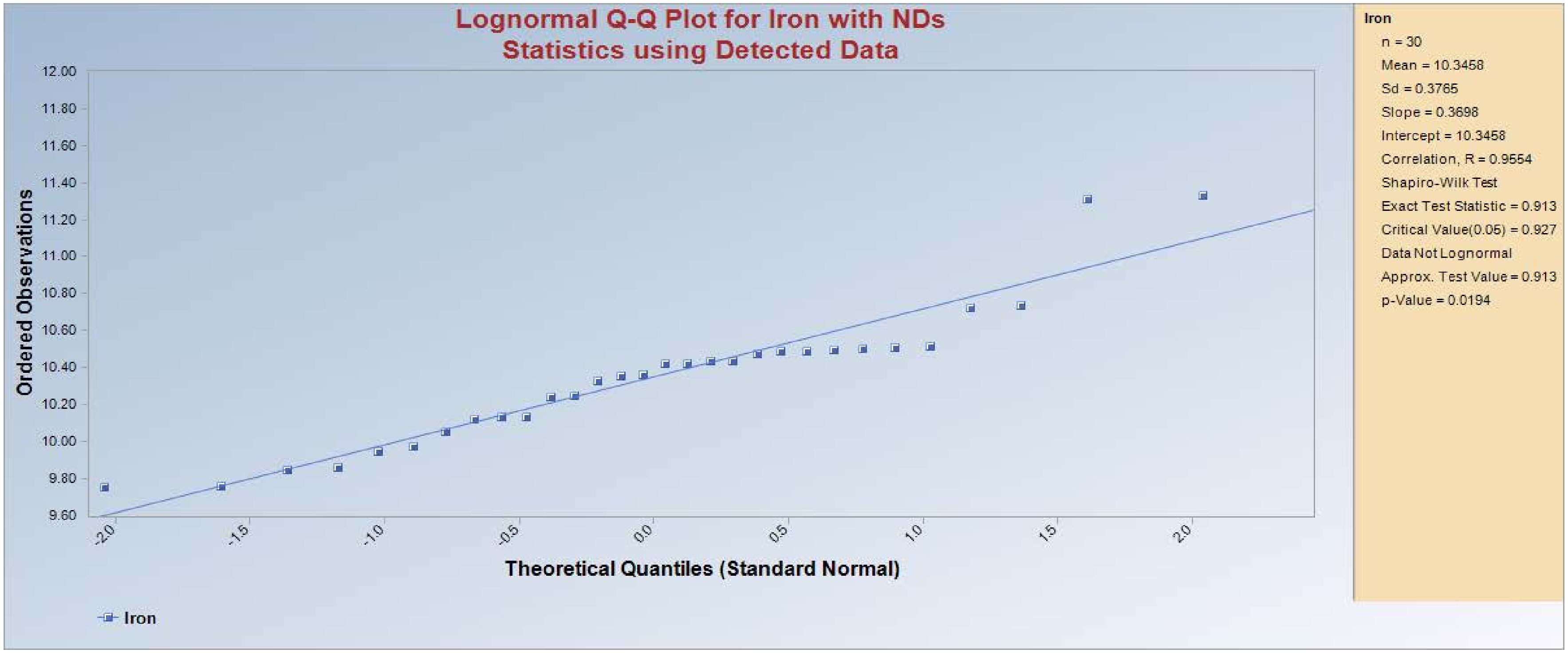


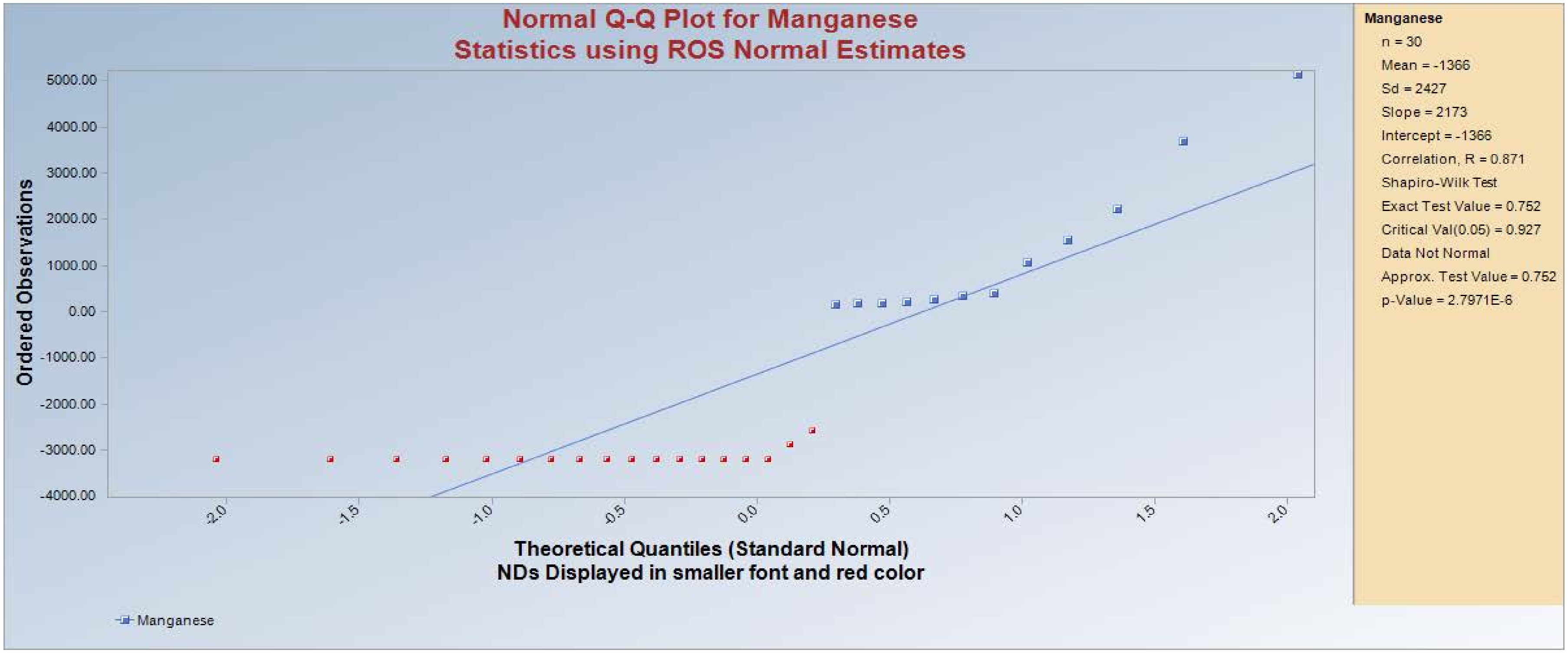
Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 30
Mean = 5.2696
Sd = 0.6743
Slope = 0.6474
Intercept = 5.2696
Correlation, R = 0.9340
Shapiro-Wilk Test
Exact Test Statistic = 0.868
Critical Value(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.867
p-Value = 0.00121


Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 30
Mean = 33574
Sd = 15304
Slope = 13498
Intercept = 33574
Correlation, R = 0.858
Shapiro-Wilk Test
Exact Test Value = 0.746
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.746
p-Value = 2.0420E-6

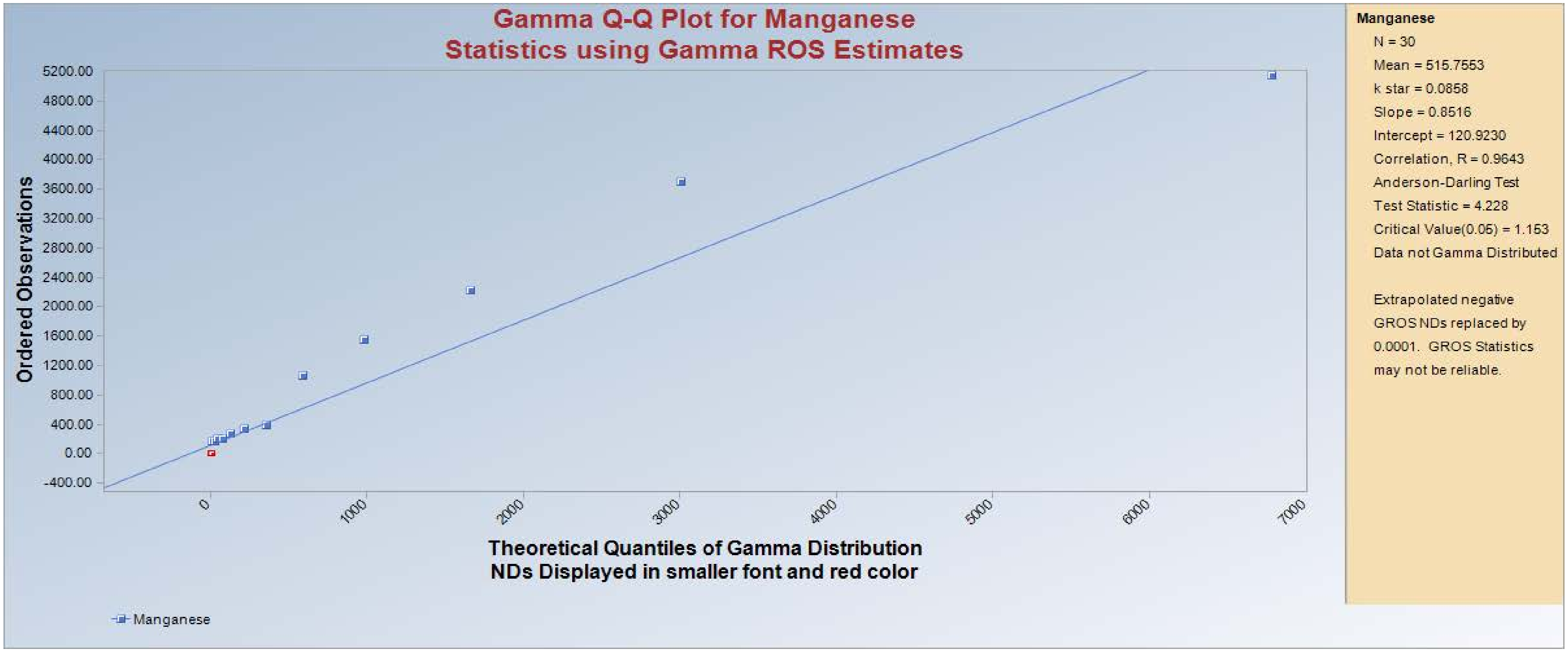


Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
Ordered Observations
10000
20000
30000
40000
50000
60000
70000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 30
Number treated as ND = 0
Max DL = N/A
N = 30
Percent NDs = 0%
Mean = 33574.4247
k star = 6.1122
Slope = 1.0359
Intercept = -1130.4903
Correlation, R = 0.9097
Anderson-Darling Test
Test Statistic = 1.111
Critical Value(0.05) = 0.746
Data not Gamma Distributed

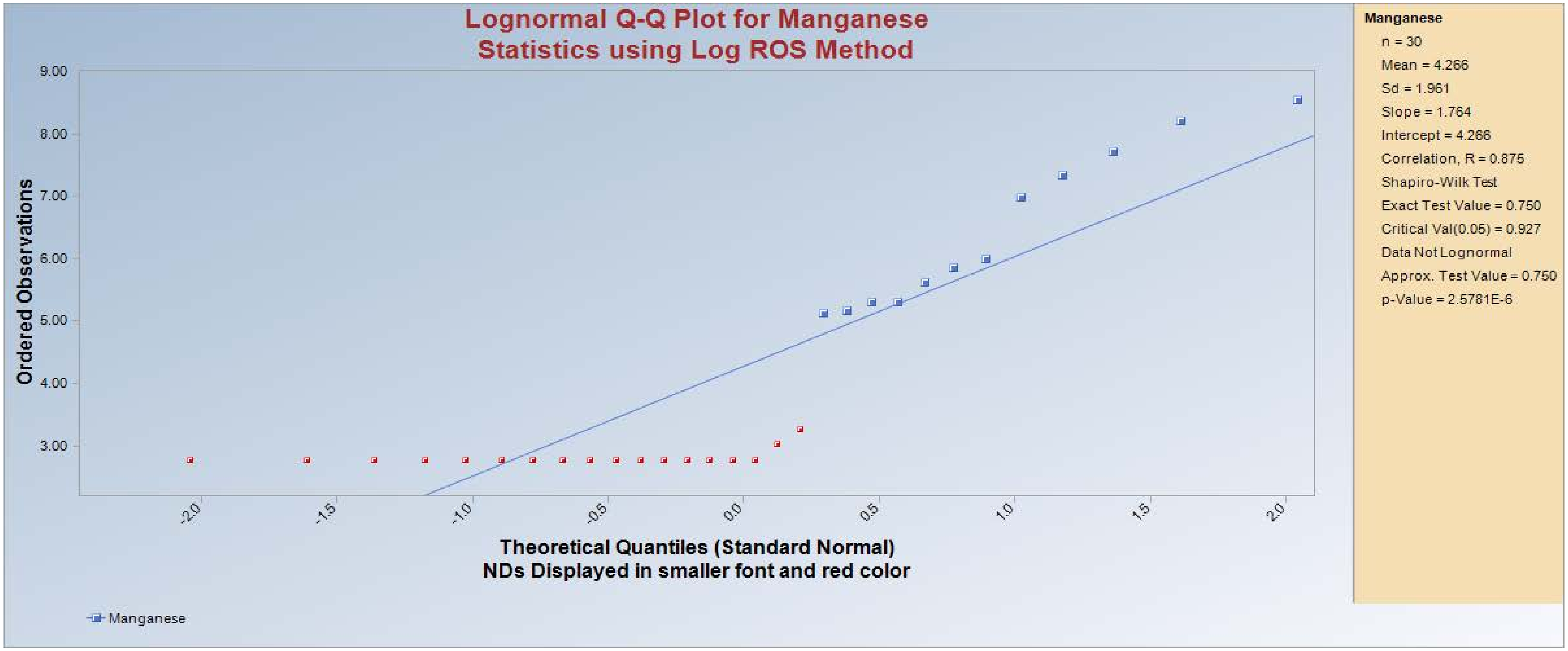

Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
12.00
11.80
11.60
11.40
11.20
11.00
10.80
10.60
10.40
10.20
10.00
9.80
9.60
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 30
Mean = 10.3458
Sd = 0.3765
Slope = 0.3698
Intercept = 10.3458
Correlation, R = 0.9554
Shapiro-Wilk Test
Exact Test Statistic = 0.913
Critical Value(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.913
p-Value = 0.0194



Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
-2000.00
-3000.00
-4000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 30
Mean = -1366
Sd = 2427
Slope = 2173
Intercept = -1366
Correlation, R = 0.871
Shapiro-Wilk Test
Exact Test Value = 0.752
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.752
p-Value = 2.7971E-6



Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
5200.00
4800.00
4400.00
4000.00
3600.00
3200.00
2800.00
2400.00
2000.00
1600.00
1200.00
800.00
400.00
0.00
-400.00
0
1000
2000
3000
4000
5000
6000
7000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 30
Mean = 515.7553
k star = 0.0858
Slope = 0.8516
Intercept = 120.9230
Correlation, R = 0.9643
Anderson-Darling Test
Test Statistic = 4.228
Critical Value(0.05) = 1.153
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
9.00
8.00
7.00
6.00
5.00
4.00
3.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 30
Mean = 4.266
Sd = 1.961
Slope = 1.764
Intercept = 4.266
Correlation, R = 0.875
Shapiro-Wilk Test
Exact Test Value = 0.750
Critical Val(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.750
p-Value = 2.5781E-6

Attachment A13
ProUCL Output for EU 11 Surface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	200	Number of Detected Data	182
Number of Distinct Detected Data	182	Number of Non-Detect Data	18
		Percent Non-Detects	9.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	9.247	Minimum Detected	2.224
Maximum Detected	616.4	Maximum Detected	6.424
Mean of Detected	110.7	Mean of Detected	4.223
SD of Detected	112.4	SD of Detected	1.016
Minimum Non-Detect	8.481	Minimum Non-Detect	2.138
Maximum Non-Detect	24.22	Maximum Non-Detect	3.187

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	57
Number treated as Detected	143
Single DL Non-Detect Percentage	28.50%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.183	Lilliefors Test Statistic	0.0787
5% Lilliefors Critical Value	0.0657	5% Lilliefors Critical Value	0.0657
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	101.4	Mean	4.018
SD	111.3	SD	1.172
95% DL/2 (t) UCL	114.4	95% H-Stat (DL/2) UCL	134.1
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	77.14	Mean in Log Scale	4.037
SD	140	SD in Log Scale	1.139
95% MLE (t) UCL	93.5	Mean in Original Scale	101.6
95% MLE (Tiku) UCL	94.19	SD in Original Scale	111.1
		95% t UCL	114.6
		95% Percentile Bootstrap UCL	115.7
		95% BCA Bootstrap UCL	115.2
		95% H UCL	130.6

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.155	Data do not follow a Discernable Distribution (0.05)	
Theta Star	95.87		
nu star	420.4		
A-D Test Statistic	2.766	Nonparametric Statistics	
5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.779	Mean	101.8
5% K-S Critical Value	0.07	SD	110.7
Data not Gamma Distributed at 5% Significance Level		SE of Mean	7.85
		95% KM (t) UCL	114.7
Assuming Gamma Distribution		95% KM (z) UCL	114.7
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	114.7
Minimum	0.000001	95% KM (bootstrap t) UCL	115.5
Maximum	616.4	95% KM (BCA) UCL	115.7
Mean	100.8	95% KM (Percentile Bootstrap) UCL	114.9
Median	55.07	95% KM (Chebyshev) UCL	136
SD	111.8	97.5% KM (Chebyshev) UCL	150.8
k star	0.334	99% KM (Chebyshev) UCL	179.9
Theta star	301.3		
Nu star	133.8	Potential UCLs to Use	
AppChi2	108.1	95% KM (Chebyshev) UCL	136
95% Gamma Approximate UCL (Use when n >= 40)	124.7		
95% Adjusted Gamma UCL (Use when n < 40)	124.9		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Observations	24	Number of Distinct Observations	24
Number of Missing Values	166		

Raw Statistics		Log-transformed Statistics	
Minimum	0.238	Minimum of Log Data	-1.435
Maximum	72.2	Maximum of Log Data	4.279
Mean	7.481	Mean of log Data	0.842
Geometric Mean	2.322	SD of log Data	1.466
Median	1.765		
SD	15.67		
Std. Error of Mean	3.198		
Coefficient of Variation	2.094		
Skewness	3.533		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.492	Shapiro Wilk Test Statistic	0.962
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12.96	95% H-UCL	18.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16.22
95% Adjusted-CLT UCL (Chen-1995)	15.21	97.5% Chebyshev (MVUE) UCL	20.53
95% Modified-t UCL (Johnson-1978)	13.35	99% Chebyshev (MVUE) UCL	29
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.498	Data appear Lognormal at 5% Significance Level	
Theta Star	15.03		
MLE of Mean	7.481		
MLE of Standard Deviation	10.6		
nu star	23.89		
Approximate Chi Square Value (.05)	13.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0392	95% CLT UCL	12.74
Adjusted Chi Square Value	13.22	95% Jackknife UCL	12.96
		95% Standard Bootstrap UCL	12.52
Anderson-Darling Test Statistic	1.466	95% Bootstrap-t UCL	25.57
Anderson-Darling 5% Critical Value	0.803	95% Hall's Bootstrap UCL	32.29
Kolmogorov-Smirnov Test Statistic	0.247	95% Percentile Bootstrap UCL	13.2
Kolmogorov-Smirnov 5% Critical Value	0.188	95% BCA Bootstrap UCL	16.19
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	21.42
		97.5% Chebyshev(Mean, Sd) UCL	27.45
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	39.3
95% Approximate Gamma UCL (Use when n >= 40)	12.98		
95% Adjusted Gamma UCL (Use when n < 40)	13.51		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	21.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	200	Number of Detected Data	196
Number of Distinct Detected Data	194	Number of Non-Detect Data	4
		Percent Non-Detects	2.00%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	16.6	Minimum Detected	2.809
Maximum Detected	3232	Maximum Detected	8.081
Mean of Detected	290	Mean of Detected	5.21
SD of Detected	379.2	SD of Detected	0.917
Minimum Non-Detect	33.3	Minimum Non-Detect	3.505
Maximum Non-Detect	36.58	Maximum Non-Detect	3.6

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	191
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	4.50%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.236	Lilliefors Test Statistic	0.0665
5% Lilliefors Critical Value	0.0633	5% Lilliefors Critical Value	0.0633
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	284.5	Mean	5.163
SD	377.3	SD	0.966
95% DL/2 (t) UCL	328.6	95% H-Stat (DL/2) UCL	322.8
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	274.5	Mean in Log Scale	5.171
SD	388.2	SD in Log Scale	0.949
95% MLE (t) UCL	319.9	Mean in Original Scale	284.7
95% MLE (Tiku) UCL	316.3	SD in Original Scale	377.2
		95% t UCL	328.8
		95% Percentile Bootstrap UCL	329.6
		95% BCA Bootstrap UCL	340.1
		95% H UCL	318.9
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.213	Data do not follow a Discernable Distribution (0.05)	
Theta Star	239.1		
nu star	475.4		
A-D Test Statistic	4.576	**Nonparametric Statistics**	
5% A-D Critical Value	0.778	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.778	Mean	284.7
5% K-S Critical Value	0.0662	SD	376.2
Data not Gamma Distributed at 5% Significance Level		SE of Mean	26.67
		95% KM (t) UCL	328.7
Assuming Gamma Distribution		95% KM (z) UCL	328.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	328.7
Minimum	0.000001	95% KM (bootstrap t) UCL	344.3
Maximum	3232	95% KM (BCA) UCL	333.2
Mean	284.2	95% KM (Percentile Bootstrap) UCL	330.1
Median	154.4	95% KM (Chebyshev) UCL	400.9
SD	377.5	97.5% KM (Chebyshev) UCL	451.2
k star	0.725	99% KM (Chebyshev) UCL	550
Theta star	392		
Nu star	290	Potential UCLs to Use	
AppChi2	251.5	95% KM (BCA) UCL	333.2
95% Gamma Approximate UCL (Use when n >= 40)	327.6		
95% Adjusted Gamma UCL (Use when n < 40)	327.9		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	200
Number of Distinct Observations	200

Raw Statistics

Minimum	10216
Maximum	199000
Mean	52609
Geometric Mean	43679
Median	42517
SD	33434
Std. Error of Mean	2364
Coefficient of Variation	0.636
Skewness	1.205

Log-transformed Statistics

Minimum of Log Data	9.232
Maximum of Log Data	12.2
Mean of log Data	10.68
SD of log Data	0.609

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.147
Lilliefors Critical Value	0.0626

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.113
Lilliefors Critical Value	0.0626

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	56516

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	56713
95% Modified-t UCL (Johnson-1978)	56550

Assuming Lognormal Distribution

95% H-UCL	57021
95% Chebyshev (MVUE) UCL	63208
97.5% Chebyshev (MVUE) UCL	67834
99% Chebyshev (MVUE) UCL	76921

Gamma Distribution Test

k star (bias corrected)	2.804
Theta Star	18762
MLE of Mean	52609
MLE of Standard Deviation	31417
nu star	1122
Approximate Chi Square Value (.05)	1045
Adjusted Level of Significance	0.0488
Adjusted Chi Square Value	1044
Anderson-Darling Test Statistic	3.452
Anderson-Darling 5% Critical Value	0.761
Kolmogorov-Smirnov Test Statistic	0.132
Kolmogorov-Smirnov 5% Critical Value	0.0641

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	56498
95% Jackknife UCL	56516
95% Standard Bootstrap UCL	56496
95% Bootstrap-t UCL	56704
95% Hall's Bootstrap UCL	56921
95% Percentile Bootstrap UCL	56296
95% BCA Bootstrap UCL	56726
95% Chebyshev(Mean, Sd) UCL	62915
97.5% Chebyshev(Mean, Sd) UCL	67374
99% Chebyshev(Mean, Sd) UCL	76133

Assuming Gamma Distribution

95% Approximate Gamma UCL (Use when n >= 40)	56474
95% Adjusted Gamma UCL (Use when n < 40)	56502

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 62915

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	200	Number of Distinct Observations	199

Raw Statistics		**Log-transformed Statistics**	
Minimum	26.36	Minimum of Log Data	3.272
Maximum	21699	Maximum of Log Data	9.985
Mean	1289	Mean of log Data	6.146
Geometric Mean	466.7	SD of log Data	1.465
Median	428.8		
SD	2447		
Std. Error of Mean	173		
Coefficient of Variation	1.897		
Skewness	5.477		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.303	Lilliefors Test Statistic	0.085
Lilliefors Critical Value	0.0626	Lilliefors Critical Value	0.0626
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1575	95% H-UCL	1794
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2208
95% Adjusted-CLT UCL (Chen-1995)	1646	97.5% Chebyshev (MVUE) UCL	2579
95% Modified-t UCL (Johnson-1978)	1587	99% Chebyshev (MVUE) UCL	3307
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.601	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2145		
MLE of Mean	1289		
MLE of Standard Deviation	1663		
nu star	240.5		
Approximate Chi Square Value (.05)	205.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0488	95% CLT UCL	1574
Adjusted Chi Square Value	205.4	95% Jackknife UCL	1575
		95% Standard Bootstrap UCL	1562
Anderson-Darling Test Statistic	4.734	95% Bootstrap-t UCL	1735
Anderson-Darling 5% Critical Value	0.81	95% Hall's Bootstrap UCL	1888
Kolmogorov-Smirnov Test Statistic	0.122	95% Percentile Bootstrap UCL	1608
Kolmogorov-Smirnov 5% Critical Value	0.0668	95% BCA Bootstrap UCL	1636
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2044
		97.5% Chebyshev(Mean, Sd) UCL	2370
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3011
95% Approximate Gamma UCL (Use when n >= 40)	1508		
95% Adjusted Gamma UCL (Use when n < 40)	1510		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	2044

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics			
Number of Valid Data	200	Number of Detected Data	195
Number of Distinct Detected Data	195	Number of Non-Detect Data	5
		Percent Non-Detects	2.50%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	75.43	Minimum Detected	4.323
Maximum Detected	23700	Maximum Detected	10.07
Mean of Detected	1546	Mean of Detected	6.699
SD of Detected	2504	SD of Detected	1.051
Minimum Non-Detect	104.4	Minimum Non-Detect	4.649
Maximum Non-Detect	154.9	Maximum Non-Detect	5.043
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	189
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	5.50%
UCL Statistics			
Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.279	Lilliefors Test Statistic	0.0958
5% Lilliefors Critical Value	0.0634	5% Lilliefors Critical Value	0.0634
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1509	Mean	6.636
SD	2483	SD	1.111
95% DL/2 (t) UCL	1799	95% H-Stat (DL/2) UCL	1689
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1421	Mean in Log Scale	6.642
SD	2571	SD in Log Scale	1.098
95% MLE (t) UCL	1722	Mean in Original Scale	1509
95% MLE (Tiku) UCL	1696	SD in Original Scale	2483
		95% t UCL	1799
		95% Percentile Bootstrap UCL	1804
		95% BCA Bootstrap UCL	1866
		95% H UCL	1670

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.896	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1725		
nu star	349.5		
A-D Test Statistic	9.145	**Nonparametric Statistics**	
5% A-D Critical Value	0.788	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.788	Mean	1509
5% K-S Critical Value	0.0671	SD	2476
Data not Gamma Distributed at 5% Significance Level		SE of Mean	175.6
		95% KM (t) UCL	1799
Assuming Gamma Distribution		95% KM (z) UCL	1798
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1799
Minimum	0.000001	95% KM (bootstrap t) UCL	1885
Maximum	23700	95% KM (BCA) UCL	1805
Mean	1507	95% KM (Percentile Bootstrap) UCL	1803
Median	704.4	95% KM (Chebyshev) UCL	2275
SD	2484	97.5% KM (Chebyshev) UCL	2606
k star	0.548	99% KM (Chebyshev) UCL	3256
Theta star	2751		
Nu star	219.1	Potential UCLs to Use	
AppChi2	185.8	95% KM (Chebyshev) UCL	2275
95% Gamma Approximate UCL (Use when n >= 40)	1777		
95% Adjusted Gamma UCL (Use when n < 40)	1779		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

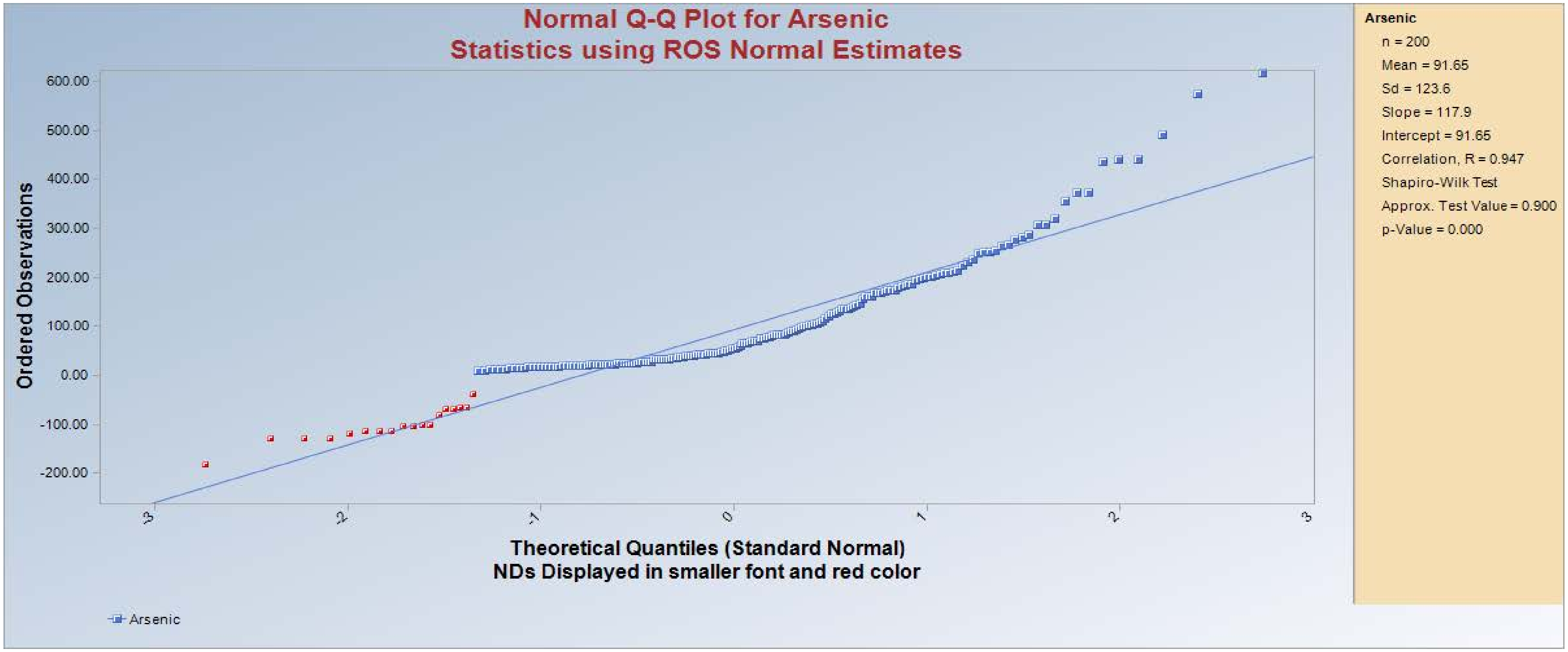
Number of Valid Data	200	Number of Detected Data	199
Number of Distinct Detected Data	199	Number of Non-Detect Data	1
		Percent Non-Detects	0.50%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	65.76	Minimum Detected	4.186
Maximum Detected	18108	Maximum Detected	9.804
Mean of Detected	1031	Mean of Detected	6.054
SD of Detected	2170	SD of Detected	1.169
Minimum Non-Detect	27.61	Minimum Non-Detect	3.318
Maximum Non-Detect	27.61	Maximum Non-Detect	3.318

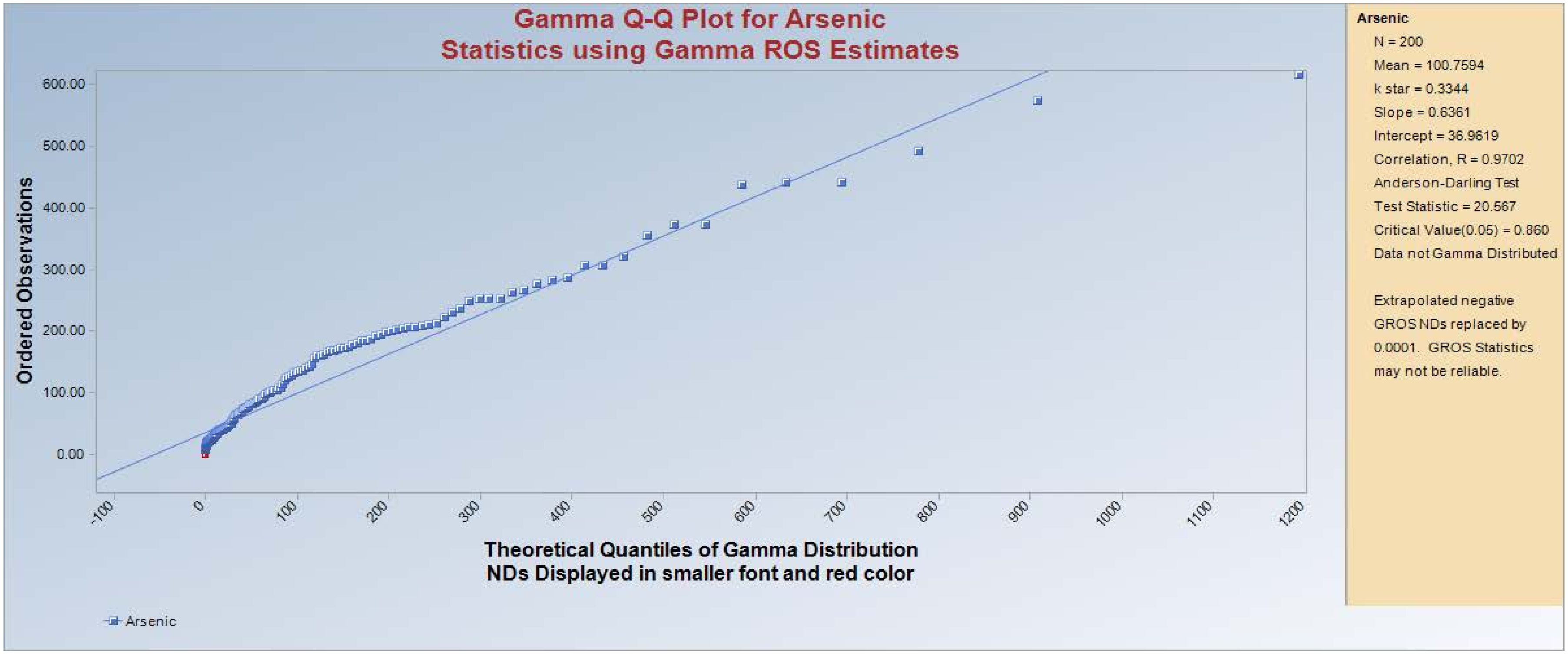
UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.328	Lilliefors Test Statistic	0.162
5% Lilliefors Critical Value	0.0628	5% Lilliefors Critical Value	0.0628
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1026	Mean	6.037
SD	2166	SD	1.191
95% DL/2 (t) UCL	1279	95% H-Stat (DL/2) UCL	1037
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1019	Mean in Log Scale	6.037
SD	2167	SD in Log Scale	1.189
95% MLE (t) UCL	1272	Mean in Original Scale	1026
95% MLE (Tiku) UCL	1244	SD in Original Scale	2166
		95% t UCL	1279
		95% Percentile Bootstrap UCL	1301
		95% BCA Bootstrap UCL	1353
		95% H UCL	1035
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.678	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1520		
nu star	269.9		
A-D Test Statistic	15.05	**Nonparametric Statistics**	
5% A-D Critical Value	0.803	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.803	Mean	1026
5% K-S Critical Value	0.0668	SD	2160
Data not Gamma Distributed at 5% Significance Level		SE of Mean	153.1
		95% KM (t) UCL	1279
Assuming Gamma Distribution		95% KM (z) UCL	1278
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1279
Minimum	0.000001	95% KM (bootstrap t) UCL	1391
Maximum	18108	95% KM (BCA) UCL	1306
Mean	1026	95% KM (Percentile Bootstrap) UCL	1289
Median	300.3	95% KM (Chebyshev) UCL	1694
SD	2166	97.5% KM (Chebyshev) UCL	1983
k star	0.621	99% KM (Chebyshev) UCL	2550
Theta star	1652		
Nu star	248.4	Potential UCLs to Use	
AppChi2	212.9	95% KM (Chebyshev) UCL	1694
95% Gamma Approximate UCL (Use when n >= 40)	1197		
95% Adjusted Gamma UCL (Use when n < 40)	1198		

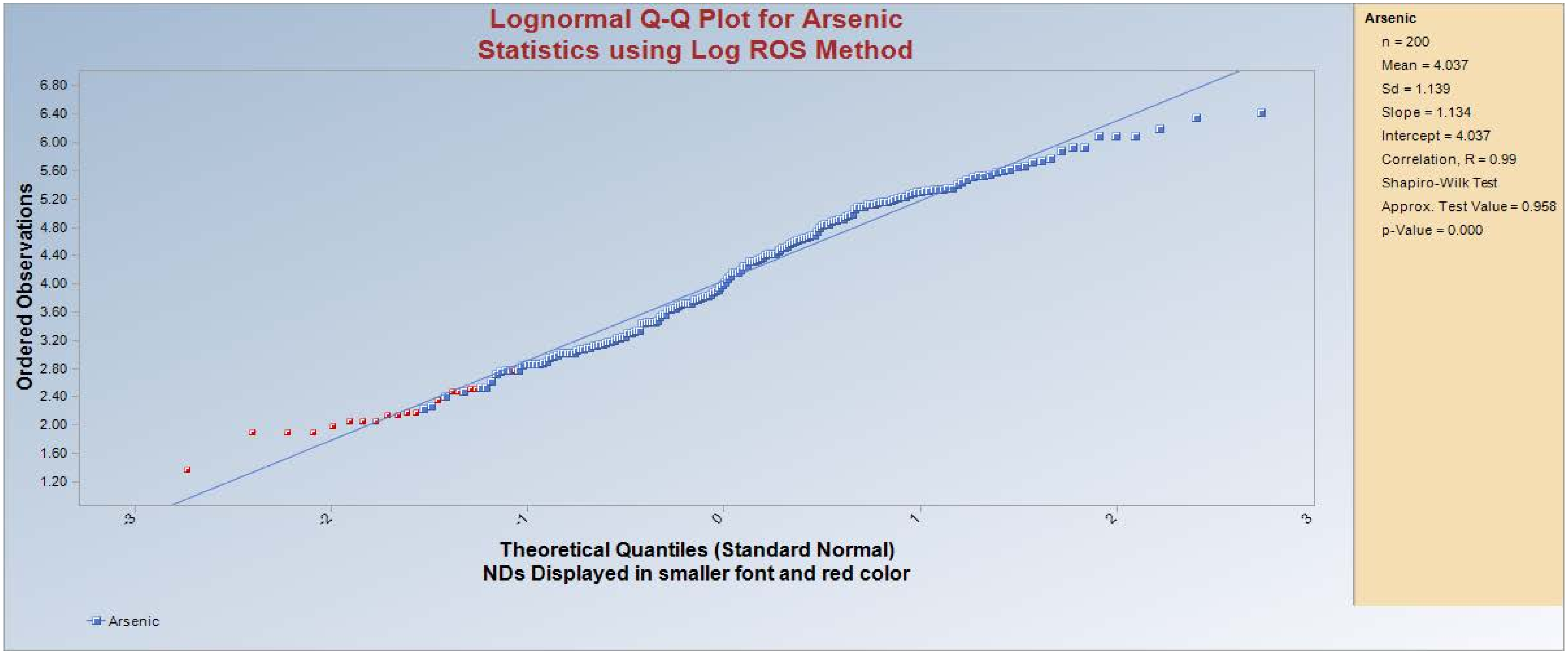
Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

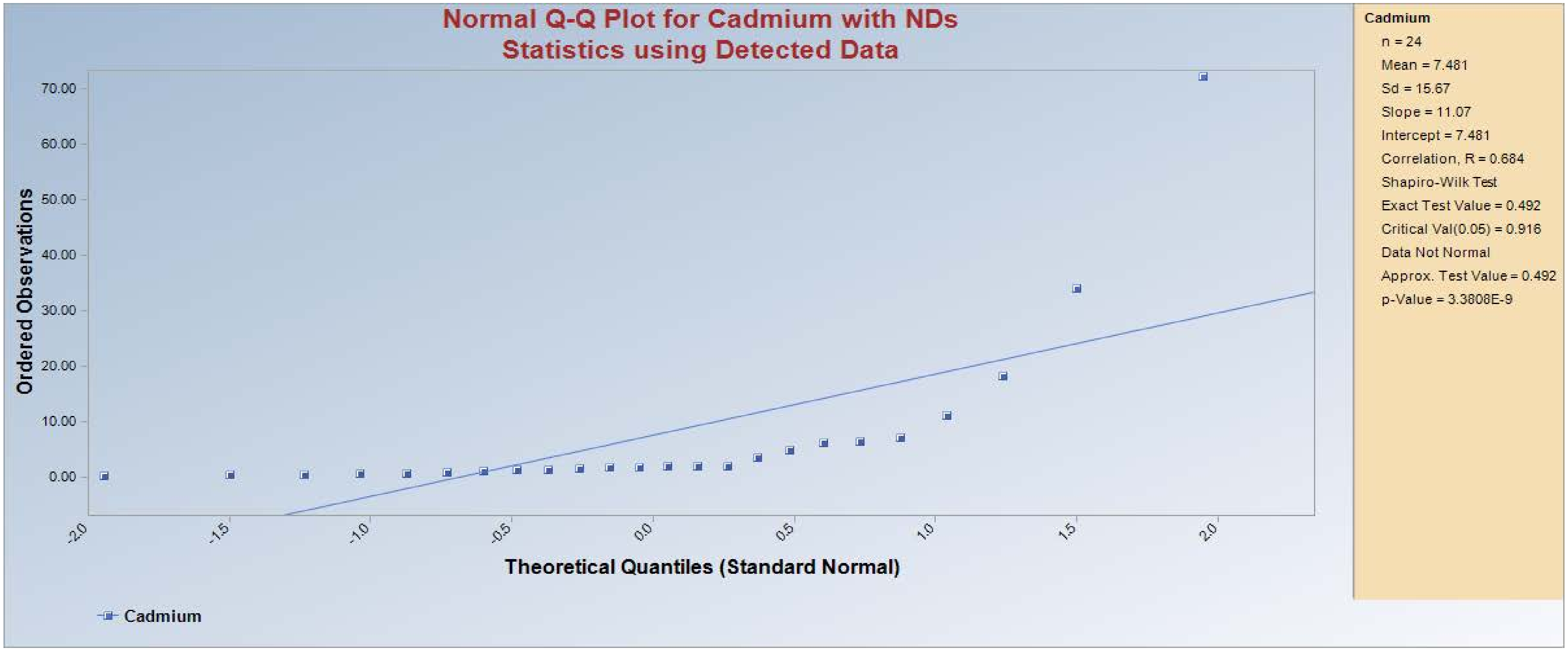

Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-200.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 200
Mean = 91.65
Sd = 123.6
Slope = 117.9
Intercept = 91.65
Correlation, R = 0.947
Shapiro-Wilk Test
Approx. Test Value = 0.900
p-Value = 0.000

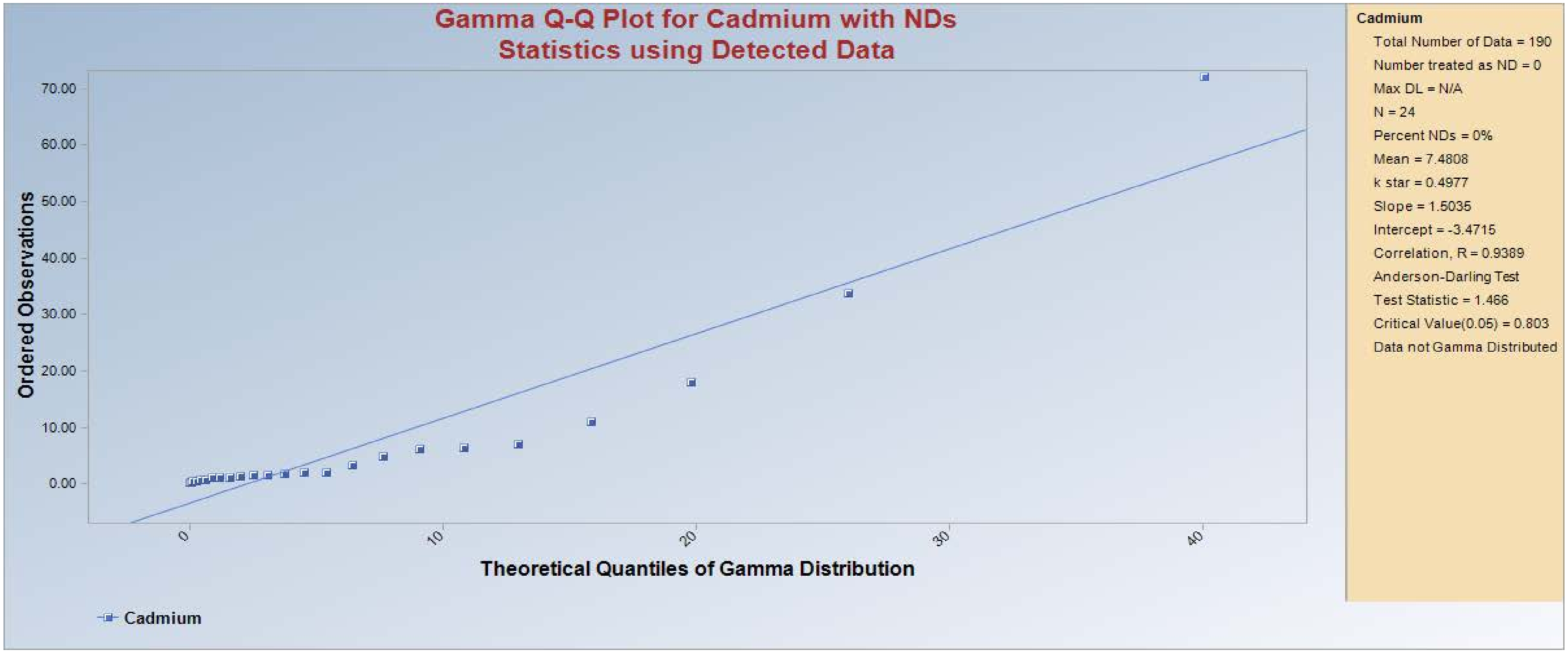


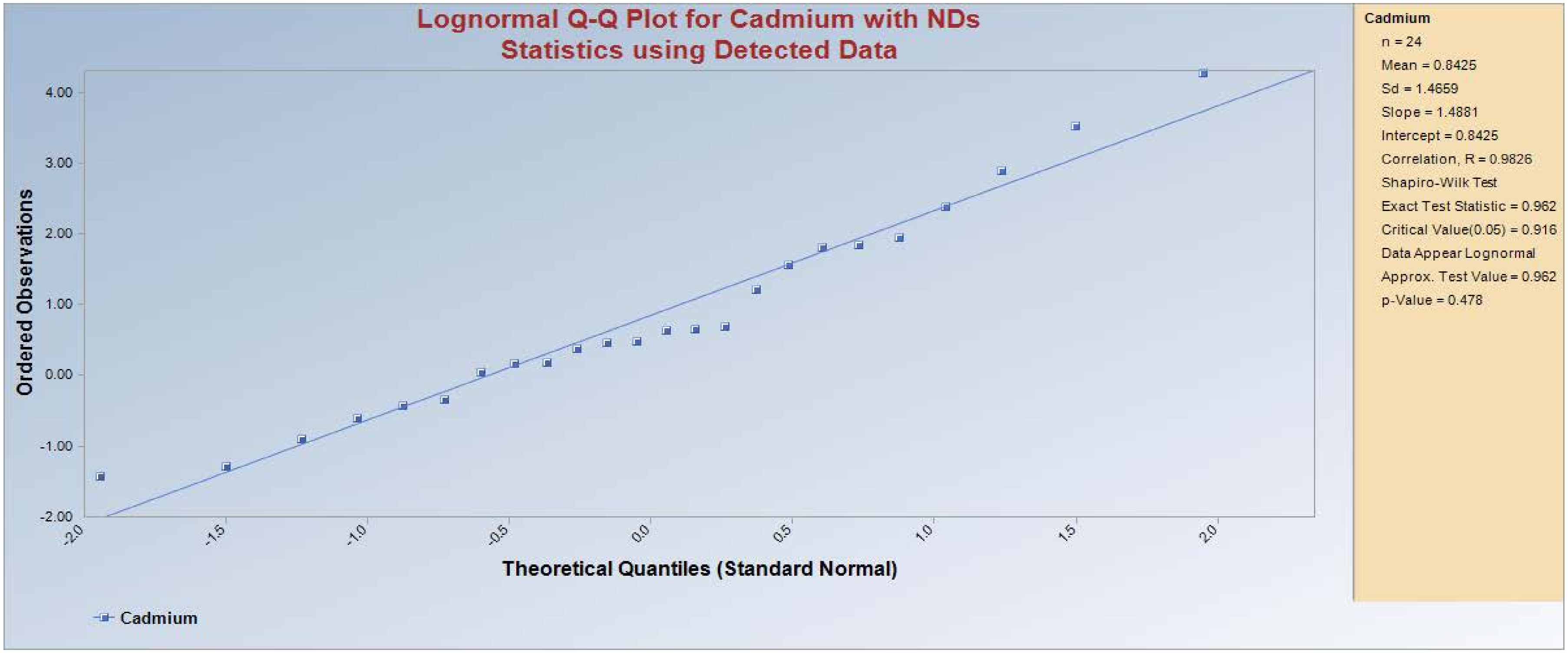
Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 200
Mean = 100.7594
k star = 0.3344
Slope = 0.6361
Intercept = 36.9619
Correlation, R = 0.9702
Anderson-Darling Test
Test Statistic = 20.567
Critical Value(0.05) = 0.860
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



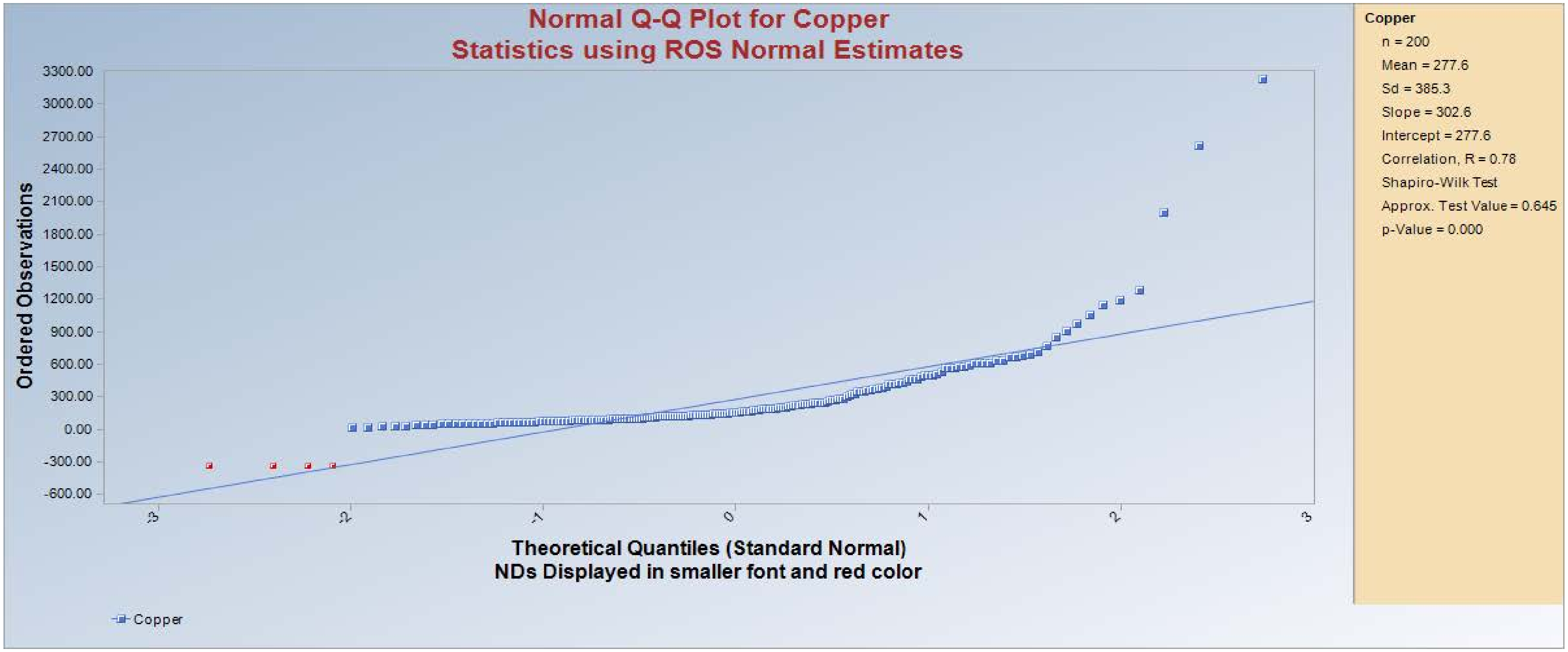
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 200
Mean = 4.037
Sd = 1.139
Slope = 1.134
Intercept = 4.037
Correlation, R = 0.99
Shapiro-Wilk Test
Approx. Test Value = 0.958
p-Value = 0.000


Normal Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Cadmium
Cadmium
n = 24
Mean = 7.481
Sd = 15.67
Slope = 11.07
Intercept = 7.481
Correlation, R = 0.684
Shapiro-Wilk Test
Exact Test Value = 0.492
Critical Val(0.05) = 0.916
Data Not Normal
Approx. Test Value = 0.492
p-Value = 3.3808E-9

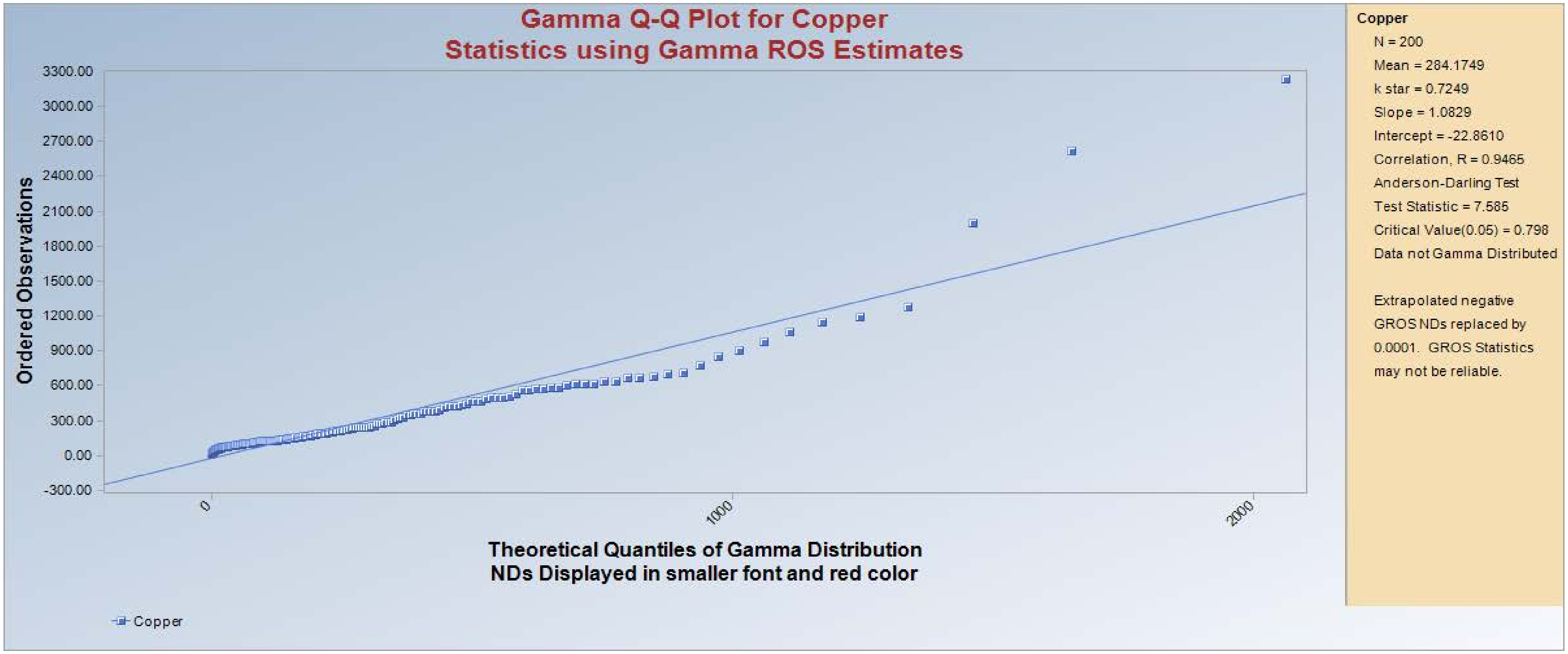

Gamma Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Ordered Observations
0
10
20
30
40
Theoretical Quantiles of Gamma Distribution
Cadmium
Cadmium
Total Number of Data = 190
Number treated as ND = 0
Max DL = N/A
N = 24
Percent NDs = 0%
Mean = 7.4808
k star = 0.4977
Slope = 1.5035
Intercept = -3.4715
Correlation, R = 0.9389
Anderson-Darling Test
Test Statistic = 1.466
Critical Value(0.05) = 0.803
Data not Gamma Distributed



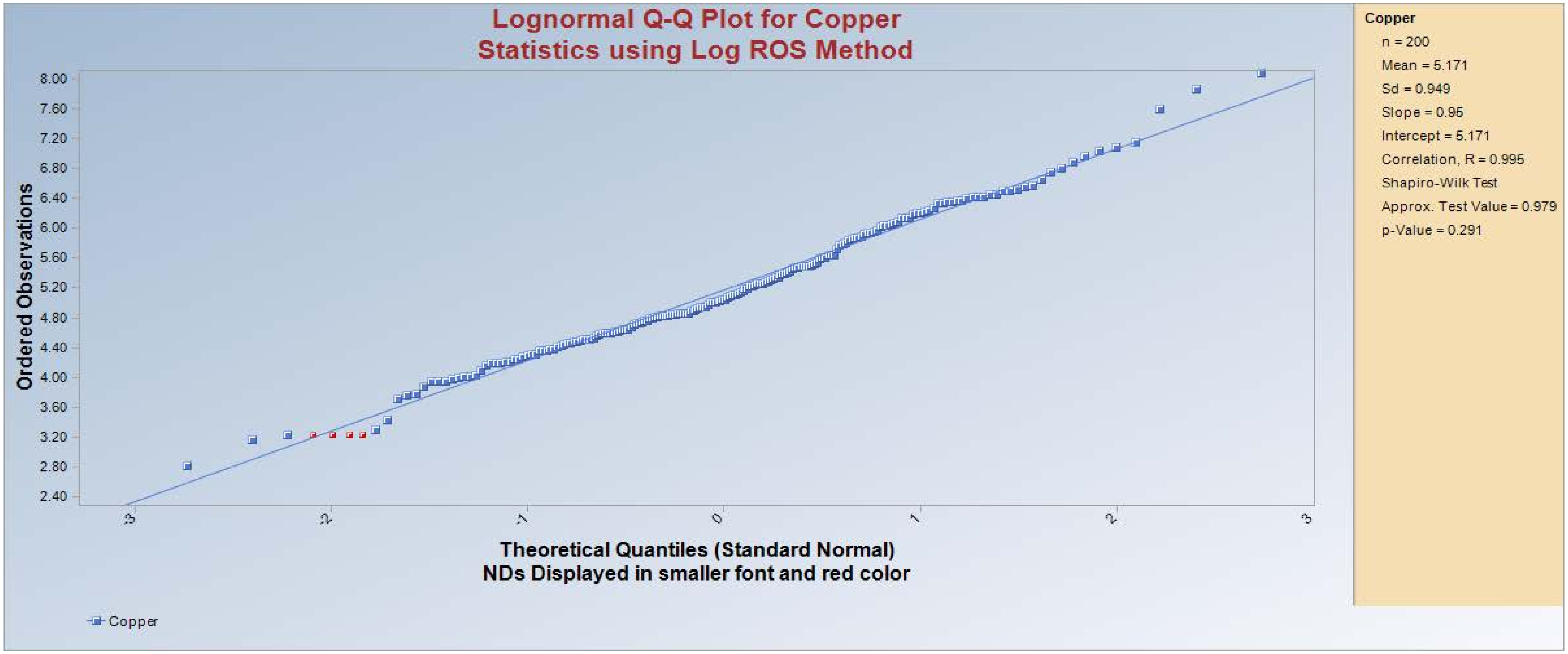
Lognormal Q-Q Plot for Cadmium with NDs
Statistics using Detected Data
Ordered Observations
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Cadmium
Cadmium
n = 24
Mean = 0.8425
Sd = 1.4659
Slope = 1.4881
Intercept = 0.8425
Correlation, R = 0.9826
Shapiro-Wilk Test
Exact Test Statistic = 0.962
Critical Value(0.05) = 0.916
Data Appear Lognormal
Approx. Test Value = 0.962
p-Value = 0.478



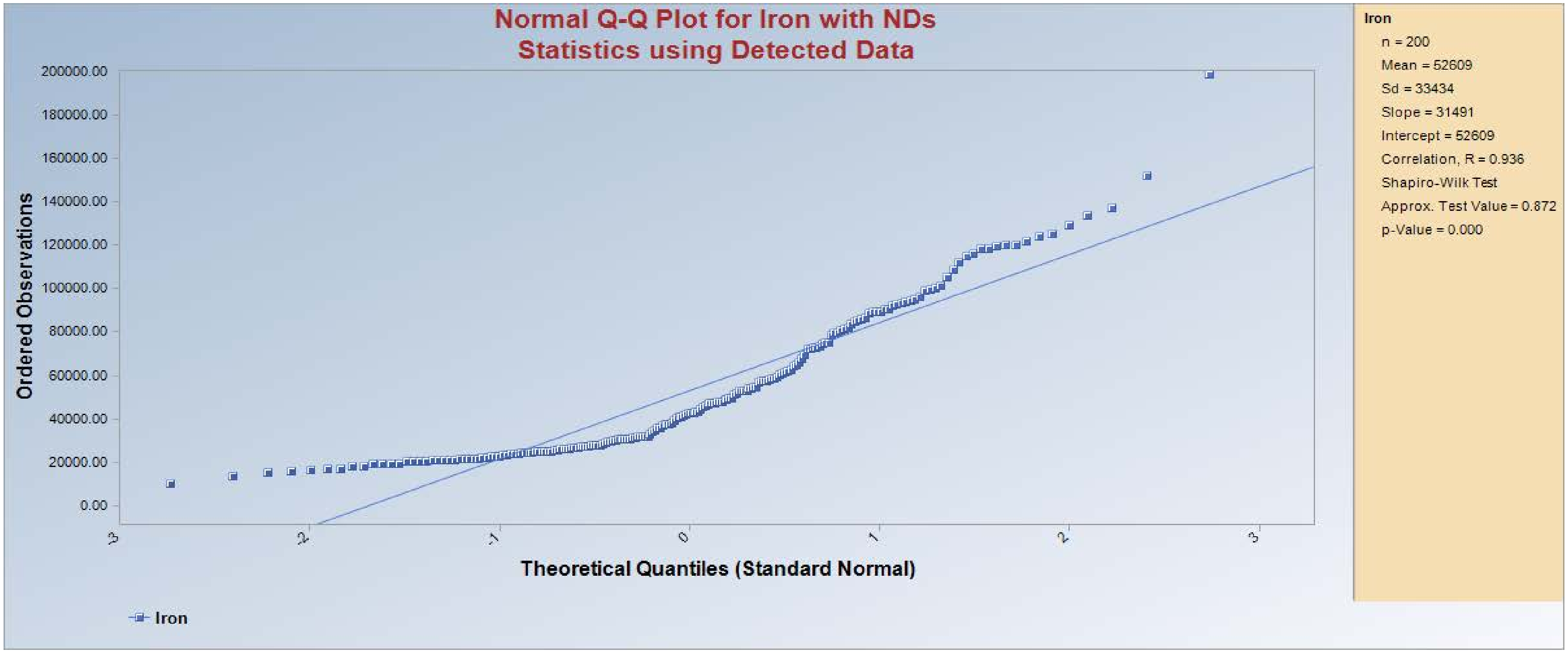
Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
Ordered Observations
3300.00
3000.00
2700.00
2400.00
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
-300.00
-600.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 200
Mean = 277.6
Sd = 385.3
Slope = 302.6
Intercept = 277.6
Correlation, R = 0.78
Shapiro-Wilk Test
Approx. Test Value = 0.645
p-Value = 0.000

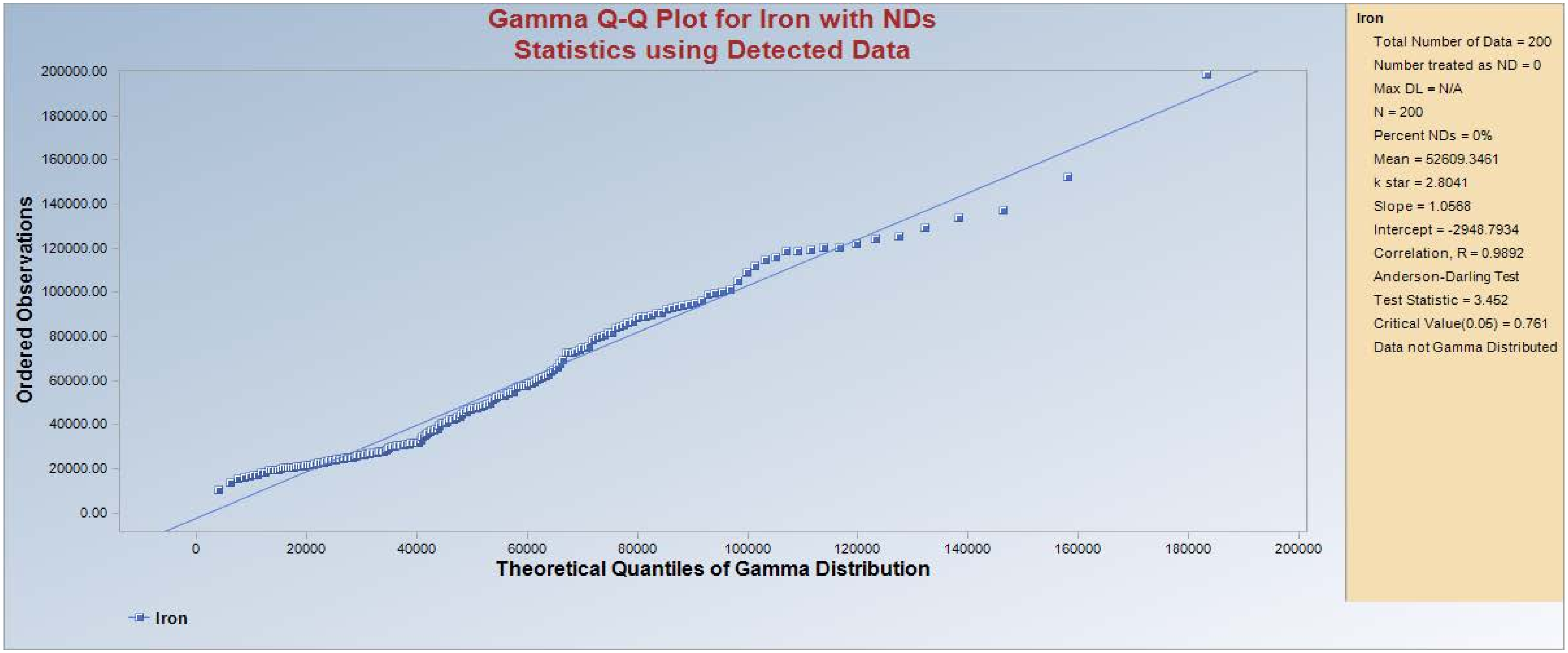


Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
Ordered Observations
3300.00
3000.00
2700.00
2400.00
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
-300.00
0
1000
2000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 200
Mean = 284.1749
k star = 0.7249
Slope = 1.0829
Intercept = -22.8610
Correlation, R = 0.9465
Anderson-Darling Test
Test Statistic = 7.585
Critical Value(0.05) = 0.798
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

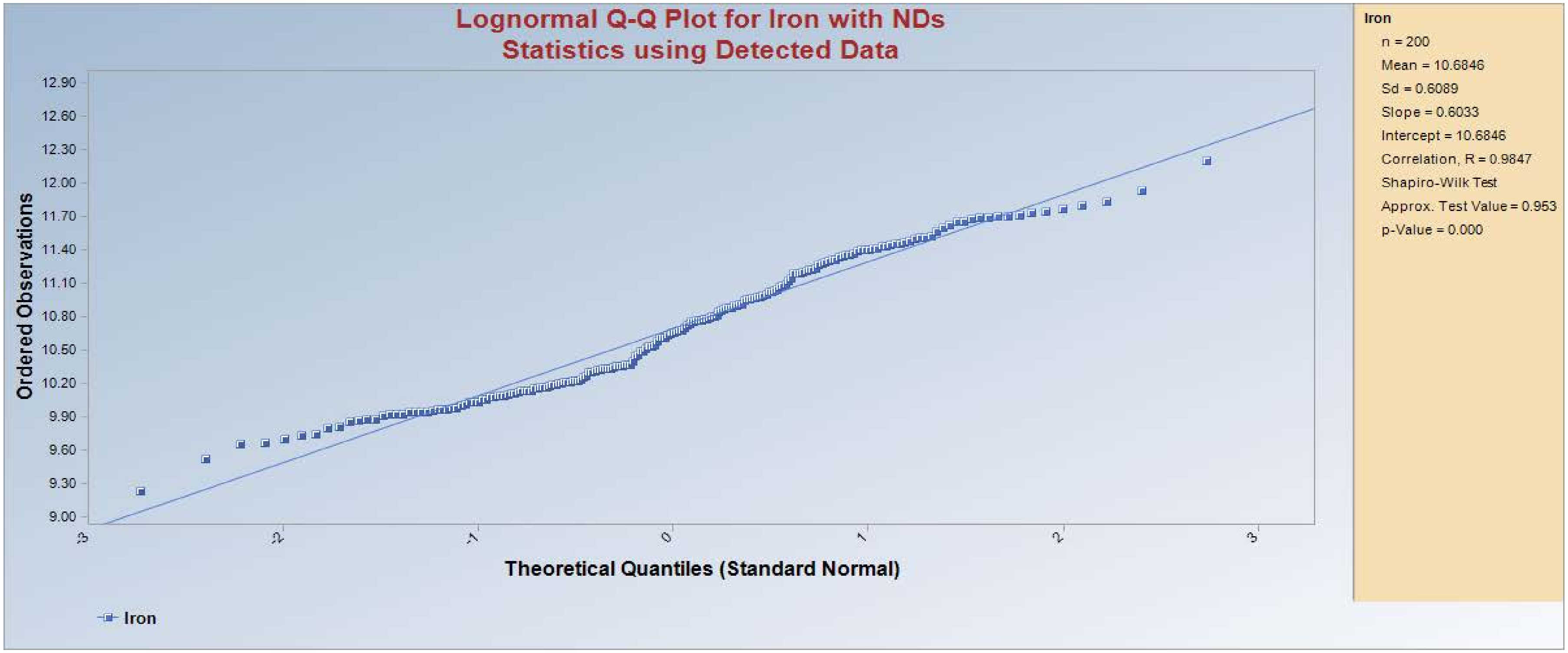


Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
Ordered Observations
8.00
7.60
7.20
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 200
Mean = 5.171
Sd = 0.949
Slope = 0.95
Intercept = 5.171
Correlation, R = 0.995
Shapiro-Wilk Test
Approx. Test Value = 0.979
p-Value = 0.291

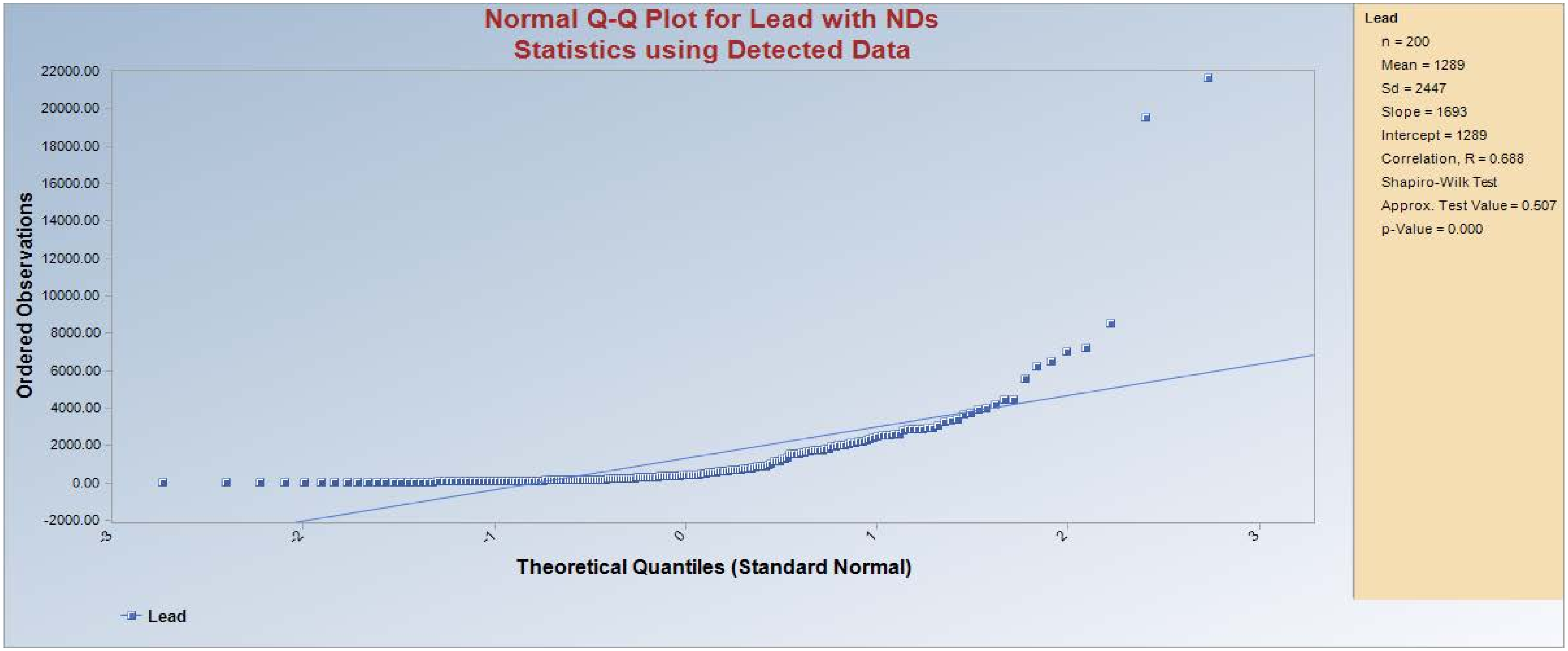

Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 200
Mean = 52609
Sd = 33434
Slope = 31491
Intercept = 52609
Correlation, R = 0.936
Shapiro-Wilk Test
Approx. Test Value = 0.872
p-Value = 0.000



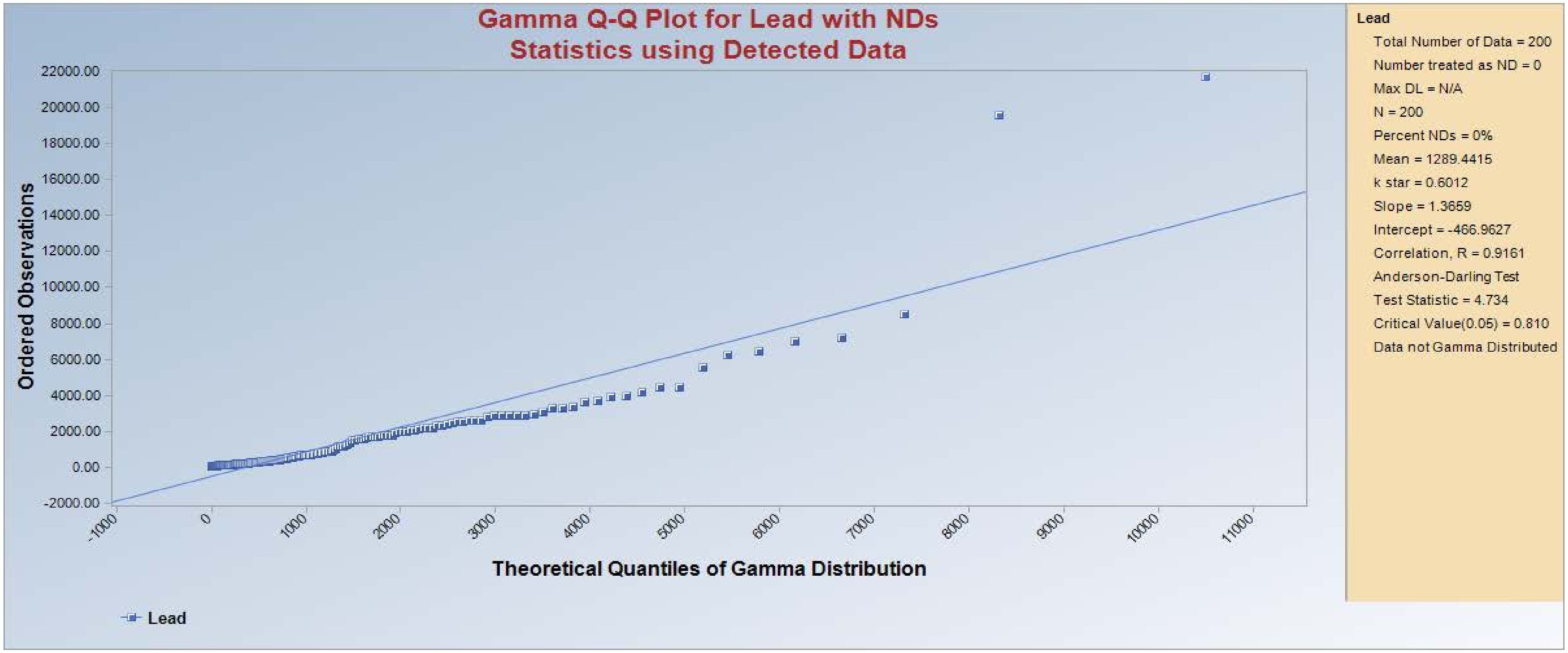
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
0
20000
40000
60000
80000
100000
120000
140000
160000
180000
200000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 200
Number treated as ND = 0
Max DL = N/A
N = 200
Percent NDs = 0%
Mean = 52609.3461
k star = 2.8041
Slope = 1.0568
Intercept = -2948.7934
Correlation, R = 0.9892
Anderson-Darling Test
Test Statistic = 3.452
Critical Value(0.05) = 0.761
Data not Gamma Distributed

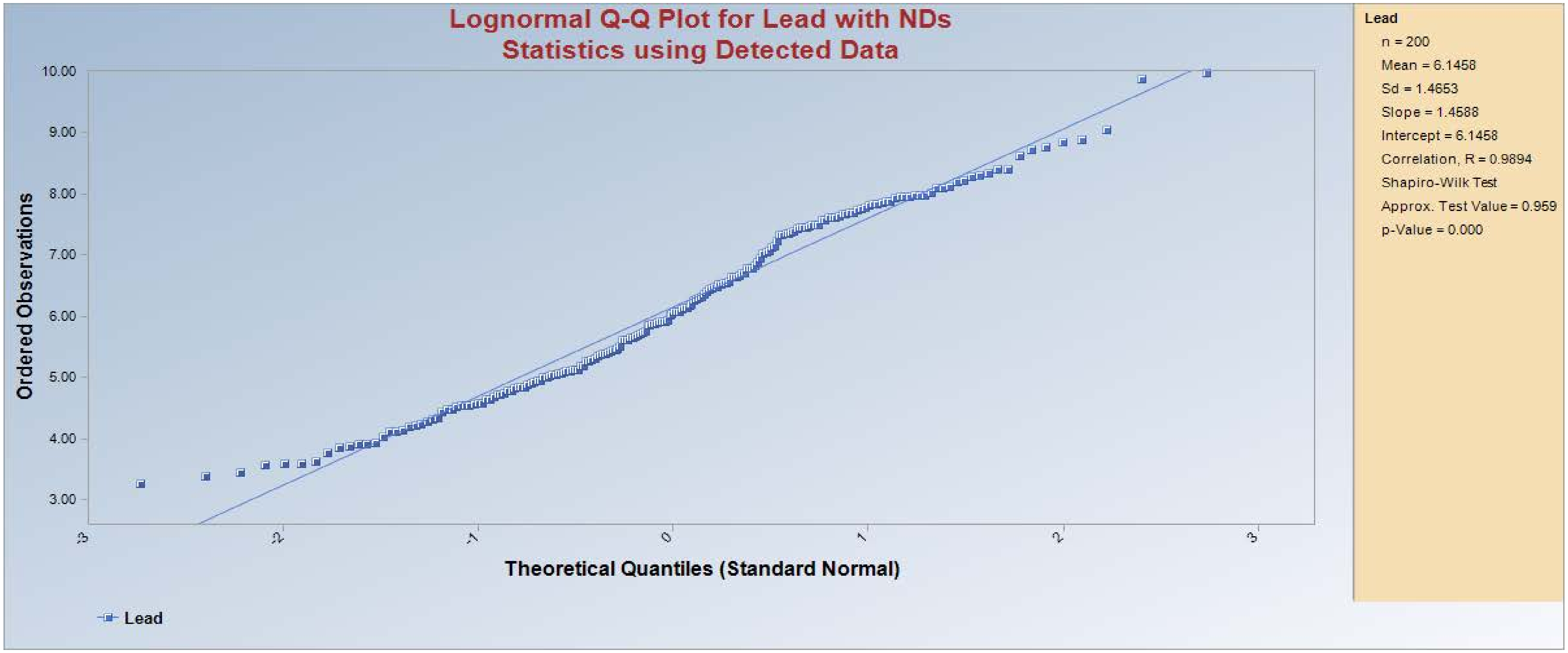


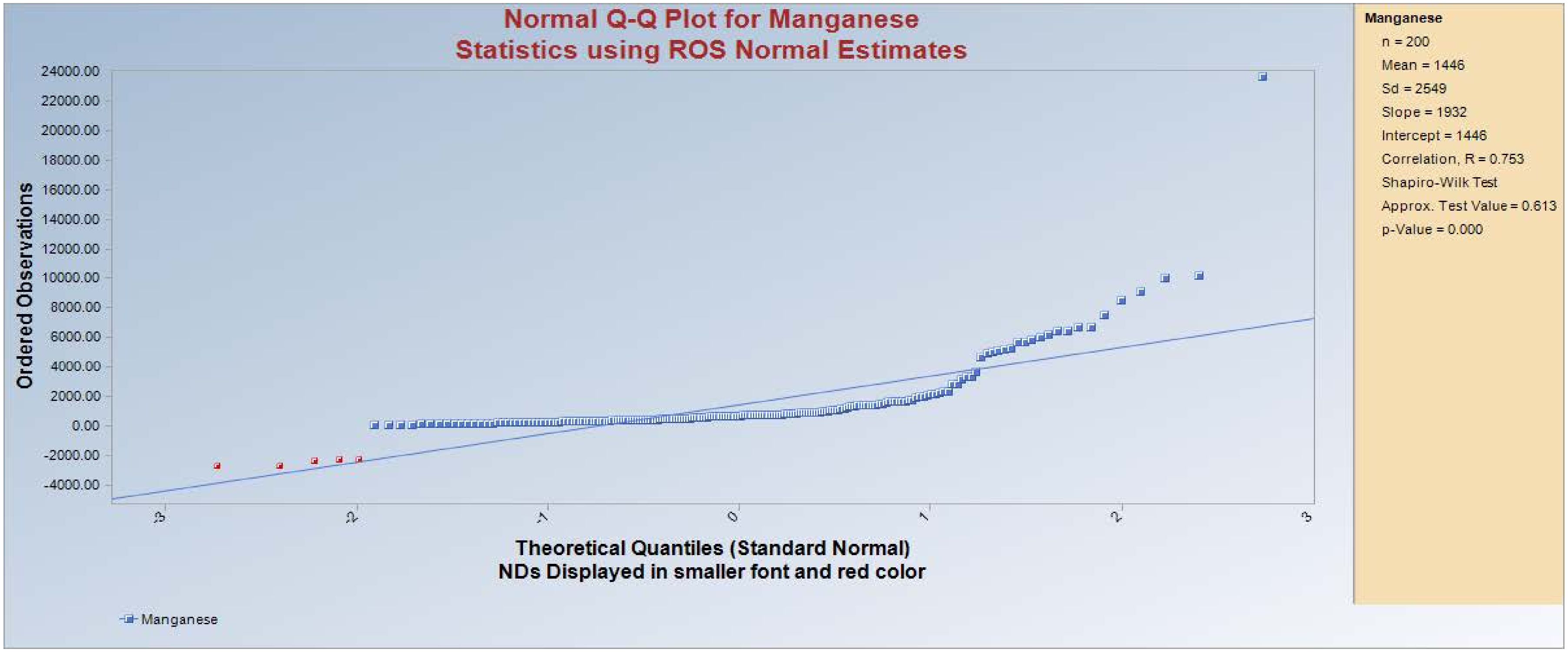
Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
12.90
12.60
12.30
12.00
11.70
11.40
11.10
10.80
10.50
10.20
9.90
9.60
9.30
9.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 200
Mean = 10.6846
Sd = 0.6089
Slope = 0.6033
Intercept = 10.6846
Correlation, R = 0.9847
Shapiro-Wilk Test
Approx. Test Value = 0.953
p-Value = 0.000

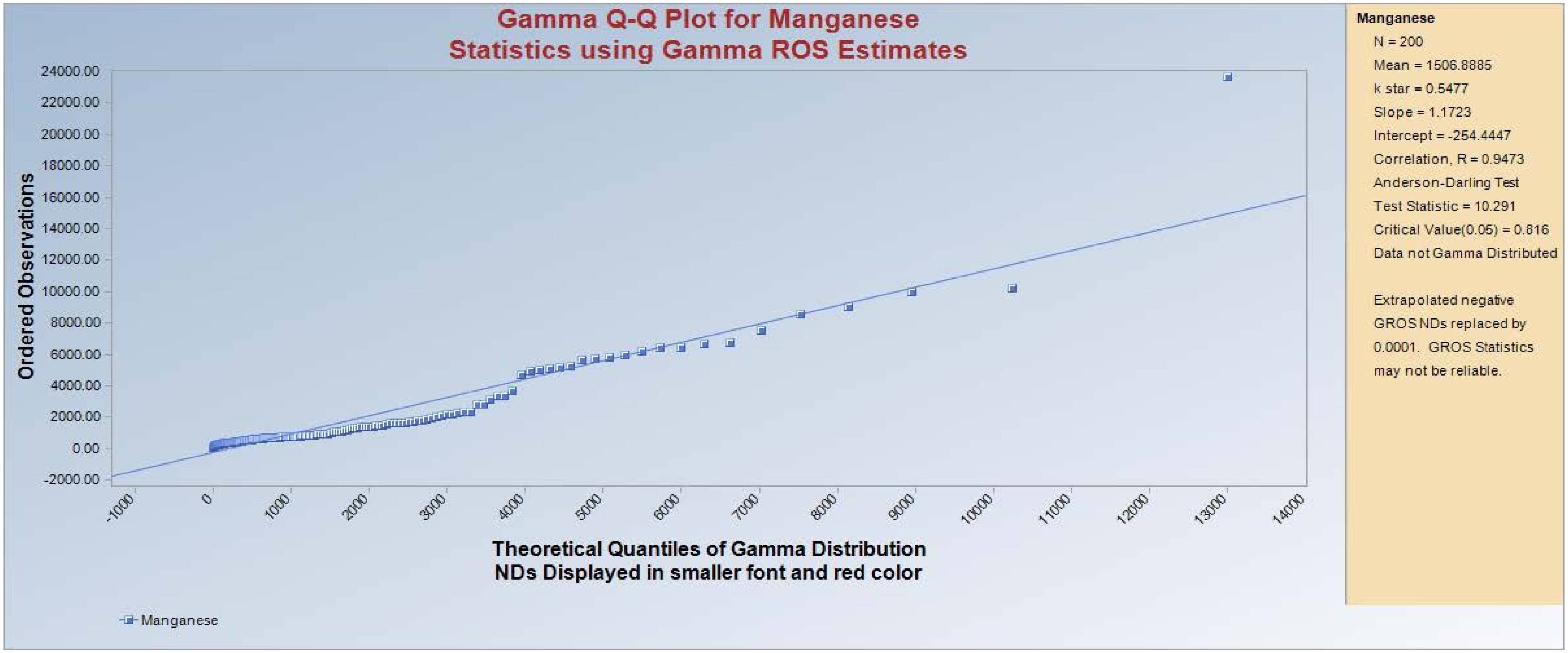


Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 200
Mean = 1289
Sd = 2447
Slope = 1693
Intercept = 1289
Correlation, R = 0.688
Shapiro-Wilk Test
Approx. Test Value = 0.507
p-Value = 0.000

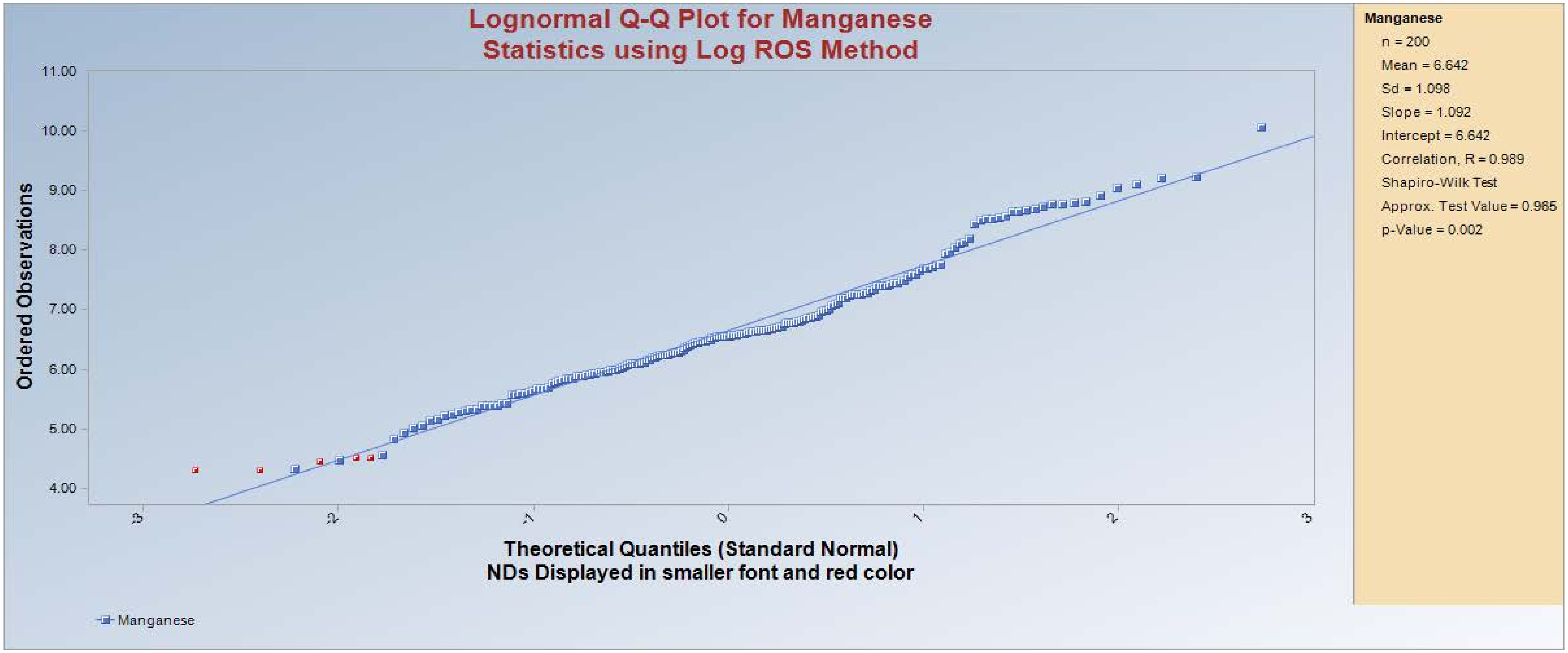

Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 200
Number treated as ND = 0
Max DL = N/A
N = 200
Percent NDs = 0%
Mean = 1289.4415
k star = 0.6012
Slope = 1.3659
Intercept = -466.9627
Correlation, R = 0.9161
Anderson-Darling Test
Test Statistic = 4.734
Critical Value(0.05) = 0.810
Data not Gamma Distributed

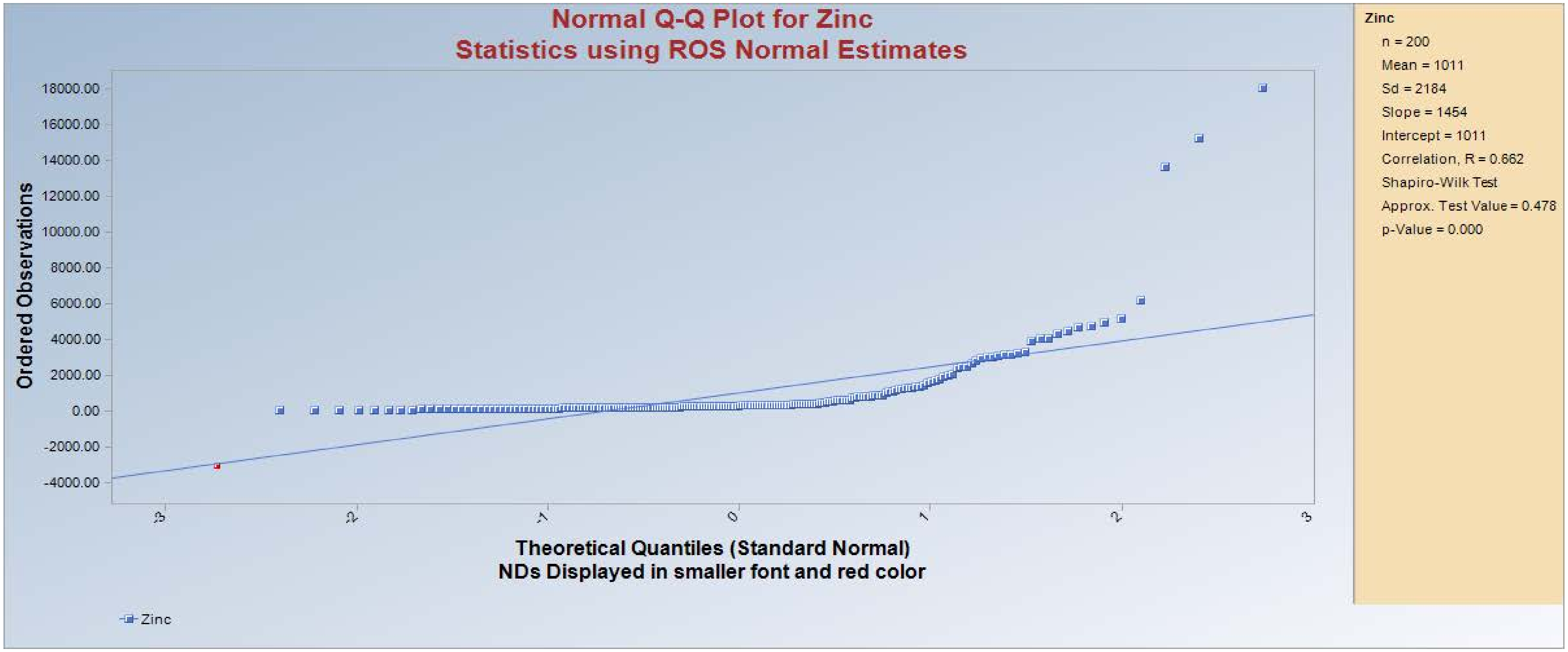

Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 200
Mean = 6.1458
Sd = 1.4653
Slope = 1.4588
Intercept = 6.1458
Correlation, R = 0.9894
Shapiro-Wilk Test
Approx. Test Value = 0.959
p-Value = 0.000


Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-4000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 200
Mean = 1446
Sd = 2549
Slope = 1932
Intercept = 1446
Correlation, R = 0.753
Shapiro-Wilk Test
Approx. Test Value = 0.613
p-Value = 0.000

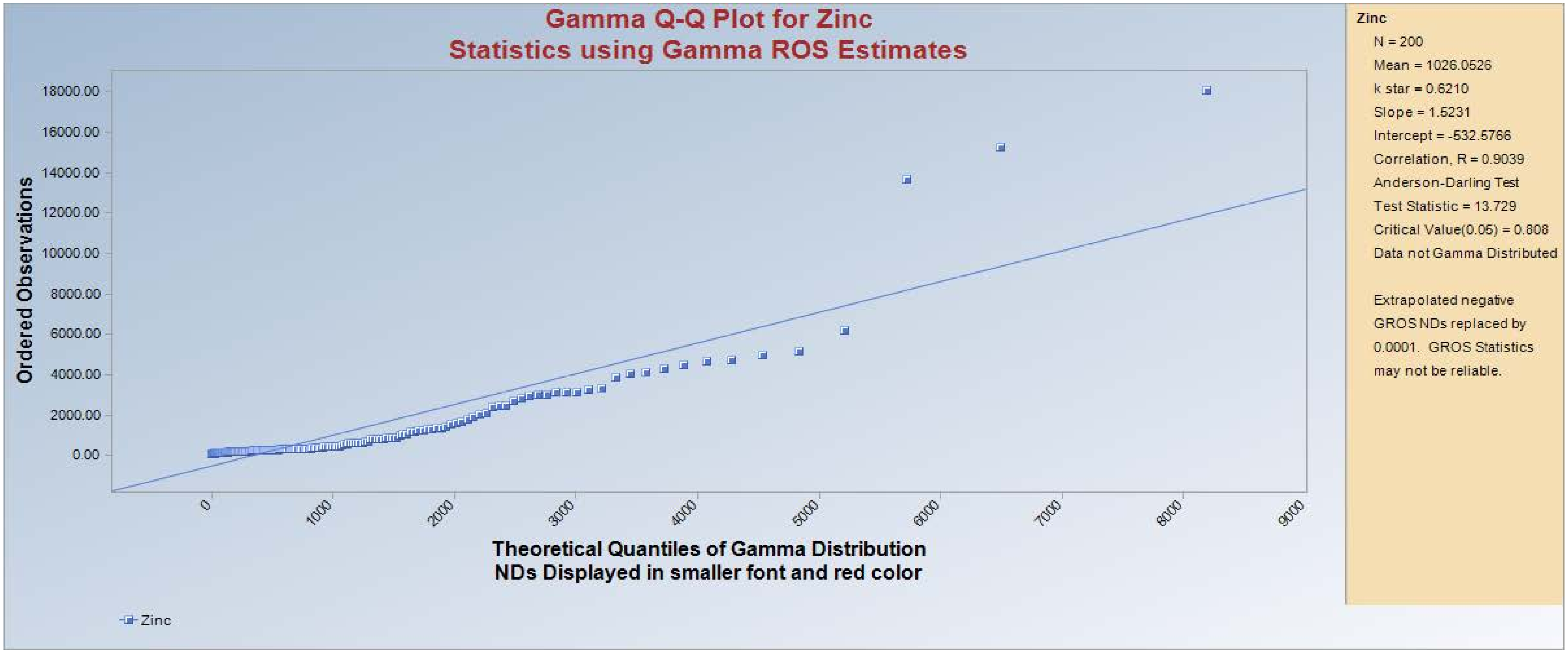


Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 200
Mean = 1506.8885
k star = 0.5477
Slope = 1.1723
Intercept = -254.4447
Correlation, R = 0.9473
Anderson-Darling Test
Test Statistic = 10.291
Critical Value(0.05) = 0.816
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

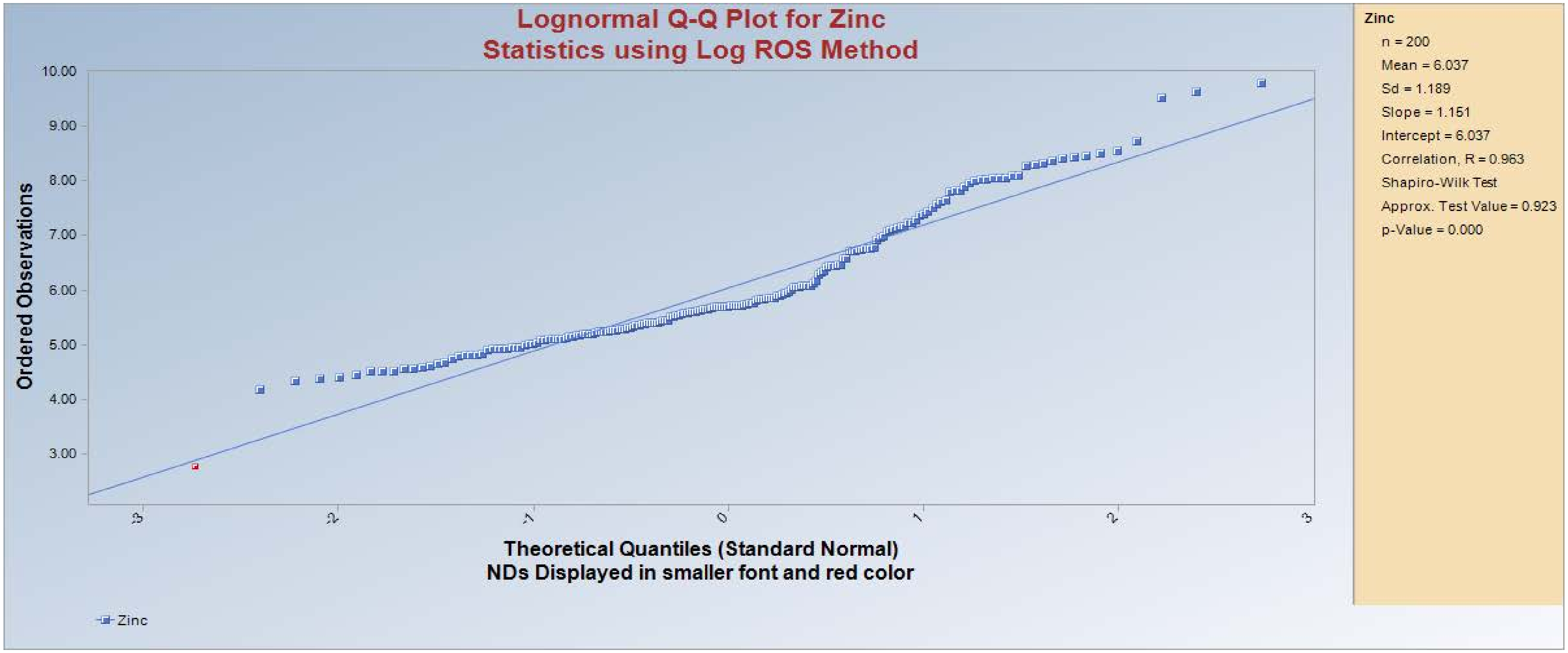

Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 200
Mean = 6.642
Sd = 1.098
Slope = 1.092
Intercept = 6.642
Correlation, R = 0.989
Shapiro-Wilk Test
Approx. Test Value = 0.965
p-Value = 0.002



Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-4000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 200
Mean = 1011
Sd = 2184
Slope = 1454
Intercept = 1011
Correlation, R = 0.662
Shapiro-Wilk Test
Approx. Test Value = 0.478
p-Value = 0.000



Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Zinc
Zinc
N = 200
Mean = 1026.0526
k star = 0.6210
Slope = 1.5231
Intercept = -532.5766
Correlation, R = 0.9039
Anderson-Darling Test
Test Statistic = 13.729
Critical Value(0.05) = 0.808
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 200
Mean = 6.037
Sd = 1.189
Slope = 1.151
Intercept = 6.037
Correlation, R = 0.963
Shapiro-Wilk Test
Approx. Test Value = 0.923
p-Value = 0.000

Attachment A14
ProUCL output for EU 11 Subsurface Soil

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Number of Valid Data	113	Number of Detected Data	110
Number of Distinct Detected Data	109	Number of Non-Detect Data	3
Number of Missing Values	1	Percent Non-Detects	2.65%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	6.547	Minimum Detected	1.879
Maximum Detected	517.8	Maximum Detected	6.25
Mean of Detected	74.74	Mean of Detected	3.769
SD of Detected	95.13	SD of Detected	0.989
Minimum Non-Detect	21.07	Minimum Non-Detect	3.048
Maximum Non-Detect	122.4	Maximum Non-Detect	4.807

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	95
Number treated as Detected	18
Single DL Non-Detect Percentage	84.07%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.253	Lilliefors Test Statistic	0.133
5% Lilliefors Critical Value	0.0845	5% Lilliefors Critical Value	0.0845
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	73.51	Mean	3.748
SD	94.23	SD	0.992
95% DL/2 (t) UCL	88.21	95% H-Stat (DL/2) UCL	85.38
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	3.748
		SD in Log Scale	0.985
		Mean in Original Scale	73.34
		SD in Original Scale	94.25
		95% t UCL	88.05
		95% Percentile Bootstrap UCL	88.76
		95% BCA Bootstrap UCL	90.3
		95% H-UCL	84.7

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.029	Data do not follow a Discernable Distribution (0.05)	
Theta Star	72.61		
nu star	226.5		
A-D Test Statistic	5.09	Nonparametric Statistics	
5% A-D Critical Value	0.782	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.782	Mean	73.39
5% K-S Critical Value	0.0894	SD	93.84
Data not Gamma Distributed at 5% Significance Level		SE of Mean	8.872
		95% KM (t) UCL	88.11
Assuming Gamma Distribution		95% KM (z) UCL	87.99
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	88.11
Minimum	0.000001	95% KM (bootstrap t) UCL	91.83
Maximum	517.8	95% KM (BCA) UCL	88.41
Mean	73.24	95% KM (Percentile Bootstrap) UCL	88.87
Median	33.86	95% KM (Chebyshev) UCL	112.1
SD	94.39	97.5% KM (Chebyshev) UCL	128.8
k star	0.708	99% KM (Chebyshev) UCL	161.7
Theta star	103.4		
Nu star	160	Potential UCLs to Use	
AppChi2	131.8	95% KM (BCA) UCL	88.41
95% Gamma Approximate UCL (Use when n >= 40)	88.93		
95% Adjusted Gamma UCL (Use when n < 40)	89.16		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Data	11	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	1
Number of Missing Values	103	Percent Non-Detects	9.09%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	1.3	Minimum Detected	0.262
Maximum Detected	120	Maximum Detected	4.787
Mean of Detected	29.31	Mean of Detected	2.468
SD of Detected	36.92	SD of Detected	1.595
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.773
5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level	

Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.842
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	26.69
SD	36.09
95% DL/2 (t) UCL	46.41
Maximum Likelihood Estimate(MLE) Method	
Mean	24.71
SD	36.84
95% MLE (t) UCL	44.85
95% MLE (Tiku) UCL	43.79

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean	2.181
SD	1.789
95% H-Stat (DL/2) UCL	616.4
Log ROS Method	
Mean in Log Scale	2.116
SD in Log Scale	1.912
Mean in Original Scale	26.67
SD in Original Scale	36.11
95% t UCL	46.4
95% Percentile Bootstrap UCL	45.67
95% BCA Bootstrap UCL	53.36
95% H UCL	1029

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.535
Theta Star	54.81
nu star	10.7
A-D Test Statistic	0.39
5% A-D Critical Value	0.763
K-S Test Statistic	0.763
5% K-S Critical Value	0.278
Data appear Gamma Distributed at 5% Significance Level	

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	120
Mean	26.65
Median	11
SD	36.13
k star	0.279
Theta star	95.47
Nu star	6.14
AppChi2	1.712
95% Gamma Approximate UCL (Use when n >= 40)	95.57
95% Adjusted Gamma UCL (Use when n < 40)	120.3

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	26.76
SD	34.36
SE of Mean	10.92
95% KM (t) UCL	46.55
95% KM (z) UCL	44.72
95% KM (jackknife) UCL	46.42
95% KM (bootstrap t) UCL	62.66
95% KM (BCA) UCL	46.75
95% KM (Percentile Bootstrap) UCL	45.35
95% KM (Chebyshev) UCL	74.36
97.5% KM (Chebyshev) UCL	94.95
99% KM (Chebyshev) UCL	135.4

Potential UCLs to Use	
95% KM (Chebyshev) UCL	74.36

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	114	Number of Detected Data	113
Number of Distinct Detected Data	113	Number of Non-Detect Data	1
		Percent Non-Detects	0.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.69	Minimum Detected	2.54
Maximum Detected	5809	Maximum Detected	8.667
Mean of Detected	484.8	Mean of Detected	5.472
SD of Detected	758	SD of Detected	1.181
Minimum Non-Detect	836.3	Minimum Non-Detect	6.729
Maximum Non-Detect	836.3	Maximum Non-Detect	6.729

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.267	Lilliefors Test Statistic	0.0674
5% Lilliefors Critical Value	0.0833	5% Lilliefors Critical Value	0.0833
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	484.2	Mean	5.477
SD	754.6	SD	1.177
95% DL/2 (t) UCL	601.4	95% H-Stat (DL/2) UCL	622.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	5.47
		SD in Log Scale	1.176
		Mean in Original Scale	482.2
		SD in Original Scale	755.1
		95% t UCL	599.5
		95% Percentile Bootstrap UCL	606.1
		95% BCA Bootstrap UCL	637.9
		95% H-UCL	617.5

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.814	Data appear Lognormal at 5% Significance Level	
Theta Star	595.4		
nu star	184		
A-D Test Statistic	2.694	**Nonparametric Statistics**	
5% A-D Critical Value	0.791	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.791	Mean	482.7
5% K-S Critical Value	0.0892	SD	751.9
Data not Gamma Distributed at 5% Significance Level		SE of Mean	70.76
		95% KM (t) UCL	600.1
Assuming Gamma Distribution		95% KM (z) UCL	599.1
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	600.1
Minimum	12.69	95% KM (bootstrap t) UCL	652.4
Maximum	5809	95% KM (BCA) UCL	610.9
Mean	483.3	95% KM (Percentile Bootstrap) UCL	611.7
Median	241.3	95% KM (Chebyshev) UCL	791.2
SD	754.8	97.5% KM (Chebyshev) UCL	924.6
k star	0.82	99% KM (Chebyshev) UCL	1187
Theta star	589.5		
Nu star	186.9	Potential UCLs to Use	
AppChi2	156.3	95% KM (Chebyshev) UCL	791.2
95% Gamma Approximate UCL (Use when n >= 40)	578		
95% Adjusted Gamma UCL (Use when n < 40)	579.4		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	114	Number of Distinct Observations	114
Raw Statistics		**Log-transformed Statistics**	
Minimum	5663	Minimum of Log Data	8.642
Maximum	142983	Maximum of Log Data	11.87
Mean	43033	Mean of log Data	10.55
Geometric Mean	38357	SD of log Data	0.465
Median	33151		
SD	23833		
Std. Error of Mean	2232		
Coefficient of Variation	0.554		
Skewness	2.058		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.228	Lilliefors Test Statistic	0.168
Lilliefors Critical Value	0.083	Lilliefors Critical Value	0.083
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	46735	95% H-UCL	46272
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	51195
95% Adjusted-CLT UCL (Chen-1995)	47164	97.5% Chebyshev (MVUE) UCL	54873
95% Modified-t UCL (Johnson-1978)	46806	99% Chebyshev (MVUE) UCL	62099
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.394	Data do not follow a Discernable Distribution (0.05)	
Theta Star	9794		
MLE of Mean	43033		
MLE of Standard Deviation	20529		
nu star	1002		
Approximate Chi Square Value (.05)	929.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0479	95% CLT UCL	46704
Adjusted Chi Square Value	928.4	95% Jackknife UCL	46735
		95% Standard Bootstrap UCL	46629
Anderson-Darling Test Statistic	5.566	95% Bootstrap-t UCL	47175
Anderson-Darling 5% Critical Value	0.755	95% Hall's Bootstrap UCL	47374
Kolmogorov-Smirnov Test Statistic	0.195	95% Percentile Bootstrap UCL	46935
Kolmogorov-Smirnov 5% Critical Value	0.0861	95% BCA Bootstrap UCL	47205
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	52763
		97.5% Chebyshev(Mean, Sd) UCL	56973
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	65243
95% Approximate Gamma UCL (Use when n >= 40)	46389		
95% Adjusted Gamma UCL (Use when n < 40)	46433		
Potential UCL to Use		Use 95% Student's-t UCL	46735
		or 95% Modified-t UCL	46806

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Data	114	Number of Detected Data	113
Number of Distinct Detected Data	113	Number of Non-Detect Data	1
		Percent Non-Detects	0.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	29	Minimum Detected	3.367
Maximum Detected	24892	Maximum Detected	10.12
Mean of Detected	2282	Mean of Detected	6.579
SD of Detected	3904	SD of Detected	1.61
Minimum Non-Detect	507	Minimum Non-Detect	6.228
Maximum Non-Detect	507	Maximum Non-Detect	6.228

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.282	Lilliefors Test Statistic	0.114
5% Lilliefors Critical Value	0.0833	5% Lilliefors Critical Value	0.0833
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2264	Mean	6.57
SD	3892	SD	1.606
95% DL/2 (t) UCL	2868	95% H-Stat (DL/2) UCL	3985
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	6.569
		SD in Log Scale	1.606
		Mean in Original Scale	2264
		SD in Original Scale	3892
		95% t UCL	2868
		95% Percentile Bootstrap UCL	2888
		95% BCA Bootstrap UCL	2979
		95% H-UCL	3987
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.535	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4264		
nu star	120.9		
A-D Test Statistic	3.177	**Nonparametric Statistics**	
5% A-D Critical Value	0.815	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.815	Mean	2264
5% K-S Critical Value	0.0908	SD	3875
Data not Gamma Distributed at 5% Significance Level		SE of Mean	364.5
		95% KM (t) UCL	2868
Assuming Gamma Distribution		95% KM (z) UCL	2863
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2868
Minimum	0.000001	95% KM (bootstrap t) UCL	3059
Maximum	24892	95% KM (BCA) UCL	2915
Mean	2262	95% KM (Percentile Bootstrap) UCL	2894
Median	576.3	95% KM (Chebyshev) UCL	3853
SD	3893	97.5% KM (Chebyshev) UCL	4540
k star	0.476	99% KM (Chebyshev) UCL	5891
Theta star	4754		
Nu star	108.5	Potential UCLs to Use	
AppChi2	85.43	97.5% KM (Chebyshev) UCL	4540
95% Gamma Approximate UCL (Use when n >= 40)	2872		
95% Adjusted Gamma UCL (Use when n < 40)	2880		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	114	Number of Detected Data	113
Number of Distinct Detected Data	113	Number of Non-Detect Data	1
		Percent Non-Detects	0.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	87.39	Minimum Detected	4.47
Maximum Detected	14715	Maximum Detected	9.597
Mean of Detected	2531	Mean of Detected	7.345
SD of Detected	2782	SD of Detected	1.023
Minimum Non-Detect	1552	Minimum Non-Detect	7.348
Maximum Non-Detect	1552	Maximum Non-Detect	7.348

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.203	Lilliefors Test Statistic	0.0502
5% Lilliefors Critical Value	0.0833	5% Lilliefors Critical Value	0.0833
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2515	Mean	7.339
SD	2775	SD	1.021
95% DL/2 (t) UCL	2946	95% H-Stat (DL/2) UCL	3212
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1222	Mean in Log Scale	7.339
SD	4120	SD in Log Scale	1.021
95% MLE (t) UCL	1862	Mean in Original Scale	2515
95% MLE (Tiku) UCL	2006	SD in Original Scale	2775
		95% t UCL	2946
		95% Percentile Bootstrap UCL	2946
		95% BCA Bootstrap UCL	2953
		95% H UCL	3212

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.131	Data appear Lognormal at 5% Significance Level	
Theta Star	2237		
nu star	255.6		
A-D Test Statistic	1.328	**Nonparametric Statistics**	
5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.779	Mean	2515
5% K-S Critical Value	0.0884	SD	2763
Data not Gamma Distributed at 5% Significance Level		SE of Mean	259.9
		95% KM (t) UCL	2946
Assuming Gamma Distribution		95% KM (z) UCL	2943
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2946
Minimum	87.39	95% KM (bootstrap t) UCL	3030
Maximum	14715	95% KM (BCA) UCL	2955
Mean	2514	95% KM (Percentile Bootstrap) UCL	2959
Median	1566	95% KM (Chebyshev) UCL	3648
SD	2775	97.5% KM (Chebyshev) UCL	4139
k star	1.128	99% KM (Chebyshev) UCL	5102
Theta star	2228		
Nu star	257.3	Potential UCLs to Use	
AppChi2	221.2	95% KM (Chebyshev) UCL	3648
95% Gamma Approximate UCL (Use when n >= 40)	2925		
95% Adjusted Gamma UCL (Use when n < 40)	2931		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Data	114	Number of Detected Data	113
Number of Distinct Detected Data	113	Number of Non-Detect Data	1
		Percent Non-Detects	0.88%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	148.2	Minimum Detected	4.999
Maximum Detected	9544	Maximum Detected	9.164
Mean of Detected	2367	Mean of Detected	7.319
SD of Detected	2130	SD of Detected	1.044
Minimum Non-Detect	633.8	Minimum Non-Detect	6.452
Maximum Non-Detect	633.8	Maximum Non-Detect	6.452

UCL Statistics

Normal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.156
5% Lilliefors Critical Value	0.0833
Data not Normal at 5% Significance Level	

Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.0744
5% Lilliefors Critical Value	0.0833
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	2349
SD	2129
95% DL/2 (t) UCL	2679
Maximum Likelihood Estimate(MLE) Method	
Mean	2057
SD	2513
95% MLE (t) UCL	2447
95% MLE (Tiku) UCL	2455

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean	7.305
SD	1.049
95% H-Stat (DL/2) UCL	3226
Log ROS Method	
Mean in Log Scale	7.307
SD in Log Scale	1.046
Mean in Original Scale	2349
SD in Original Scale	2128
95% t UCL	2680
95% Percentile Bootstrap UCL	2664
95% BCA Bootstrap UCL	2733
95% H UCL	3219

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	1.223
Theta Star	1936
nu star	276.3
A-D Test Statistic	0.471
5% A-D Critical Value	0.777
K-S Test Statistic	0.777
5% K-S Critical Value	0.0882
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

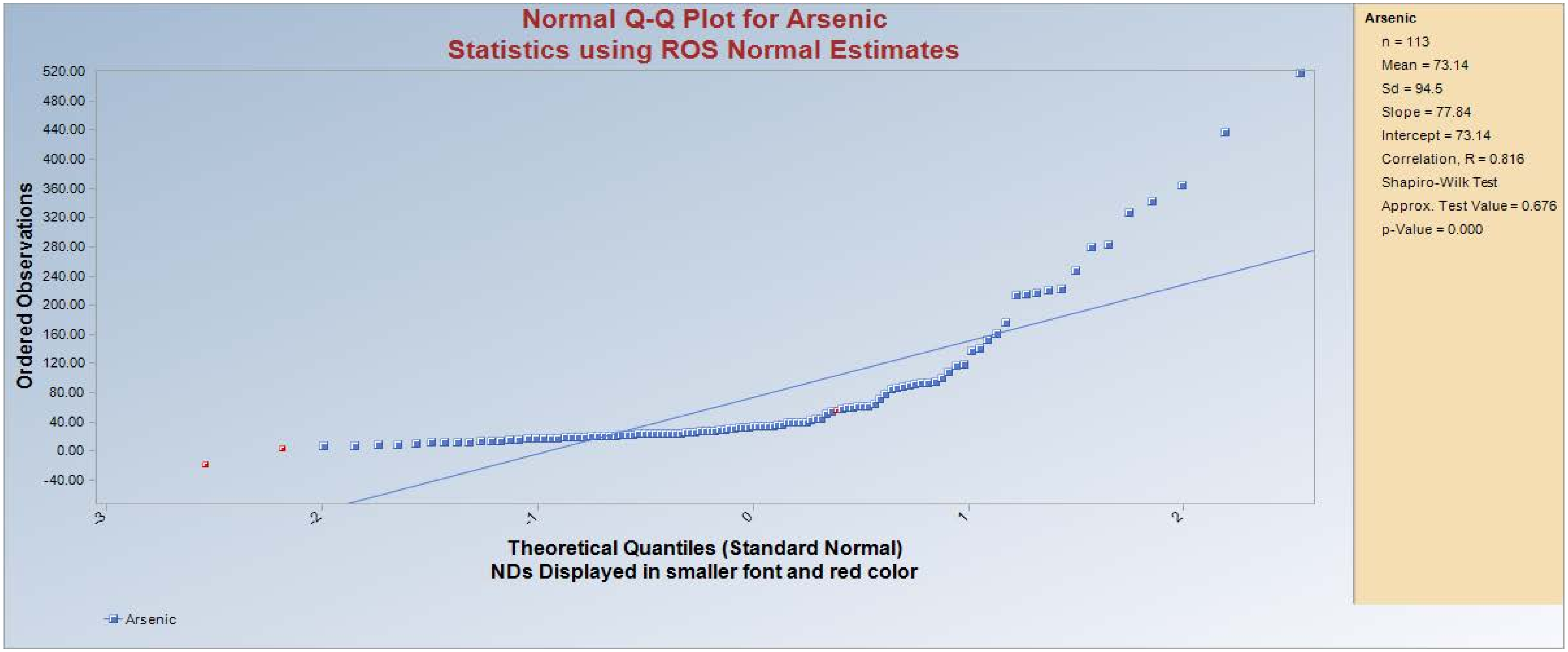
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	9544
Mean	2346
Median	1691
SD	2132
k star	0.91
Theta star	2578
Nu star	207.5
AppChi2	175.1
95% Gamma Approximate UCL (Use when n >= 40)	2779
95% Adjusted Gamma UCL (Use when n < 40)	2785

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	2349
SD	2119
SE of Mean	199.4
95% KM (t) UCL	2680
95% KM (z) UCL	2677
95% KM (jackknife) UCL	2679
95% KM (bootstrap t) UCL	2725
95% KM (BCA) UCL	2694
95% KM (Percentile Bootstrap) UCL	2675
95% KM (Chebyshev) UCL	3218
97.5% KM (Chebyshev) UCL	3594
99% KM (Chebyshev) UCL	4333

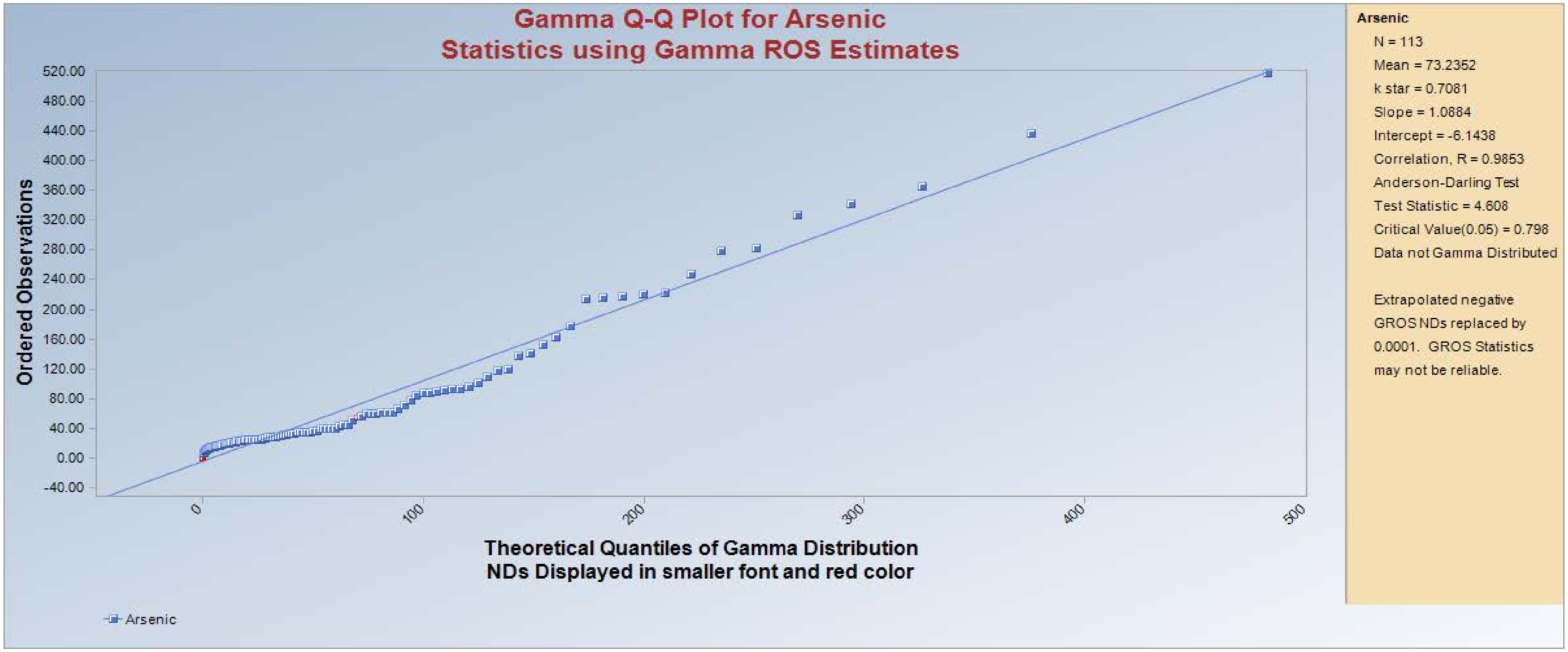
Potential UCLs to Use	
95% KM (Chebyshev) UCL	3218

Note: DL/2 is not a recommended method.

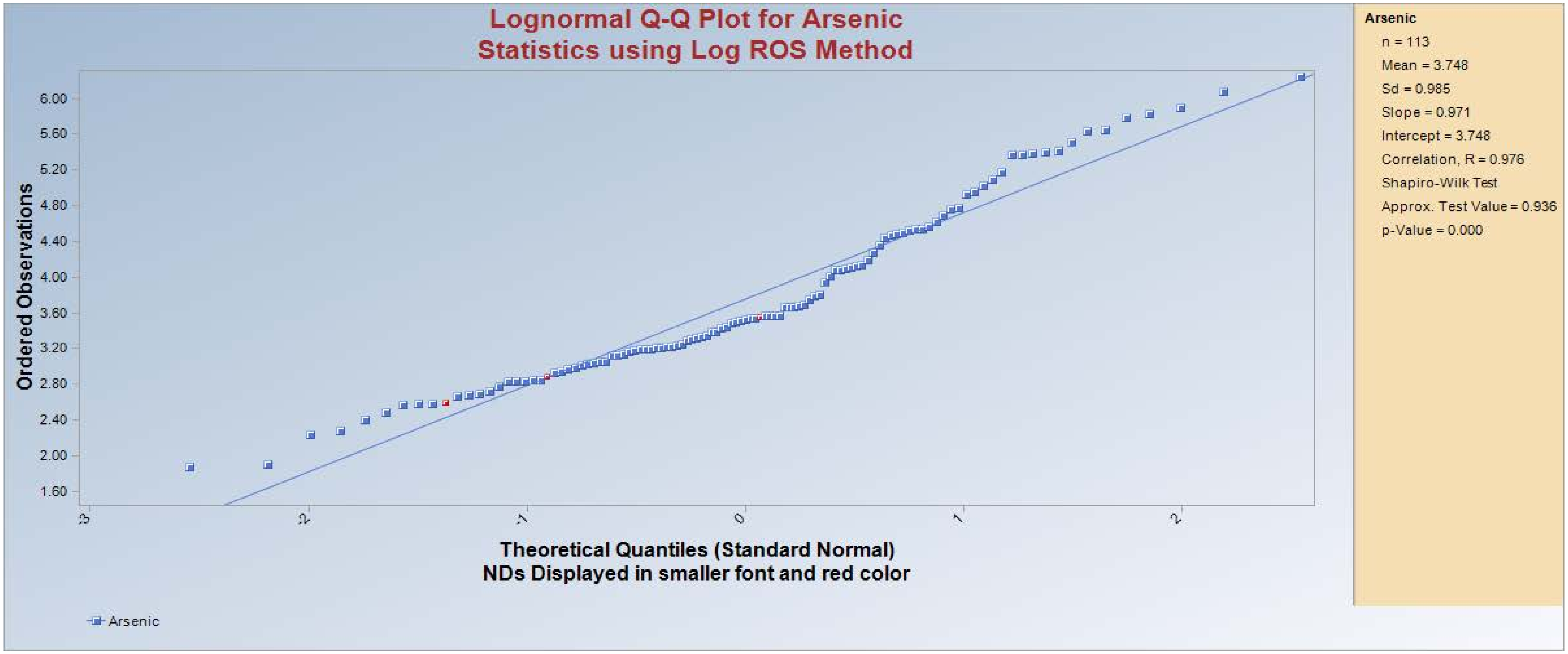
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

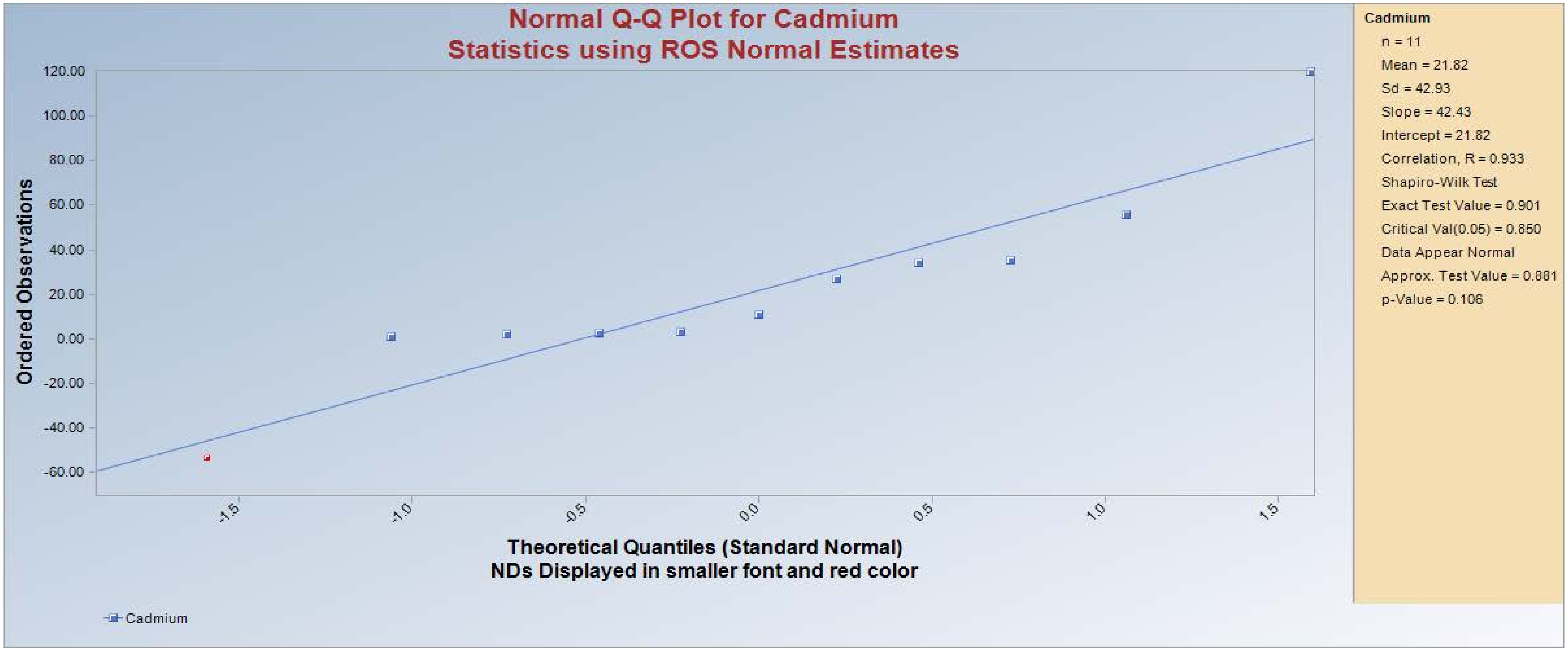


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
520.00
480.00
440.00
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
40.00
0.00
-40.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 113
Mean = 73.14
Sd = 94.5
Slope = 77.84
Intercept = 73.14
Correlation, R = 0.816
Shapiro-Wilk Test
Approx. Test Value = 0.676
p-Value = 0.000

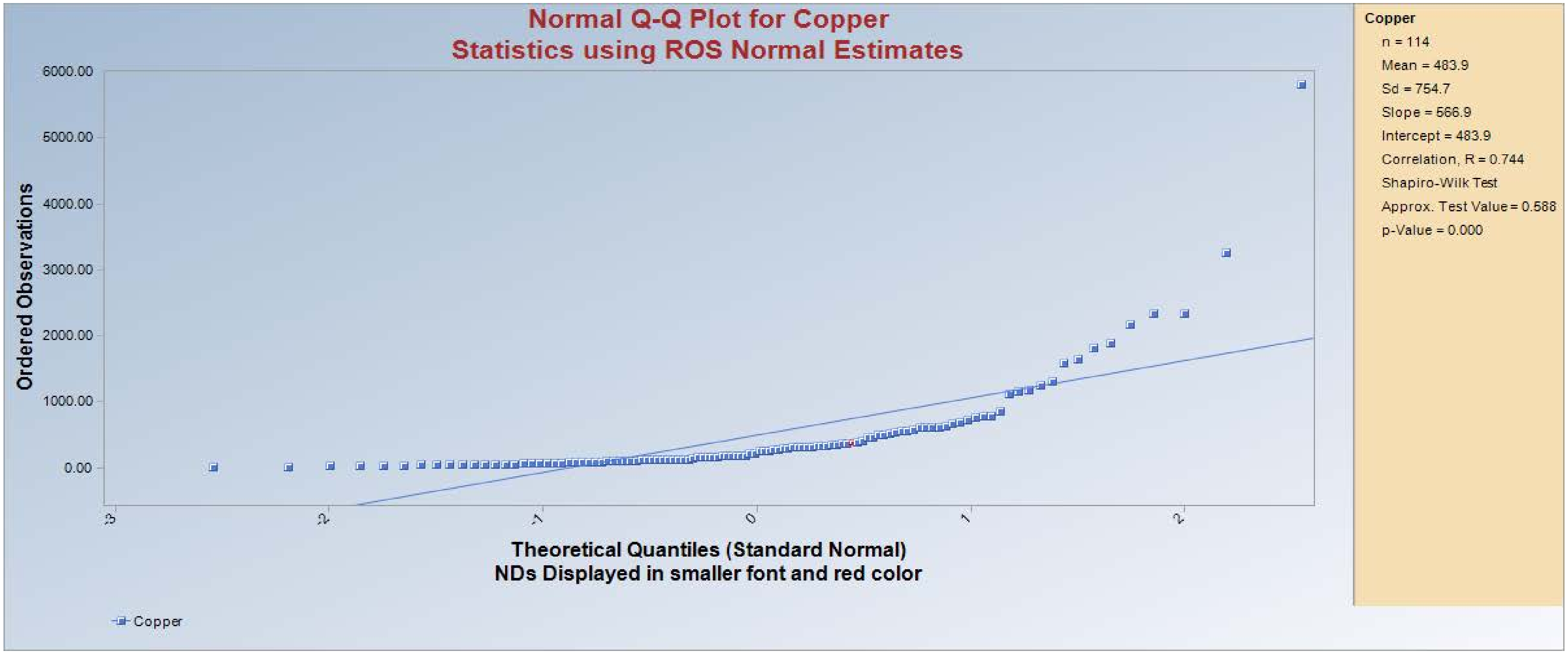


Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
520.00
480.00
440.00
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
40.00
0.00
-40.00
0
100
200
300
400
500
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 113
Mean = 73.2352
k star = 0.7081
Slope = 1.0884
Intercept = -6.1438
Correlation, R = 0.9853
Anderson-Darling Test
Test Statistic = 4.608
Critical Value(0.05) = 0.798
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

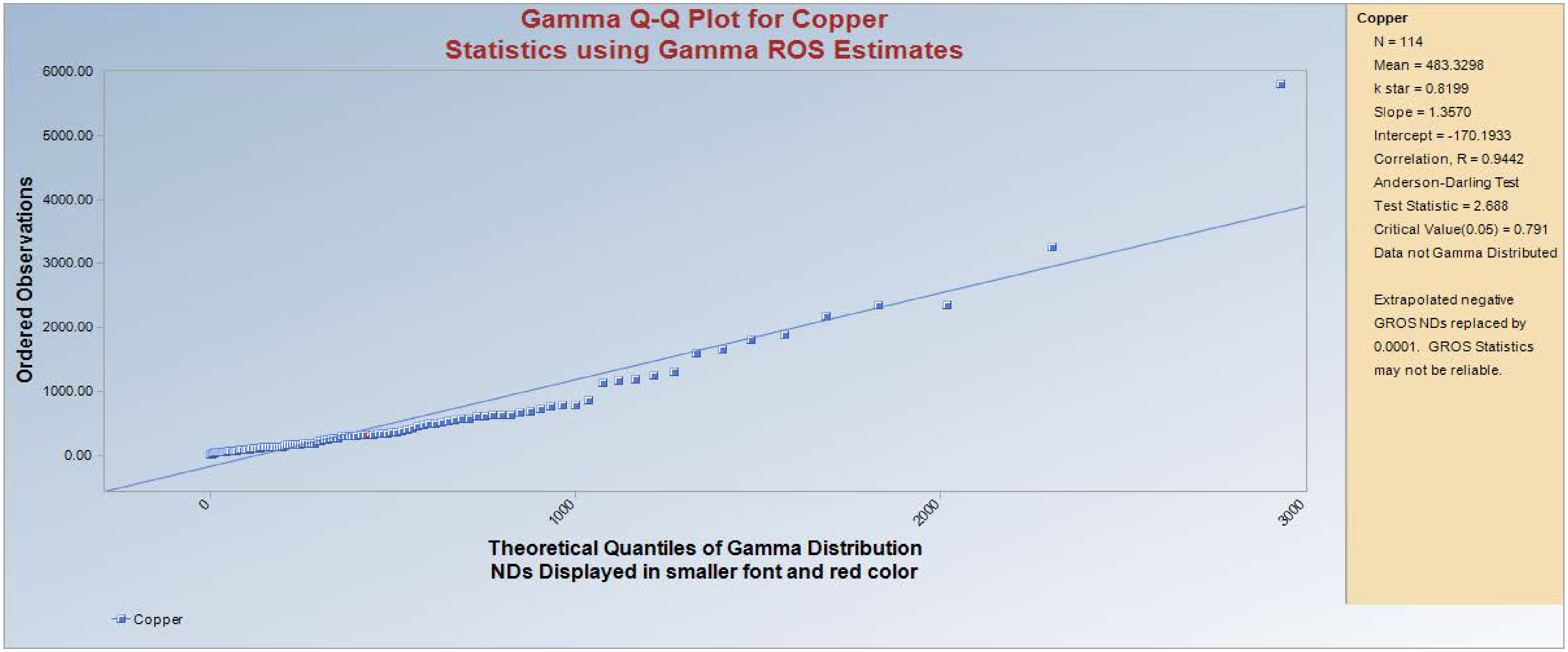

Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 113
Mean = 3.748
Sd = 0.985
Slope = 0.971
Intercept = 3.748
Correlation, R = 0.976
Shapiro-Wilk Test
Approx. Test Value = 0.936
p-Value = 0.000

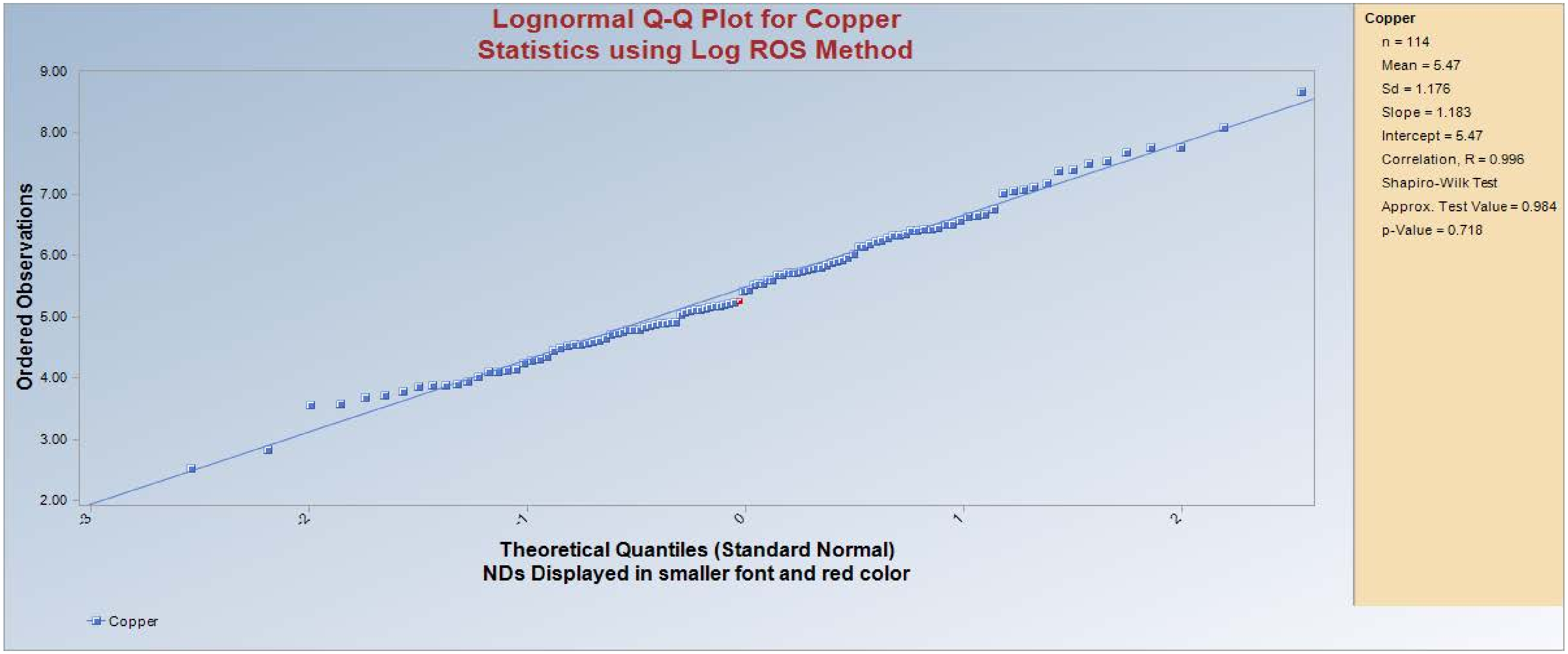


Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
120.00
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 11
Mean = 21.82
Sd = 42.93
Slope = 42.43
Intercept = 21.82
Correlation, R = 0.933
Shapiro-Wilk Test
Exact Test Value = 0.901
Critical Val(0.05) = 0.850
Data Appear Normal
Approx. Test Value = 0.881
p-Value = 0.106

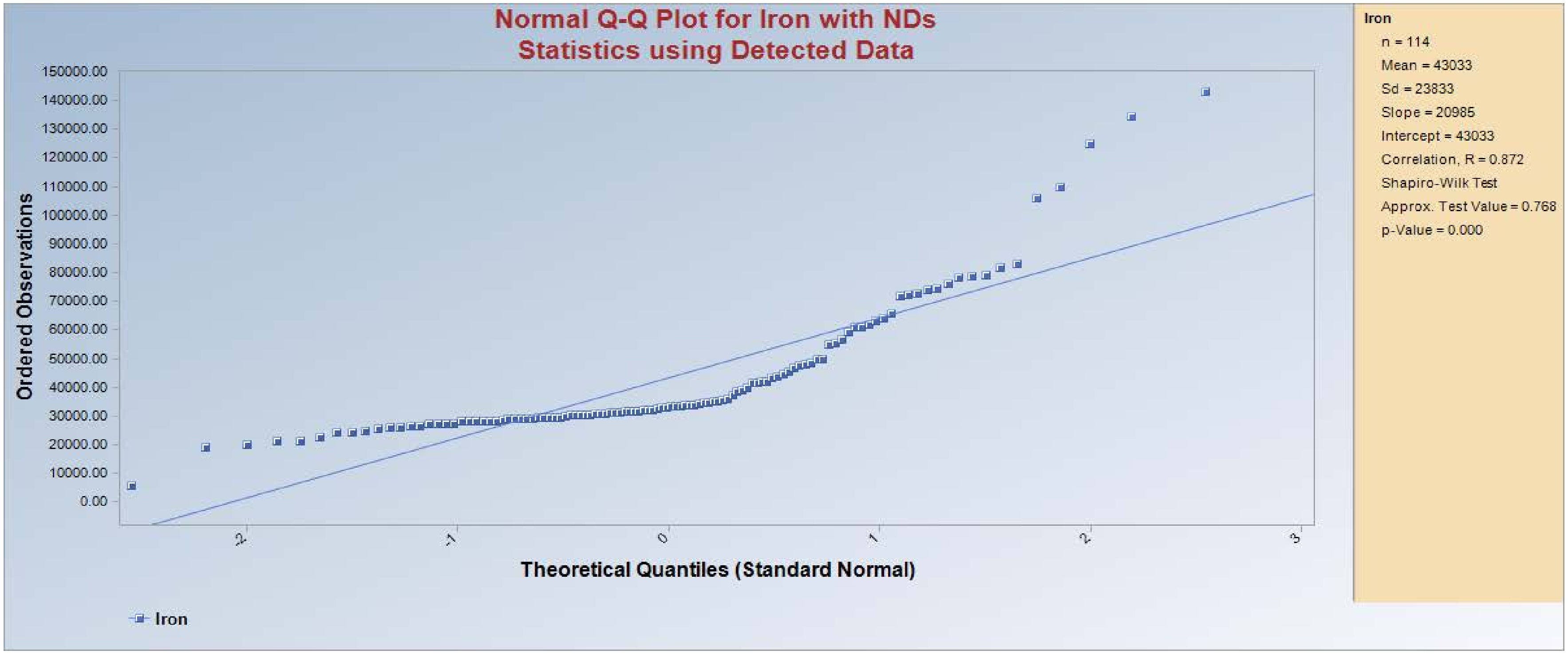


Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 114
Mean = 483.9
Sd = 754.7
Slope = 566.9
Intercept = 483.9
Correlation, R = 0.744
Shapiro-Wilk Test
Approx. Test Value = 0.588
p-Value = 0.000

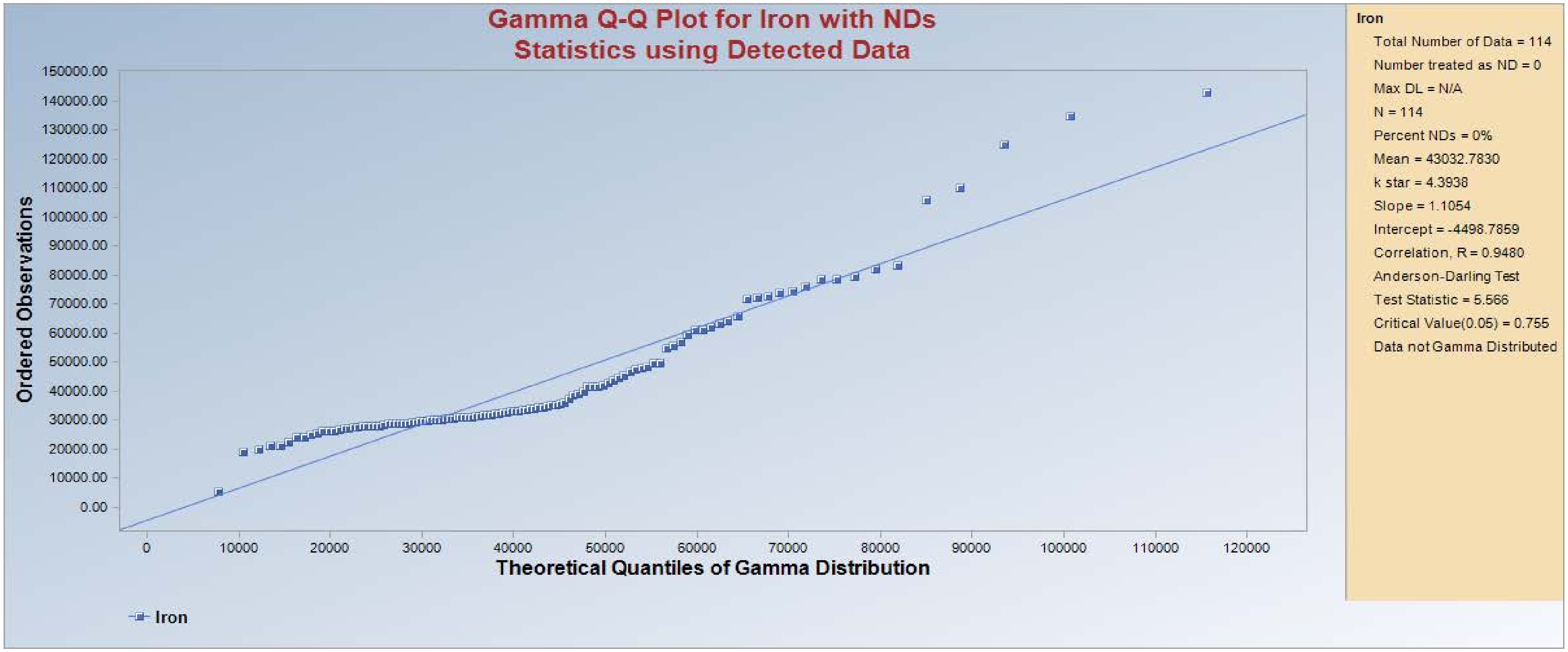

Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
0
1000
2000
3000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 114
Mean = 483.3298
k star = 0.8199
Slope = 1.3570
Intercept = -170.1933
Correlation, R = 0.9442
Anderson-Darling Test
Test Statistic = 2.688
Critical Value(0.05) = 0.791
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



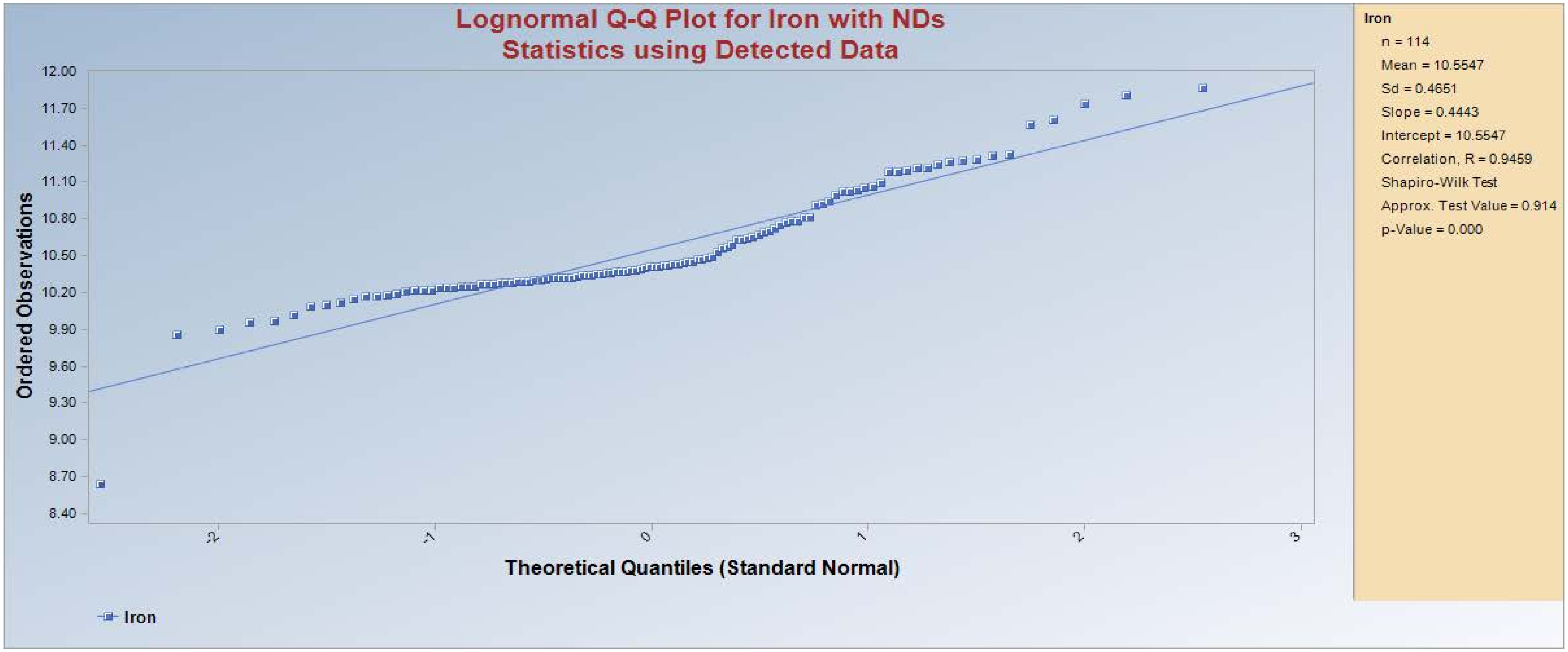
Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
Ordered Observations
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 114
Mean = 5.47
Sd = 1.176
Slope = 1.183
Intercept = 5.47
Correlation, R = 0.996
Shapiro-Wilk Test
Approx. Test Value = 0.984
p-Value = 0.718



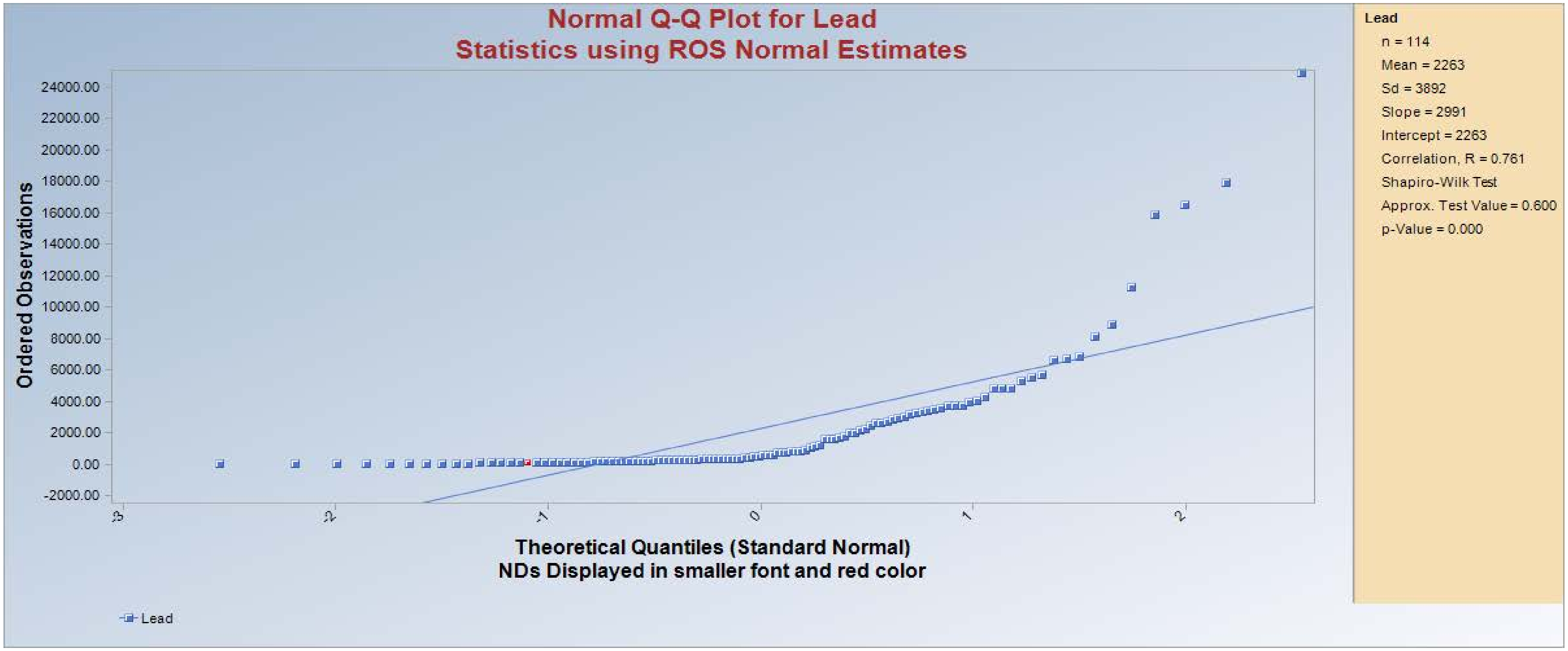
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 114
Mean = 43033
Sd = 23833
Slope = 20985
Intercept = 43033
Correlation, R = 0.872
Shapiro-Wilk Test
Approx. Test Value = 0.768
p-Value = 0.000



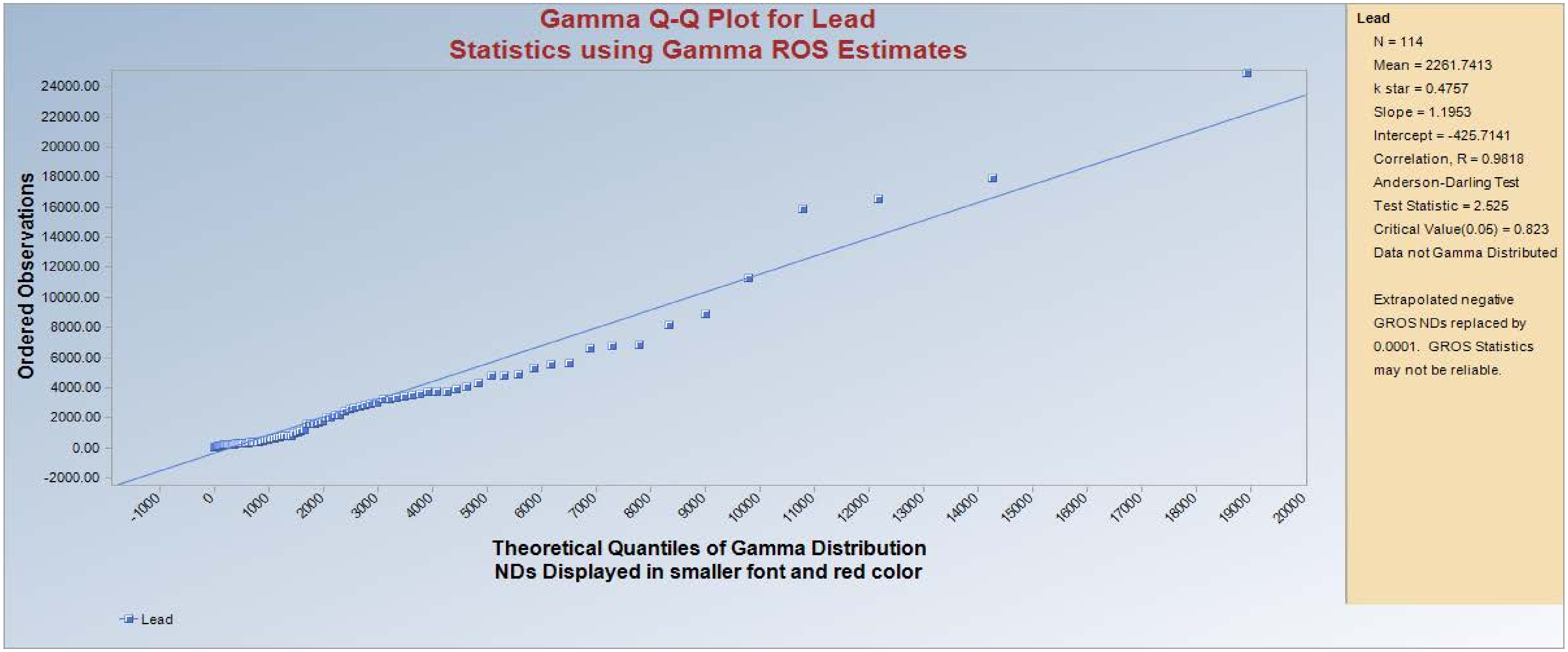
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
150000.00
140000.00
130000.00
120000.00
110000.00
100000.00
90000.00
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 114
Number treated as ND = 0
Max DL = N/A
N = 114
Percent NDs = 0%
Mean = 43032.7830
k star = 4.3938
Slope = 1.1054
Intercept = -4498.7859
Correlation, R = 0.9480
Anderson-Darling Test
Test Statistic = 5.566
Critical Value(0.05) = 0.755
Data not Gamma Distributed

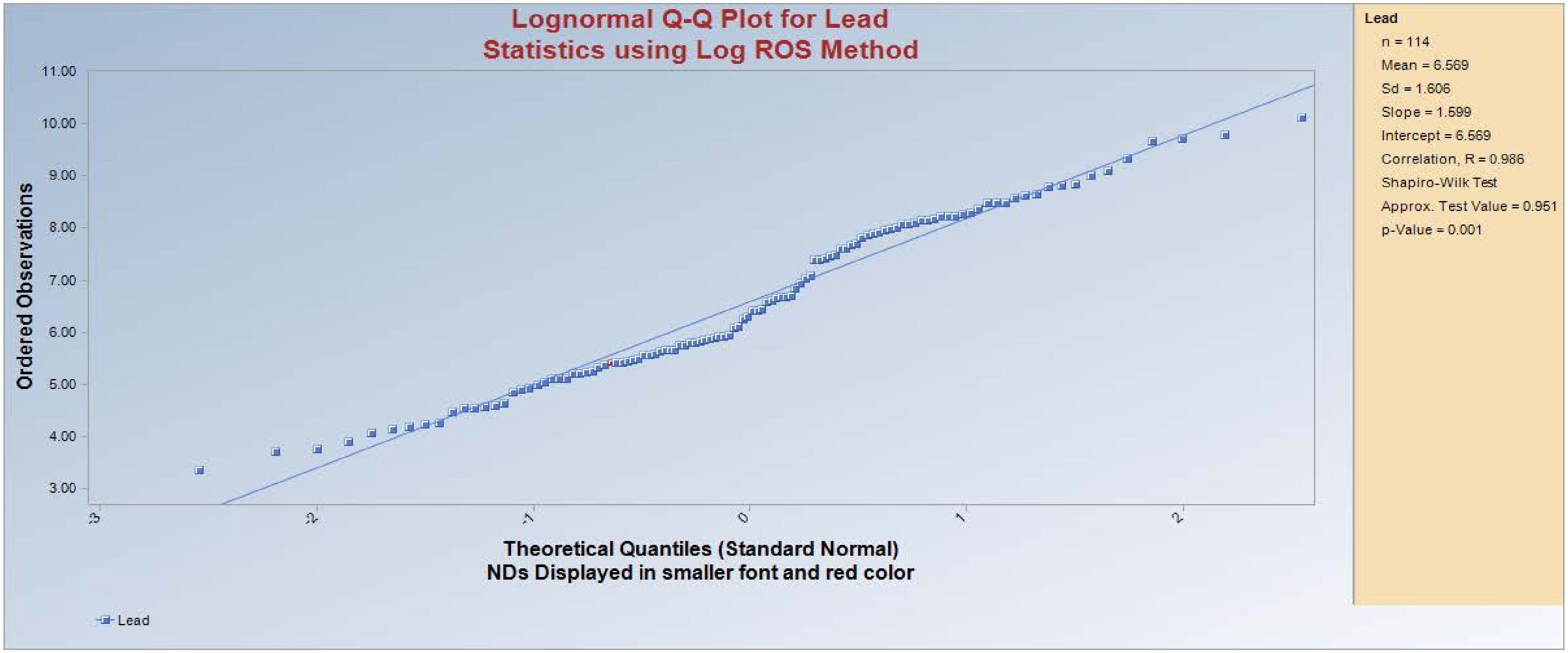


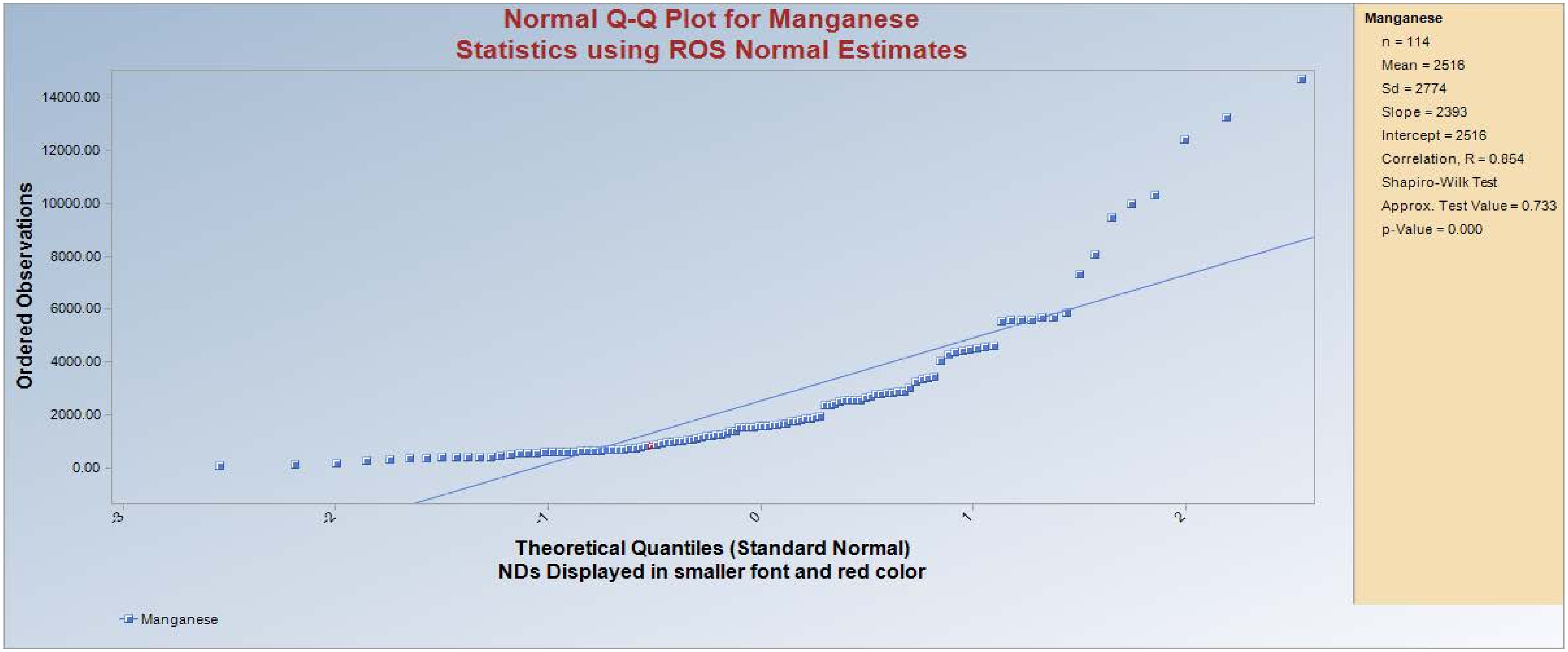
Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
12.00
11.70
11.40
11.10
10.80
10.50
10.20
9.90
9.60
9.30
9.00
8.70
8.40
Ordered Observations
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 114
Mean = 10.5547
Sd = 0.4651
Slope = 0.4443
Intercept = 10.5547
Correlation, R = 0.9459
Shapiro-Wilk Test
Approx. Test Value = 0.914
p-Value = 0.000

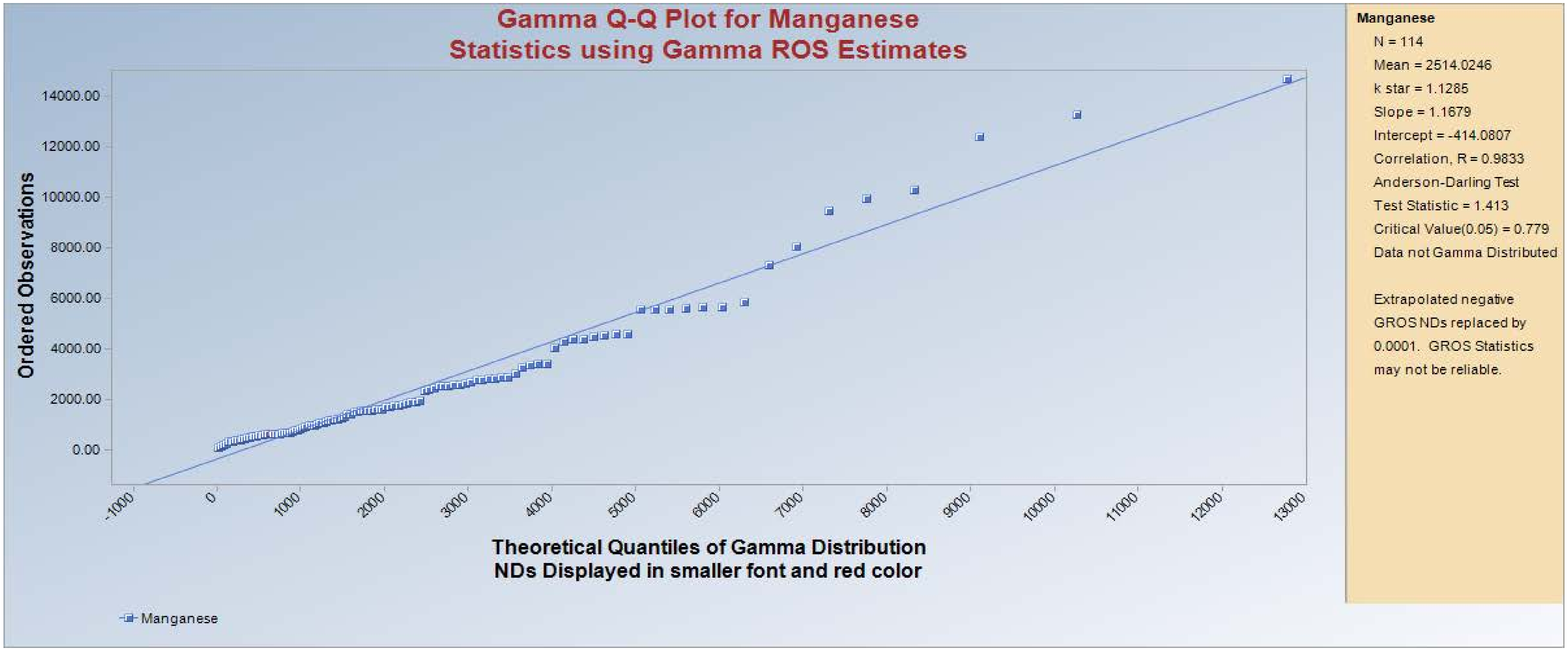


Normal Q-Q Plot for Lead
Statistics using ROS Normal Estimates
Ordered Observations
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Lead
Lead
n = 114
Mean = 2263
Sd = 3892
Slope = 2991
Intercept = 2263
Correlation, R = 0.761
Shapiro-Wilk Test
Approx. Test Value = 0.600
p-Value = 0.000

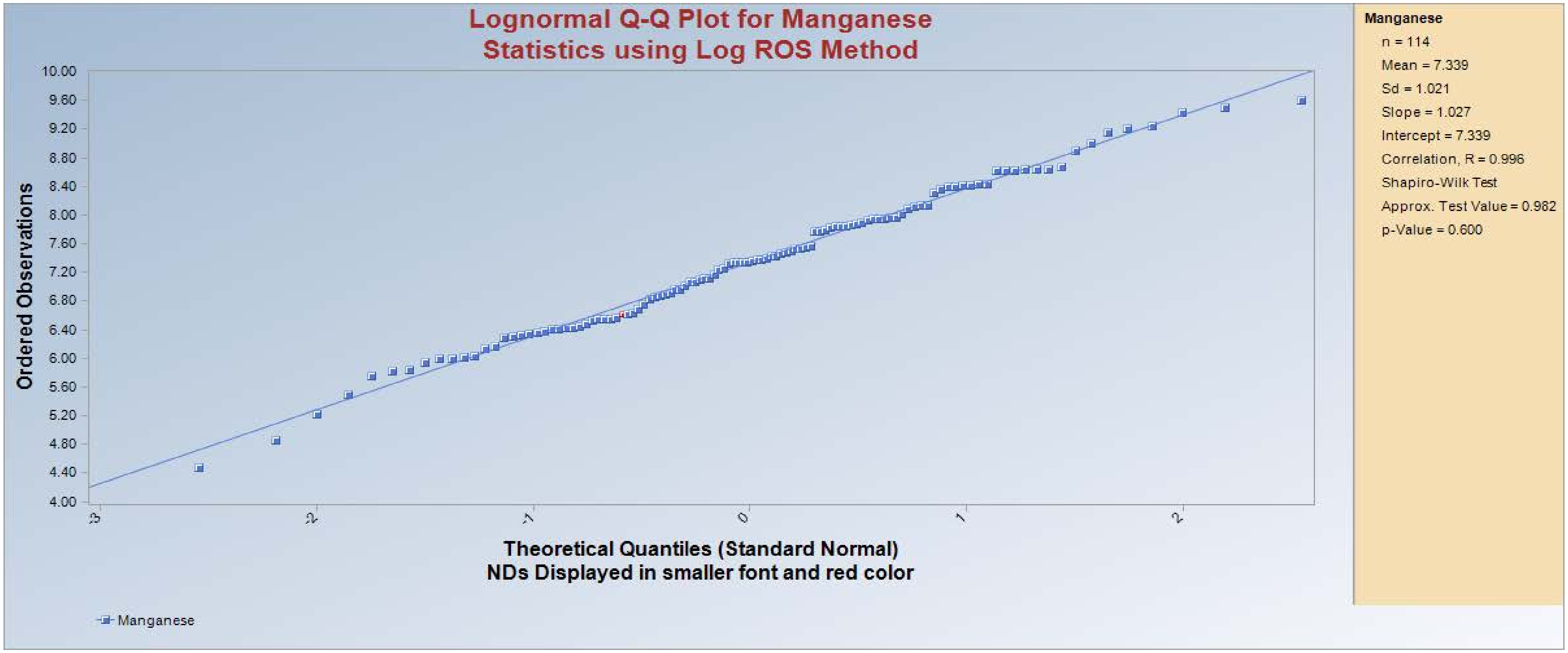

Gamma Q-Q Plot for Lead
Statistics using Gamma ROS Estimates
Ordered Observations
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Lead
Lead
N = 114
Mean = 2261.7413
k star = 0.4757
Slope = 1.1953
Intercept = -425.7141
Correlation, R = 0.9818
Anderson-Darling Test
Test Statistic = 2.525
Critical Value(0.05) = 0.823
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.


Lognormal Q-Q Plot for Lead
Statistics using Log ROS Method
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Lead
Lead
n = 114
Mean = 6.569
Sd = 1.606
Slope = 1.599
Intercept = 6.569
Correlation, R = 0.986
Shapiro-Wilk Test
Approx. Test Value = 0.951
p-Value = 0.001

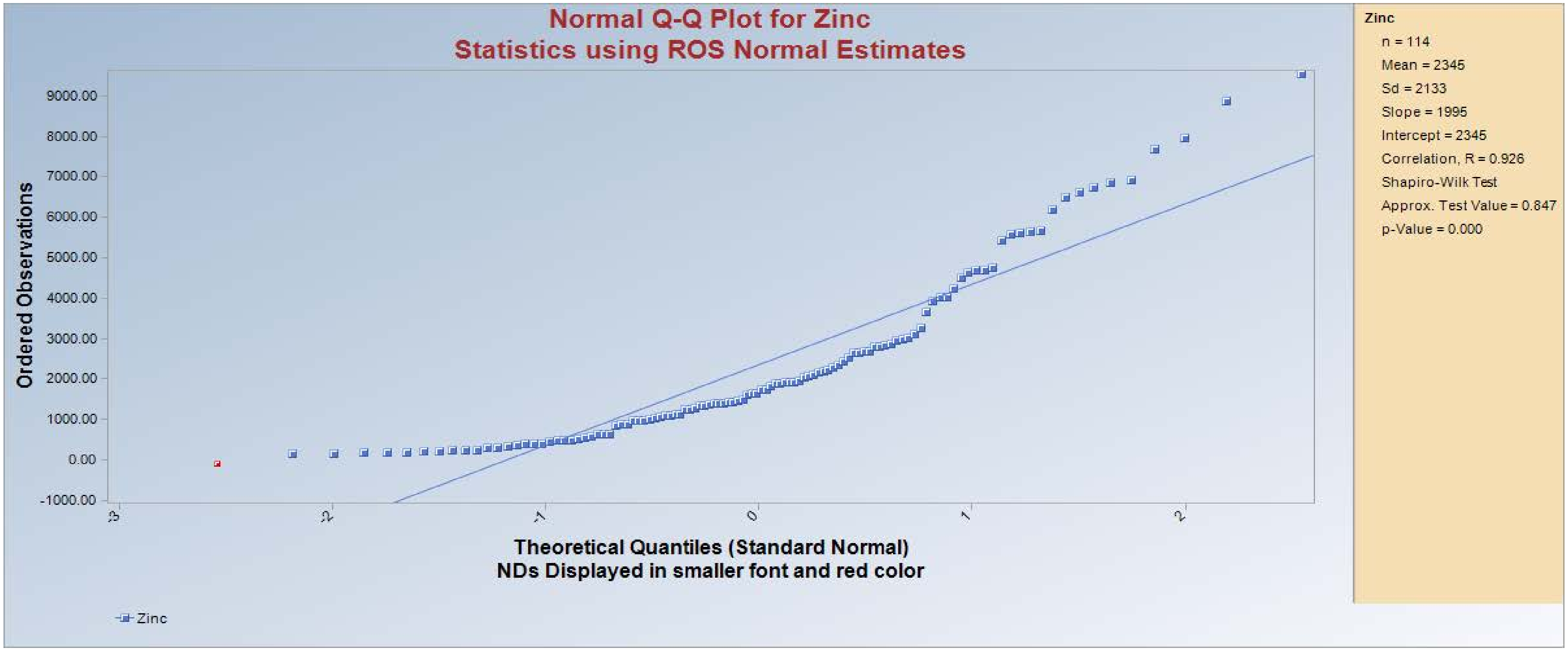

Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 114
Mean = 2516
Sd = 2774
Slope = 2393
Intercept = 2516
Correlation, R = 0.854
Shapiro-Wilk Test
Approx. Test Value = 0.733
p-Value = 0.000



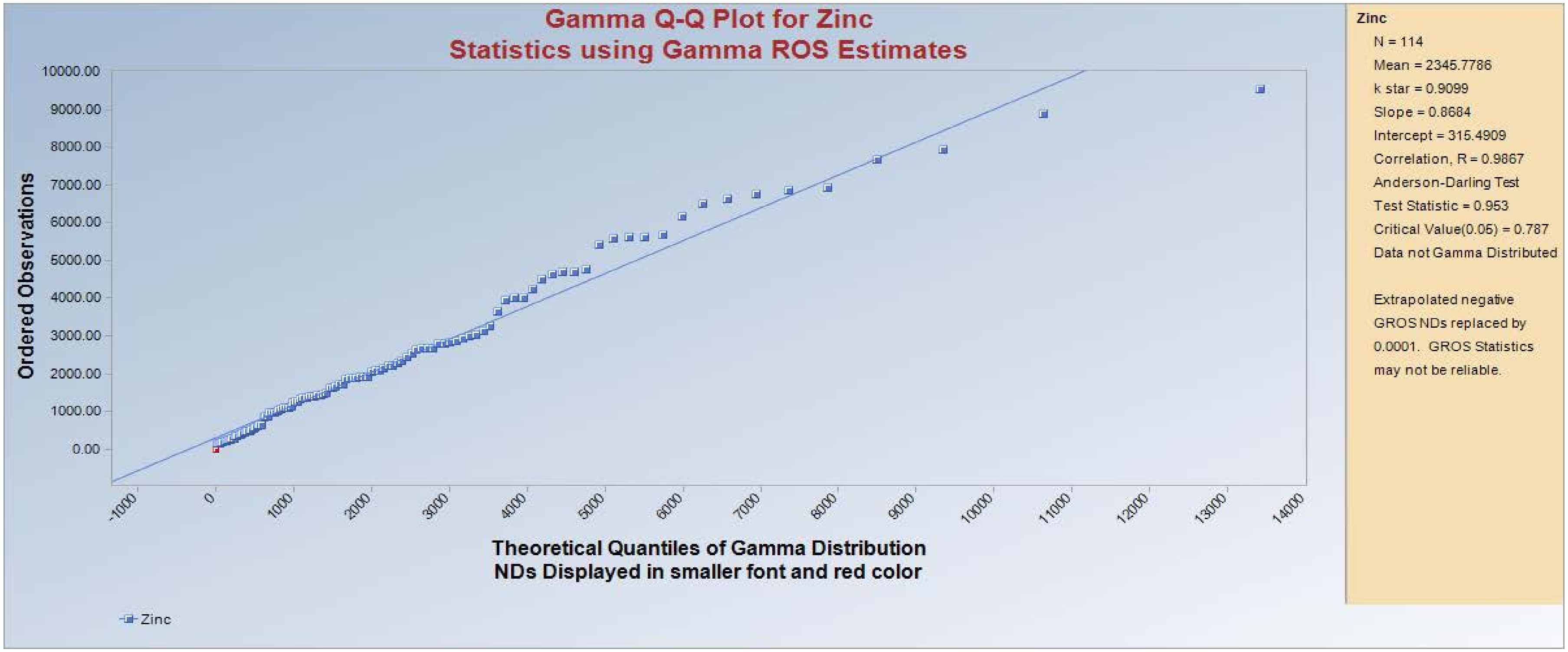
Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 114
Mean = 2514.0246
k star = 1.1285
Slope = 1.1679
Intercept = -414.0807
Correlation, R = 0.9833
Anderson-Darling Test
Test Statistic = 1.413
Critical Value(0.05) = 0.779
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

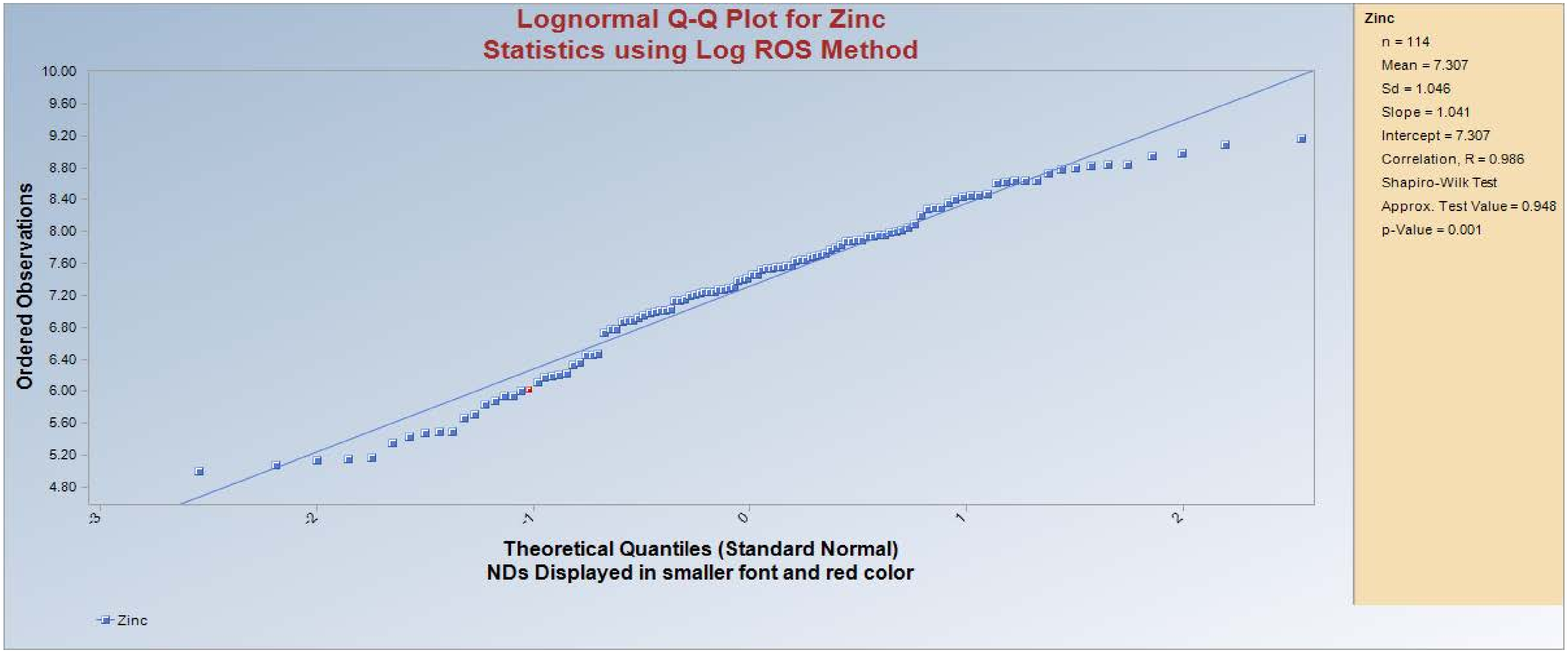


Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
10.00
9.60
9.20
8.80
8.40
8.00
7.60
7.20
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 114
Mean = 7.339
Sd = 1.021
Slope = 1.027
Intercept = 7.339
Correlation, R = 0.996
Shapiro-Wilk Test
Approx. Test Value = 0.982
p-Value = 0.600



Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 114
Mean = 2345
Sd = 2133
Slope = 1995
Intercept = 2345
Correlation, R = 0.926
Shapiro-Wilk Test
Approx. Test Value = 0.847
p-Value = 0.000


Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Zinc
Zinc
N = 114
Mean = 2345.7786
k star = 0.9099
Slope = 0.8684
Intercept = 315.4909
Correlation, R = 0.9867
Anderson-Darling Test
Test Statistic = 0.953
Critical Value(0.05) = 0.787
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
10.00
9.60
9.20
8.80
8.40
8.00
7.60
7.20
6.80
6.40
6.00
5.60
5.20
4.80
Ordered Observations
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 114
Mean = 7.307
Sd = 1.046
Slope = 1.041
Intercept = 7.307
Correlation, R = 0.986
Shapiro-Wilk Test
Approx. Test Value = 0.948
p-Value = 0.001

Attachment A15
ProUCL output for EU 12 Surface Sediment

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	56	Number of Distinct Observations	53
Number of Missing Values	190		

Raw Statistics		Log-transformed Statistics	
Minimum	1090	Minimum of Log Data	6.994
Maximum	23500	Maximum of Log Data	10.06
Mean	10134	Mean of log Data	9.04
Geometric Mean	8437	SD of log Data	0.664
Median	8900		
SD	5625		
Std. Error of Mean	751.7		
Coefficient of Variation	0.555		
Skewness	0.553		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.115	Lilliefors Test Statistic	0.11
Lilliefors Critical Value	0.118	Lilliefors Critical Value	0.118
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	11392	95% H-UCL	12589
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14876
95% Adjusted-CLT UCL (Chen-1995)	11430	97.5% Chebyshev (MVUE) UCL	16782
95% Modified-t UCL (Johnson-1978)	11401	99% Chebyshev (MVUE) UCL	20527

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.741	Data appear Normal at 5% Significance Level	
Theta Star	3697		
MLE of Mean	10134		
MLE of Standard Deviation	6121		
nu star	307		
Approximate Chi Square Value (.05)	267.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0457	95% CLT UCL	11371
Adjusted Chi Square Value	266.5	95% Jackknife UCL	11392
		95% Standard Bootstrap UCL	11375
Anderson-Darling Test Statistic	0.32	95% Bootstrap-t UCL	11496
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL	11409
Kolmogorov-Smirnov Test Statistic	0.0768	95% Percentile Bootstrap UCL	11372
Kolmogorov-Smirnov 5% Critical Value	0.12	95% BCA Bootstrap UCL	11440
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13411
		97.5% Chebyshev(Mean, Sd) UCL	14829
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	17614
95% Approximate Gamma UCL (Use when n >= 40)	11635		
95% Adjusted Gamma UCL (Use when n < 40)	11677		

Potential UCL to Use		Use 95% Student's-t UCL	11392

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics

Number of Valid Data	293	Number of Detected Data	289
Number of Distinct Detected Data	278	Number of Non-Detect Data	4
		Percent Non-Detects	1.37%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.954	Minimum Detected	-0.0471
Maximum Detected	507	Maximum Detected	6.229
Mean of Detected	55.43	Mean of Detected	3.452
SD of Detected	57.81	SD of Detected	1.137
Minimum Non-Detect	6.414	Minimum Non-Detect	1.858
Maximum Non-Detect	43.61	Maximum Non-Detect	3.775

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	166
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	127
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	56.66%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.18	Lilliefors Test Statistic	0.112
5% Lilliefors Critical Value	0.0521	5% Lilliefors Critical Value	0.0521
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	54.8	Mean	3.43
SD	57.68	SD	1.148
95% DL/2 (t) UCL	60.36	95% H-Stat (DL/2) UCL	69.5
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	27.15	Mean in Log Scale	3.43
SD	88.43	SD in Log Scale	1.147
95% MLE (t) UCL	35.67	Mean in Original Scale	54.79
95% MLE (Tiku) UCL	38.59	SD in Original Scale	57.68
		95% t UCL	60.35
		95% Percentile Bootstrap UCL	60.31
		95% BCA Bootstrap UCL	61.01
		95% H UCL	69.44

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.014	Data do not follow a Discernable Distribution (0.05)	
Theta Star	54.69		
nu star	585.8		
A-D Test Statistic	6.551	Nonparametric Statistics	
5% A-D Critical Value	0.783	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.783	Mean	54.79
5% K-S Critical Value	0.055	SD	57.59
Data not Gamma Distributed at 5% Significance Level		SE of Mean	3.37
		95% KM (t) UCL	60.35
Assuming Gamma Distribution		95% KM (z) UCL	60.33
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	60.35
Minimum	0.000001	95% KM (bootstrap t) UCL	60.99
Maximum	507	95% KM (BCA) UCL	60.69
Mean	54.73	95% KM (Percentile Bootstrap) UCL	60.11
Median	29.98	95% KM (Chebyshev) UCL	69.48
SD	57.73	97.5% KM (Chebyshev) UCL	75.83
k star	0.806	99% KM (Chebyshev) UCL	88.32
Theta star	67.92		
Nu star	472.2	Potential UCLs to Use	
AppChi2	422.8	95% KM (Chebyshev) UCL	69.48
95% Gamma Approximate UCL (Use when n >= 40)	61.13		
95% Adjusted Gamma UCL (Use when n < 40)	61.16		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Data	129	Number of Detected Data	120
Number of Distinct Detected Data	115	Number of Non-Detect Data	9
Number of Missing Values	164	Percent Non-Detects	6.98%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.152	Minimum Detected	-1.884
Maximum Detected	78	Maximum Detected	4.357
Mean of Detected	7.814	Mean of Detected	1.251
SD of Detected	10.11	SD of Detected	1.409
Minimum Non-Detect	0.15	Minimum Non-Detect	-1.897
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	116
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	10.08%

UCL Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.224
5% Lilliefors Critical Value	0.0809

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	7.275
SD	9.947
95% DL/2 (t) UCL	8.726
Maximum Likelihood Estimate(MLE) Method	
Mean	6.622
SD	10.69
95% MLE (t) UCL	8.181
95% MLE (Tiku) UCL	8.101

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.105
5% Lilliefors Critical Value	0.0809

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	0.985
SD	1.672
95% H-Stat (DL/2) UCL	16.58
Log ROS Method	
Mean in Log Scale	1.027
SD in Log Scale	1.592
Mean in Original Scale	7.28
SD in Original Scale	9.943
95% t UCL	8.73
95% Percentile Bootstrap UCL	8.706
95% BCA Bootstrap UCL	9.14
95% H UCL	14.69

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.731
Theta Star	10.68
nu star	175.6
A-D Test Statistic	1.809
5% A-D Critical Value	0.796
K-S Test Statistic	0.796
5% K-S Critical Value	0.0876

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	78
Mean	7.269
Median	2.79
SD	9.951
k star	0.37
Theta star	19.67
Nu star	95.35
AppChi2	73.83
95% Gamma Approximate UCL (Use when n >= 40)	9.388
95% Adjusted Gamma UCL (Use when n < 40)	9.415

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	7.28
SD	9.905
SE of Mean	0.876
95% KM (t) UCL	8.731
95% KM (z) UCL	8.72
95% KM (jackknife) UCL	8.73
95% KM (bootstrap t) UCL	9.041
95% KM (BCA) UCL	8.711
95% KM (Percentile Bootstrap) UCL	8.812
95% KM (Chebyshev) UCL	11.1
97.5% KM (Chebyshev) UCL	12.75
99% KM (Chebyshev) UCL	15.99

Potential UCLs to Use

95% KM (Chebyshev) UCL	11.1

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	293	Number of Distinct Observations	284

Raw Statistics		Log-transformed Statistics	
Minimum	1.52	Minimum of Log Data	0.419
Maximum	2760	Maximum of Log Data	7.923
Mean	533.5	Mean of log Data	5.737
Geometric Mean	310.2	SD of log Data	1.228
Median	354		
SD	528.4		
Std. Error of Mean	30.87		
Coefficient of Variation	0.99		
Skewness	1.631		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.184	Lilliefors Test Statistic	0.0618
Lilliefors Critical Value	0.0518	Lilliefors Critical Value	0.0518
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	584.4	95% H-UCL	779.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	924.7
95% Adjusted-CLT UCL (Chen-1995)	587.4	97.5% Chebyshev (MVUE) UCL	1041
95% Modified-t UCL (Johnson-1978)	584.9	99% Chebyshev (MVUE) UCL	1269
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.049	Data do not follow a Discernable Distribution (0.05)	
Theta Star	508.4		
MLE of Mean	533.5		
MLE of Standard Deviation	520.8		
nu star	614.9		
Approximate Chi Square Value (.05)	558.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0492	95% CLT UCL	584.2
Adjusted Chi Square Value	558.2	95% Jackknife UCL	584.4
		95% Standard Bootstrap UCL	584.1
Anderson-Darling Test Statistic	1.262	95% Bootstrap-t UCL	588.1
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL	587.6
Kolmogorov-Smirnov Test Statistic	0.0617	95% Percentile Bootstrap UCL	584.4
Kolmogorov-Smirnov 5% Critical Value	0.0544	95% BCA Bootstrap UCL	588.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	668
		97.5% Chebyshev(Mean, Sd) UCL	726.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	840.6
95% Approximate Gamma UCL (Use when n >= 40)	587.5		
95% Adjusted Gamma UCL (Use when n < 40)	587.7		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	668

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	220	Number of Distinct Observations	212
Number of Missing Values	26		

Raw Statistics		Log-transformed Statistics	
Minimum	5582	Minimum of Log Data	8.627
Maximum	199000	Maximum of Log Data	12.2
Mean	42590	Mean of log Data	10.51
Geometric Mean	36719	SD of log Data	0.558
Median	37152		
SD	24606		
Std. Error of Mean	1659		
Coefficient of Variation	0.578		
Skewness	2.25		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.107	Lilliefors Test Statistic	0.0776
Lilliefors Critical Value	0.0597	Lilliefors Critical Value	0.0597
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	45331	95% H-UCL	45987
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	50415
95% Adjusted-CLT UCL (Chen-1995)	45588	97.5% Chebyshev (MVUE) UCL	53677
95% Modified-t UCL (Johnson-1978)	45373	99% Chebyshev (MVUE) UCL	60085

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.484	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	12225		
MLE of Mean	42590		
MLE of Standard Deviation	22818		
nu star	1533		
Approximate Chi Square Value (.05)	1443	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0489	95% CLT UCL	45319
Adjusted Chi Square Value	1442	95% Jackknife UCL	45331
		95% Standard Bootstrap UCL	45323
Anderson-Darling Test Statistic	0.999	95% Bootstrap-t UCL	45762
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL	45764
Kolmogorov-Smirnov Test Statistic	0.0603	95% Percentile Bootstrap UCL	45364
Kolmogorov-Smirnov 5% Critical Value	0.0617	95% BCA Bootstrap UCL	45439
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	49821
		97.5% Chebyshev(Mean, Sd) UCL	52950
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	59097
95% Approximate Gamma UCL (Use when n >= 40)	45244		
95% Adjusted Gamma UCL (Use when n < 40)	45262		

Potential UCL to Use		Use 95% Approximate Gamma UCL	45244

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	293
Number of Distinct Observations	283

Raw Statistics

Minimum	1.86
Maximum	30867
Mean	1561
Geometric Mean	537
Median	794
SD	2589
Std. Error of Mean	151.2
Coefficient of Variation	1.658
Skewness	6.014

Log-transformed Statistics

Minimum of Log Data	0.621
Maximum of Log Data	10.34
Mean of log Data	6.286
SD of log Data	1.709

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.273
Lilliefors Critical Value	0.0518

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.121
Lilliefors Critical Value	0.0518

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1811
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995)	1867
95% Modified-t UCL (Johnson-1978)	1820

Assuming Lognormal Distribution

95% H-UCL	3065
95% Chebyshev (MVUE) UCL	3807
97.5% Chebyshev (MVUE) UCL	4466
99% Chebyshev (MVUE) UCL	5759

Gamma Distribution Test

k star (bias corrected)	0.578
Theta Star	2701
MLE of Mean	1561
MLE of Standard Deviation	2054
nu star	338.7
Approximate Chi Square Value (.05)	297
Adjusted Level of Significance	0.0492
Adjusted Chi Square Value	296.8
Anderson-Darling Test Statistic	4.771
Anderson-Darling 5% Critical Value	0.814
Kolmogorov-Smirnov Test Statistic	0.13
Kolmogorov-Smirnov 5% Critical Value	0.0557

Data not Gamma Distributed at 5% Significance Level

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1810
95% Jackknife UCL	1811
95% Standard Bootstrap UCL	1811
95% Bootstrap-t UCL	1881
95% Hall's Bootstrap UCL	2026
95% Percentile Bootstrap UCL	1826
95% BCA Bootstrap UCL	1882
95% Chebyshev(Mean, Sd) UCL	2221
97.5% Chebyshev(Mean, Sd) UCL	2506
99% Chebyshev(Mean, Sd) UCL	3066

Assuming Gamma Distribution

95% Approximate Gamma UCL (Use when n >= 40)	1780
95% Adjusted Gamma UCL (Use when n < 40)	1781

Potential UCL to Use — Use 95% Chebyshev (Mean, Sd) UCL 2221

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	293	Number of Detected Data	277
Number of Distinct Detected Data	274	Number of Non-Detect Data	16
		Percent Non-Detects	5.46%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.3	Minimum Detected	2.51
Maximum Detected	75108	Maximum Detected	11.23
Mean of Detected	3438	Mean of Detected	6.771
SD of Detected	7255	SD of Detected	1.845
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	22.21	Maximum Non-Detect	3.1

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	17
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	276
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	5.80%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.318	Lilliefors Test Statistic	0.09
5% Lilliefors Critical Value	0.0532	5% Lilliefors Critical Value	0.0532
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3251	Mean	6.517
SD	7097	SD	2.084
95% DL/2 (t) UCL	3935	95% H-Stat (DL/2) UCL	8794
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2966	Mean in Log Scale	6.543
SD	7366	SD in Log Scale	2.03
95% MLE (t) UCL	3676	Mean in Original Scale	3251
95% MLE (Tiku) UCL	3612	SD in Original Scale	7097
		95% t UCL	3935
		95% Percentile Bootstrap UCL	3996
		95% BCA Bootstrap UCL	4154
		95% H UCL	7942

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.465	Data do not follow a Discernable Distribution (0.05)	
Theta Star	7389		
nu star	257.8		
A-D Test Statistic	5.214	Nonparametric Statistics	
5% A-D Critical Value	0.829	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.829	Mean	3251
5% K-S Critical Value	0.0582	SD	7084
Data not Gamma Distributed at 5% Significance Level		SE of Mean	414.6
		95% KM (t) UCL	3935
Assuming Gamma Distribution		95% KM (z) UCL	3933
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3935
Minimum	0.000001	95% KM (bootstrap t) UCL	4148
Maximum	75108	95% KM (BCA) UCL	3932
Mean	3250	95% KM (Percentile Bootstrap) UCL	3953
Median	760	95% KM (Chebyshev) UCL	5058
SD	7097	97.5% KM (Chebyshev) UCL	5840
k star	0.284	99% KM (Chebyshev) UCL	7377
Theta star	11429		
Nu star	166.7	Potential UCLs to Use	
AppChi2	137.8	97.5% KM (Chebyshev) UCL	5840
95% Gamma Approximate UCL (Use when n >= 40)	3931		
95% Adjusted Gamma UCL (Use when n < 40)	3935		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Data	293	Number of Detected Data	292
Number of Distinct Detected Data	282	Number of Non-Detect Data	1
		Percent Non-Detects	0.34%

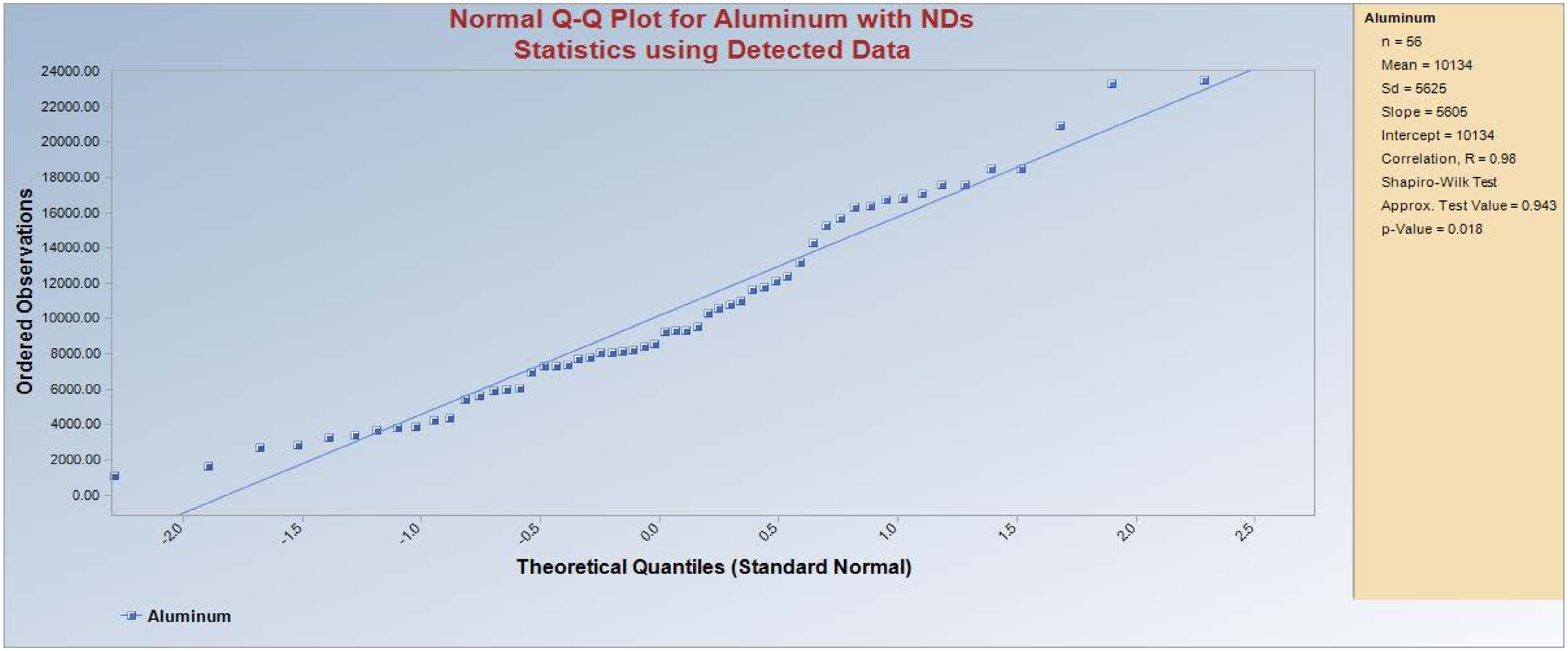
Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.38	Minimum Detected	1.477
Maximum Detected	36572	Maximum Detected	10.51
Mean of Detected	2821	Mean of Detected	6.917
SD of Detected	4688	SD of Detected	1.603
Minimum Non-Detect	2	Minimum Non-Detect	0.693
Maximum Non-Detect	2	Maximum Non-Detect	0.693

UCL Statistics

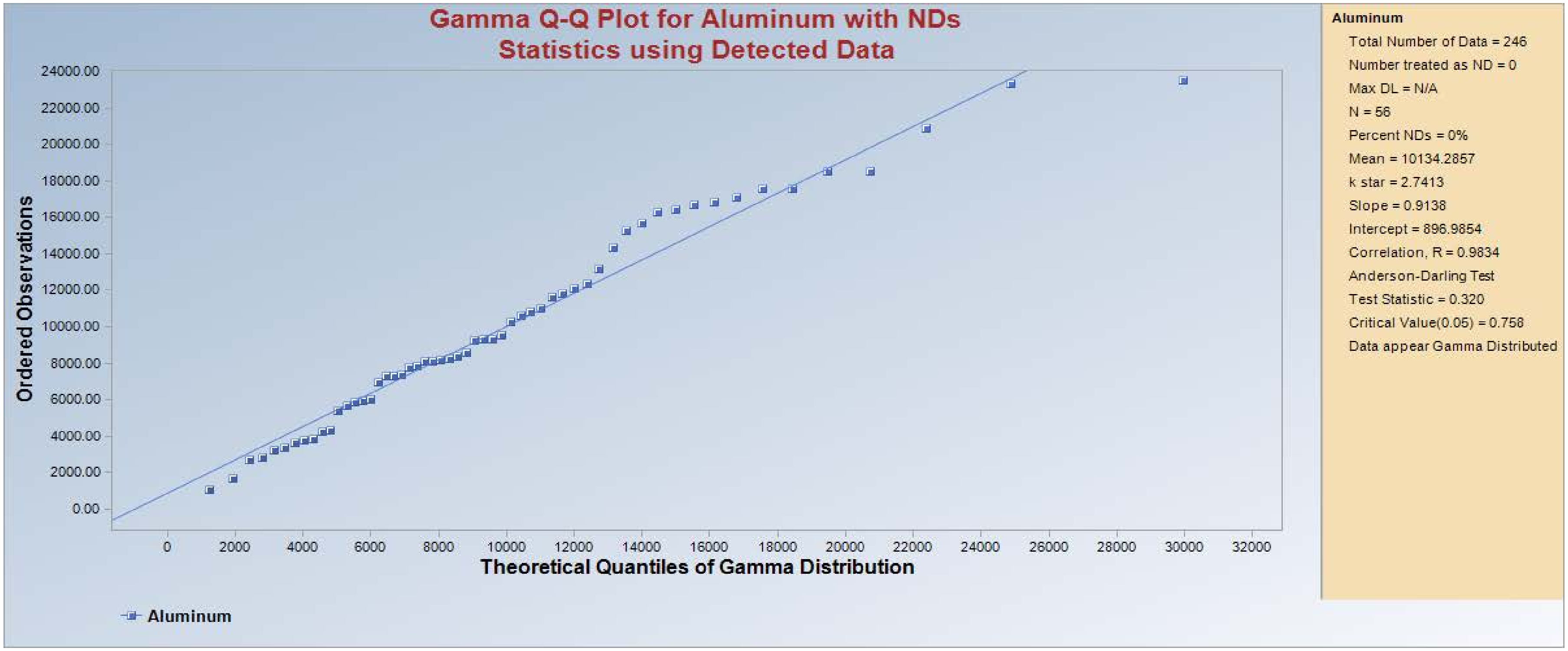
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.274	Lilliefors Test Statistic	0.0647
5% Lilliefors Critical Value	0.0518	5% Lilliefors Critical Value	0.0518
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2811	Mean	6.894
SD	4683	SD	1.65
95% DL/2 (t) UCL	3263	95% H-Stat (DL/2) UCL	5019
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2802	Mean in Log Scale	6.901
SD	4686	SD in Log Scale	1.624
95% MLE (t) UCL	3253	Mean in Original Scale	2811
95% MLE (Tiku) UCL	3208	SD in Original Scale	4683
		95% t UCL	3263
		95% Percentile Bootstrap UCL	3297
		95% BCA Bootstrap UCL	3356
		95% H UCL	4812
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.597	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4723		
nu star	348.8		
A-D Test Statistic	3.567	**Nonparametric Statistics**	
5% A-D Critical Value	0.812	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.812	Mean	2811
5% K-S Critical Value	0.0557	SD	4675
Data not Gamma Distributed at 5% Significance Level		SE of Mean	273.6
		95% KM (t) UCL	3263
Assuming Gamma Distribution		95% KM (z) UCL	3261
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3263
Minimum	0.000001	95% KM (bootstrap t) UCL	3353
Maximum	36572	95% KM (BCA) UCL	3255
Mean	2811	95% KM (Percentile Bootstrap) UCL	3276
Median	1089	95% KM (Chebyshev) UCL	4004
SD	4683	97.5% KM (Chebyshev) UCL	4520
k star	0.565	99% KM (Chebyshev) UCL	5533
Theta star	4974		
Nu star	331.2	Potential UCLs to Use	
AppChi2	290.1	97.5% KM (Chebyshev) UCL	4520
95% Gamma Approximate UCL (Use when n >= 40)	3210		
95% Adjusted Gamma UCL (Use when n < 40)	3212		

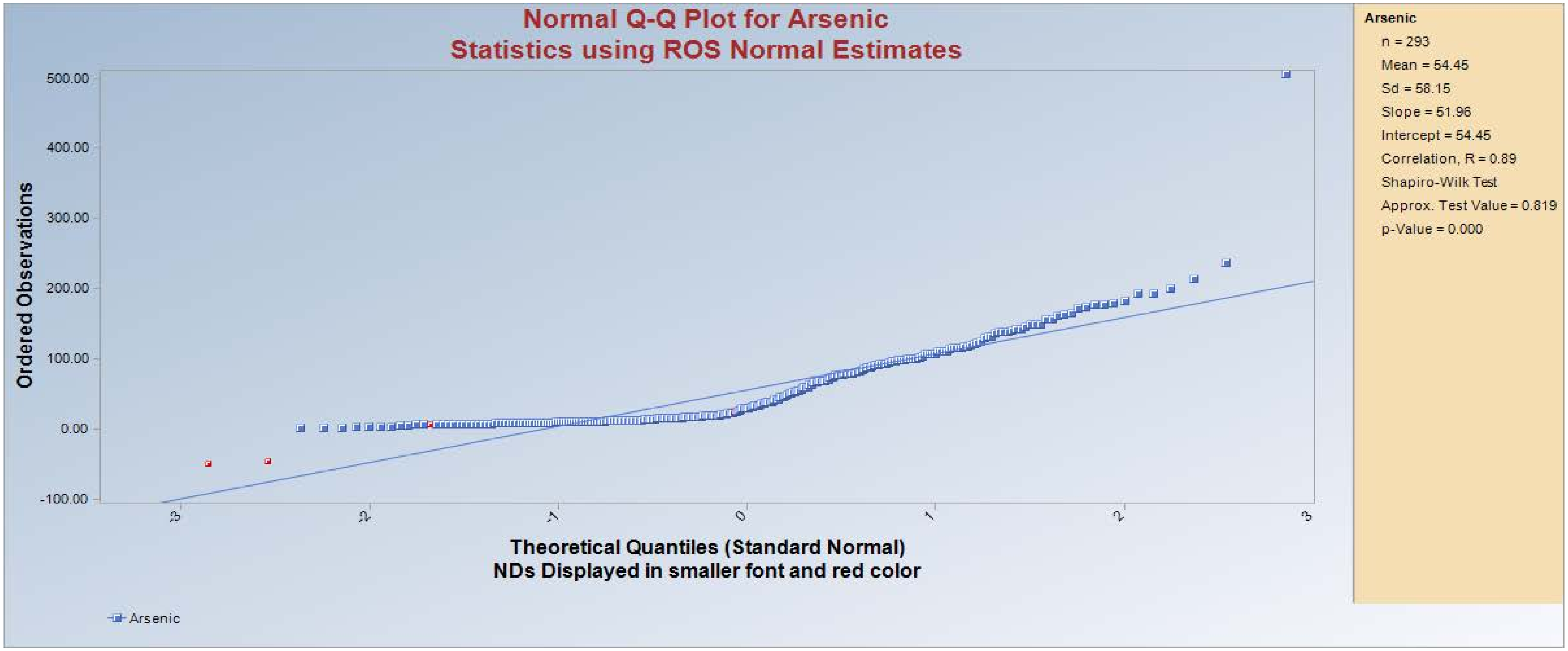
Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

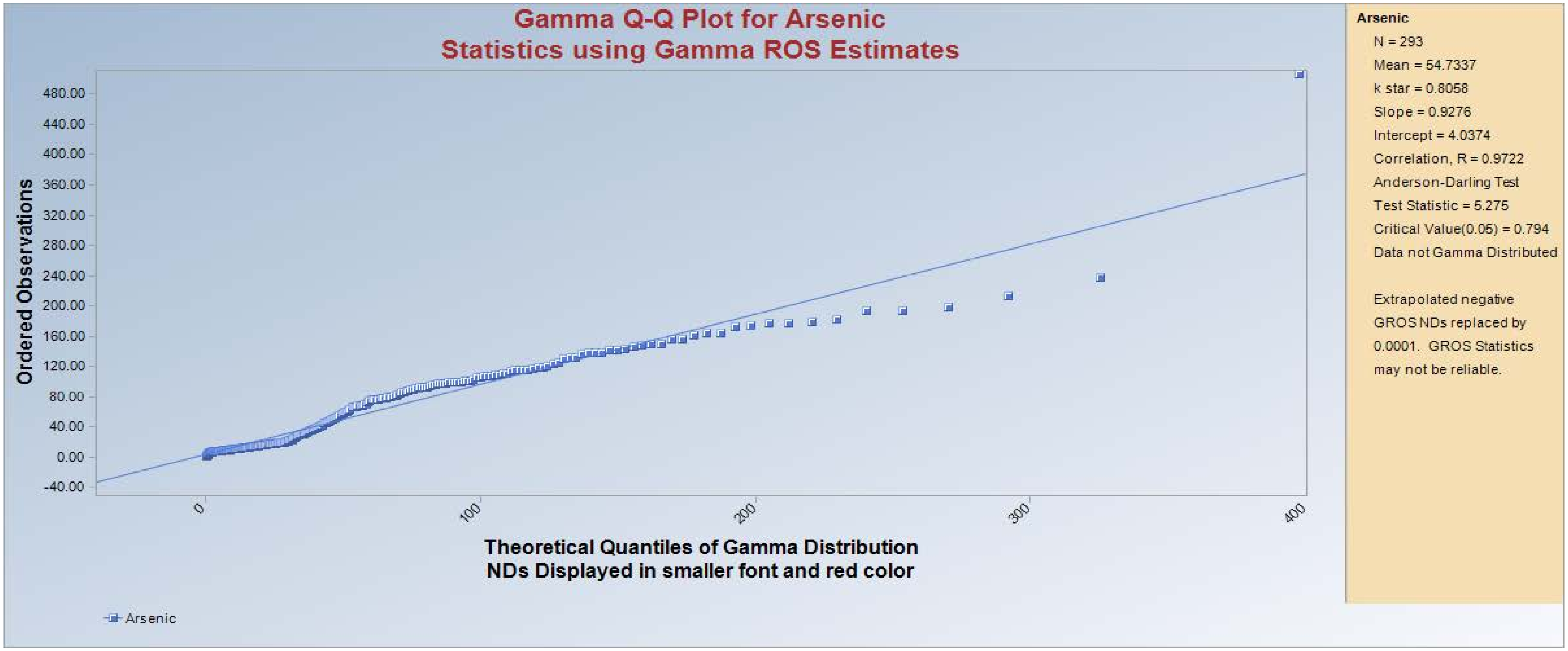


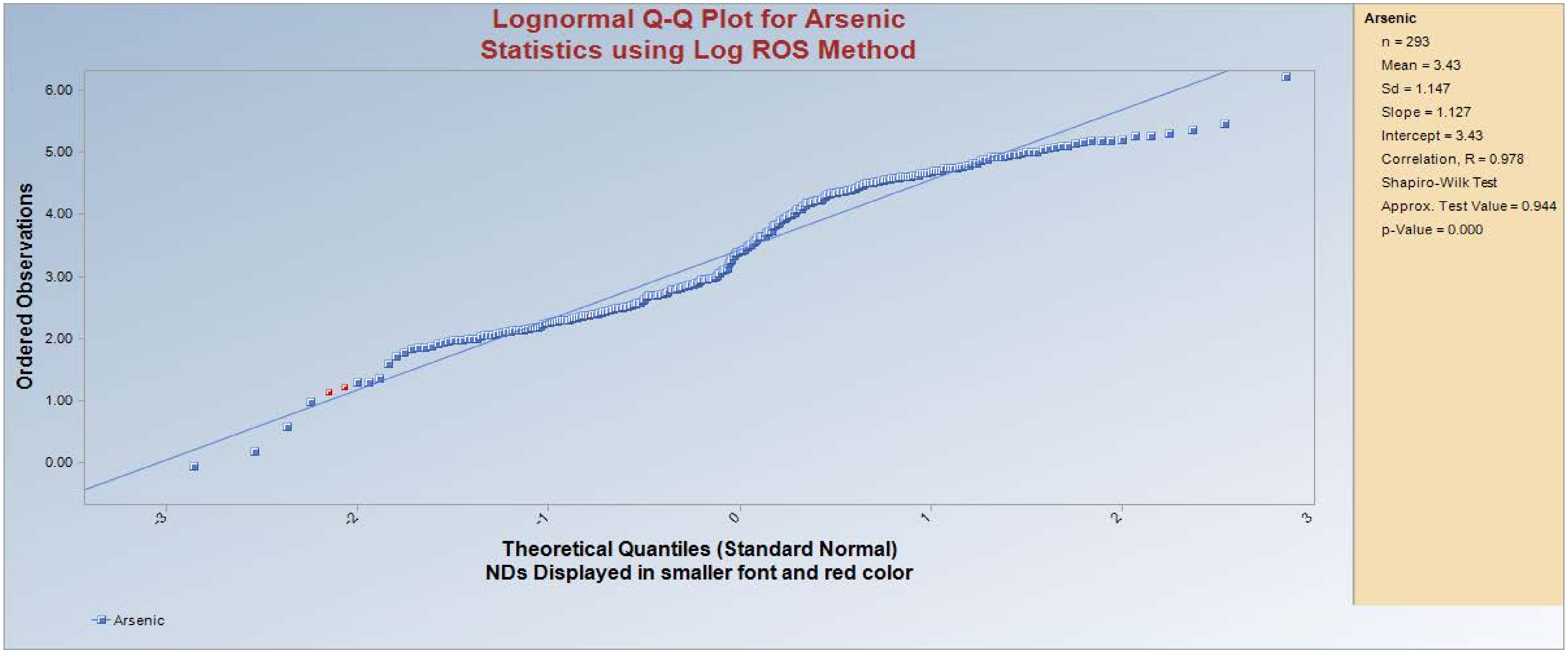
Normal Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Aluminum
Aluminum
n = 56
Mean = 10134
Sd = 5625
Slope = 5605
Intercept = 10134
Correlation, R = 0.98
Shapiro-Wilk Test
Approx. Test Value = 0.943
p-Value = 0.018

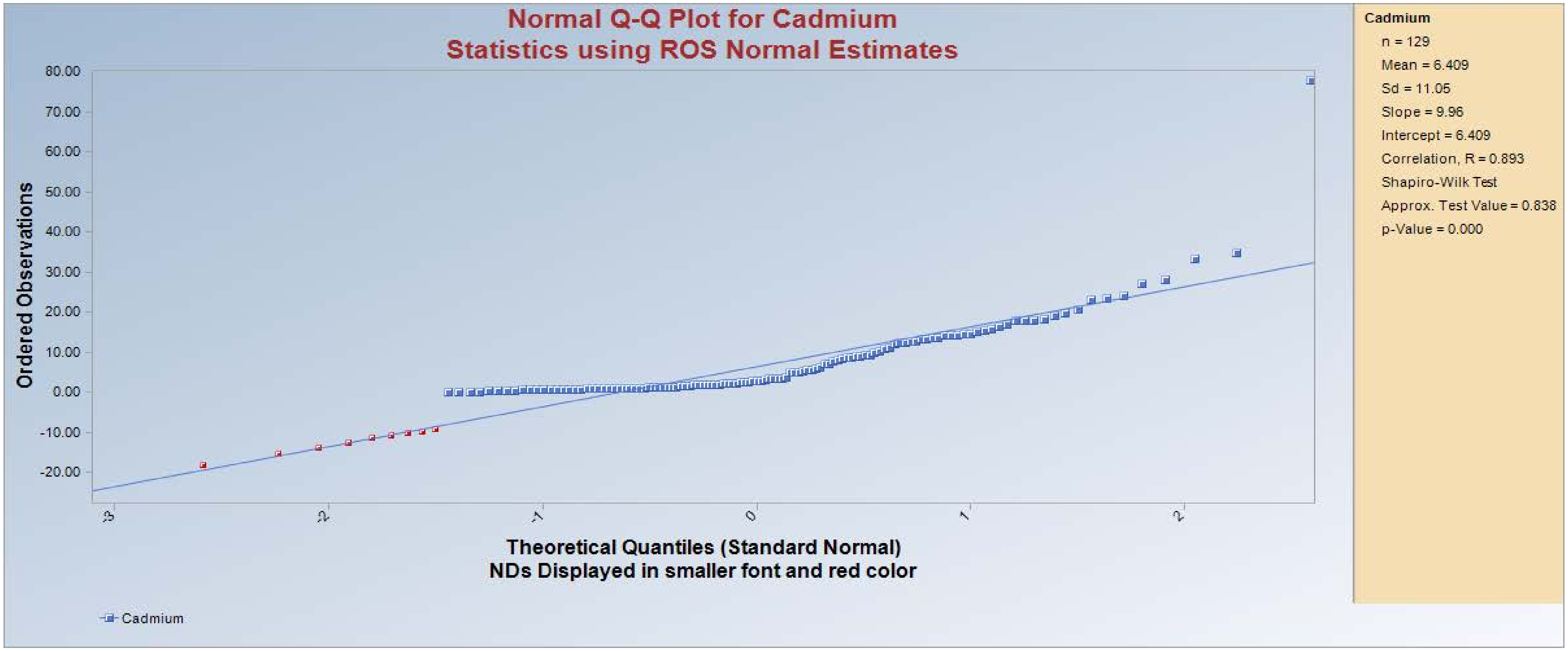

Gamma Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
Ordered Observations
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
Theoretical Quantiles of Gamma Distribution
Aluminum
Aluminum
Total Number of Data = 246
Number treated as ND = 0
Max DL = N/A
N = 56
Percent NDs = 0%
Mean = 10134.2857
k star = 2.7413
Slope = 0.9138
Intercept = 896.9854
Correlation, R = 0.9834
Anderson-Darling Test
Test Statistic = 0.320
Critical Value(0.05) = 0.758
Data appear Gamma Distributed

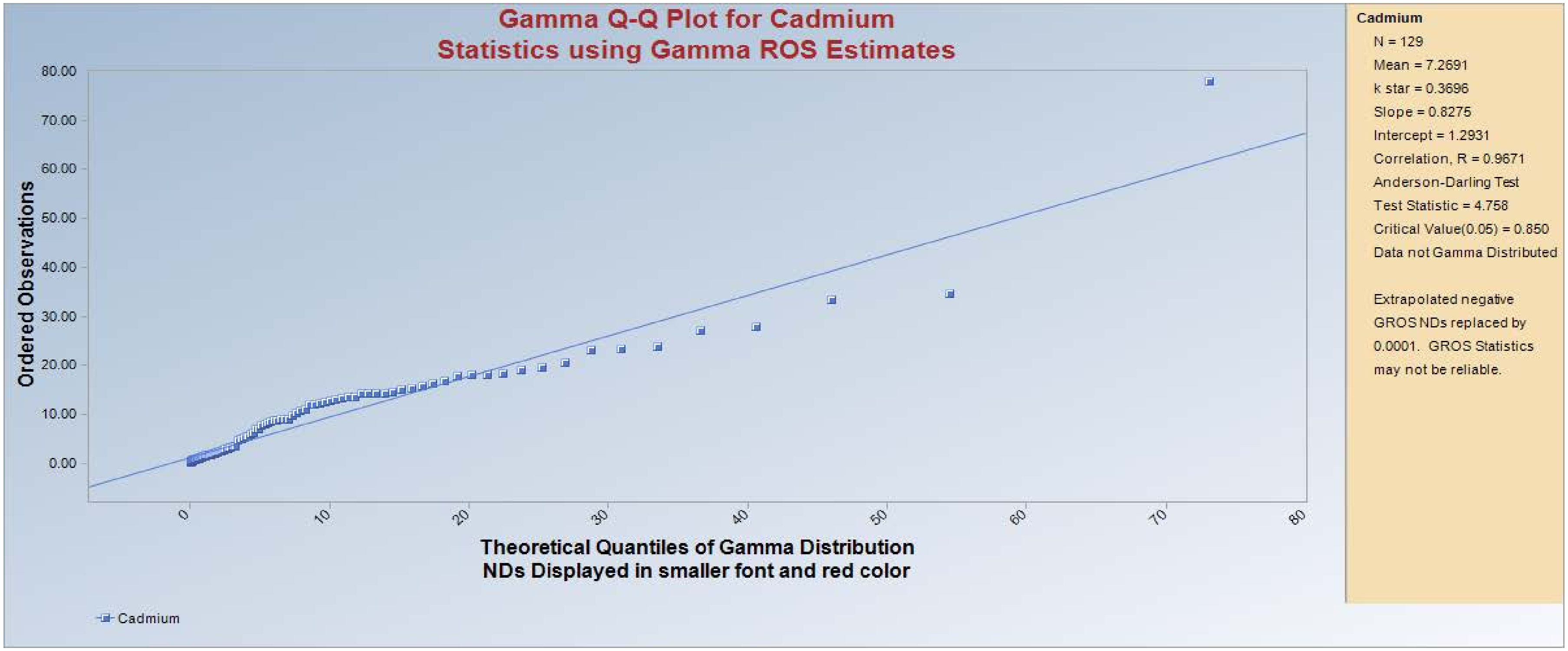


Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 293
Mean = 54.45
Sd = 58.15
Slope = 51.96
Intercept = 54.45
Correlation, R = 0.89
Shapiro-Wilk Test
Approx. Test Value = 0.819
p-Value = 0.000

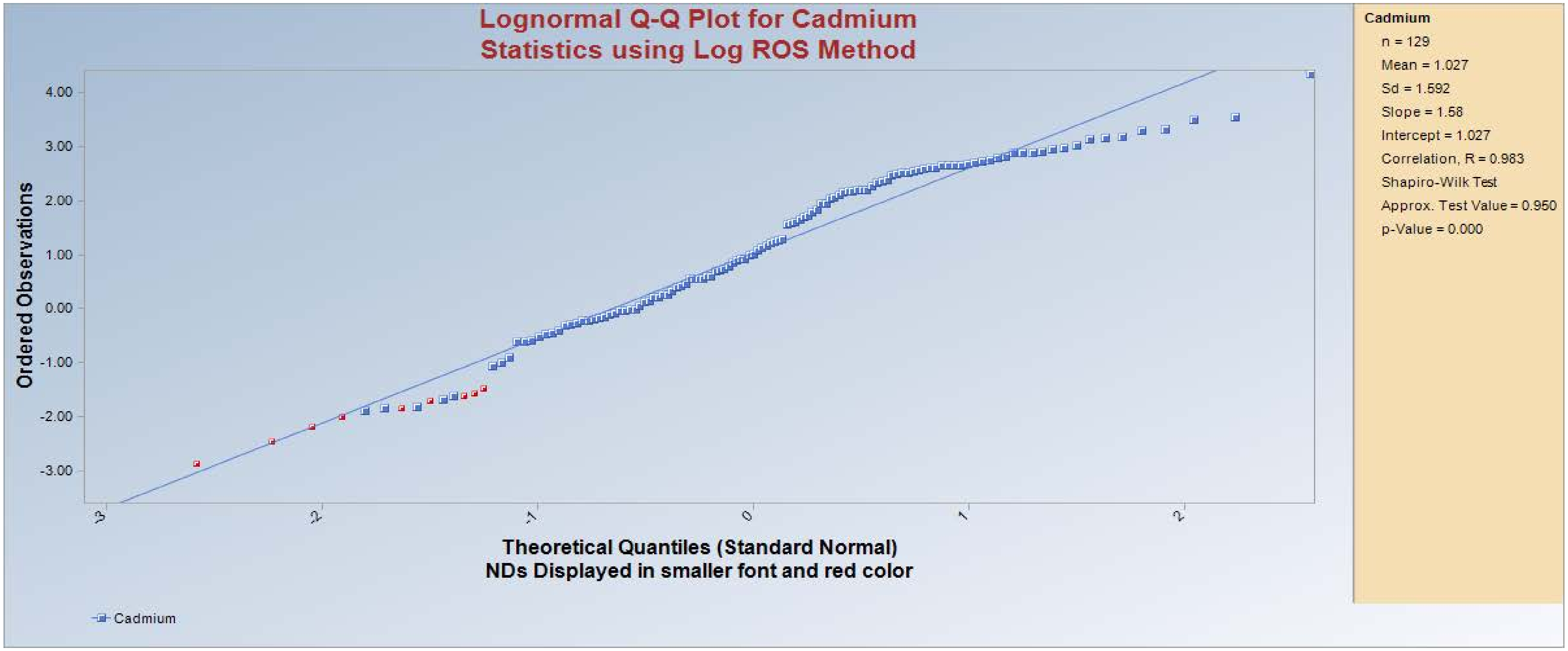

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
480.00
440.00
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
40.00
0.00
-40.00
0
100
200
300
400
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 293
Mean = 54.7337
k star = 0.8058
Slope = 0.9276
Intercept = 4.0374
Correlation, R = 0.9722
Anderson-Darling Test
Test Statistic = 5.275
Critical Value(0.05) = 0.794
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.


Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 293
Mean = 3.43
Sd = 1.147
Slope = 1.127
Intercept = 3.43
Correlation, R = 0.978
Shapiro-Wilk Test
Approx. Test Value = 0.944
p-Value = 0.000

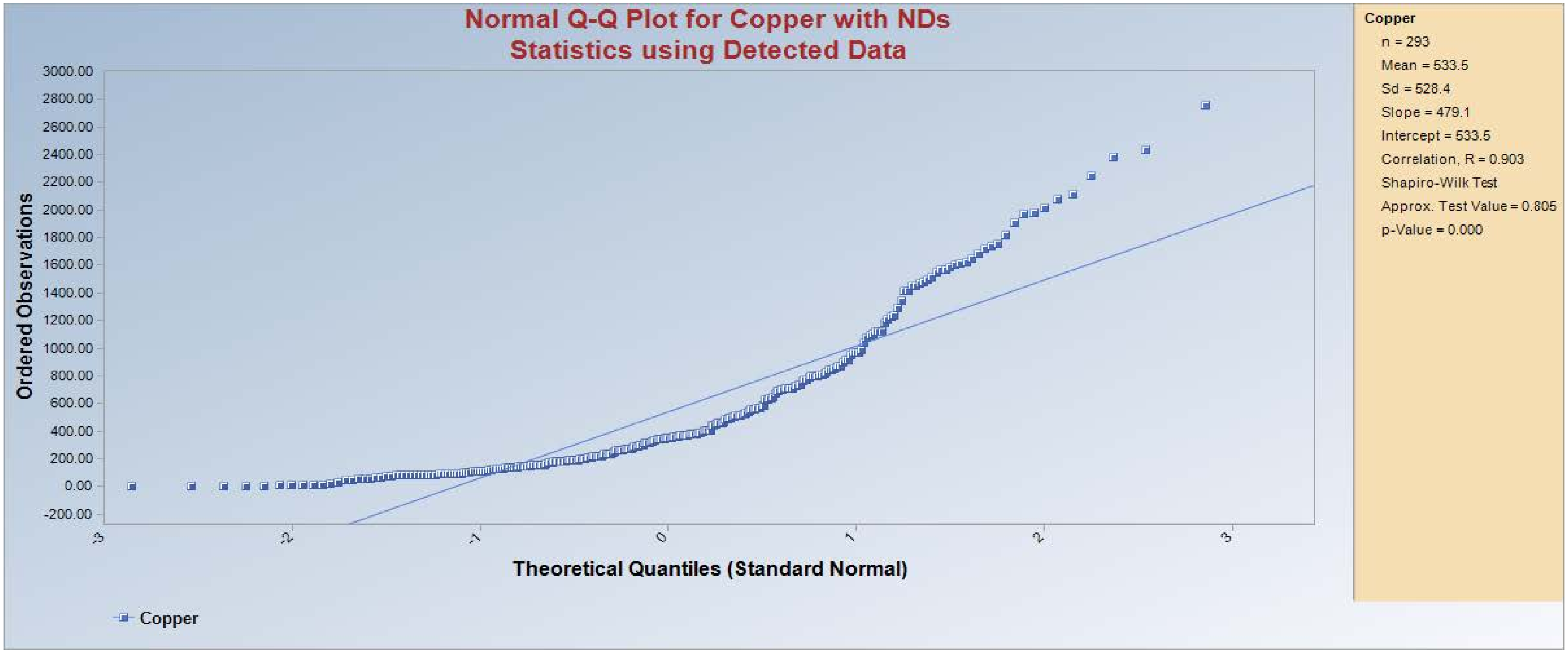

Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 129
Mean = 6.409
Sd = 11.05
Slope = 9.96
Intercept = 6.409
Correlation, R = 0.893
Shapiro-Wilk Test
Approx. Test Value = 0.838
p-Value = 0.000



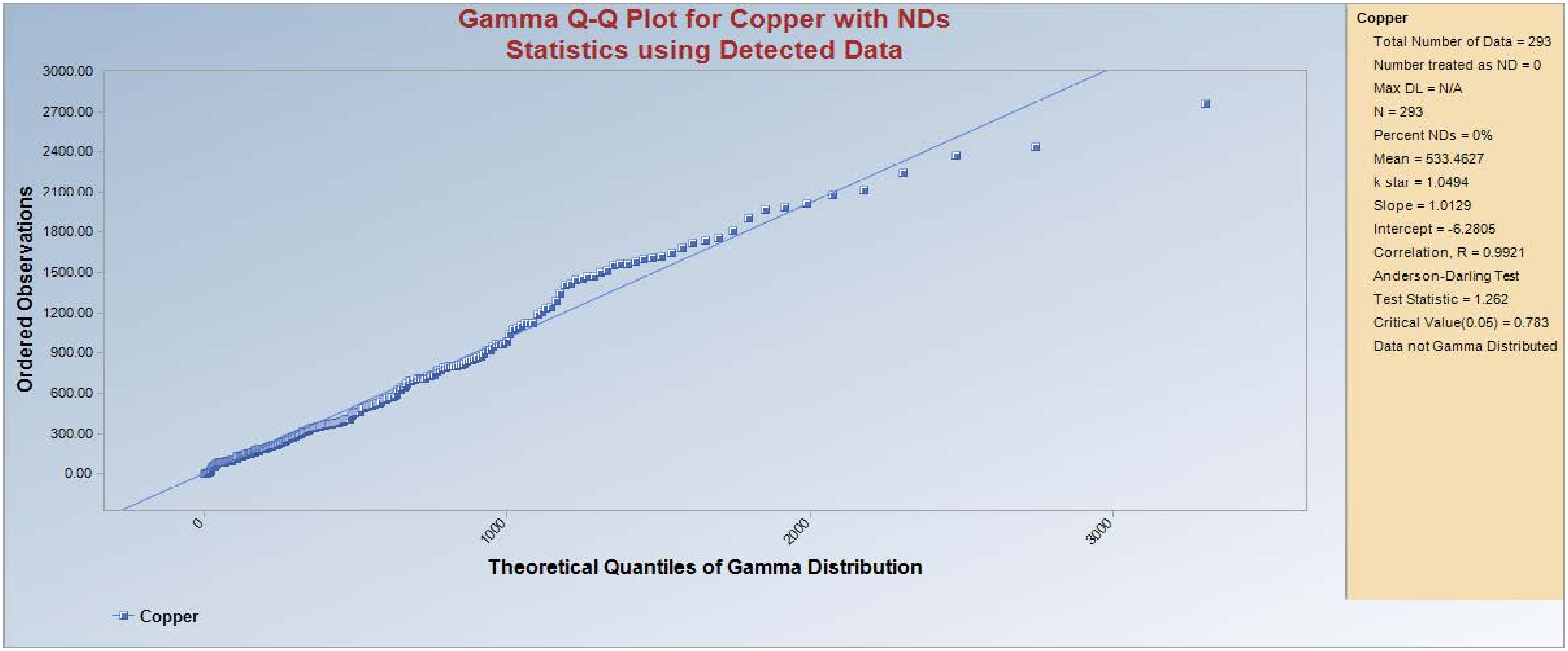
Gamma Q-Q Plot for Cadmium
Statistics using Gamma ROS Estimates
Ordered Observations
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
10
20
30
40
50
60
70
80
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Cadmium
Cadmium
N = 129
Mean = 7.2691
k star = 0.3696
Slope = 0.8275
Intercept = 1.2931
Correlation, R = 0.9671
Anderson-Darling Test
Test Statistic = 4.758
Critical Value(0.05) = 0.850
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

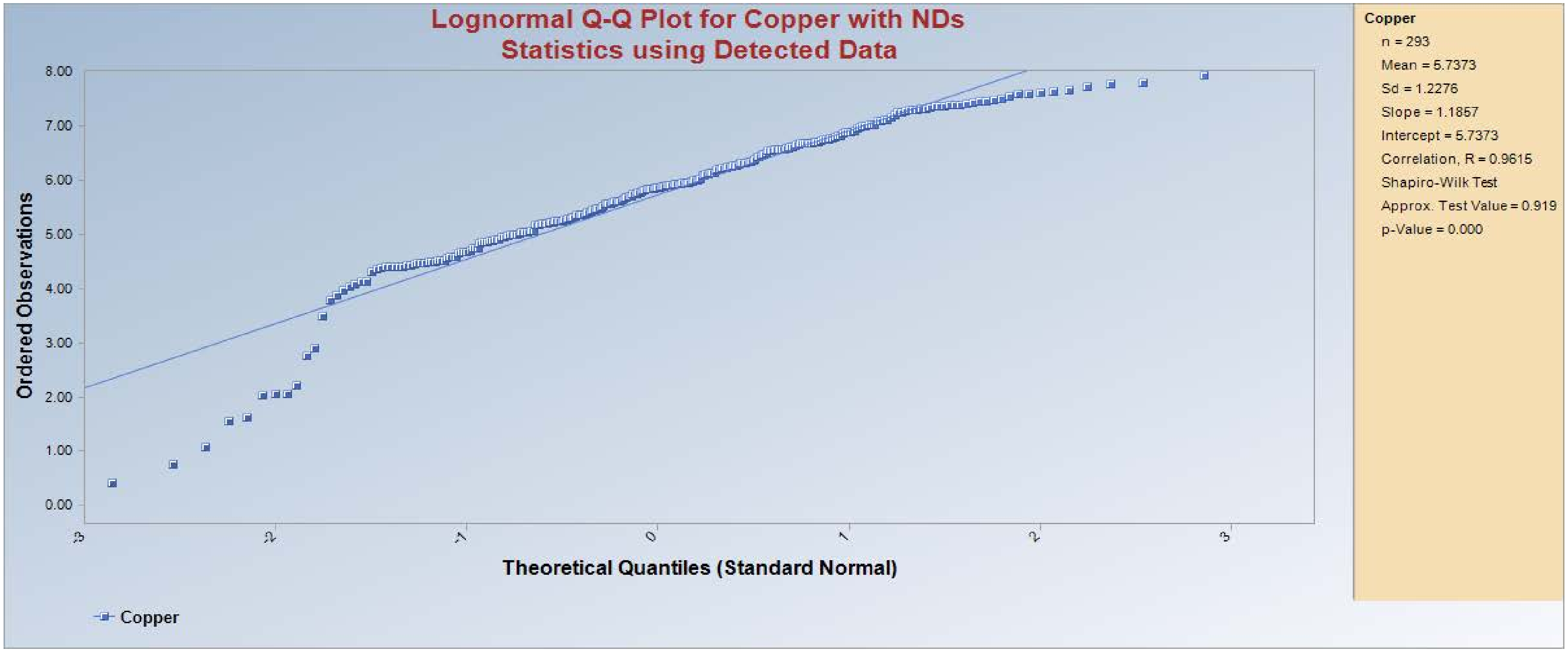


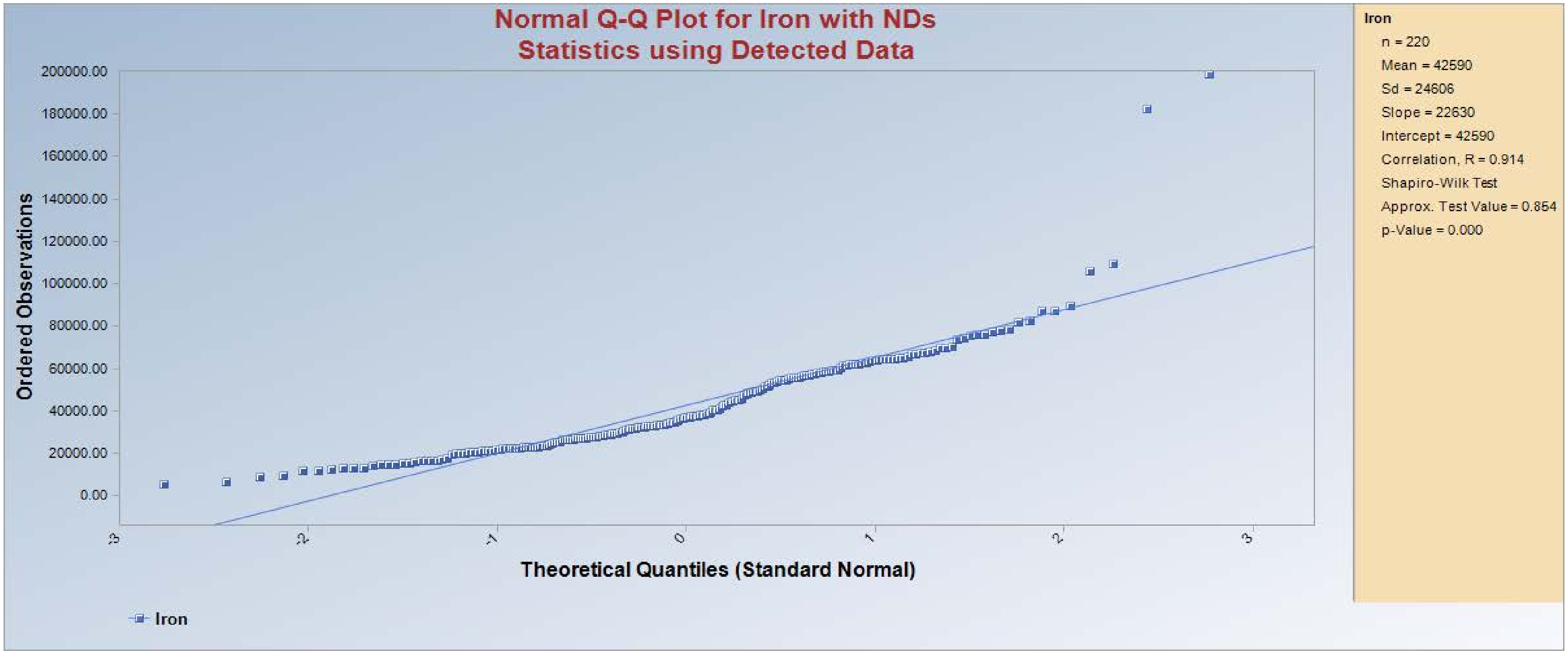
Lognormal Q-Q Plot for Cadmium
Statistics using Log ROS Method
Ordered Observations
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-3
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 129
Mean = 1.027
Sd = 1.592
Slope = 1.58
Intercept = 1.027
Correlation, R = 0.983
Shapiro-Wilk Test
Approx. Test Value = 0.950
p-Value = 0.000



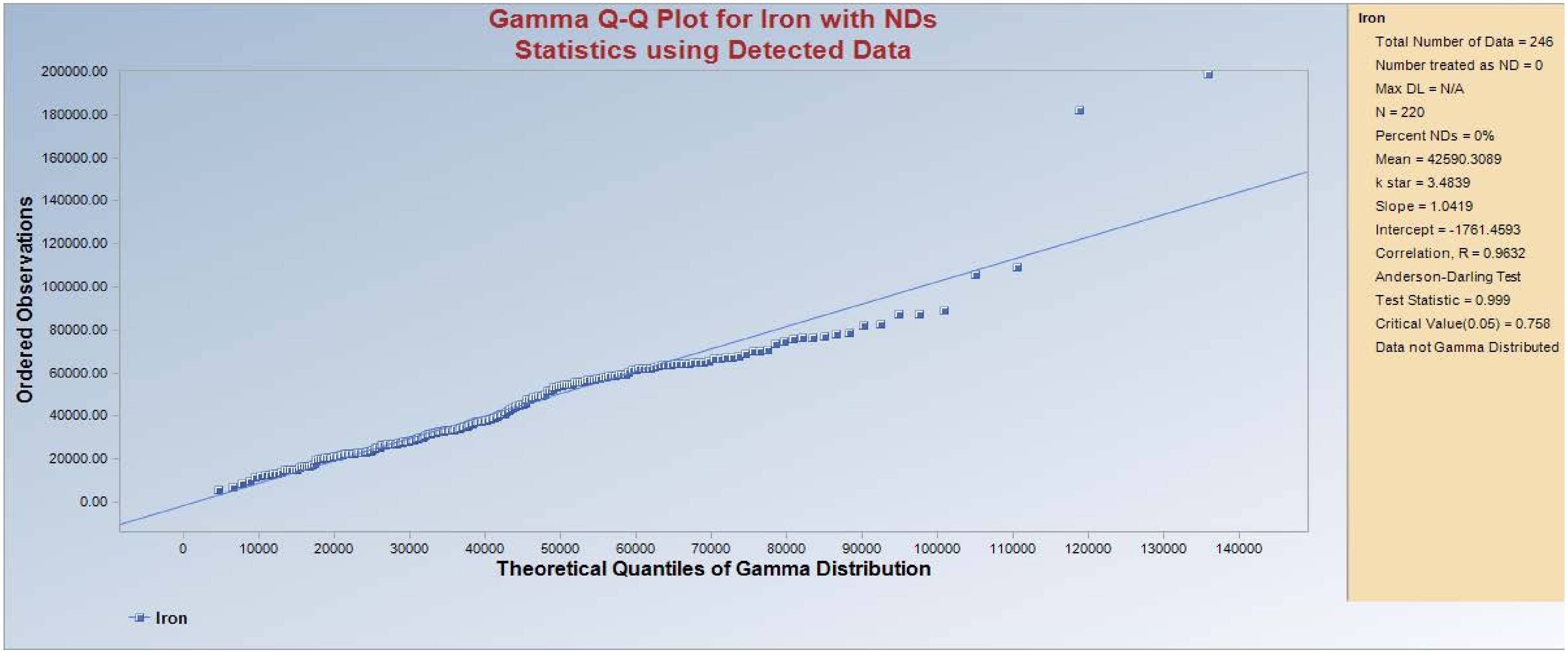
Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 293
Mean = 533.5
Sd = 528.4
Slope = 479.1
Intercept = 533.5
Correlation, R = 0.903
Shapiro-Wilk Test
Approx. Test Value = 0.805
p-Value = 0.000

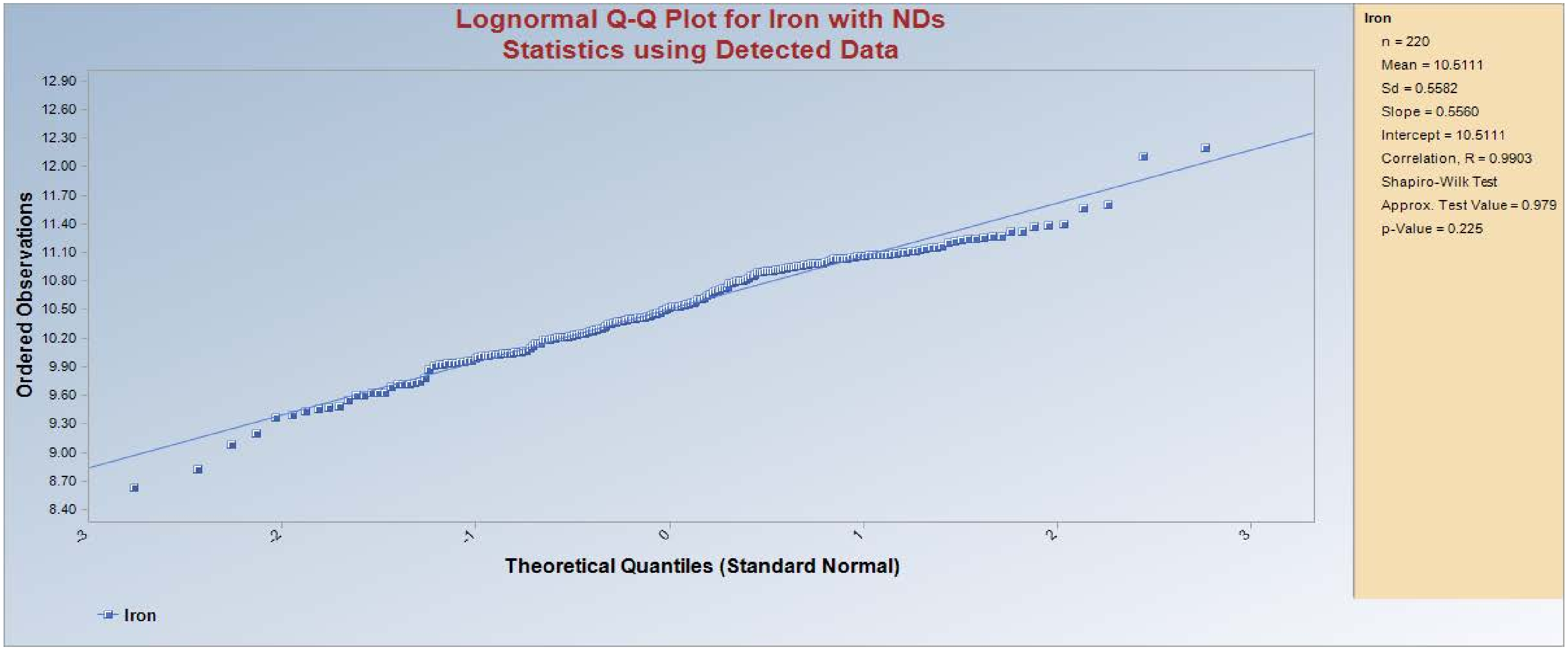

Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2700.00
2400.00
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
0
1000
2000
3000
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 293
Number treated as ND = 0
Max DL = N/A
N = 293
Percent NDs = 0%
Mean = 533.4627
k star = 1.0494
Slope = 1.0129
Intercept = -6.2805
Correlation, R = 0.9921
Anderson-Darling Test
Test Statistic = 1.262
Critical Value(0.05) = 0.783
Data not Gamma Distributed


Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 293
Mean = 5.7373
Sd = 1.2276
Slope = 1.1857
Intercept = 5.7373
Correlation, R = 0.9615
Shapiro-Wilk Test
Approx. Test Value = 0.919
p-Value = 0.000

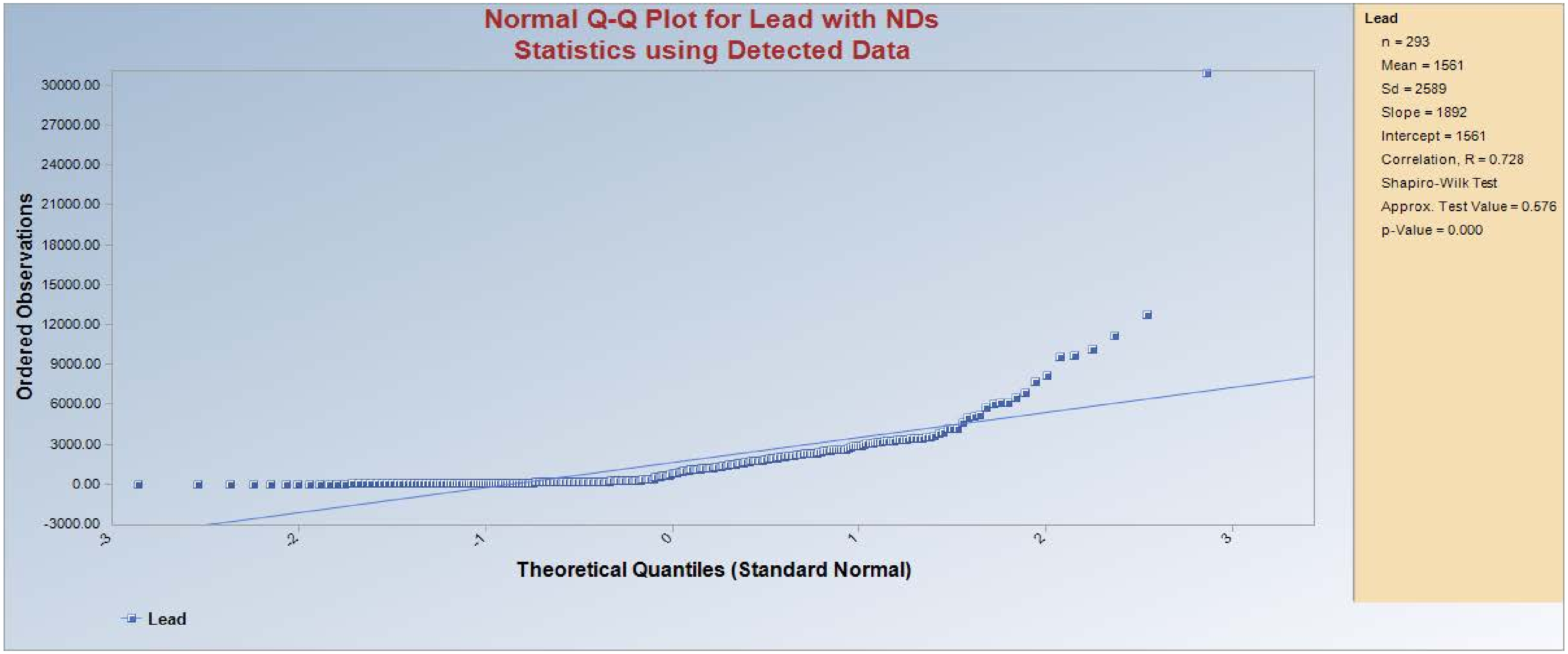


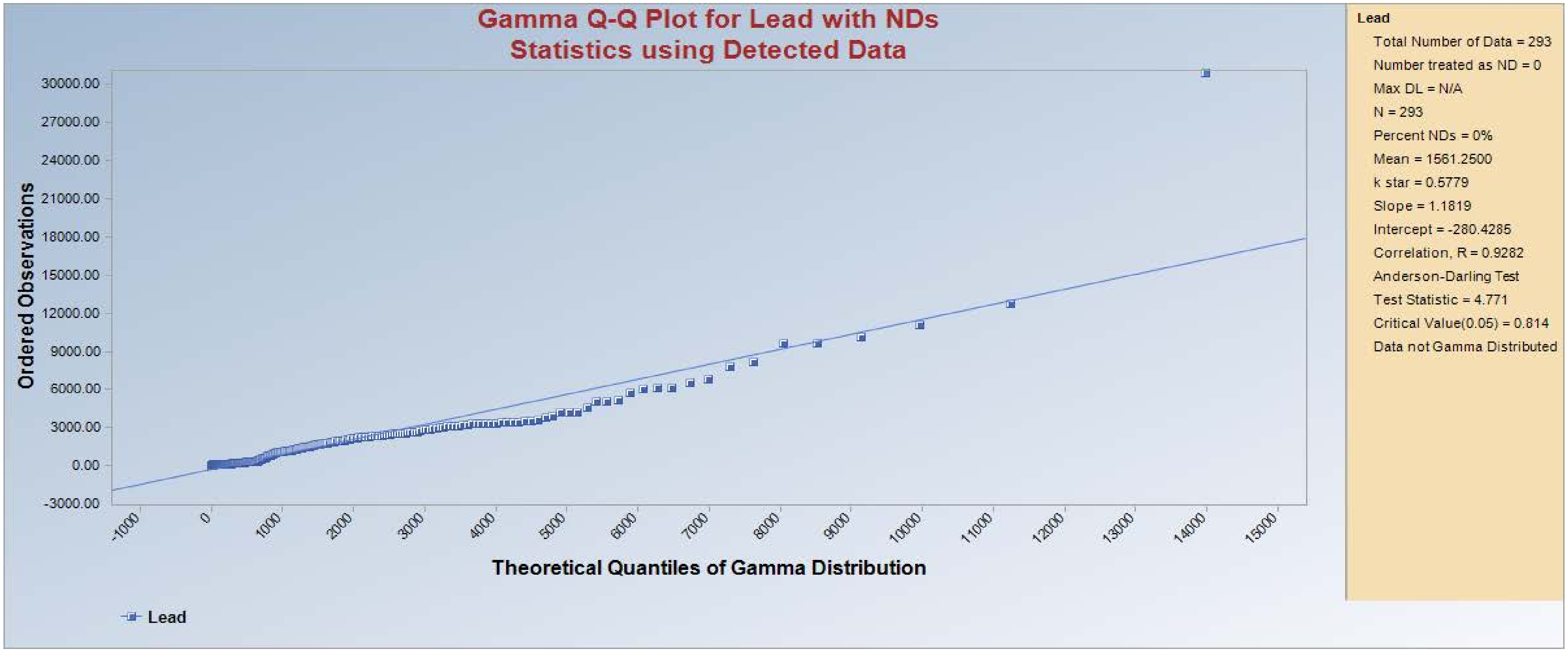
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
Ordered Observations
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 220
Mean = 42590
Sd = 24606
Slope = 22630
Intercept = 42590
Correlation, R = 0.914
Shapiro-Wilk Test
Approx. Test Value = 0.854
p-Value = 0.000

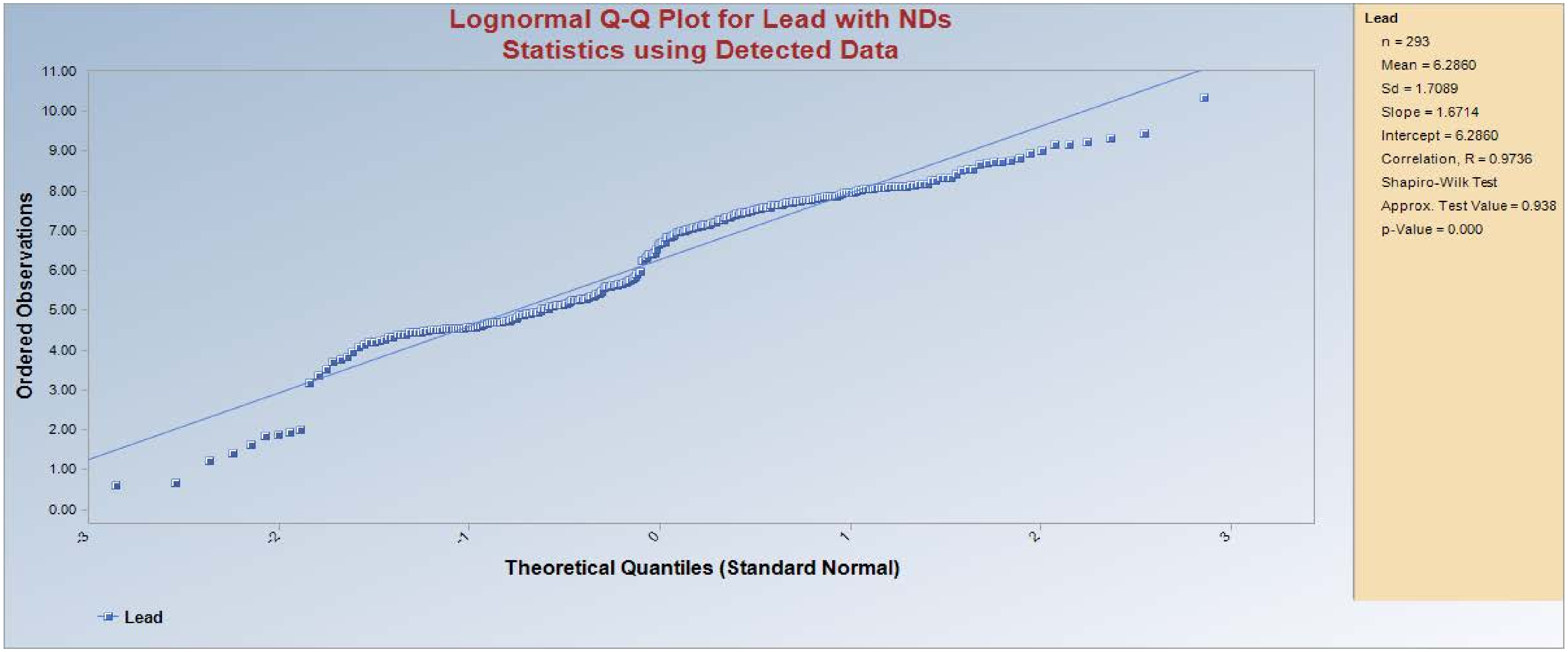

Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
200000.00
180000.00
160000.00
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
130000
140000
Theoretical Quantiles of Gamma Distribution
Iron
Iron
Total Number of Data = 246
Number treated as ND = 0
Max DL = N/A
N = 220
Percent NDs = 0%
Mean = 42590.3089
k star = 3.4839
Slope = 1.0419
Intercept = -1761.4593
Correlation, R = 0.9632
Anderson-Darling Test
Test Statistic = 0.999
Critical Value(0.05) = 0.758
Data not Gamma Distributed

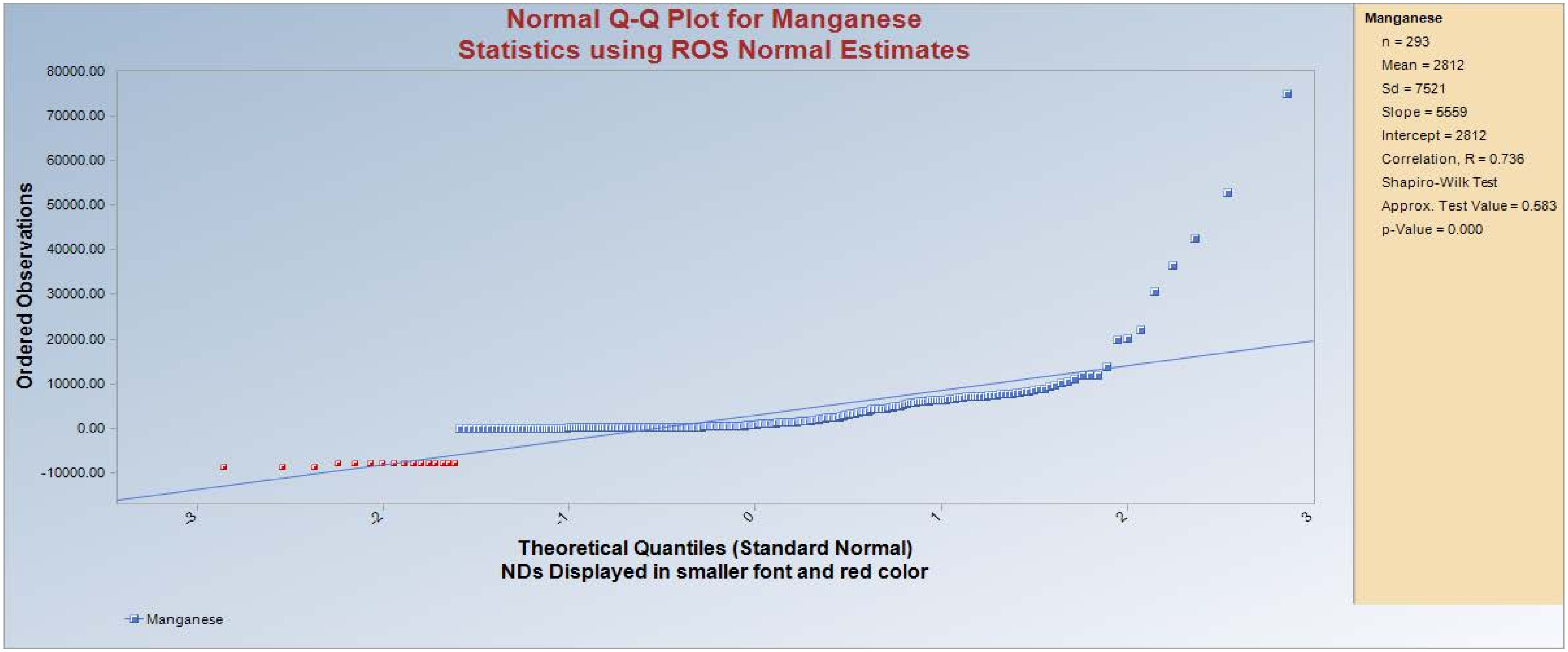


Lognormal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
12.90
12.60
12.30
12.00
11.70
11.40
11.10
10.80
10.50
10.20
9.90
9.60
9.30
9.00
8.70
8.40
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 220
Mean = 10.5111
Sd = 0.5582
Slope = 0.5560
Intercept = 10.5111
Correlation, R = 0.9903
Shapiro-Wilk Test
Approx. Test Value = 0.979
p-Value = 0.225

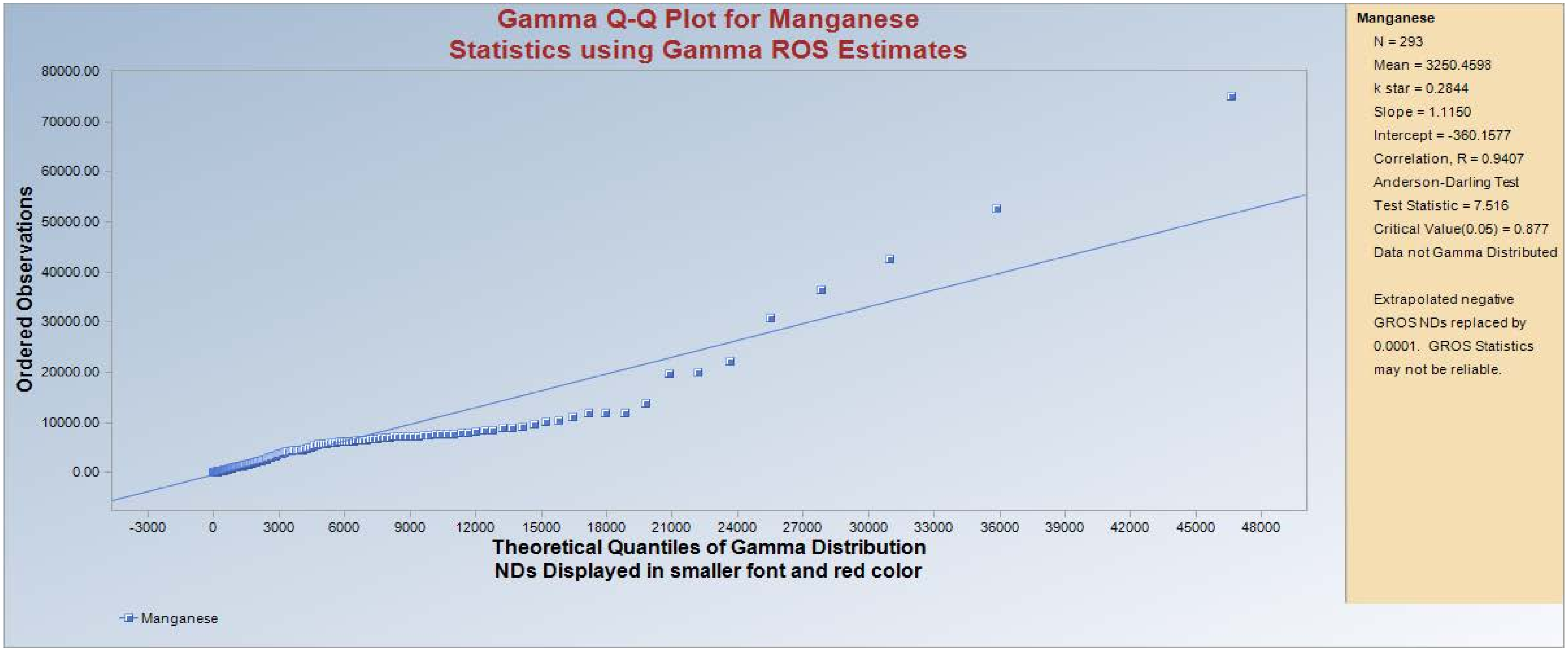

Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 293
Mean = 1561
Sd = 2589
Slope = 1892
Intercept = 1561
Correlation, R = 0.728
Shapiro-Wilk Test
Approx. Test Value = 0.576
p-Value = 0.000


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 293
Number treated as ND = 0
Max DL = N/A
N = 293
Percent NDs = 0%
Mean = 1561.2500
k star = 0.5779
Slope = 1.1819
Intercept = -280.4285
Correlation, R = 0.9282
Anderson-Darling Test
Test Statistic = 4.771
Critical Value(0.05) = 0.814
Data not Gamma Distributed

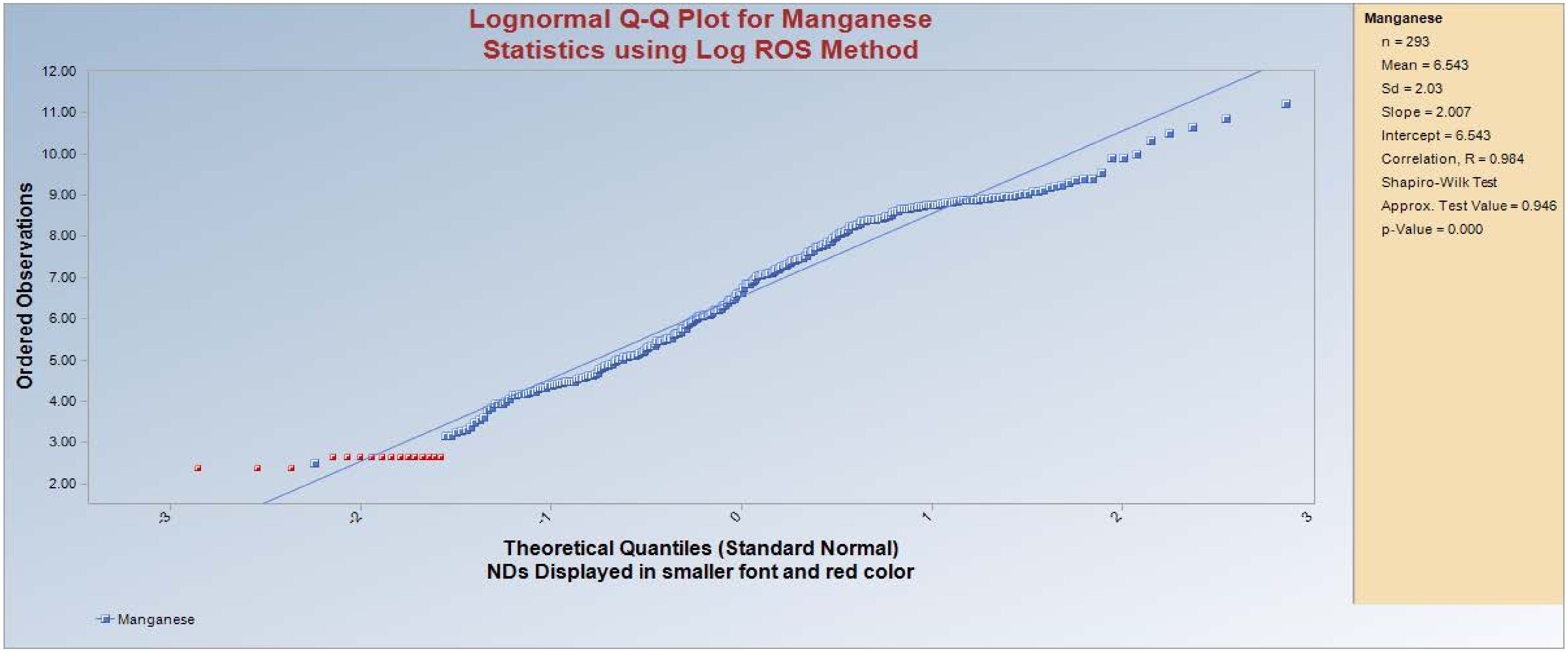

Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 293
Mean = 6.2860
Sd = 1.7089
Slope = 1.6714
Intercept = 6.2860
Correlation, R = 0.9736
Shapiro-Wilk Test
Approx. Test Value = 0.938
p-Value = 0.000



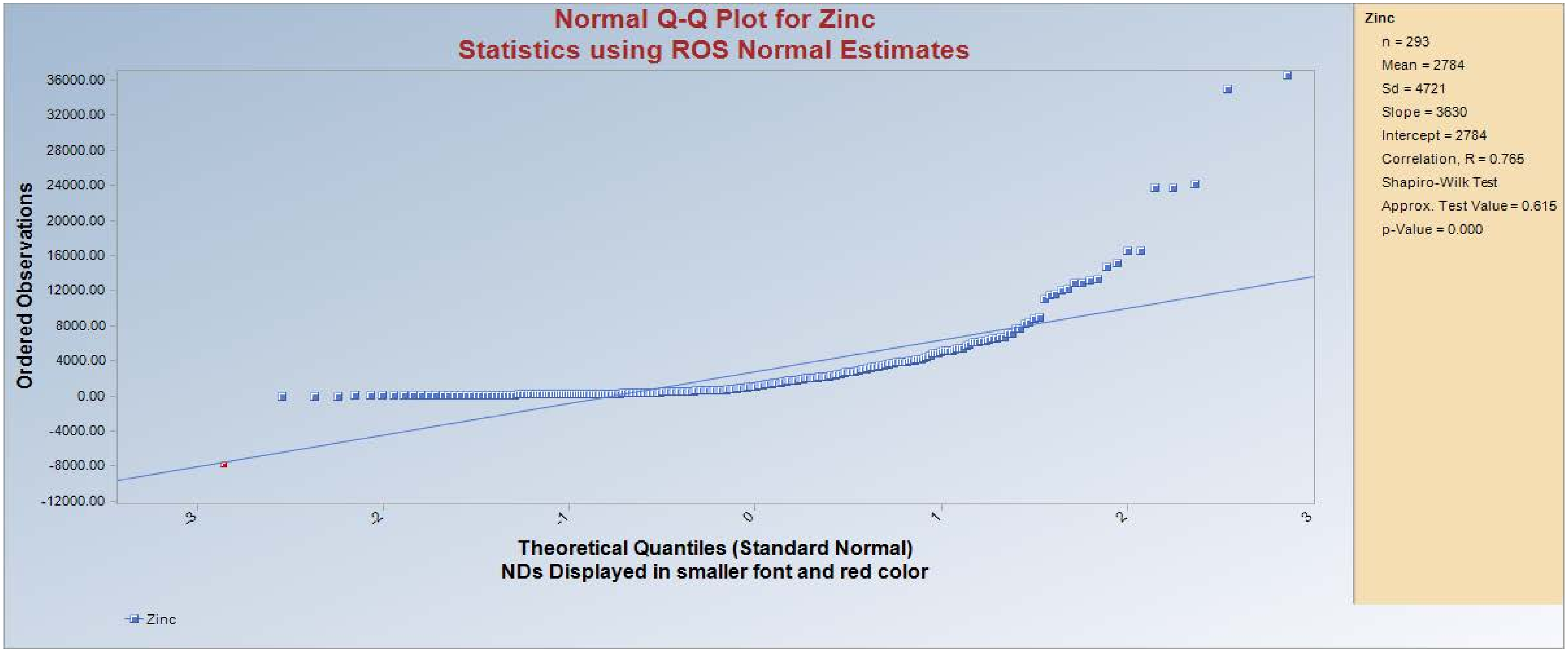
Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
-10000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 293
Mean = 2812
Sd = 7521
Slope = 5559
Intercept = 2812
Correlation, R = 0.736
Shapiro-Wilk Test
Approx. Test Value = 0.583
p-Value = 0.000



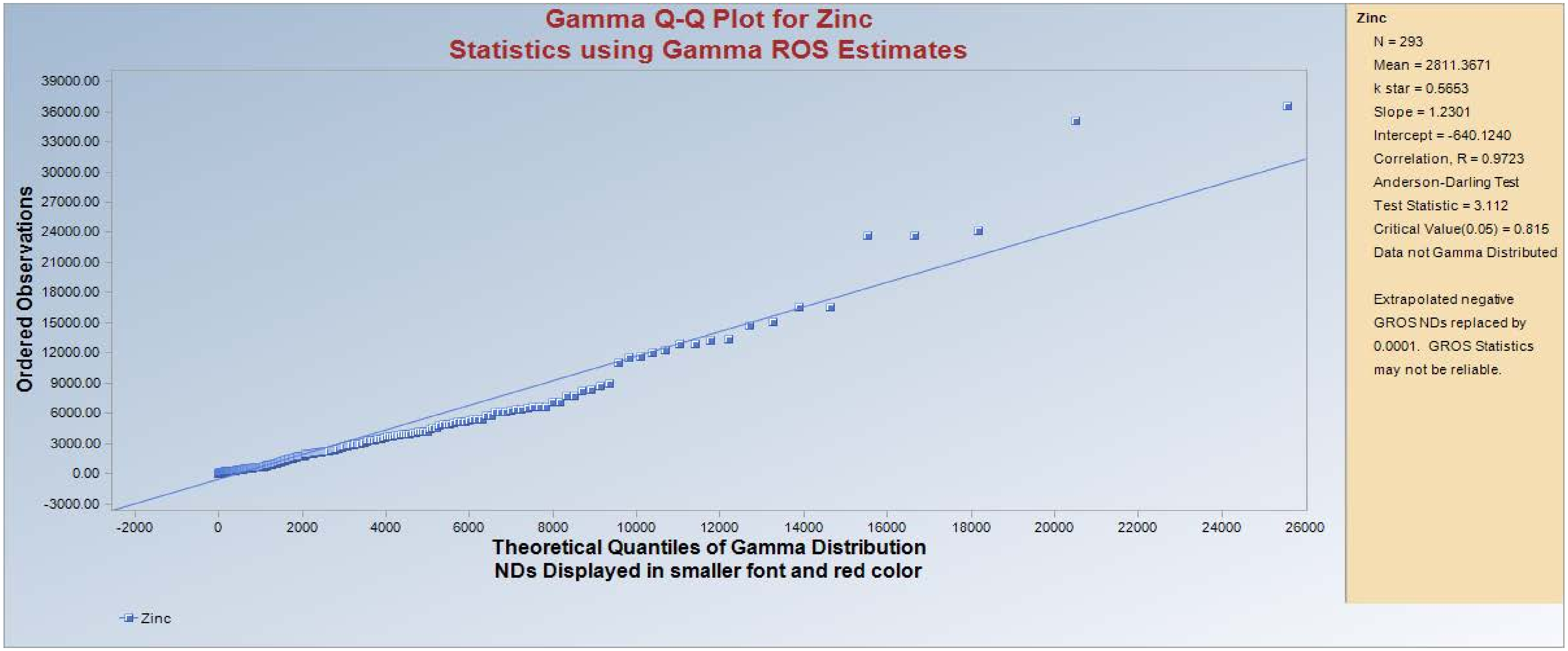
Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
80000.00
70000.00
60000.00
50000.00
40000.00
30000.00
20000.00
10000.00
0.00
-3000
0
3000
6000
9000
12000
15000
18000
21000
24000
27000
30000
33000
36000
39000
42000
45000
48000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 293
Mean = 3250.4598
k star = 0.2844
Slope = 1.1150
Intercept = -360.1577
Correlation, R = 0.9407
Anderson-Darling Test
Test Statistic = 7.516
Critical Value(0.05) = 0.877
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

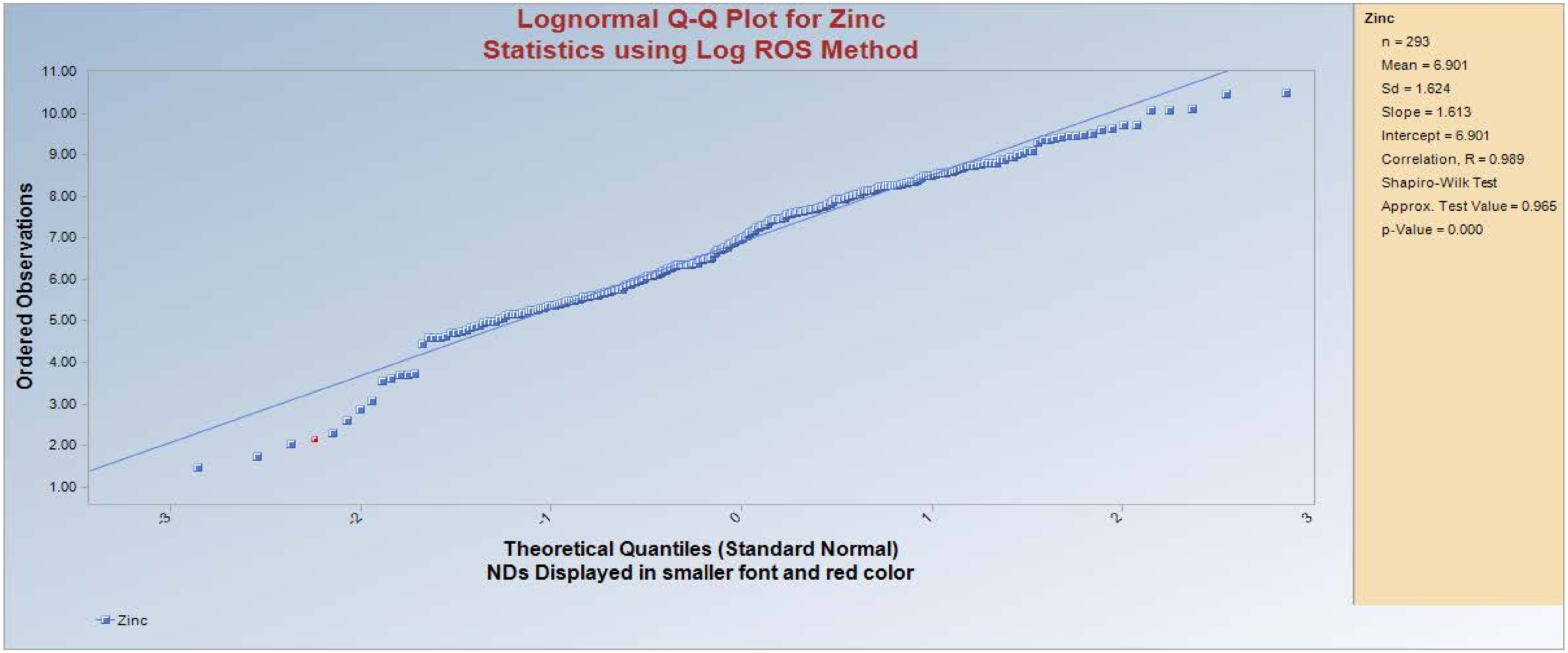


Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 293
Mean = 6.543
Sd = 2.03
Slope = 2.007
Intercept = 6.543
Correlation, R = 0.984
Shapiro-Wilk Test
Approx. Test Value = 0.946
p-Value = 0.000



Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
36000.00
32000.00
28000.00
24000.00
20000.00
16000.00
12000.00
8000.00
4000.00
0.00
-4000.00
-8000.00
-12000.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 293
Mean = 2784
Sd = 4721
Slope = 3630
Intercept = 2784
Correlation, R = 0.765
Shapiro-Wilk Test
Approx. Test Value = 0.615
p-Value = 0.000


Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
39000.00
36000.00
33000.00
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
9000.00
6000.00
3000.00
0.00
-3000.00
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Zinc
Zinc
N = 293
Mean = 2811.3671
k star = 0.5653
Slope = 1.2301
Intercept = -640.1240
Correlation, R = 0.9723
Anderson-Darling Test
Test Statistic = 3.112
Critical Value(0.05) = 0.815
Data not Gamma Distributed
Extrapolated negative GROS NDs replaced by 0.0001. GROS Statistics may not be reliable.


Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
Ordered Observations
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 293
Mean = 6.901
Sd = 1.624
Slope = 1.613
Intercept = 6.901
Correlation, R = 0.989
Shapiro-Wilk Test
Approx. Test Value = 0.965
p-Value = 0.000

Attachment A16
ProUCL Output for EU 12 Subsurface Sediment

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	6
Number of Missing Values	51		

Raw Statistics		Log-transformed Statistics	
Minimum	17100	Minimum of Log Data	9.747
Maximum	33600	Maximum of Log Data	10.42
Mean	21571	Mean of log Data	9.952
Geometric Mean	20998	SD of log Data	0.242
Median	21500		
SD	5834		
Std. Error of Mean	2205		
Coefficient of Variation	0.27		
Skewness	1.746		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.775	Shapiro Wilk Test Statistic	0.825
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	25856	95% H-UCL	26522
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	30114
95% Adjusted-CLT UCL (Chen-1995)	26753	97.5% Chebyshev (MVUE) UCL	33829
95% Modified-t UCL (Johnson-1978)	26098	99% Chebyshev (MVUE) UCL	41126

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	10.8	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1997		
MLE of Mean	21571		
MLE of Standard Deviation	6563		
nu star	151.2		
Approximate Chi Square Value (.05)	123.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	25198
Adjusted Chi Square Value	116.3	95% Jackknife UCL	25856
		95% Standard Bootstrap UCL	24902
Anderson-Darling Test Statistic	0.641	95% Bootstrap-t UCL	29770
Anderson-Darling 5% Critical Value	0.707	95% Hall's Bootstrap UCL	40070
Kolmogorov-Smirnov Test Statistic	0.239	95% Percentile Bootstrap UCL	25014
Kolmogorov-Smirnov 5% Critical Value	0.312	95% BCA Bootstrap UCL	26429
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	31183
		97.5% Chebyshev(Mean, Sd) UCL	35341
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	43510
95% Approximate Gamma UCL (Use when n >= 40)	26350		
95% Adjusted Gamma UCL (Use when n < 40)	28048		
Potential UCL to Use		Use 95% Approximate Gamma UCL	26350

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics			
Number of Valid Data	61	Number of Detected Data	58
Number of Distinct Detected Data	57	Number of Non-Detect Data	3
		Percent Non-Detects	4.92%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.454	Minimum Detected	1.24
Maximum Detected	114.4	Maximum Detected	4.74
Mean of Detected	18.61	Mean of Detected	2.543
SD of Detected	23.85	SD of Detected	0.762
Minimum Non-Detect	2.031	Minimum Non-Detect	0.709
Maximum Non-Detect	3.033	Maximum Non-Detect	1.11
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	58
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	4.92%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.307	Lilliefors Test Statistic	0.15
5% Lilliefors Critical Value	0.116	5% Lilliefors Critical Value	0.116
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	17.76	Mean	2.428
SD	23.55	SD	0.9
95% DL/2 (t) UCL	22.79	95% H-Stat (DL/2) UCL	21.9
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	17.11	Mean in Log Scale	2.457
SD	24.13	SD in Log Scale	0.835
95% MLE (t) UCL	22.27	Mean in Original Scale	17.8
95% MLE (Tiku) UCL	21.86	SD in Original Scale	23.52
		95% t UCL	22.83
		95% Percentile Bootstrap UCL	22.88
		95% BCA Bootstrap UCL	24.6
		95% H UCL	20.77
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.393	Data do not follow a Discernable Distribution (0.05)	
Theta Star	13.36		
nu star	161.6		
A-D Test Statistic	4.096	**Nonparametric Statistics**	
5% A-D Critical Value	0.769	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.769	Mean	17.86
5% K-S Critical Value	0.119	SD	23.28
Data not Gamma Distributed at 5% Significance Level		SE of Mean	3.007
		95% KM (t) UCL	22.89
Assuming Gamma Distribution		95% KM (z) UCL	22.81
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	22.88
Minimum	0.000001	95% KM (bootstrap t) UCL	25.47
Maximum	114.4	95% KM (BCA) UCL	23.68
Mean	17.7	95% KM (Percentile Bootstrap) UCL	23.02
Median	10.44	95% KM (Chebyshev) UCL	30.97
SD	23.59	97.5% KM (Chebyshev) UCL	36.64
k star	0.535	99% KM (Chebyshev) UCL	47.78
Theta star	33.07		
Nu star	65.28	**Potential UCLs to Use**	
AppChi2	47.69	95% KM (Chebyshev) UCL	30.97
95% Gamma Approximate UCL (Use when n >= 40)	24.22		
95% Adjusted Gamma UCL (Use when n < 40)	24.41		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	61	Number of Distinct Observations	61

Raw Statistics		Log-transformed Statistics	
Minimum	61.79	Minimum of Log Data	4.124
Maximum	1067	Maximum of Log Data	6.972
Mean	288.1	Mean of log Data	5.503
Geometric Mean	245.5	SD of log Data	0.563
Median	229.4		
SD	181.3		
Std. Error of Mean	23.21		
Coefficient of Variation	0.629		
Skewness	1.931		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.188	Lilliefors Test Statistic	0.0899
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	326.8	95% H-UCL	330.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	382.9
95% Adjusted-CLT UCL (Chen-1995)	332.4	97.5% Chebyshev (MVUE) UCL	424.5
95% Modified-t UCL (Johnson-1978)	327.8	99% Chebyshev (MVUE) UCL	506.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.134	Data appear Lognormal at 5% Significance Level	
Theta Star	91.92		
MLE of Mean	288.1		
MLE of Standard Deviation	162.7		
nu star	382.3		
Approximate Chi Square Value (.05)	338	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0461	95% CLT UCL	326.2
Adjusted Chi Square Value	337	95% Jackknife UCL	326.8
		95% Standard Bootstrap UCL	326.9
Anderson-Darling Test Statistic	0.877	95% Bootstrap-t UCL	336.8
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	336
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	326
Kolmogorov-Smirnov 5% Critical Value	0.115	95% BCA Bootstrap UCL	334
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	389.2
		97.5% Chebyshev(Mean, Sd) UCL	433
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	519
95% Approximate Gamma UCL (Use when n >= 40)	325.8		
95% Adjusted Gamma UCL (Use when n < 40)	326.8		
Potential UCL to Use		Use 95% H-UCL	330.4

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	61	Number of Distinct Observations	61

Raw Statistics		Log-transformed Statistics	
Minimum	5030	Minimum of Log Data	8.523
Maximum	59591	Maximum of Log Data	11
Mean	30010	Mean of log Data	10.23
Geometric Mean	27644	SD of log Data	0.425
Median	27920		
SD	12122		
Std. Error of Mean	1552		
Coefficient of Variation	0.404		
Skewness	0.86		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.117	Lilliefors Test Statistic	0.0705
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	32603	95% H-UCL	33426
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37645
95% Adjusted-CLT UCL (Chen-1995)	32746	97.5% Chebyshev (MVUE) UCL	40863
95% Modified-t UCL (Johnson-1978)	32631	99% Chebyshev (MVUE) UCL	47184

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.954	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5040		
MLE of Mean	30010		
MLE of Standard Deviation	12298		
nu star	726.4		
Approximate Chi Square Value (.05)	664.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0461	95% CLT UCL	32563
Adjusted Chi Square Value	663.5	95% Jackknife UCL	32603
		95% Standard Bootstrap UCL	32572
Anderson-Darling Test Statistic	0.556	95% Bootstrap-t UCL	32771
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	33040
Kolmogorov-Smirnov Test Statistic	0.0709	95% Percentile Bootstrap UCL	32495
Kolmogorov-Smirnov 5% Critical Value	0.114	95% BCA Bootstrap UCL	32760
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	36775
		97.5% Chebyshev(Mean, Sd) UCL	39702
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	45452
95% Approximate Gamma UCL (Use when n >= 40)	32788		
95% Adjusted Gamma UCL (Use when n < 40)	32857		

Potential UCL to Use		Use 95% Approximate Gamma UCL	32788

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	61	Number of Distinct Observations	61

Raw Statistics		Log-transformed Statistics	
Minimum	43.43	Minimum of Log Data	3.771
Maximum	3019	Maximum of Log Data	8.013
Mean	357	Mean of log Data	5.428
Geometric Mean	227.7	SD of log Data	0.783
Median	188.5		
SD	536.2		
Std. Error of Mean	68.65		
Coefficient of Variation	1.502		
Skewness	3.457		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.356	Lilliefors Test Statistic	0.212
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	471.7	95% H-UCL	381.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	457.7
95% Adjusted-CLT UCL (Chen-1995)	502.4	97.5% Chebyshev (MVUE) UCL	522.8
95% Modified-t UCL (Johnson-1978)	476.7	99% Chebyshev (MVUE) UCL	650.6
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.202	Data do not follow a Discernable Distribution (0.05)	
Theta Star	297.1		
MLE of Mean	357		
MLE of Standard Deviation	325.7		
nu star	146.6		
Approximate Chi Square Value (.05)	119.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0461	95% CLT UCL	469.9
Adjusted Chi Square Value	119	95% Jackknife UCL	471.7
		95% Standard Bootstrap UCL	466.5
Anderson-Darling Test Statistic	7.31	95% Bootstrap-t UCL	543.9
Anderson-Darling 5% Critical Value	0.774	95% Hall's Bootstrap UCL	486.2
Kolmogorov-Smirnov Test Statistic	0.281	95% Percentile Bootstrap UCL	477.9
Kolmogorov-Smirnov 5% Critical Value	0.117	95% BCA Bootstrap UCL	511
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	656.2
		97.5% Chebyshev(Mean, Sd) UCL	785.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1040
95% Approximate Gamma UCL (Use when n >= 40)	437.5		
95% Adjusted Gamma UCL (Use when n < 40)	439.7		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	656.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	61	Number of Detected Data	55
Number of Distinct Detected Data	55	Number of Non-Detect Data	6
		Percent Non-Detects	9.84%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	33.17	Minimum Detected	3.502
Maximum Detected	6040	Maximum Detected	8.706
Mean of Detected	611	Mean of Detected	5.426
SD of Detected	1238	SD of Detected	1.268
Minimum Non-Detect	14.14	Minimum Non-Detect	2.649
Maximum Non-Detect	21.42	Maximum Non-Detect	3.064

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	55
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	9.84%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.326	Lilliefors Test Statistic	0.142
5% Lilliefors Critical Value	0.119	5% Lilliefors Critical Value	0.119
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	551.9	Mean	5.116
SD	1188	SD	1.531
95% DL/2 (t) UCL	806.1	95% H-Stat (DL/2) UCL	894.7
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	468.5	Mean in Log Scale	5.148
SD	1261	SD in Log Scale	1.471
95% MLE (t) UCL	738.1	Mean in Original Scale	552.3
95% MLE (Tiku) UCL	718.2	SD in Original Scale	1188
		95% t UCL	806.4
		95% Percentile Bootstrap UCL	800.8
		95% BCA Bootstrap UCL	885.1
		95% H UCL	815.9

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.599	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1019		
nu star	65.94		
A-D Test Statistic	4.022	**Nonparametric Statistics**	
5% A-D Critical Value	0.804	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.804	Mean	554.2
5% K-S Critical Value	0.126	SD	1177
Data not Gamma Distributed at 5% Significance Level		SE of Mean	152.1
		95% KM (t) UCL	808.4
Assuming Gamma Distribution		95% KM (z) UCL	804.4
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	808
Minimum	0.000001	95% KM (bootstrap t) UCL	1033
Maximum	6040	95% KM (BCA) UCL	839.4
Mean	550.9	95% KM (Percentile Bootstrap) UCL	823.8
Median	157.9	95% KM (Chebyshev) UCL	1217
SD	1189	97.5% KM (Chebyshev) UCL	1504
k star	0.253	99% KM (Chebyshev) UCL	2068
Theta star	2176		
Nu star	30.89	Potential UCLs to Use	
AppChi2	19.2	95% KM (Chebyshev) UCL	1217
95% Gamma Approximate UCL (Use when n >= 40)	886.6		
95% Adjusted Gamma UCL (Use when n < 40)	897		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

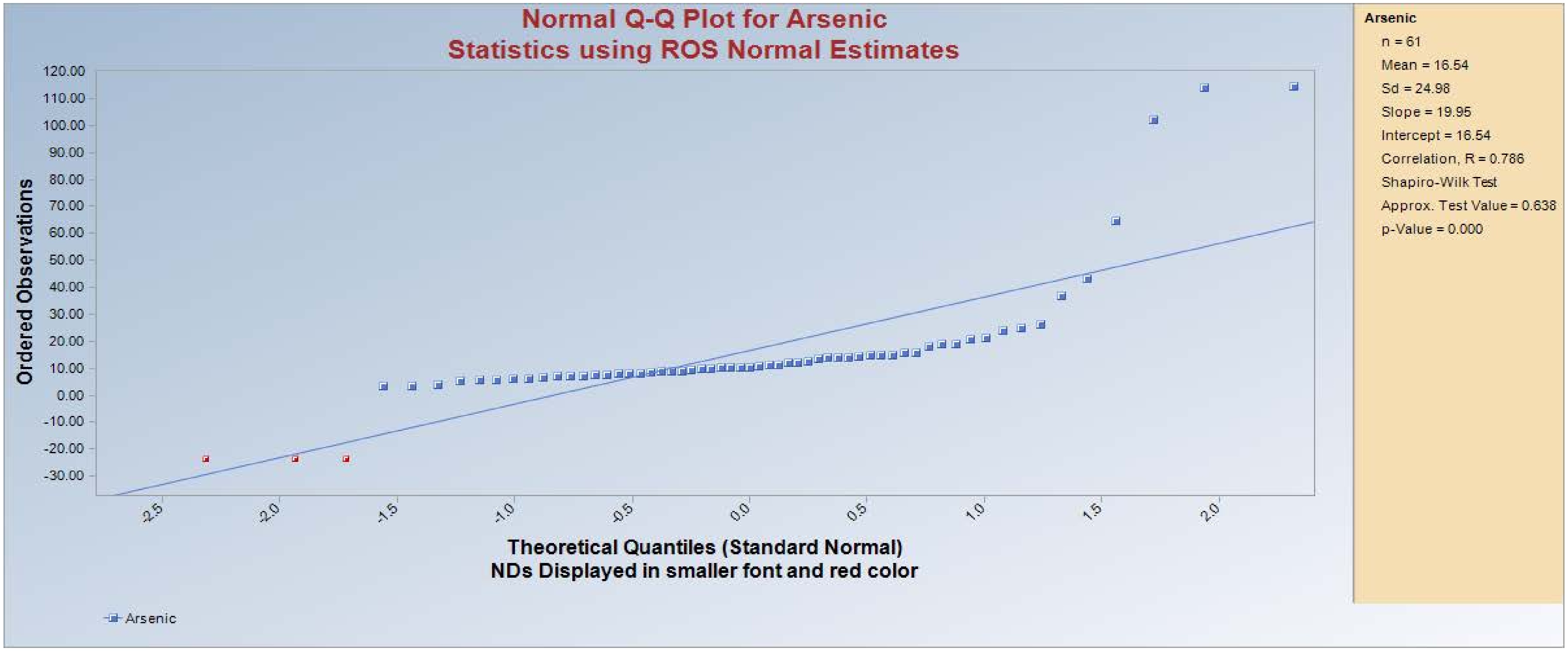
General Statistics

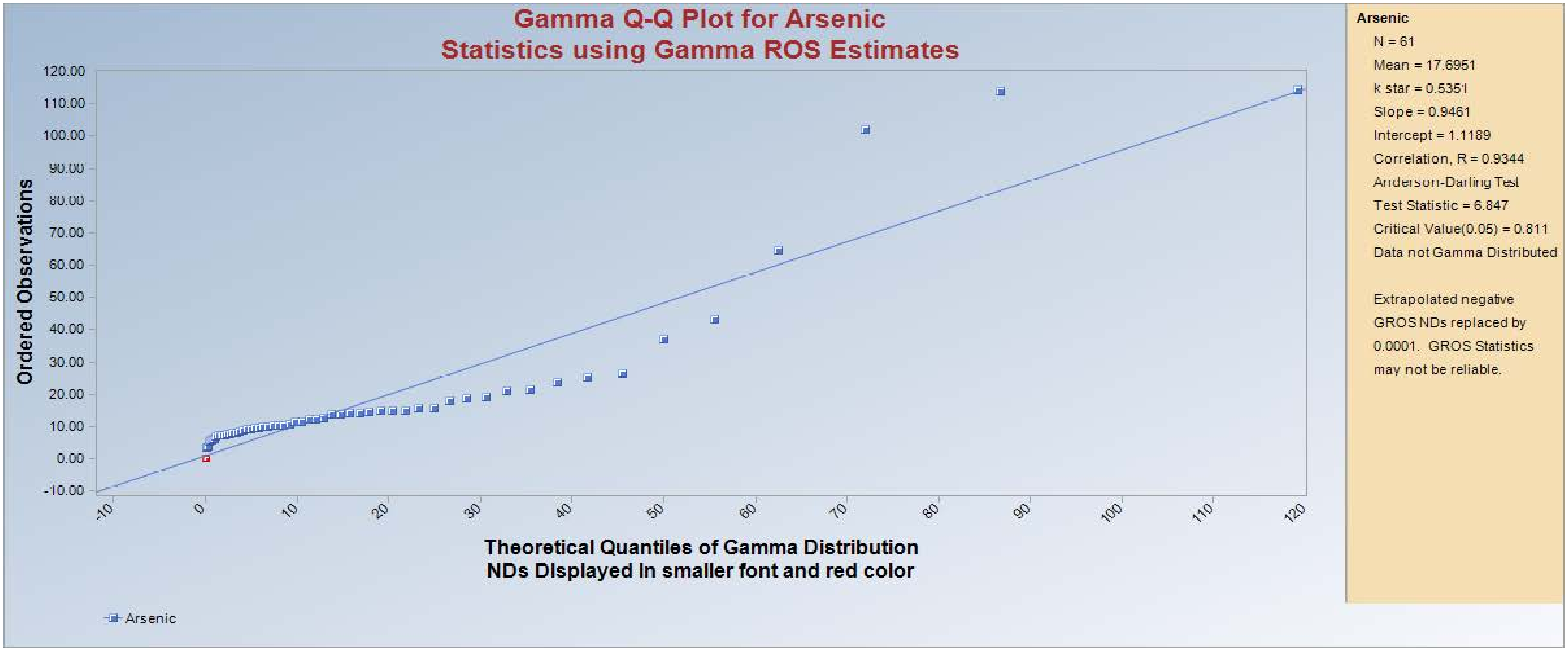
Number of Valid Observations	61	Number of Distinct Observations	61
Raw Statistics		**Log-transformed Statistics**	
Minimum	104	Minimum of Log Data	4.644
Maximum	5083	Maximum of Log Data	8.534
Mean	677.2	Mean of log Data	6.072
Geometric Mean	433.4	SD of log Data	0.863
Median	380.9		
SD	880		
Std. Error of Mean	112.7		
Coefficient of Variation	1.299		
Skewness	3.311		

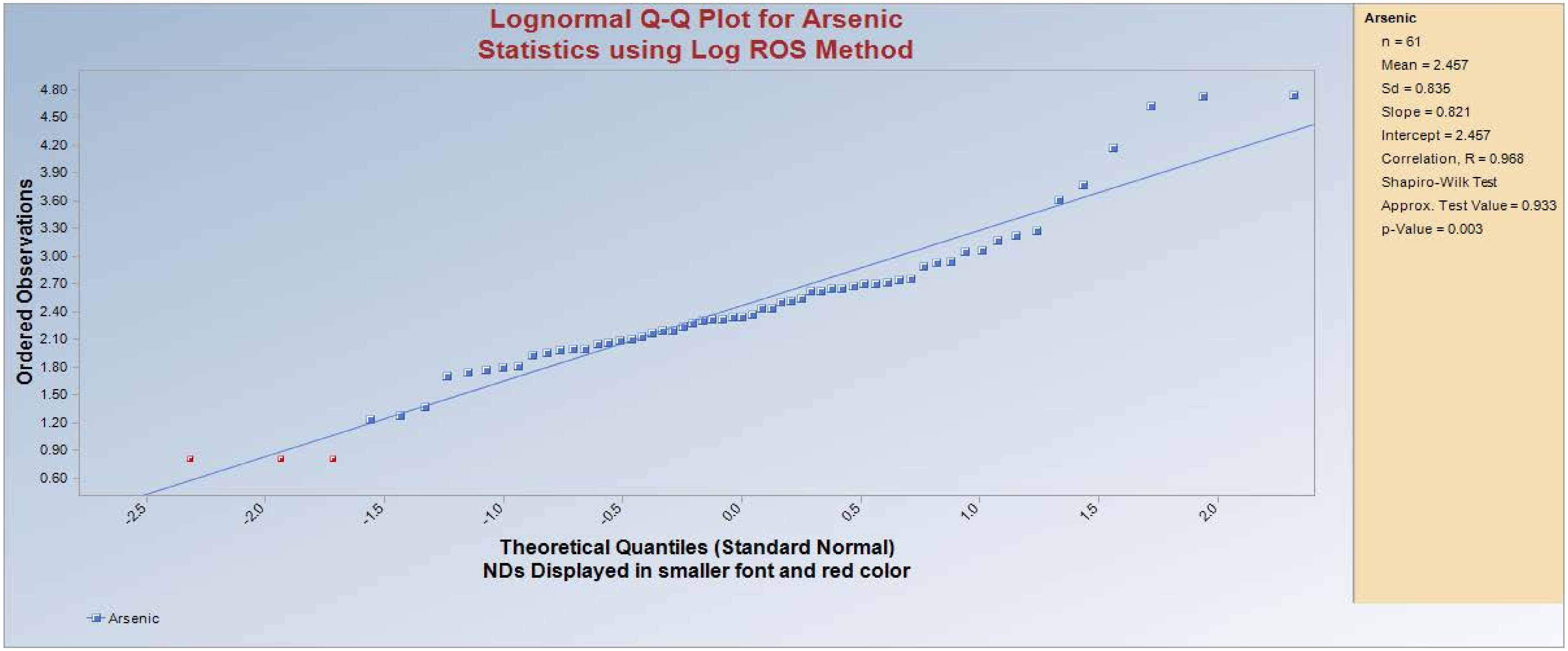
Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.257	Lilliefors Test Statistic	0.115
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	865.5	95% H-UCL	798.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	967.5
95% Adjusted-CLT UCL (Chen-1995)	913.6	97.5% Chebyshev (MVUE) UCL	1116
95% Modified-t UCL (Johnson-1978)	873.4	99% Chebyshev (MVUE) UCL	1408
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.21	Data do not follow a Discernable Distribution (0.05)	
Theta Star	559.9		
MLE of Mean	677.2		
MLE of Standard Deviation	615.8		
nu star	147.6		
Approximate Chi Square Value (.05)	120.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0461	95% CLT UCL	862.5
Adjusted Chi Square Value	119.9	95% Jackknife UCL	865.5
		95% Standard Bootstrap UCL	863
Anderson-Darling Test Statistic	2.71	95% Bootstrap-t UCL	975.6
Anderson-Darling 5% Critical Value	0.774	95% Hall's Bootstrap UCL	1043
Kolmogorov-Smirnov Test Statistic	0.158	95% Percentile Bootstrap UCL	878.4
Kolmogorov-Smirnov 5% Critical Value	0.117	95% BCA Bootstrap UCL	935.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1168
		97.5% Chebyshev(Mean, Sd) UCL	1381
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1798
95% Approximate Gamma UCL (Use when n >= 40)	829.4		
95% Adjusted Gamma UCL (Use when n < 40)	833.5		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	1168

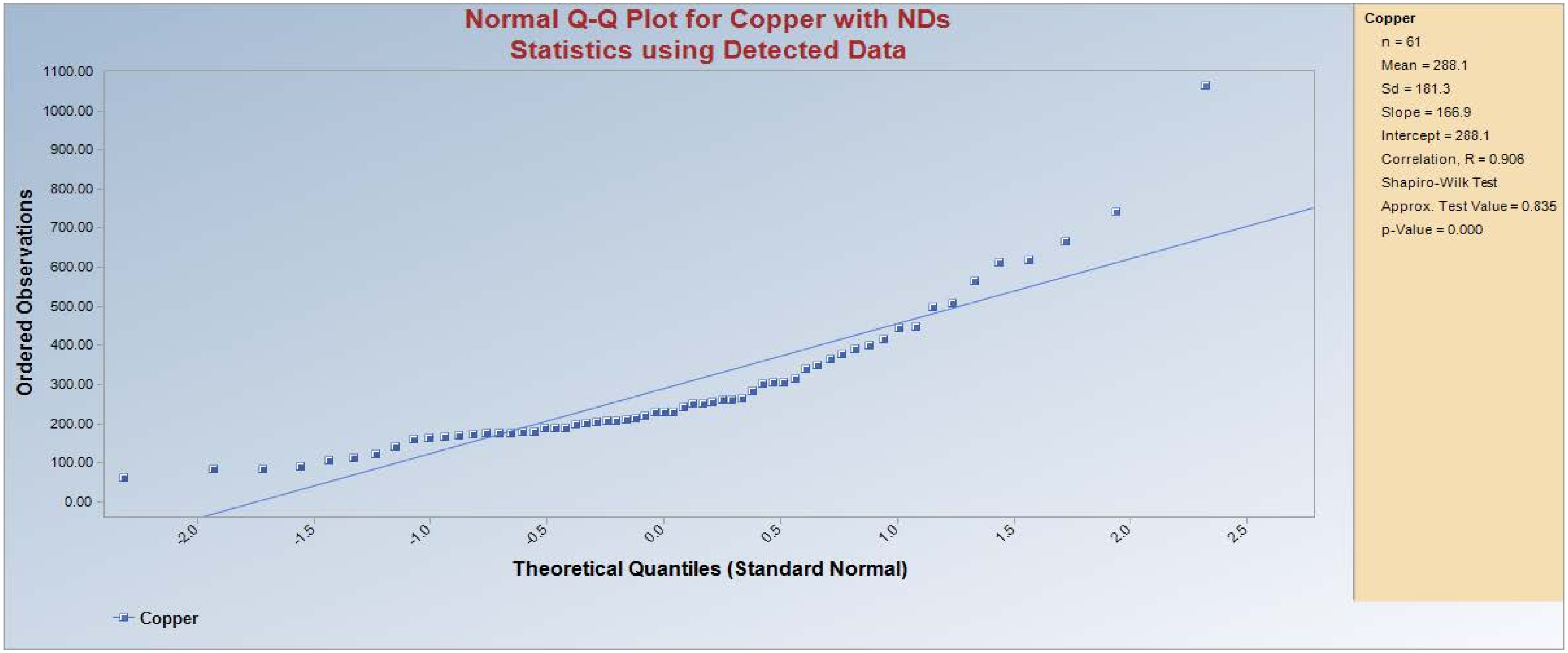
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

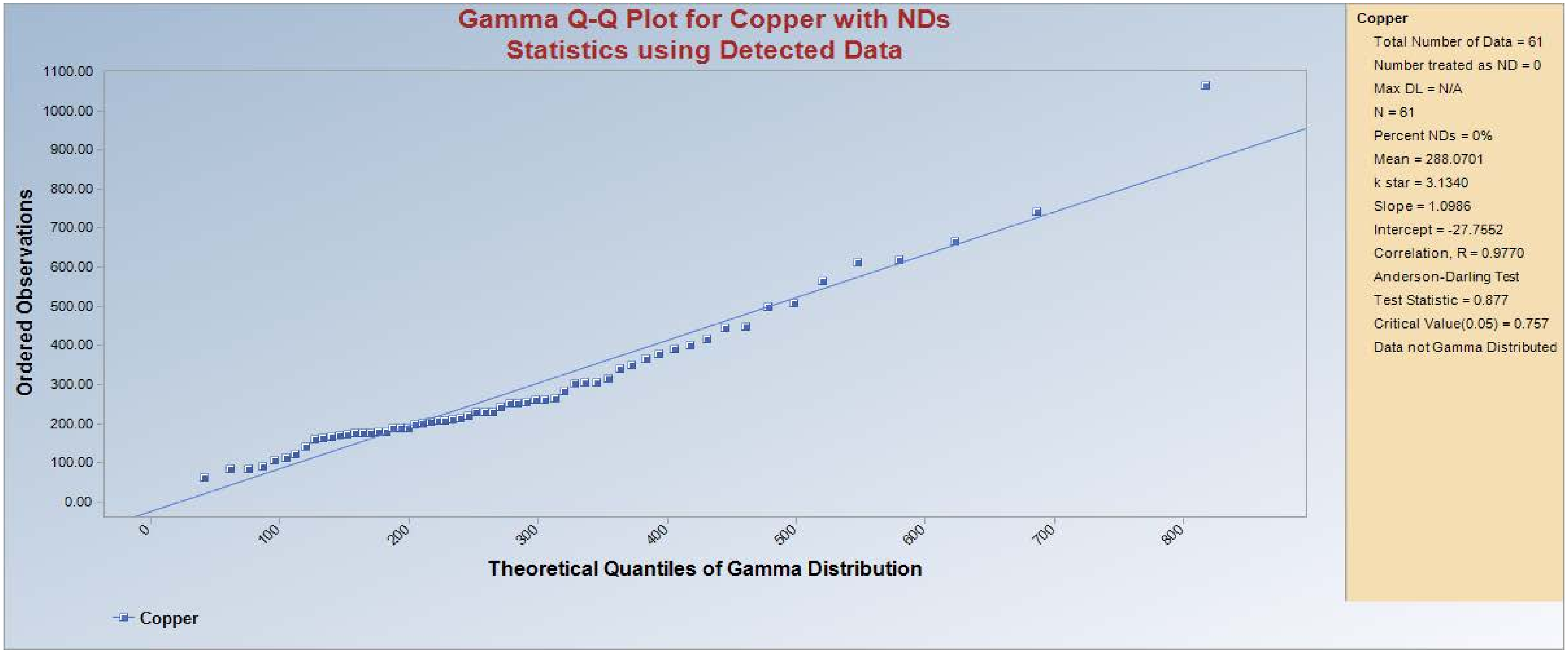

Normal Q-Q Plot for Arsenic
Statistics using ROS Normal Estimates
Ordered Observations
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 61
Mean = 16.54
Sd = 24.98
Slope = 19.95
Intercept = 16.54
Correlation, R = 0.786
Shapiro-Wilk Test
Approx. Test Value = 0.638
p-Value = 0.000

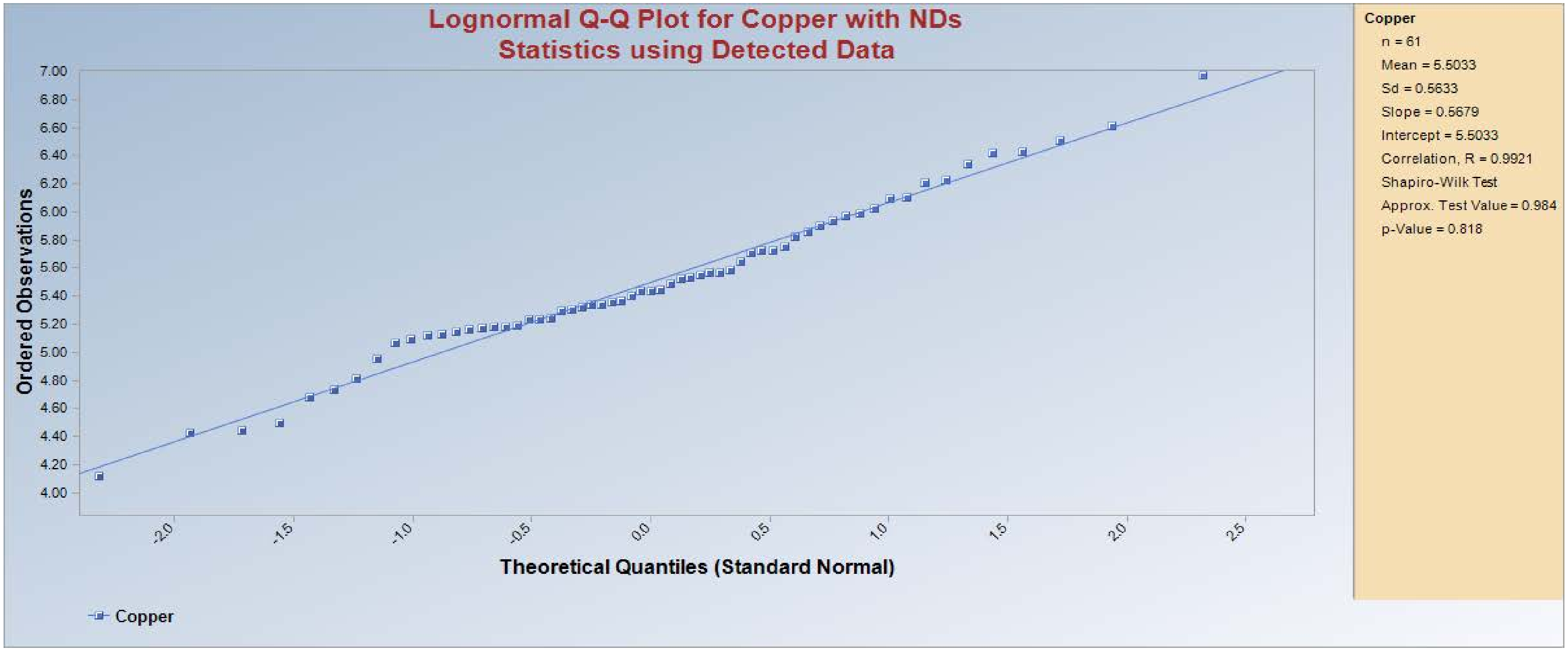

Gamma Q-Q Plot for Arsenic
Statistics using Gamma ROS Estimates
Ordered Observations
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Arsenic
Arsenic
N = 61
Mean = 17.6951
k star = 0.5351
Slope = 0.9461
Intercept = 1.1189
Correlation, R = 0.9344
Anderson-Darling Test
Test Statistic = 6.847
Critical Value(0.05) = 0.811
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



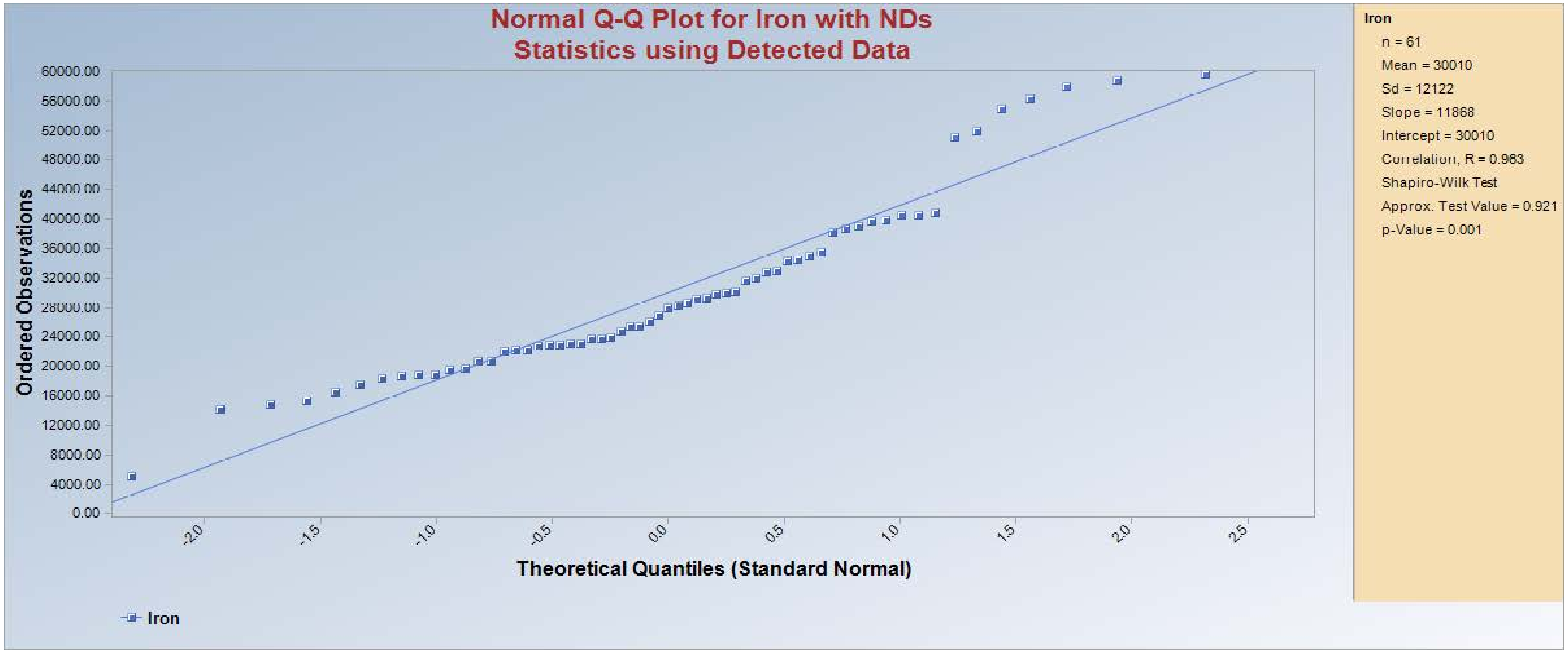
Lognormal Q-Q Plot for Arsenic
Statistics using Log ROS Method
Ordered Observations
4.80
4.50
4.20
3.90
3.60
3.30
3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.90
0.60
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Arsenic
Arsenic
n = 61
Mean = 2.457
Sd = 0.835
Slope = 0.821
Intercept = 2.457
Correlation, R = 0.968
Shapiro-Wilk Test
Approx. Test Value = 0.933
p-Value = 0.003

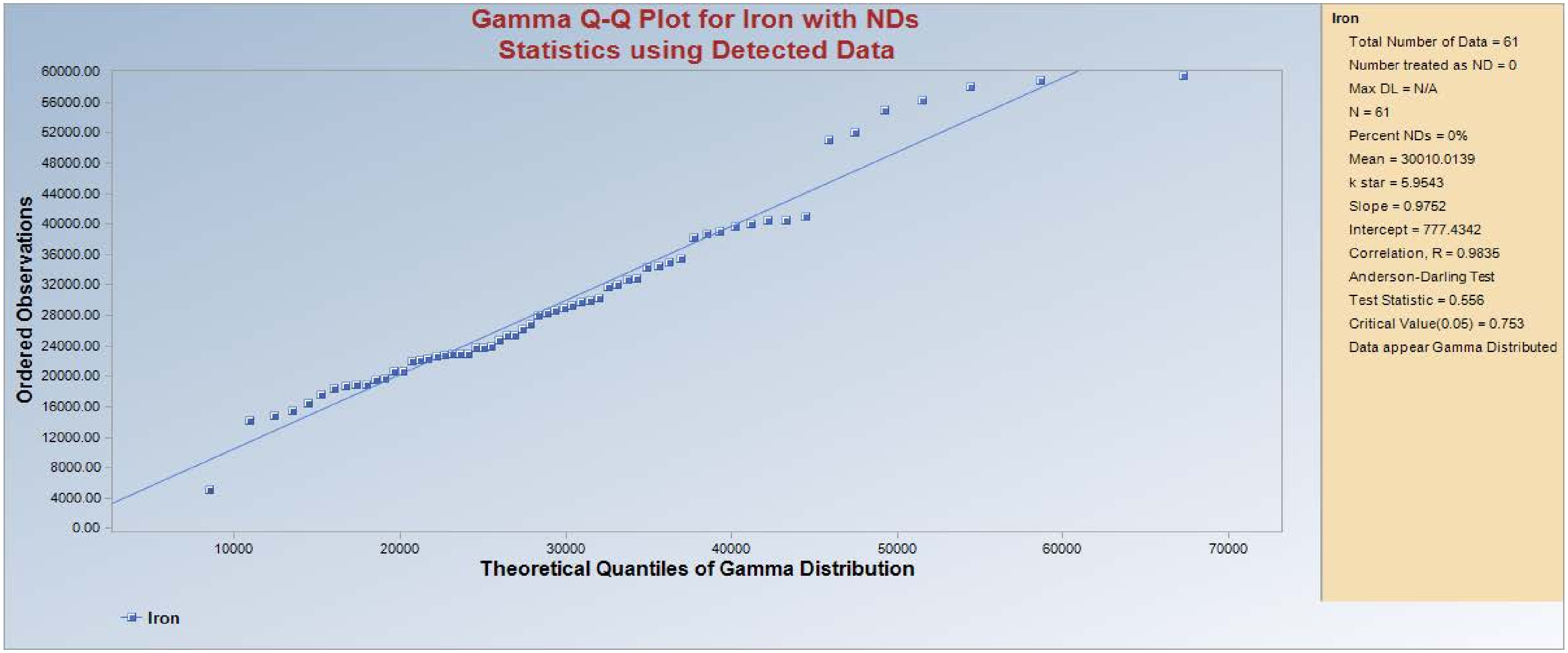

Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 61
Mean = 288.1
Sd = 181.3
Slope = 166.9
Intercept = 288.1
Correlation, R = 0.906
Shapiro-Wilk Test
Approx. Test Value = 0.835
p-Value = 0.000


Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
100
200
300
400
500
600
700
800
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 61
Number treated as ND = 0
Max DL = N/A
N = 61
Percent NDs = 0%
Mean = 288.0701
k star = 3.1340
Slope = 1.0986
Intercept = -27.7552
Correlation, R = 0.9770
Anderson-Darling Test
Test Statistic = 0.877
Critical Value(0.05) = 0.757
Data not Gamma Distributed

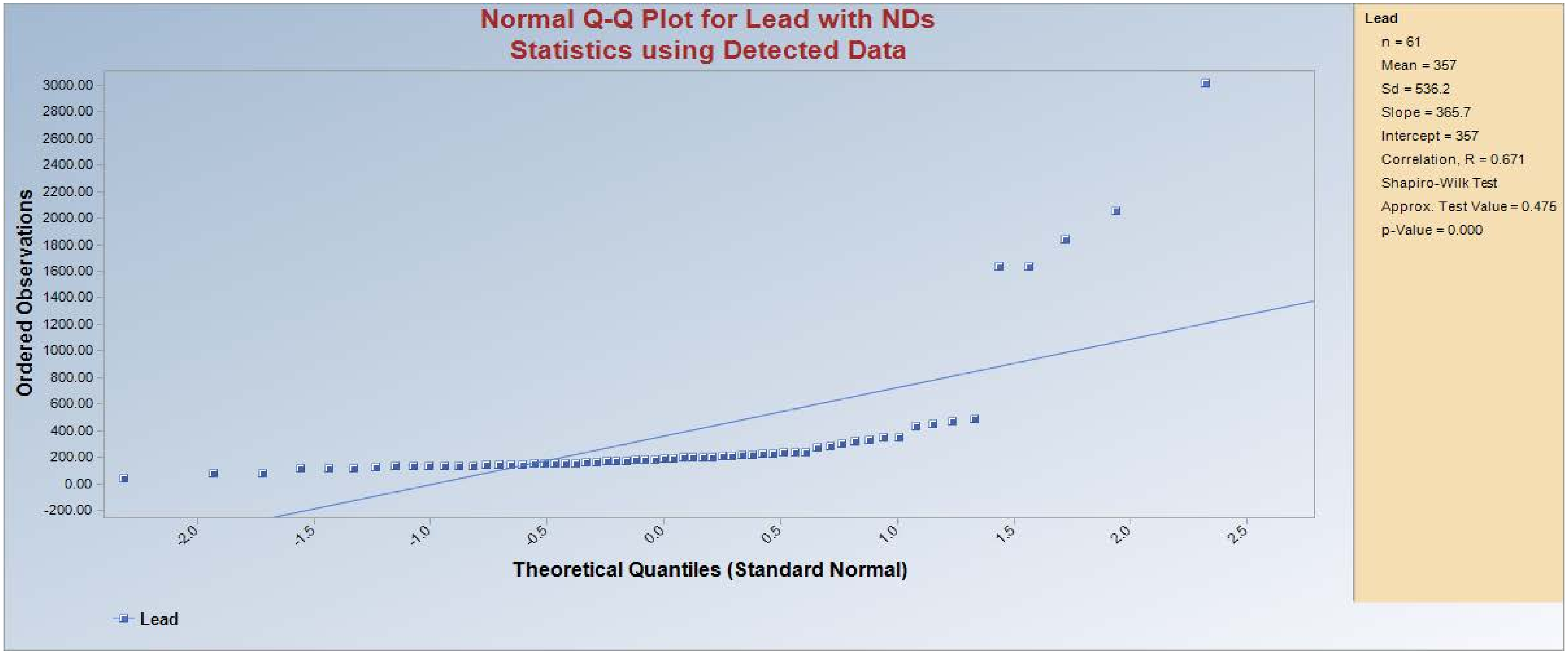


Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 61
Mean = 5.5033
Sd = 0.5633
Slope = 0.5679
Intercept = 5.5033
Correlation, R = 0.9921
Shapiro-Wilk Test
Approx. Test Value = 0.984
p-Value = 0.818

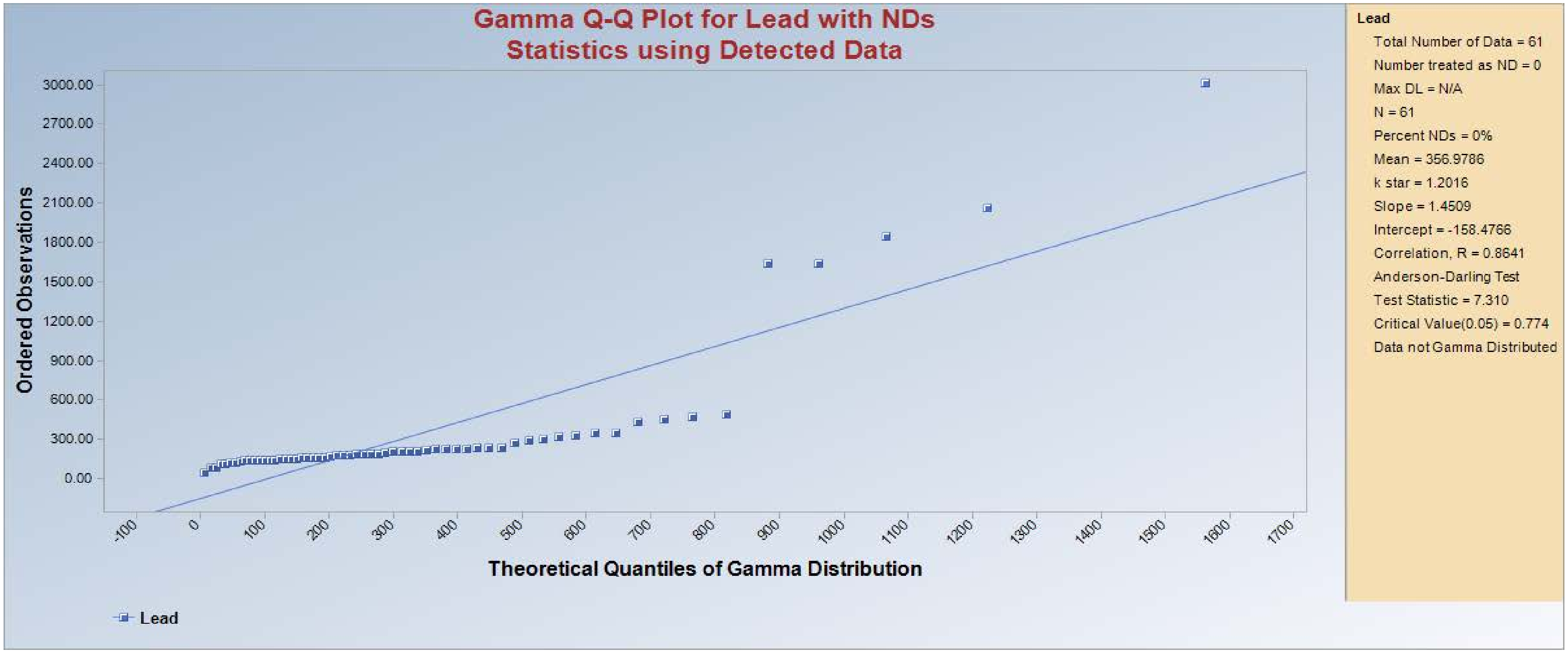

Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
60000.00
56000.00
52000.00
48000.00
44000.00
40000.00
36000.00
32000.00
28000.00
24000.00
20000.00
16000.00
12000.00
8000.00
4000.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 61
Mean = 30010
Sd = 12122
Slope = 11868
Intercept = 30010
Correlation, R = 0.963
Shapiro-Wilk Test
Approx. Test Value = 0.921
p-Value = 0.001



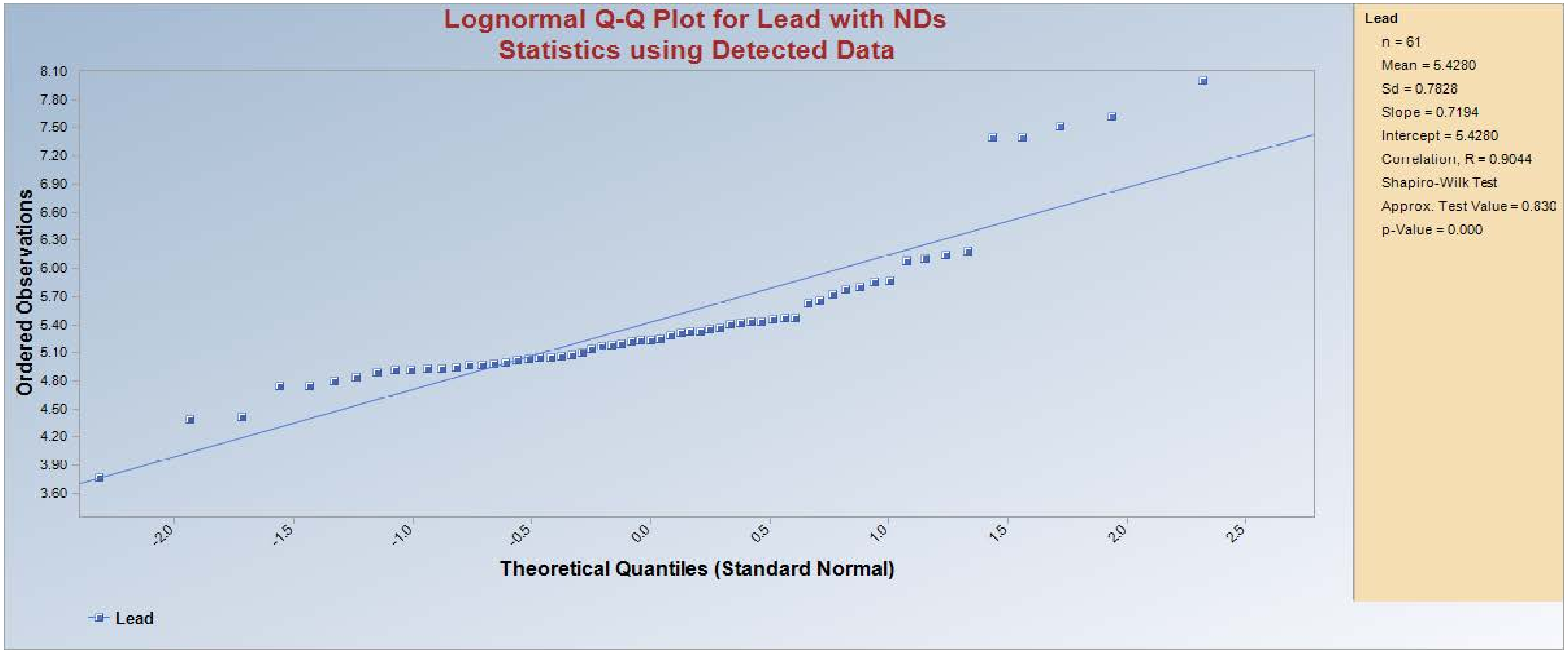
Gamma Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
Theoretical Quantiles of Gamma Distribution
0.00
4000.00
8000.00
12000.00
16000.00
20000.00
24000.00
28000.00
32000.00
36000.00
40000.00
44000.00
48000.00
52000.00
56000.00
60000.00
10000
20000
30000
40000
50000
60000
70000
Iron
Iron
Total Number of Data = 61
Number treated as ND = 0
Max DL = N/A
N = 61
Percent NDs = 0%
Mean = 30010.0139
k star = 5.9543
Slope = 0.9752
Intercept = 777.4342
Correlation, R = 0.9836
Anderson-Darling Test
Test Statistic = 0.556
Critical Value(0.05) = 0.753
Data appear Gamma Distributed

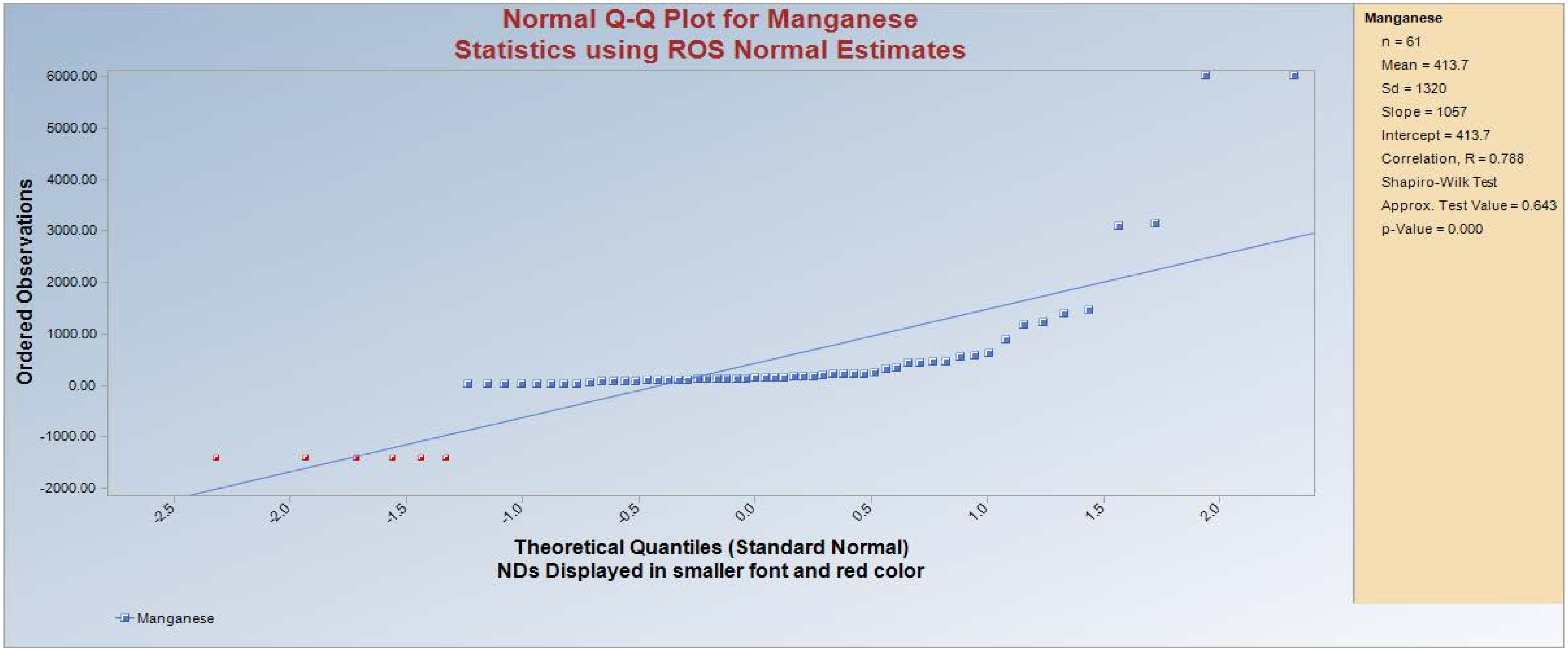


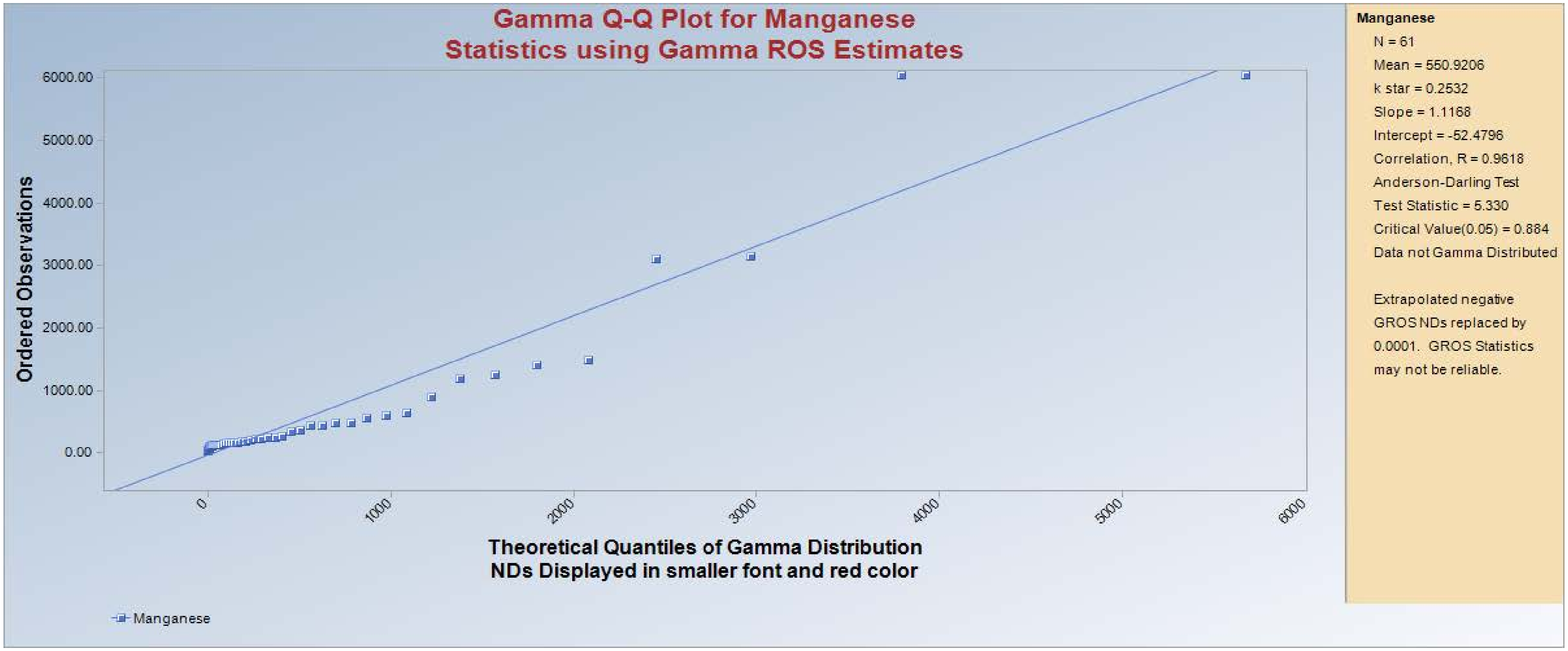
Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 61
Mean = 357
Sd = 536.2
Slope = 365.7
Intercept = 357
Correlation, R = 0.671
Shapiro-Wilk Test
Approx. Test Value = 0.475
p-Value = 0.000



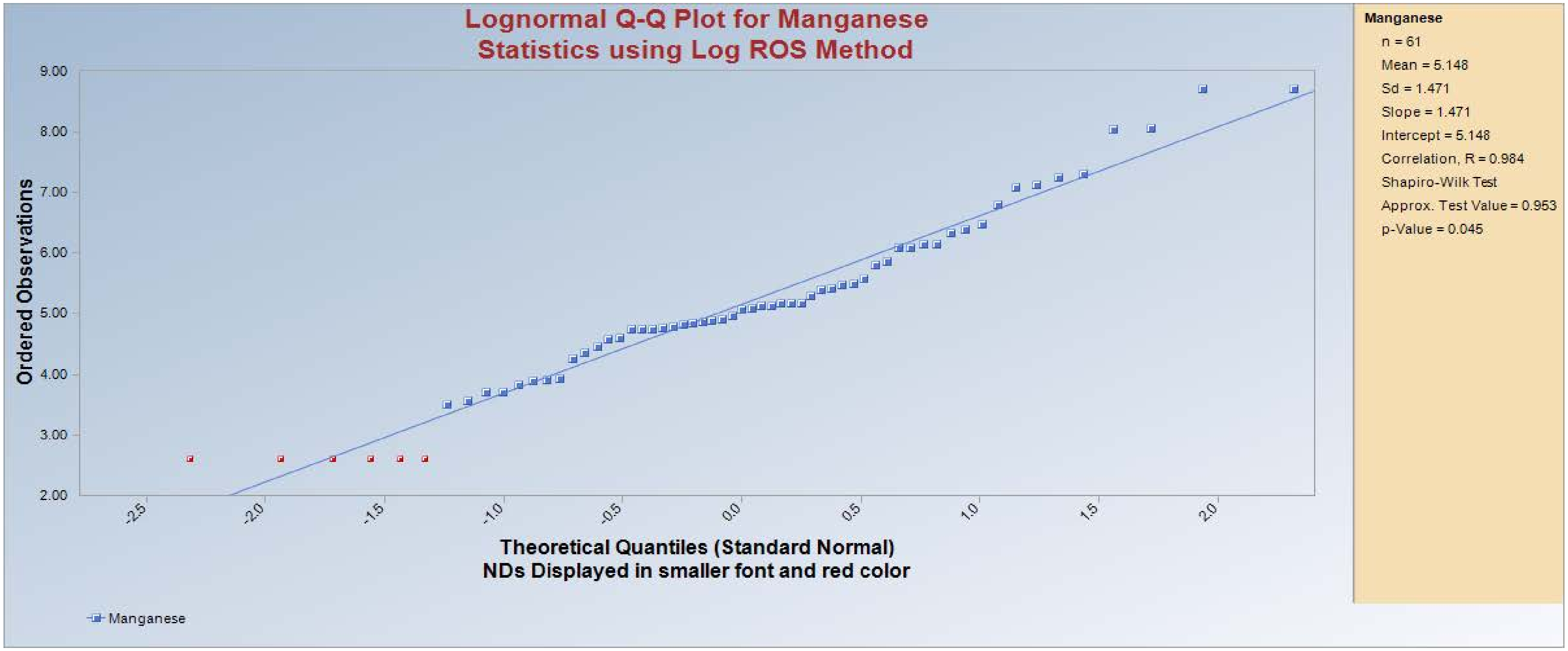
Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2700.00
2400.00
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 61
Number treated as ND = 0
Max DL = N/A
N = 61
Percent NDs = 0%
Mean = 356.9786
k star = 1.2016
Slope = 1.4509
Intercept = -158.4766
Correlation, R = 0.8641
Anderson-Darling Test
Test Statistic = 7.310
Critical Value(0.05) = 0.774
Data not Gamma Distributed


Lognormal Q-Q Plot for Lead with NDs
Statistics using Detected Data
8.10
7.80
7.50
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
4.20
3.90
3.60
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 61
Mean = 5.4280
Sd = 0.7828
Slope = 0.7194
Intercept = 5.4280
Correlation, R = 0.9044
Shapiro-Wilk Test
Approx. Test Value = 0.830
p-Value = 0.000

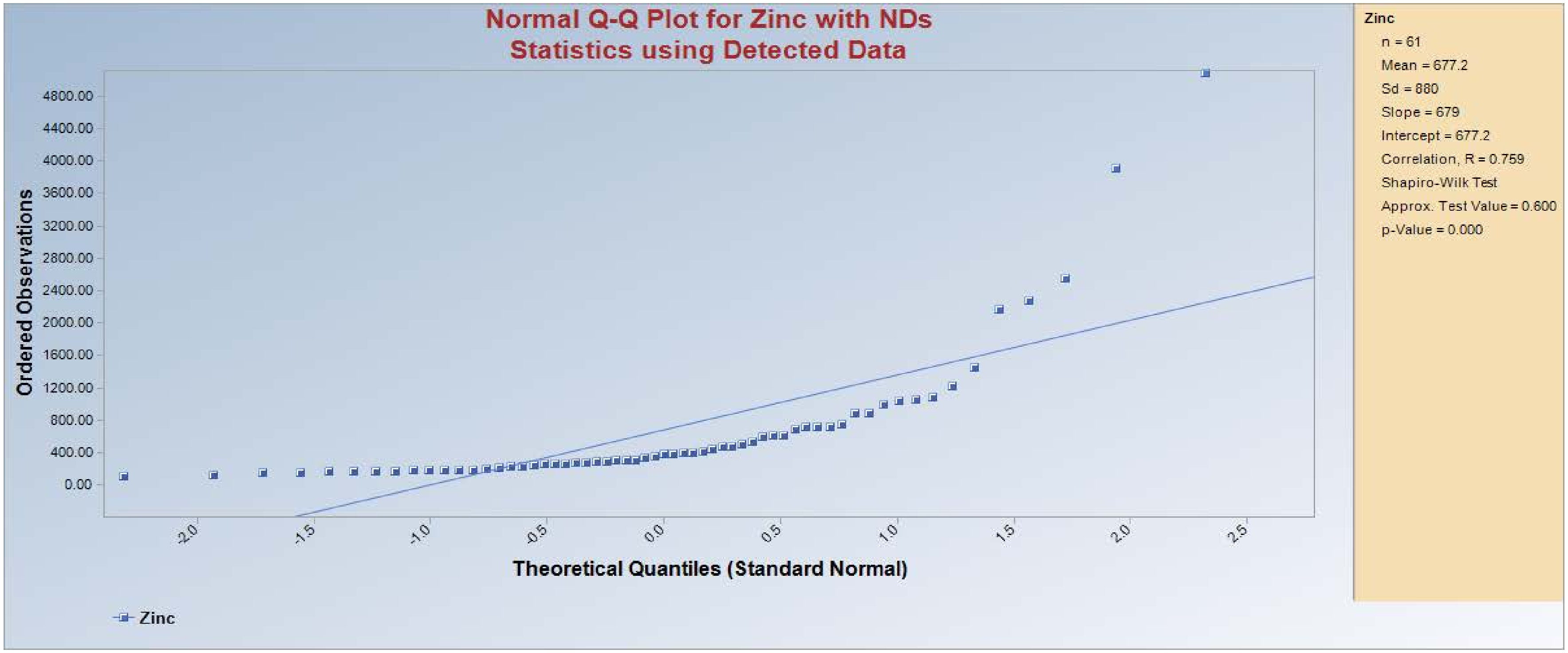

Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
-2000.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 61
Mean = 413.7
Sd = 1320
Slope = 1057
Intercept = 413.7
Correlation, R = 0.788
Shapiro-Wilk Test
Approx. Test Value = 0.643
p-Value = 0.000



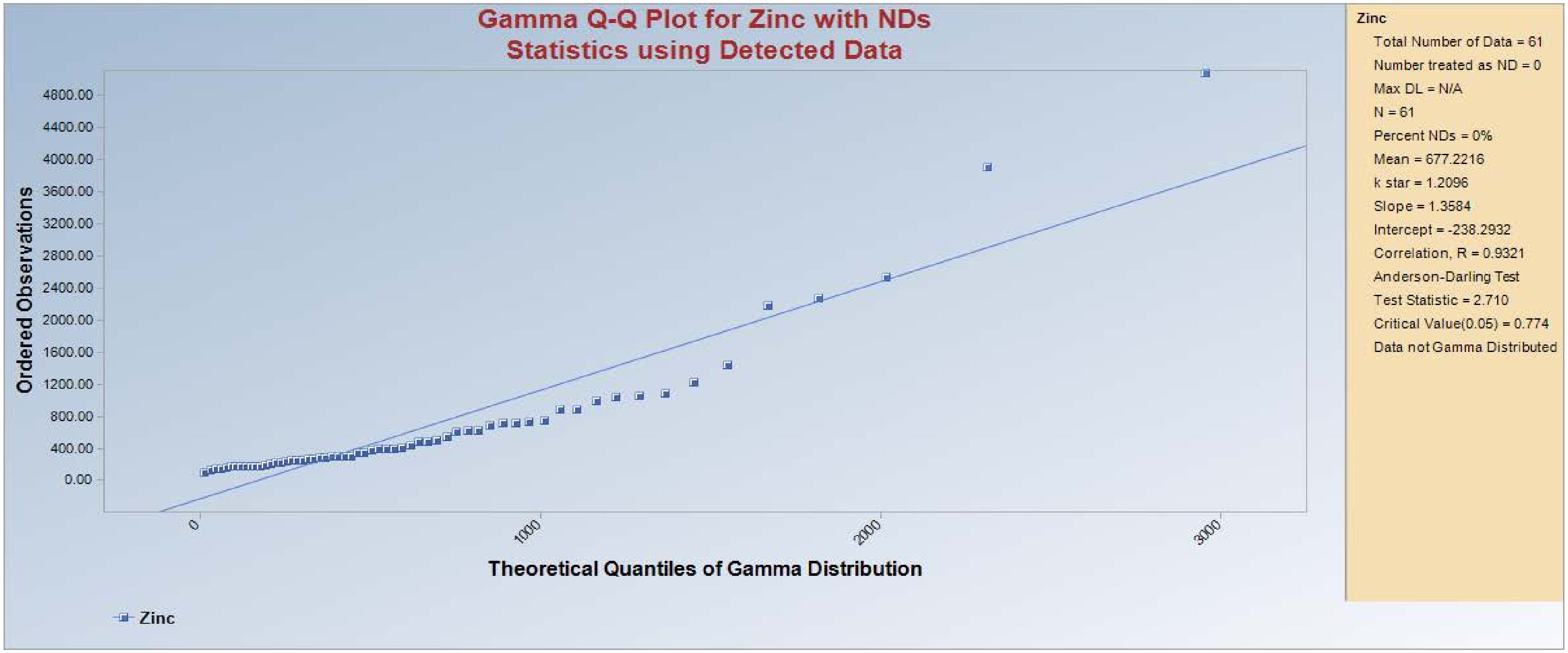
Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
1000
2000
3000
4000
5000
6000
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 61
Mean = 550.9206
k star = 0.2532
Slope = 1.1168
Intercept = -52.4796
Correlation, R = 0.9618
Anderson-Darling Test
Test Statistic = 5.330
Critical Value(0.05) = 0.884
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

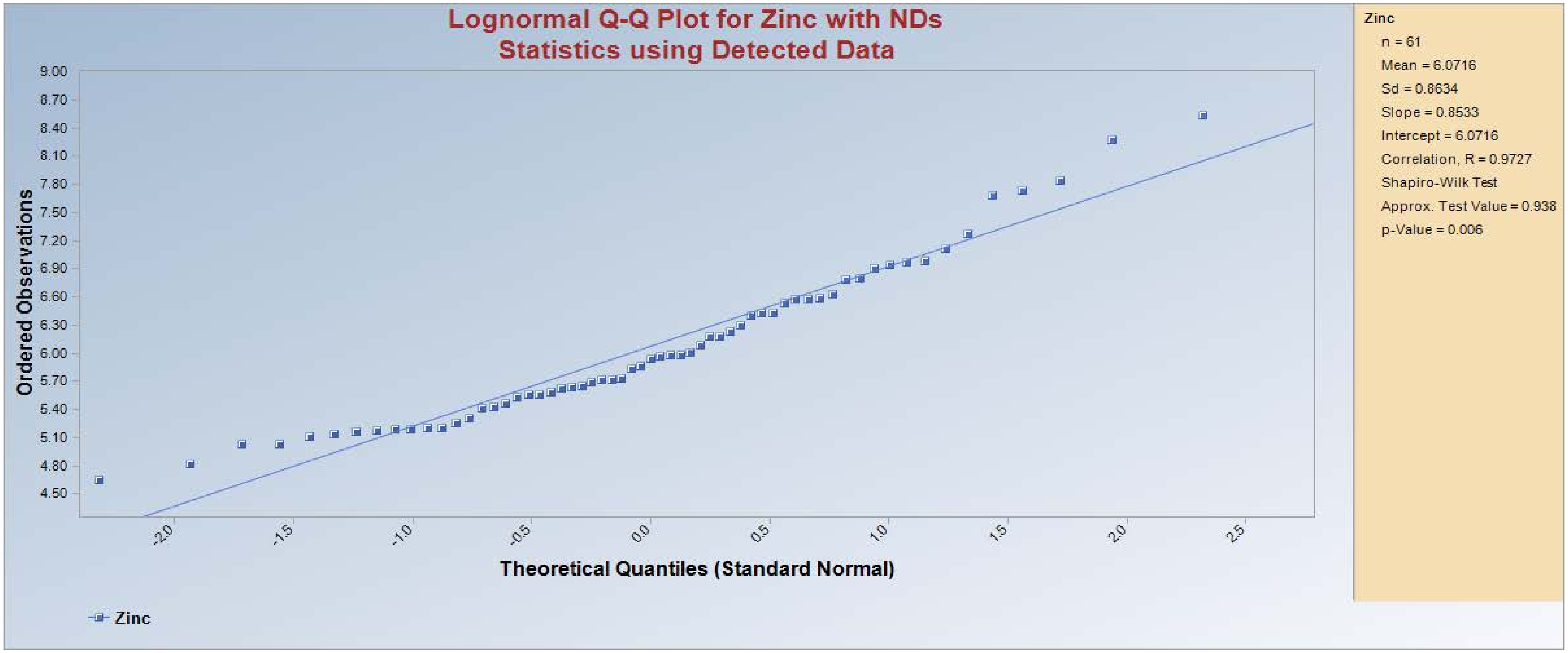


Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 61
Mean = 5.148
Sd = 1.471
Slope = 1.471
Intercept = 5.148
Correlation, R = 0.984
Shapiro-Wilk Test
Approx. Test Value = 0.953
p-Value = 0.045



Normal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
4800.00
4400.00
4000.00
3600.00
3200.00
2800.00
2400.00
2000.00
1600.00
1200.00
800.00
400.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 61
Mean = 677.2
Sd = 880
Slope = 679
Intercept = 677.2
Correlation, R = 0.759
Shapiro-Wilk Test
Approx. Test Value = 0.600
p-Value = 0.000


Gamma Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
4800.00
4400.00
4000.00
3600.00
3200.00
2800.00
2400.00
2000.00
1600.00
1200.00
800.00
400.00
0.00
0
1000
2000
3000
Theoretical Quantiles of Gamma Distribution
Zinc
Zinc
Total Number of Data = 61
Number treated as ND = 0
Max DL = N/A
N = 61
Percent NDs = 0%
Mean = 677.2216
k star = 1.2096
Slope = 1.3584
Intercept = -238.2932
Correlation, R = 0.9321
Anderson-Darling Test
Test Statistic = 2.710
Critical Value(0.05) = 0.774
Data not Gamma Distributed



Lognormal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
9.00
8.70
8.40
8.10
7.80
7.50
7.20
6.90
6.60
6.30
6.00
5.70
5.40
5.10
4.80
4.50
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 61
Mean = 6.0716
Sd = 0.8634
Slope = 0.8533
Intercept = 6.0716
Correlation, R = 0.9727
Shapiro-Wilk Test
Approx. Test Value = 0.938
p-Value = 0.006

Attachment A17
ProUCL Output for EU 13 Surface Sediment

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	ProUCL_input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19
Number of Missing Values	25		

Raw Statistics		Log-transformed Statistics	
Minimum	3920	Minimum of Log Data	8.274
Maximum	23000	Maximum of Log Data	10.04
Mean	8110	Mean of log Data	8.855
Geometric Mean	7007	SD of log Data	0.507
Median	6780		
SD	5529		
Std. Error of Mean	1269		
Coefficient of Variation	0.682		
Skewness	2.243		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.659	Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10310	95% H-UCL	10137
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12063
95% Adjusted-CLT UCL (Chen-1995)	10894	97.5% Chebyshev (MVUE) UCL	13861
95% Modified-t UCL (Johnson-1978)	10418	99% Chebyshev (MVUE) UCL	17393

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.048	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2661		
MLE of Mean	8110		
MLE of Standard Deviation	4646		
nu star	115.8		
Approximate Chi Square Value (.05)	91.97	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	10197
Adjusted Chi Square Value	90.11	95% Jackknife UCL	10310
		95% Standard Bootstrap UCL	10115
Anderson-Darling Test Statistic	1.423	95% Bootstrap-t UCL	13491
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	22591
Kolmogorov-Smirnov Test Statistic	0.217	95% Percentile Bootstrap UCL	10337
Kolmogorov-Smirnov 5% Critical Value	0.2	95% BCA Bootstrap UCL	10994
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13639
		97.5% Chebyshev(Mean, Sd) UCL	16032
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20732
95% Approximate Gamma UCL (Use when n >= 40)	10213		
95% Adjusted Gamma UCL (Use when n < 40)	10423		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	13639

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics

Number of Valid Observations	47	Number of Distinct Observations	45

Raw Statistics		Log-transformed Statistics	
Minimum	3.03	Minimum of Log Data	1.109
Maximum	86.8	Maximum of Log Data	4.464
Mean	16.26	Mean of log Data	2.475
Geometric Mean	11.89	SD of log Data	0.78
Median	12.9		
SD	15.47		
Std. Error of Mean	2.256		
Coefficient of Variation	0.951		
Skewness	2.747		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.725	Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical Value	0.946	Shapiro Wilk Critical Value	0.946
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	20.05	95% H-UCL	20.54
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24.8
95% Adjusted-CLT UCL (Chen-1995)	20.93	97.5% Chebyshev (MVUE) UCL	28.62
95% Modified-t UCL (Johnson-1978)	20.2	99% Chebyshev (MVUE) UCL	36.12

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.647	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	9.87		
MLE of Mean	16.26		
MLE of Standard Deviation	12.67		
nu star	154.8		
Approximate Chi Square Value (.05)	127.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0449	95% CLT UCL	19.97
Adjusted Chi Square Value	126.3	95% Jackknife UCL	20.05
		95% Standard Bootstrap UCL	19.91
Anderson-Darling Test Statistic	0.663	95% Bootstrap-t UCL	21.98
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	22.66
Kolmogorov-Smirnov Test Statistic	0.106	95% Percentile Bootstrap UCL	20.13
Kolmogorov-Smirnov 5% Critical Value	0.131	95% BCA Bootstrap UCL	21.16
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	26.09
		97.5% Chebyshev(Mean, Sd) UCL	30.35
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	38.71
95% Approximate Gamma UCL (Use when n >= 40)	19.81		
95% Adjusted Gamma UCL (Use when n < 40)	19.93		

Potential UCL to Use		Use 95% Approximate Gamma UCL	19.81

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cadmium

General Statistics

Number of Valid Data	47	Number of Detected Data	39
Number of Distinct Detected Data	38	Number of Non-Detect Data	8
		Percent Non-Detects	17.02%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.5	Minimum Detected	-0.693
Maximum Detected	20.3	Maximum Detected	3.011
Mean of Detected	6.416	Mean of Detected	1.413
SD of Detected	5.367	SD of Detected	1.07
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.928
5% Shapiro Wilk Critical Value	0.939	5% Shapiro Wilk Critical Value	0.939
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.367	Mean	0.937
SD	5.411	SD	1.441
95% DL/2 (t) UCL	6.692	95% H-Stat (DL/2) UCL	13.2
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	4.792	Mean in Log Scale	1.009
SD	6.138	SD in Log Scale	1.341
95% MLE (t) UCL	6.295	Mean in Original Scale	5.395
95% MLE (Tiku) UCL	6.291	SD in Original Scale	5.385
		95% t UCL	6.714
		95% Percentile Bootstrap UCL	6.761
		95% BCA Bootstrap UCL	6.73
		95% H UCL	11.54

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.183	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5.423		
nu star	92.29		
A-D Test Statistic	0.442	Nonparametric Statistics	
5% A-D Critical Value	0.772	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.772	Mean	5.409
5% K-S Critical Value	0.145	SD	5.314
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.785
		95% KM (t) UCL	6.728
Assuming Gamma Distribution		95% KM (z) UCL	6.701
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6.718
Minimum	0.000001	95% KM (bootstrap t) UCL	6.908
Maximum	20.3	95% KM (BCA) UCL	6.727
Mean	5.324	95% KM (Percentile Bootstrap) UCL	6.695
Median	3.86	95% KM (Chebyshev) UCL	8.832
SD	5.453	97.5% KM (Chebyshev) UCL	10.31
k star	0.248	99% KM (Chebyshev) UCL	13.22
Theta star	21.51		
Nu star	23.27	Potential UCLs to Use	
AppChi2	13.29	95% KM (BCA) UCL	6.727
95% Gamma Approximate UCL (Use when n >= 40)	9.319		
95% Adjusted Gamma UCL (Use when n < 40)	9.49		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Observations	47	Number of Distinct Observations	46
Raw Statistics		Log-transformed Statistics	
Minimum	26.9	Minimum of Log Data	3.292
Maximum	3030	Maximum of Log Data	8.016
Mean	290.5	Mean of log Data	4.971
Geometric Mean	144.2	SD of log Data	1.097
Median	181		
SD	557.5		
Std. Error of Mean	81.33		
Coefficient of Variation	1.919		
Skewness	4.34		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.413	Shapiro Wilk Test Statistic	0.914
Shapiro Wilk Critical Value	0.946	Shapiro Wilk Critical Value	0.946
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	427.1	95% H-UCL	390.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	474
95% Adjusted-CLT UCL (Chen-1995)	479.3	97.5% Chebyshev (MVUE) UCL	567.5
95% Modified-t UCL (Johnson-1978)	435.6	99% Chebyshev (MVUE) UCL	751.1

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.802	Data do not follow a Discernable Distribution (0.05)	
Theta Star	362.2		
MLE of Mean	290.5		
MLE of Standard Deviation	324.4		
nu star	75.4		
Approximate Chi Square Value (.05)	56.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0449	95% CLT UCL	424.3
Adjusted Chi Square Value	55.88	95% Jackknife UCL	427.1
		95% Standard Bootstrap UCL	423.4
Anderson-Darling Test Statistic	2.44	95% Bootstrap-t UCL	830.4
Anderson-Darling 5% Critical Value	0.786	95% Hall's Bootstrap UCL	1166
Kolmogorov-Smirnov Test Statistic	0.204	95% Percentile Bootstrap UCL	446.1
Kolmogorov-Smirnov 5% Critical Value	0.134	95% BCA Bootstrap UCL	486.4
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	645
		97.5% Chebyshev(Mean, Sd) UCL	798.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1100
95% Approximate Gamma UCL (Use when n >= 40)	388.4		
95% Adjusted Gamma UCL (Use when n < 40)	392		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	645

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19
Number of Missing Values	25		

Raw Statistics		Log-transformed Statistics	
Minimum	9650	Minimum of Log Data	9.175
Maximum	35800	Maximum of Log Data	10.49
Mean	20503	Mean of log Data	9.849
Geometric Mean	18938	SD of log Data	0.413
Median	20000		
SD	8298		
Std. Error of Mean	1904		
Coefficient of Variation	0.405		
Skewness	0.455		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.918	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	23804	95% H-UCL	24882
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	29200
95% Adjusted-CLT UCL (Chen-1995)	23846	97.5% Chebyshev (MVUE) UCL	32955
95% Modified-t UCL (Johnson-1978)	23837	99% Chebyshev (MVUE) UCL	40330
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.477	Data appear Normal at 5% Significance Level	
Theta Star	3744		
MLE of Mean	20503		
MLE of Standard Deviation	8761		
nu star	208.1		
Approximate Chi Square Value (.05)	175.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	23634
Adjusted Chi Square Value	173.1	95% Jackknife UCL	23804
		95% Standard Bootstrap UCL	23578
Anderson-Darling Test Statistic	0.534	95% Bootstrap-t UCL	23910
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	23843
Kolmogorov-Smirnov Test Statistic	0.173	95% Percentile Bootstrap UCL	23595
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	23650
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	28800
		97.5% Chebyshev(Mean, Sd) UCL	32391
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	39443
95% Approximate Gamma UCL (Use when n >= 40)	24281		
95% Adjusted Gamma UCL (Use when n < 40)	24645		
Potential UCL to Use		Use 95% Student's-t UCL	23804

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	47	Number of Distinct Observations	44
Raw Statistics		**Log-transformed Statistics**	
Minimum	7.5	Minimum of Log Data	2.015
Maximum	1500	Maximum of Log Data	7.313
Mean	247.6	Mean of log Data	4.715
Geometric Mean	111.6	SD of log Data	1.411
Median	138		
SD	313.1		
Std. Error of Mean	45.68		
Coefficient of Variation	1.265		
Skewness	2.417		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.724	Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.946	Shapiro Wilk Critical Value	0.946
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	324.2	95% H-UCL	541.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	626.8
95% Adjusted-CLT UCL (Chen-1995)	339.9	97.5% Chebyshev (MVUE) UCL	772.5
95% Modified-t UCL (Johnson-1978)	326.9	99% Chebyshev (MVUE) UCL	1059
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.717	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	345.1		
MLE of Mean	247.6		
MLE of Standard Deviation	292.3		
nu star	67.43		
Approximate Chi Square Value (.05)	49.53	Nonparametric Statistics	
Adjusted Level of Significance	0.0449	95% CLT UCL	322.7
Adjusted Chi Square Value	49.05	95% Jackknife UCL	324.2
		95% Standard Bootstrap UCL	323.4
Anderson-Darling Test Statistic	0.579	95% Bootstrap-t UCL	355.8
Anderson-Darling 5% Critical Value	0.791	95% Hall's Bootstrap UCL	373.4
Kolmogorov-Smirnov Test Statistic	0.119	95% Percentile Bootstrap UCL	324.5
Kolmogorov-Smirnov 5% Critical Value	0.134	95% BCA Bootstrap UCL	342.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	446.7
		97.5% Chebyshev(Mean, Sd) UCL	532.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	702
95% Approximate Gamma UCL (Use when n >= 40)	337		
95% Adjusted Gamma UCL (Use when n < 40)	340.4		
Potential UCL to Use		Use 95% Approximate Gamma UCL	337

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Observations	47	Number of Distinct Observations	46
Raw Statistics		Log-transformed Statistics	
Minimum	8.24	Minimum of Log Data	2.109
Maximum	11300	Maximum of Log Data	9.333
Mean	1799	Mean of log Data	6.743
Geometric Mean	848	SD of log Data	1.504
Median	1190		
SD	2234		
Std. Error of Mean	325.9		
Coefficient of Variation	1.242		
Skewness	2.866		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.688	Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical Value	0.946	Shapiro Wilk Critical Value	0.946
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2346	95% H-UCL	5029
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5669
95% Adjusted-CLT UCL (Chen-1995)	2481	97.5% Chebyshev (MVUE) UCL	7039
95% Modified-t UCL (Johnson-1978)	2369	99% Chebyshev (MVUE) UCL	9729

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.754	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2387		
MLE of Mean	1799		
MLE of Standard Deviation	2072		
nu star	70.87		
Approximate Chi Square Value (.05)	52.49	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0449	95% CLT UCL	2335
Adjusted Chi Square Value	51.99	95% Jackknife UCL	2346
		95% Standard Bootstrap UCL	2318
Anderson-Darling Test Statistic	0.289	95% Bootstrap-t UCL	2671
Anderson-Darling 5% Critical Value	0.789	95% Hall's Bootstrap UCL	4817
Kolmogorov-Smirnov Test Statistic	0.0623	95% Percentile Bootstrap UCL	2365
Kolmogorov-Smirnov 5% Critical Value	0.134	95% BCA Bootstrap UCL	2513
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3220
		97.5% Chebyshev(Mean, Sd) UCL	3835
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5042
95% Approximate Gamma UCL (Use when n >= 40)	2430		
95% Adjusted Gamma UCL (Use when n < 40)	2453		

Potential UCL to Use		Use 95% Approximate Gamma UCL	2430

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

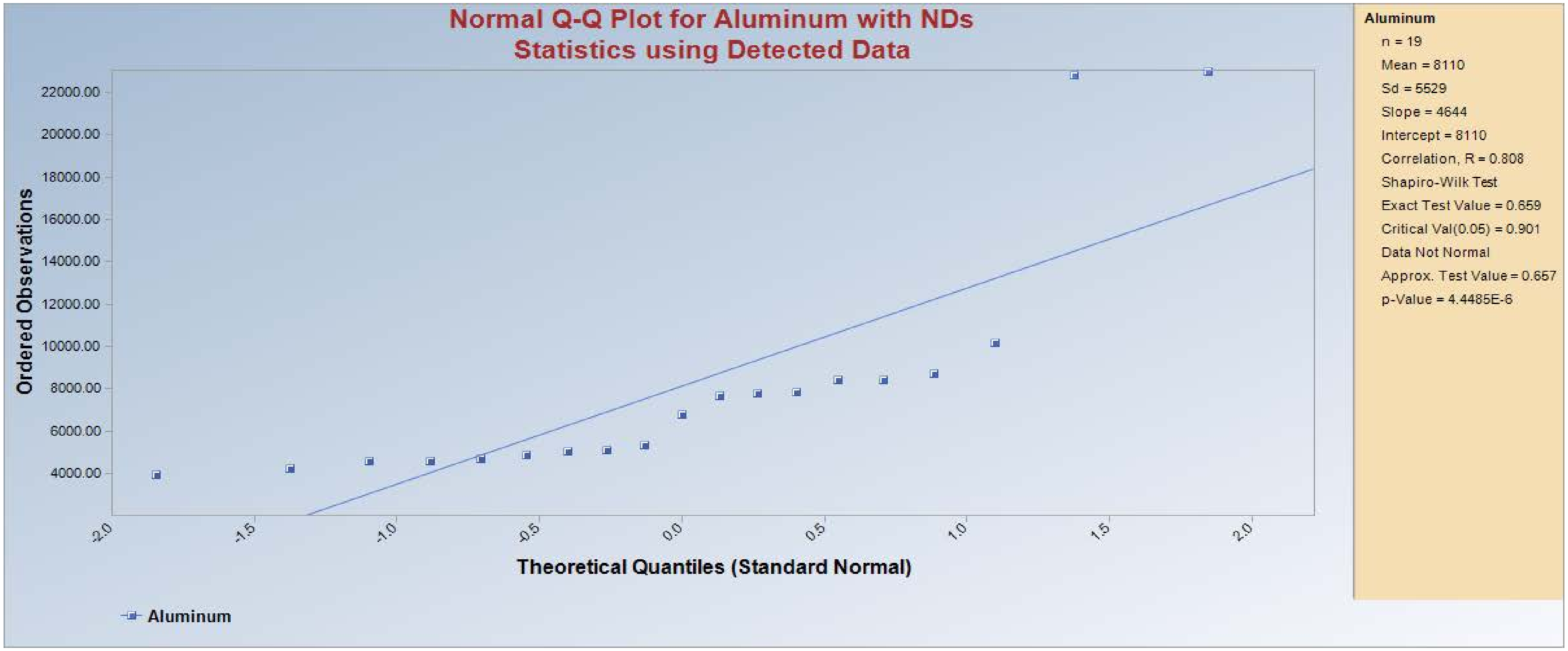
Number of Valid Observations	47	Number of Distinct Observations	45

Raw Statistics		Log-transformed Statistics	
Minimum	8.5	Minimum of Log Data	2.14
Maximum	4810	Maximum of Log Data	8.478
Mean	1148	Mean of log Data	6.435
Geometric Mean	623.3	SD of log Data	1.387
Median	878		
SD	1048		
Std. Error of Mean	152.8		
Coefficient of Variation	0.913		
Skewness	1.307		

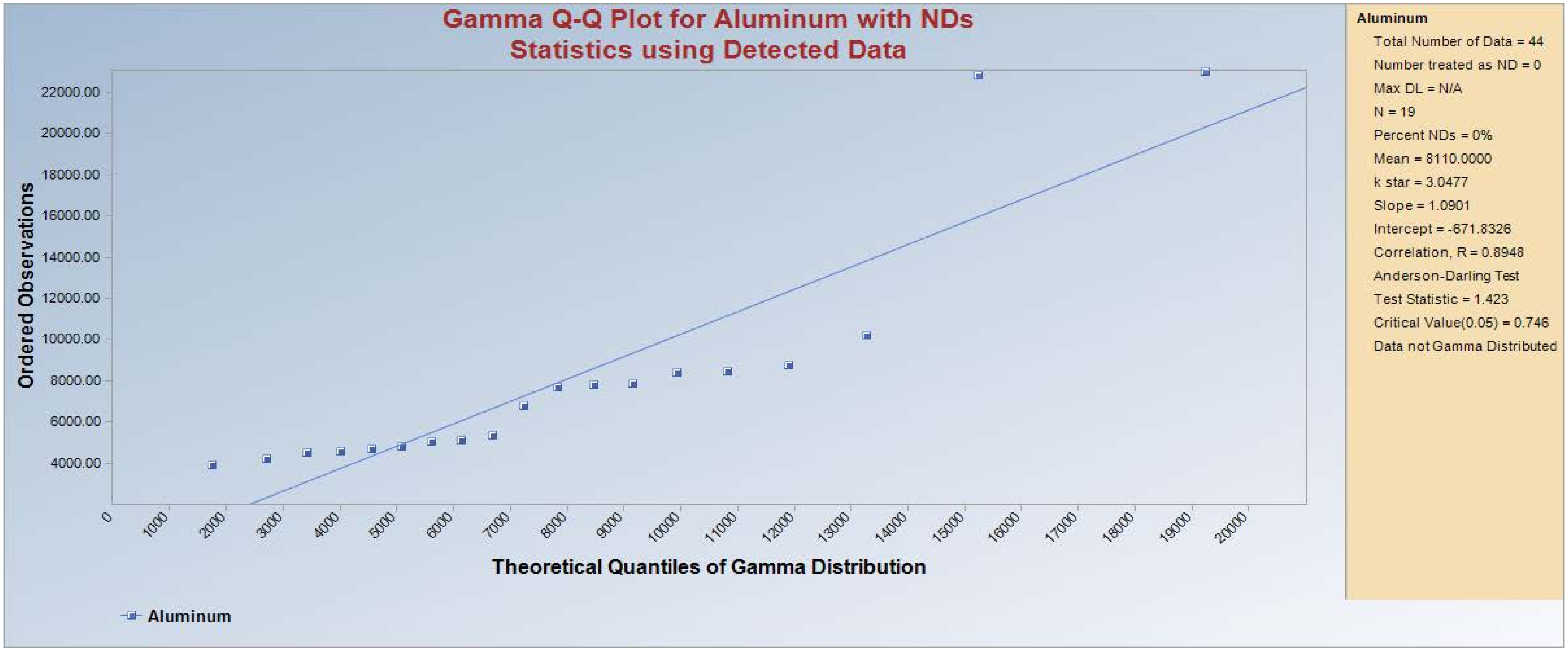
Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.878	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.946	Shapiro Wilk Critical Value	0.946
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1404	95% H-UCL	2880
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3354
95% Adjusted-CLT UCL (Chen-1995)	1430	97.5% Chebyshev (MVUE) UCL	4126
95% Modified-t UCL (Johnson-1978)	1409	99% Chebyshev (MVUE) UCL	5642
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.904	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1269		
MLE of Mean	1148		
MLE of Standard Deviation	1207		
nu star	85.01		
Approximate Chi Square Value (.05)	64.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0449	95% CLT UCL	1399
Adjusted Chi Square Value	64.2	95% Jackknife UCL	1404
		95% Standard Bootstrap UCL	1397
Anderson-Darling Test Statistic	0.446	95% Bootstrap-t UCL	1441
Anderson-Darling 5% Critical Value	0.781	95% Hall's Bootstrap UCL	1450
Kolmogorov-Smirnov Test Statistic	0.105	95% Percentile Bootstrap UCL	1405
Kolmogorov-Smirnov 5% Critical Value	0.133	95% BCA Bootstrap UCL	1426
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1814
		97.5% Chebyshev(Mean, Sd) UCL	2102
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2669
95% Approximate Gamma UCL (Use when n >= 40)	1507		
95% Adjusted Gamma UCL (Use when n < 40)	1520		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1507

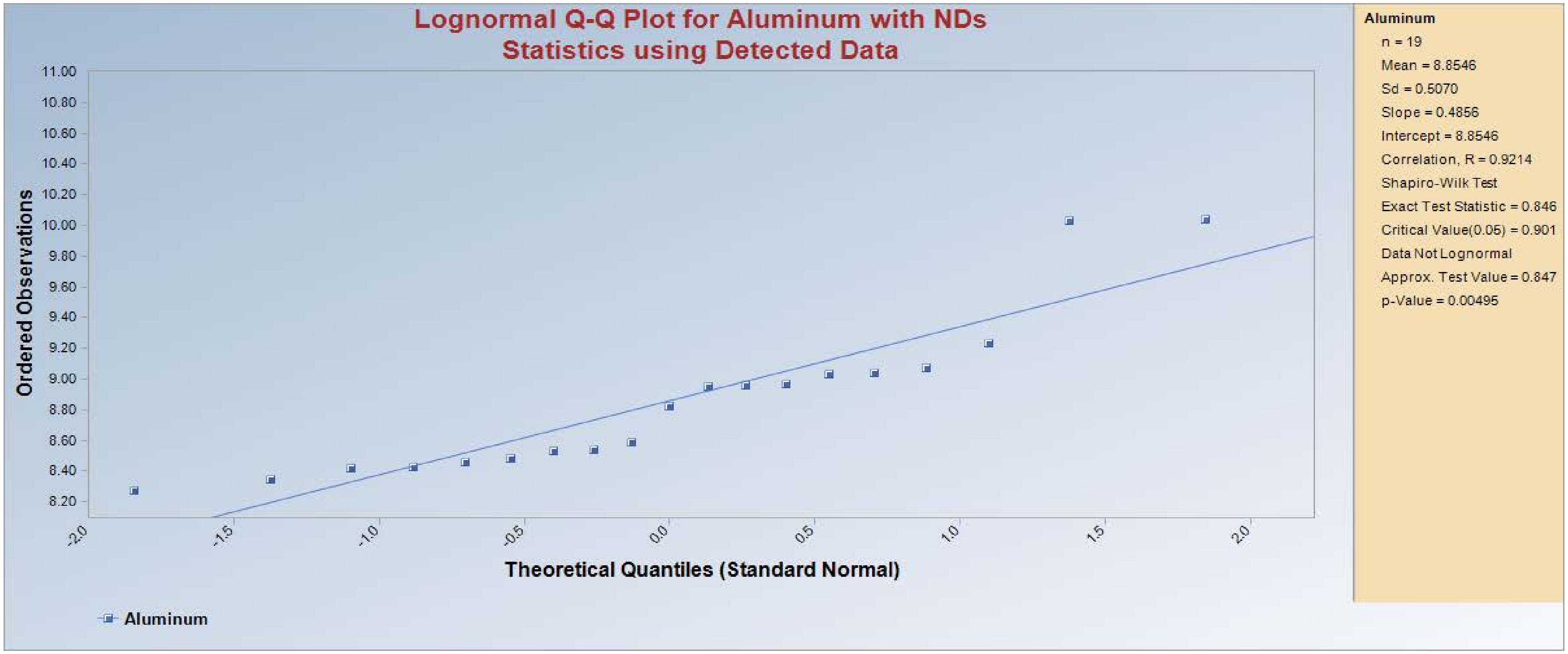
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

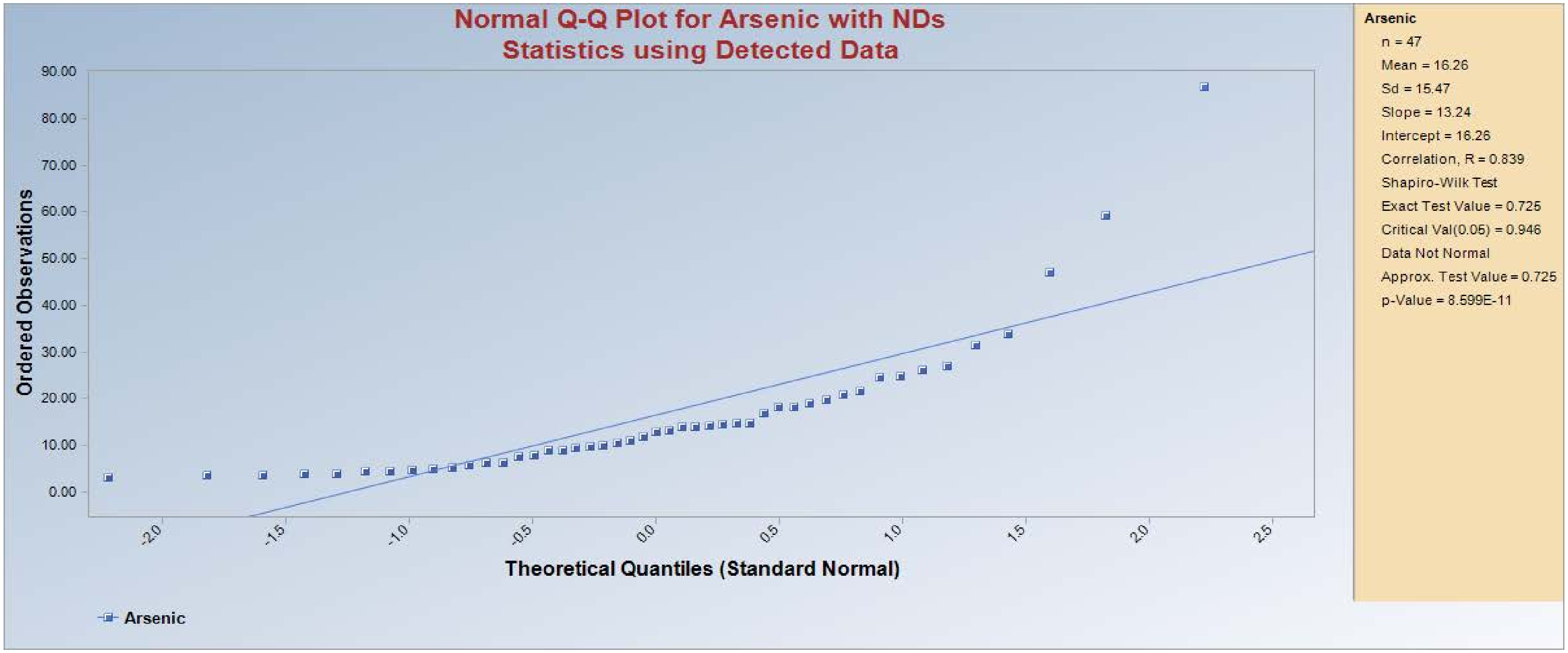


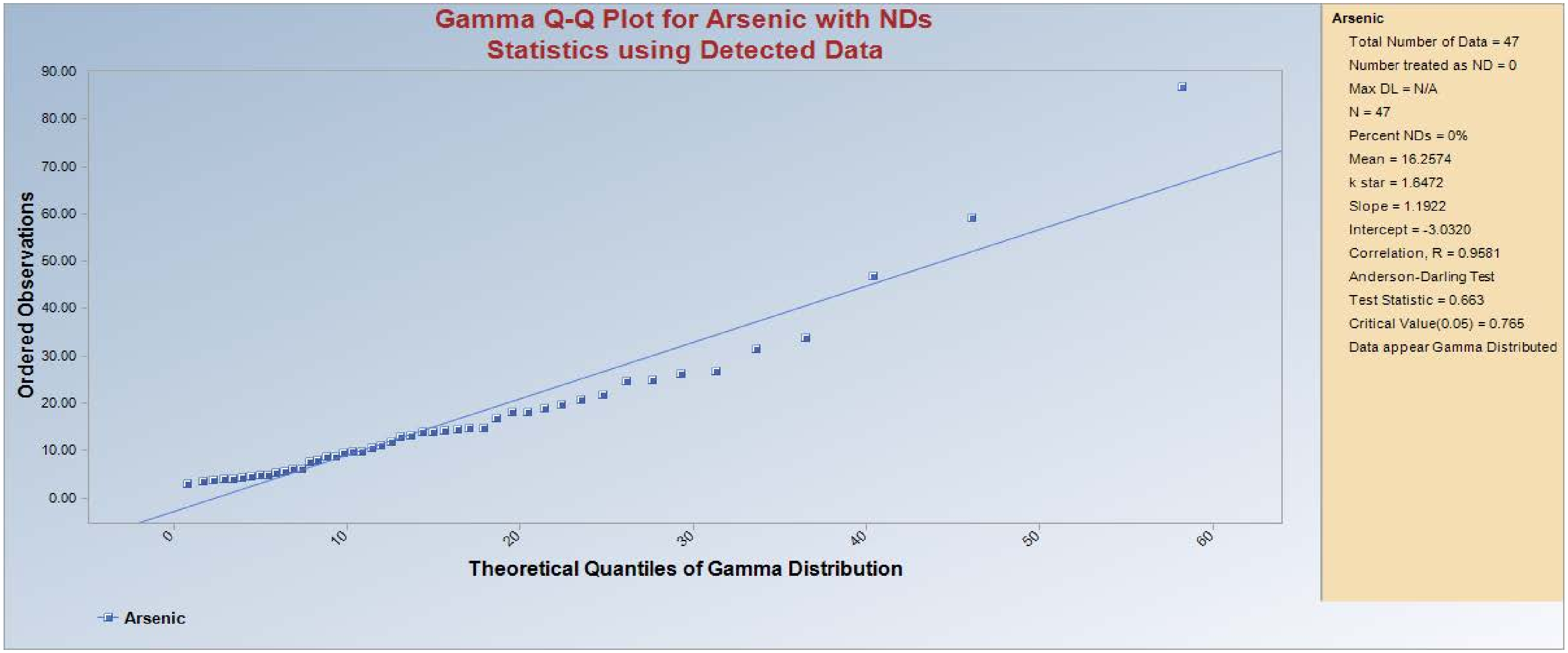
Normal Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Aluminum
Aluminum
n = 19
Mean = 8110
Sd = 5529
Slope = 4644
Intercept = 8110
Correlation, R = 0.808
Shapiro-Wilk Test
Exact Test Value = 0.659
Critical Val(0.05) = 0.901
Data Not Normal
Approx. Test Value = 0.657
p-Value = 4.4485E-6



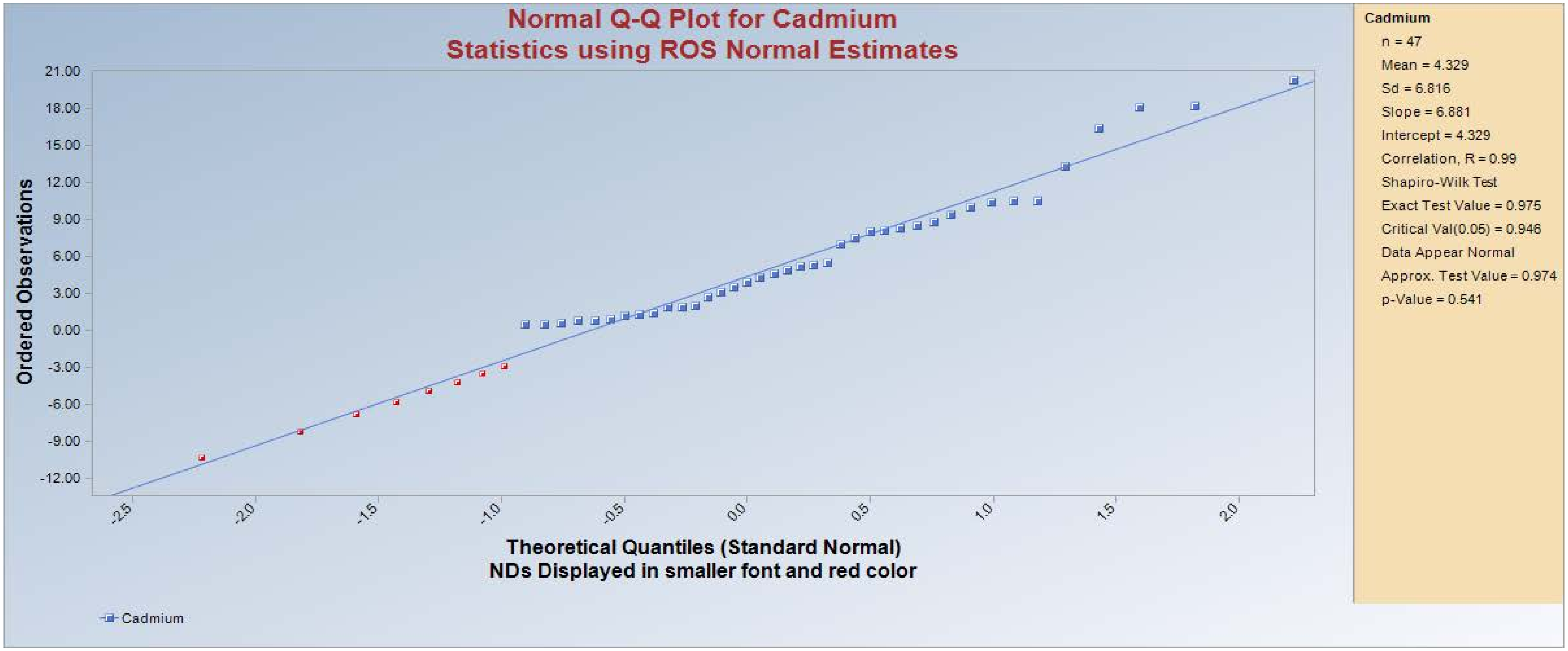
Gamma Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
Ordered Observations
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
Theoretical Quantiles of Gamma Distribution
Aluminum
Aluminum
Total Number of Data = 44
Number treated as ND = 0
Max DL = N/A
N = 19
Percent NDs = 0%
Mean = 8110.0000
k star = 3.0477
Slope = 1.0901
Intercept = -671.8326
Correlation, R = 0.8948
Anderson-Darling Test
Test Statistic = 1.423
Critical Value(0.05) = 0.746
Data not Gamma Distributed

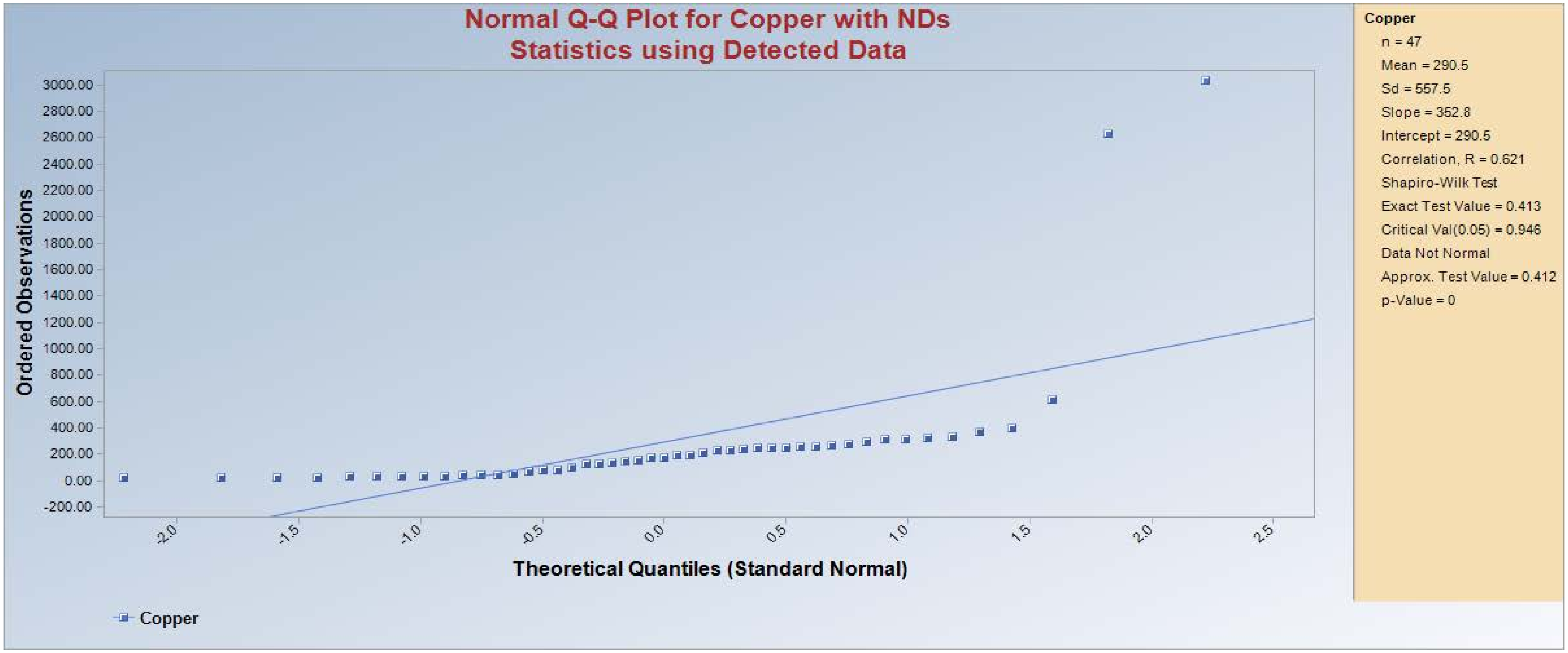

Lognormal Q-Q Plot for Aluminum with NDs
Statistics using Detected Data
11.00
10.80
10.60
10.40
10.20
10.00
9.80
9.60
9.40
9.20
9.00
8.80
8.60
8.40
8.20
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Aluminum
Aluminum
n = 19
Mean = 8.8546
Sd = 0.5070
Slope = 0.4856
Intercept = 8.8546
Correlation, R = 0.9214
Shapiro-Wilk Test
Exact Test Statistic = 0.846
Critical Value(0.05) = 0.901
Data Not Lognormal
Approx. Test Value = 0.847
p-Value = 0.00495


Normal Q-Q Plot for Arsenic with NDs
Statistics using Detected Data
Ordered Observations
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Arsenic
Arsenic
n = 47
Mean = 16.26
Sd = 15.47
Slope = 13.24
Intercept = 16.26
Correlation, R = 0.839
Shapiro-Wilk Test
Exact Test Value = 0.725
Critical Val(0.05) = 0.946
Data Not Normal
Approx. Test Value = 0.725
p-Value = 8.599E-11

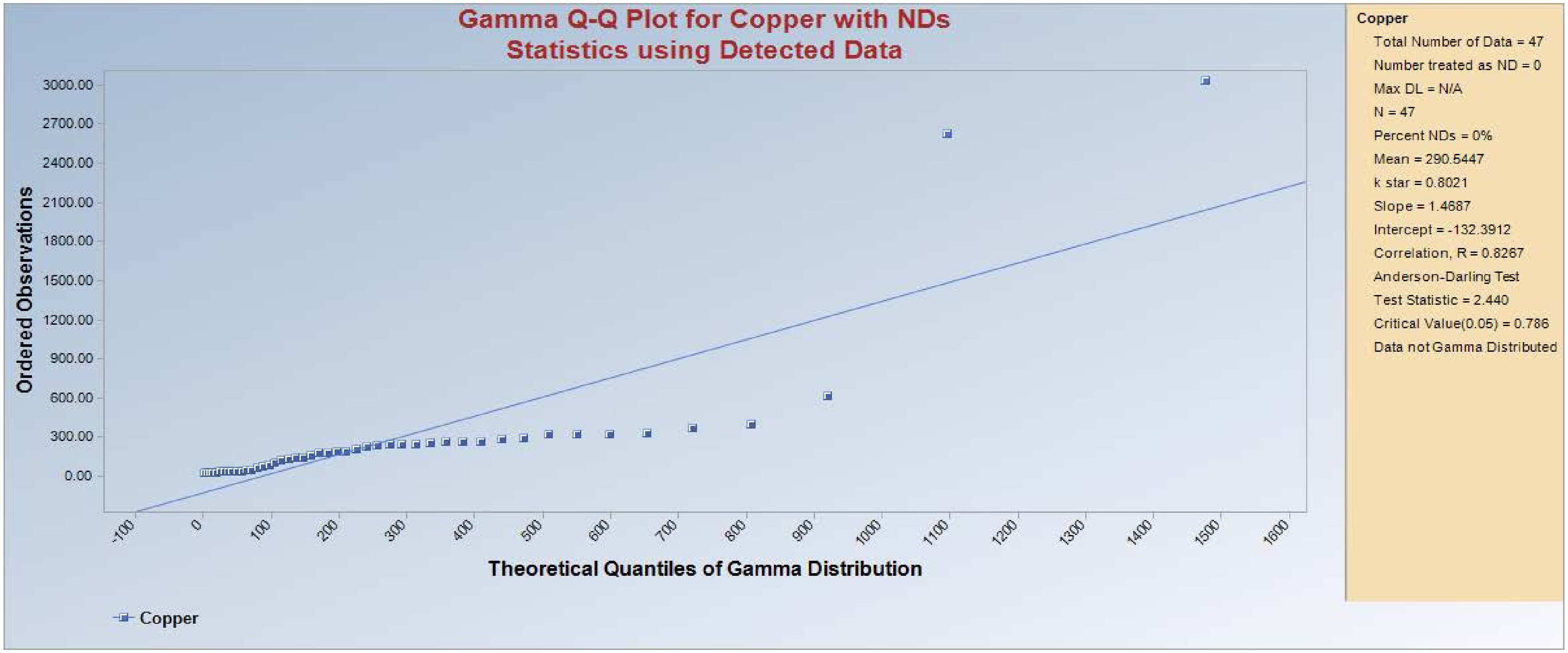


Gamma Q-Q Plot for Arsenic with NDs
Statistics using Detected Data
Ordered Observations
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
10
20
30
40
50
60
Theoretical Quantiles of Gamma Distribution
Arsenic
Arsenic
Total Number of Data = 47
Number treated as ND = 0
Max DL = N/A
N = 47
Percent NDs = 0%
Mean = 16.2574
k star = 1.6472
Slope = 1.1922
Intercept = -3.0320
Correlation, R = 0.9581
Anderson-Darling Test
Test Statistic = 0.663
Critical Value(0.05) = 0.765
Data appear Gamma Distributed

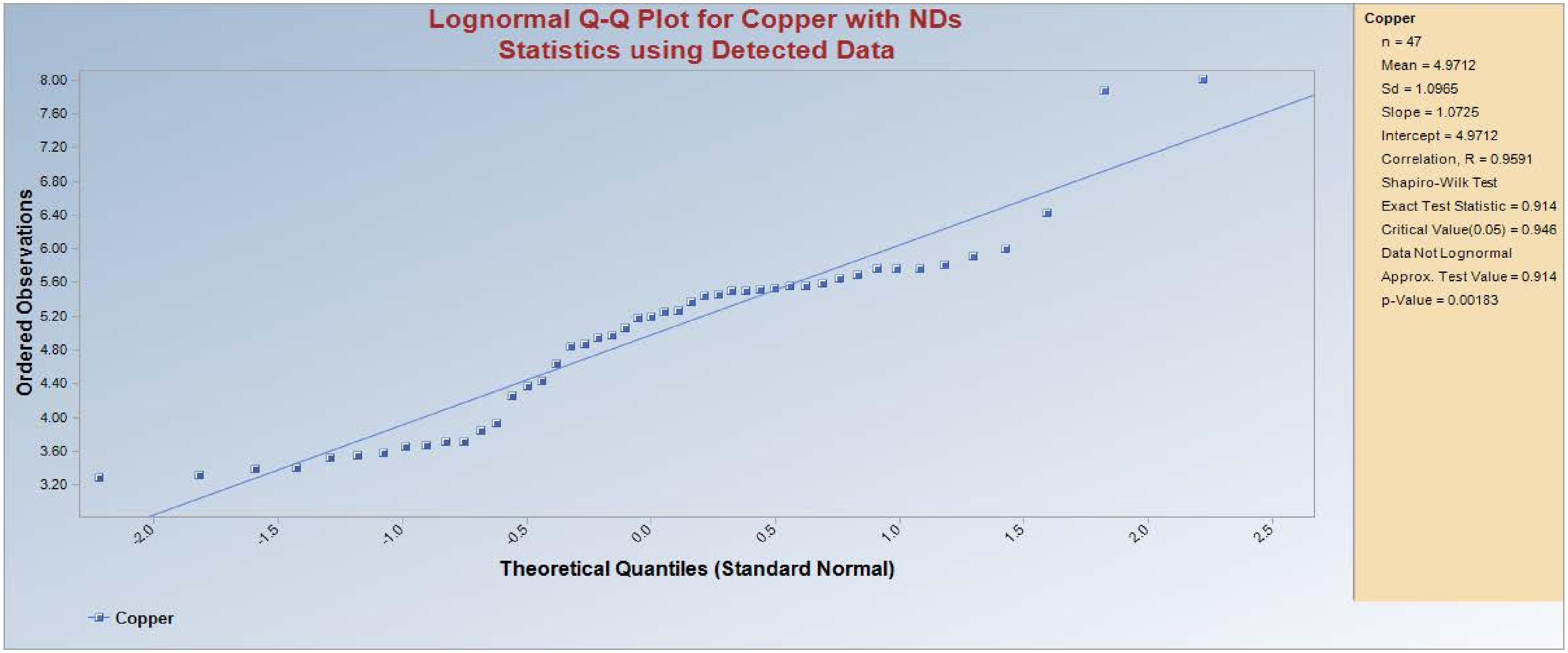

Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-6.00
-9.00
-12.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 47
Mean = 4.329
Sd = 6.816
Slope = 6.881
Intercept = 4.329
Correlation, R = 0.99
Shapiro-Wilk Test
Exact Test Value = 0.975
Critical Val(0.05) = 0.946
Data Appear Normal
Approx. Test Value = 0.974
p-Value = 0.541



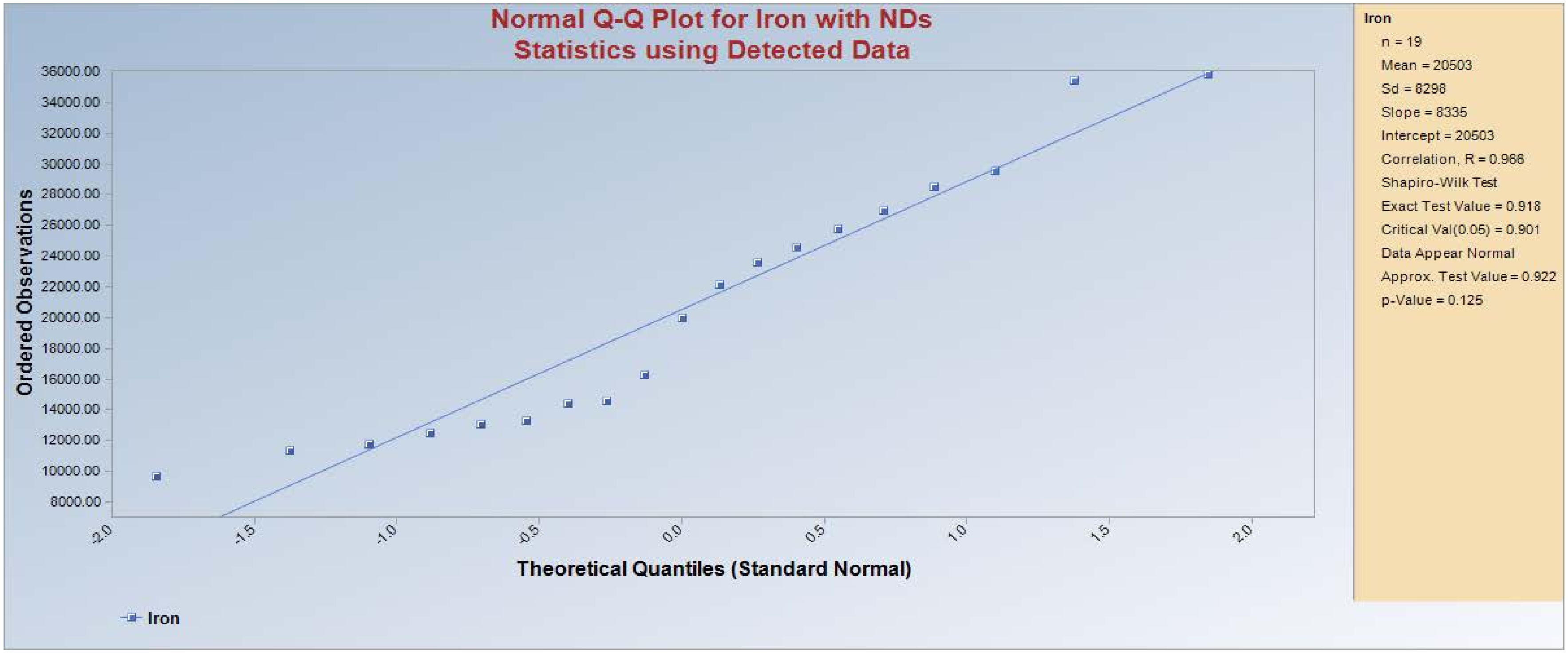
Normal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2800.00
2600.00
2400.00
2200.00
2000.00
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 47
Mean = 290.5
Sd = 557.5
Slope = 352.8
Intercept = 290.5
Correlation, R = 0.621
Shapiro-Wilk Test
Exact Test Value = 0.413
Critical Val(0.05) = 0.946
Data Not Normal
Approx. Test Value = 0.412
p-Value = 0



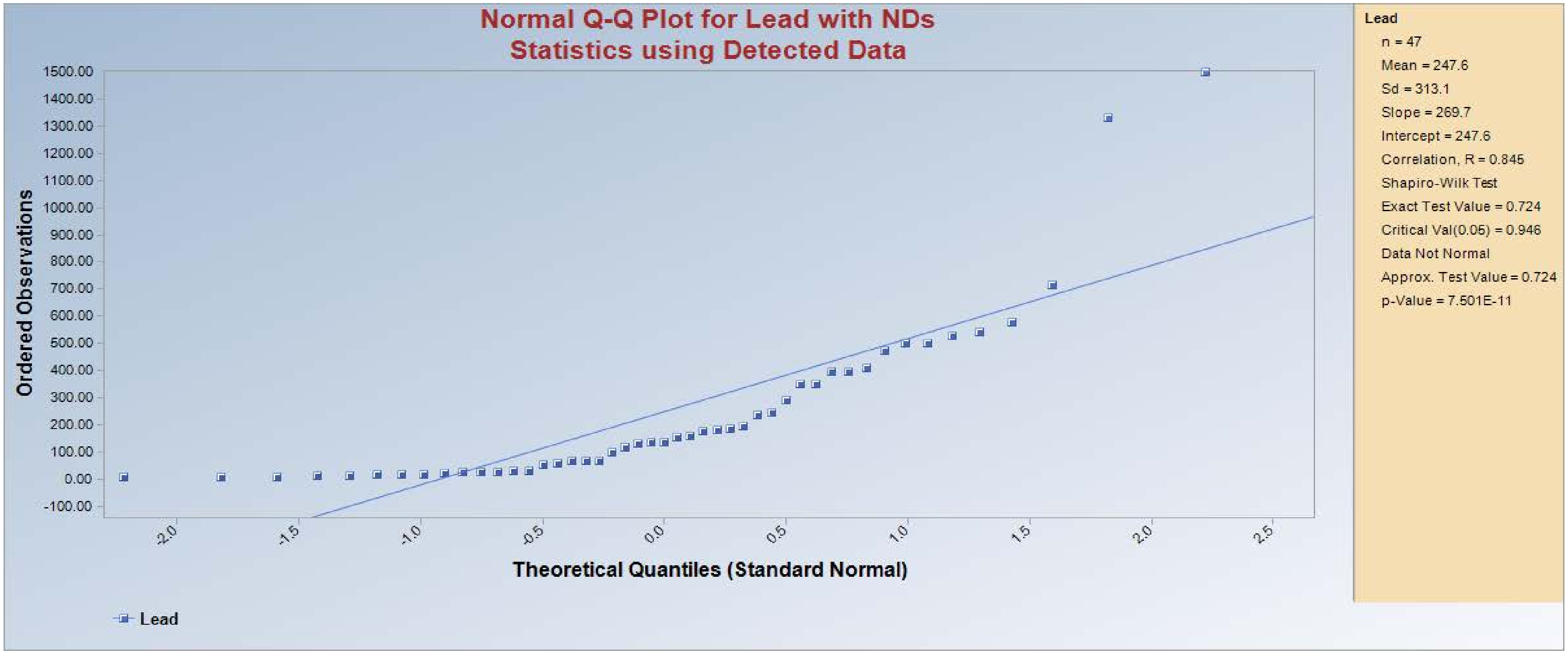
Gamma Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
3000.00
2700.00
2400.00
2100.00
1800.00
1500.00
1200.00
900.00
600.00
300.00
0.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
Theoretical Quantiles of Gamma Distribution
Copper
Copper
Total Number of Data = 47
Number treated as ND = 0
Max DL = N/A
N = 47
Percent NDs = 0%
Mean = 290.5447
k star = 0.8021
Slope = 1.4687
Intercept = -132.3912
Correlation, R = 0.8267
Anderson-Darling Test
Test Statistic = 2.440
Critical Value(0.05) = 0.786
Data not Gamma Distributed

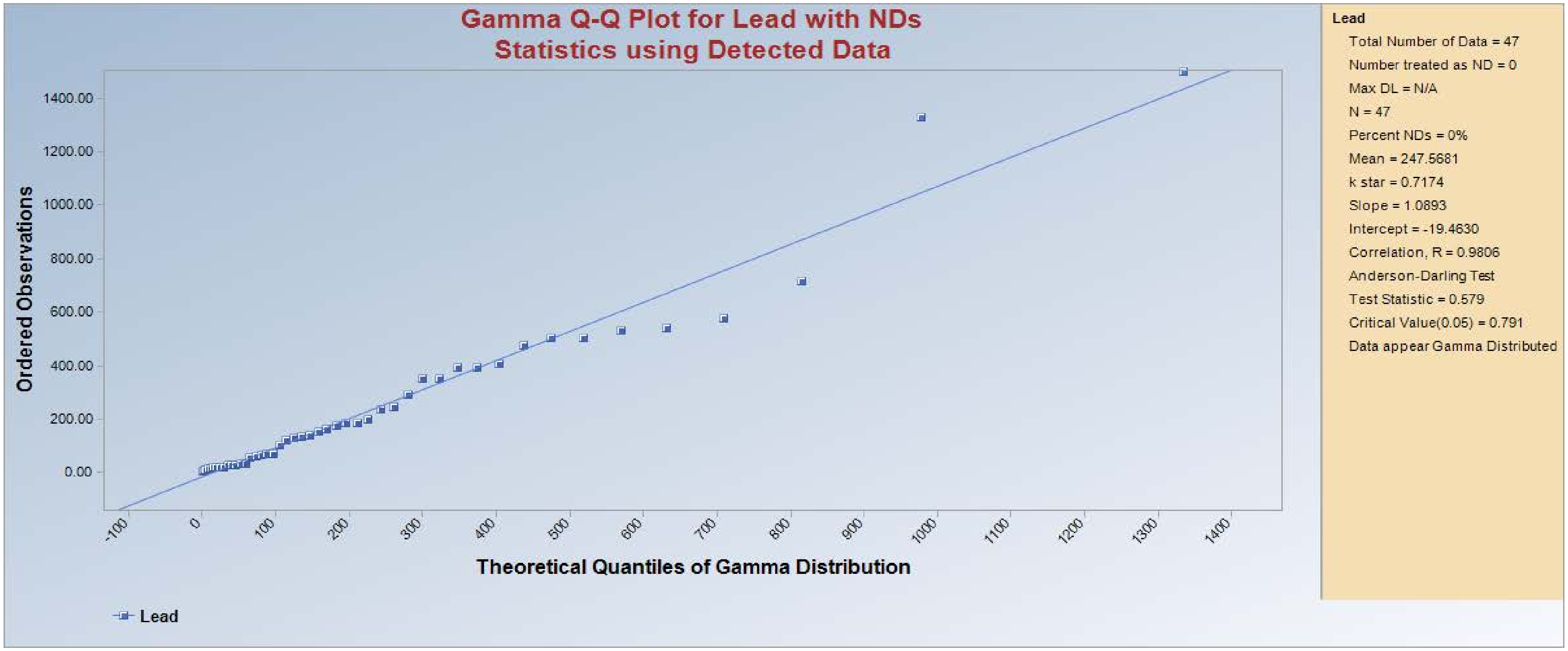


Lognormal Q-Q Plot for Copper with NDs
Statistics using Detected Data
Ordered Observations
8.00
7.60
7.20
6.80
6.40
6.00
5.60
5.20
4.80
4.40
4.00
3.60
3.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Copper
Copper
n = 47
Mean = 4.9712
Sd = 1.0965
Slope = 1.0725
Intercept = 4.9712
Correlation, R = 0.9591
Shapiro-Wilk Test
Exact Test Statistic = 0.914
Critical Value(0.05) = 0.946
Data Not Lognormal
Approx. Test Value = 0.914
p-Value = 0.00183

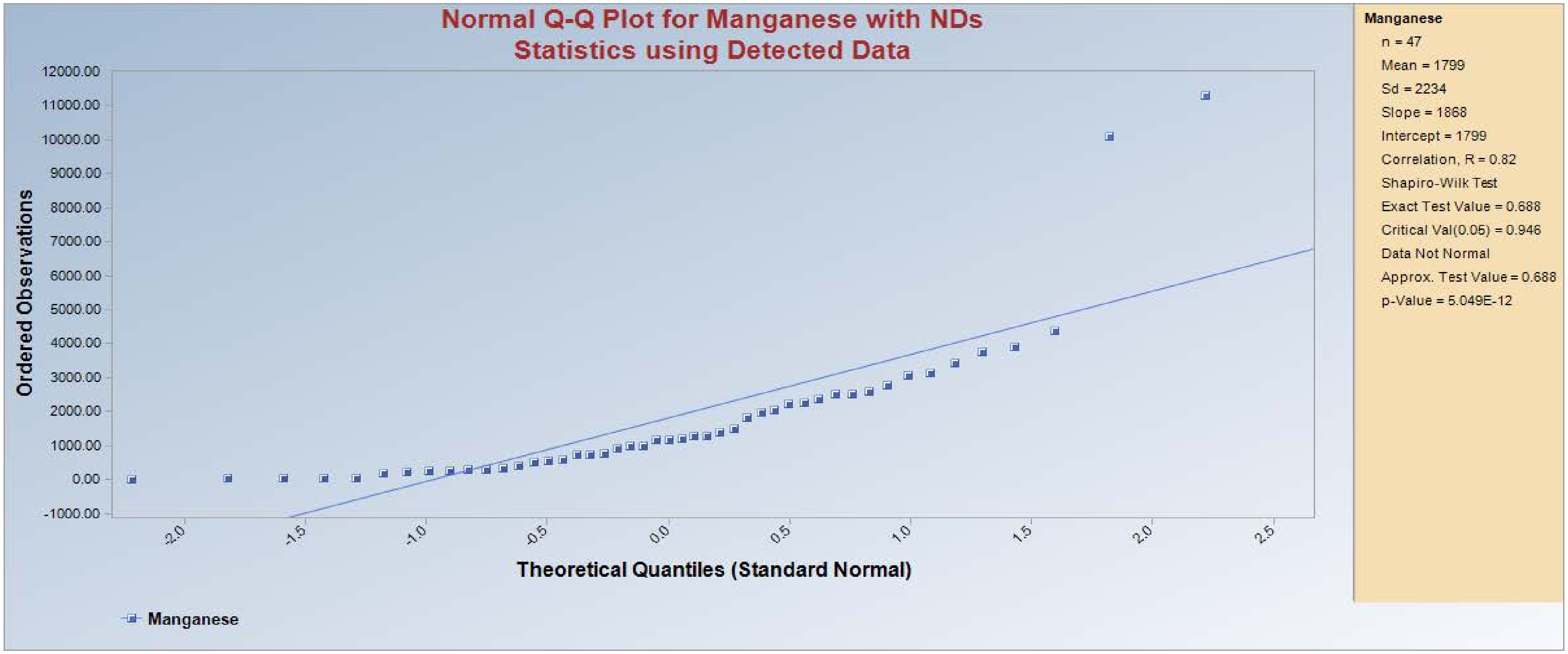


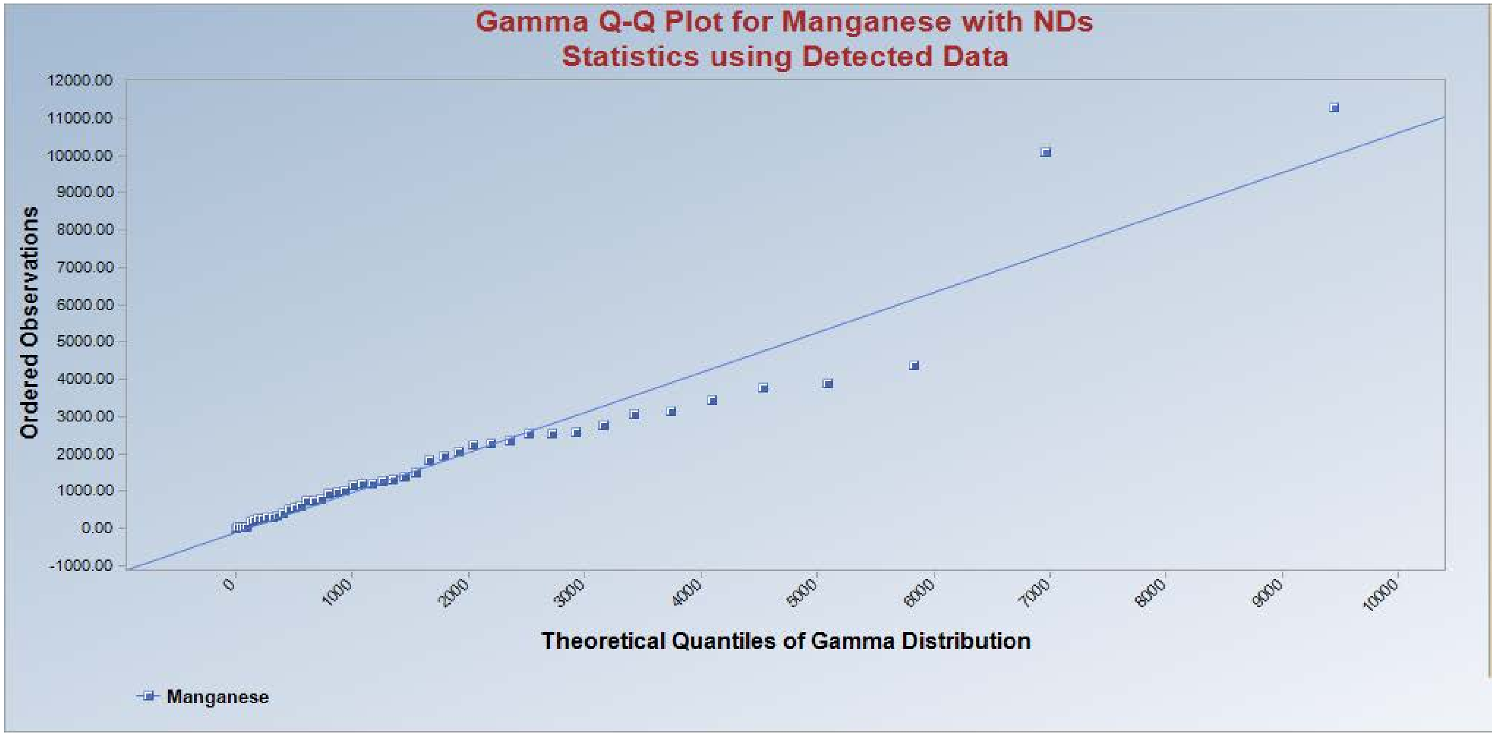
Normal Q-Q Plot for Iron with NDs
Statistics using Detected Data
Ordered Observations
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Iron
Iron
n = 19
Mean = 20503
Sd = 8298
Slope = 8335
Intercept = 20503
Correlation, R = 0.966
Shapiro-Wilk Test
Exact Test Value = 0.918
Critical Val(0.05) = 0.901
Data Appear Normal
Approx. Test Value = 0.922
p-Value = 0.125


Normal Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
1500.00
1400.00
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Lead
Lead
n = 47
Mean = 247.6
Sd = 313.1
Slope = 269.7
Intercept = 247.6
Correlation, R = 0.845
Shapiro-Wilk Test
Exact Test Value = 0.724
Critical Val(0.05) = 0.946
Data Not Normal
Approx. Test Value = 0.724
p-Value = 7.501E-11

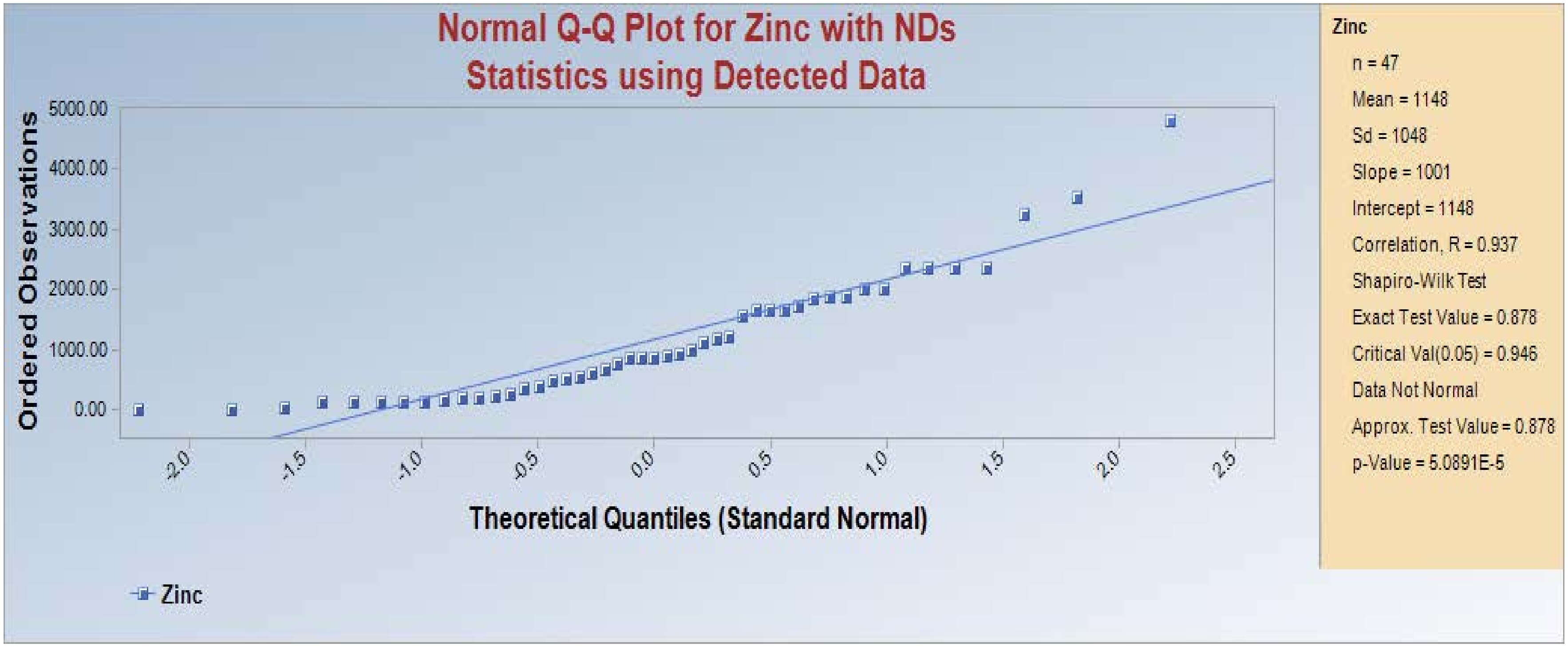


Gamma Q-Q Plot for Lead with NDs
Statistics using Detected Data
Ordered Observations
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Theoretical Quantiles of Gamma Distribution
Lead
Lead
Total Number of Data = 47
Number treated as ND = 0
Max DL = N/A
N = 47
Percent NDs = 0%
Mean = 247.5681
k star = 0.7174
Slope = 1.0893
Intercept = -19.4630
Correlation, R = 0.9806
Anderson-Darling Test
Test Statistic = 0.579
Critical Value(0.05) = 0.791
Data appear Gamma Distributed

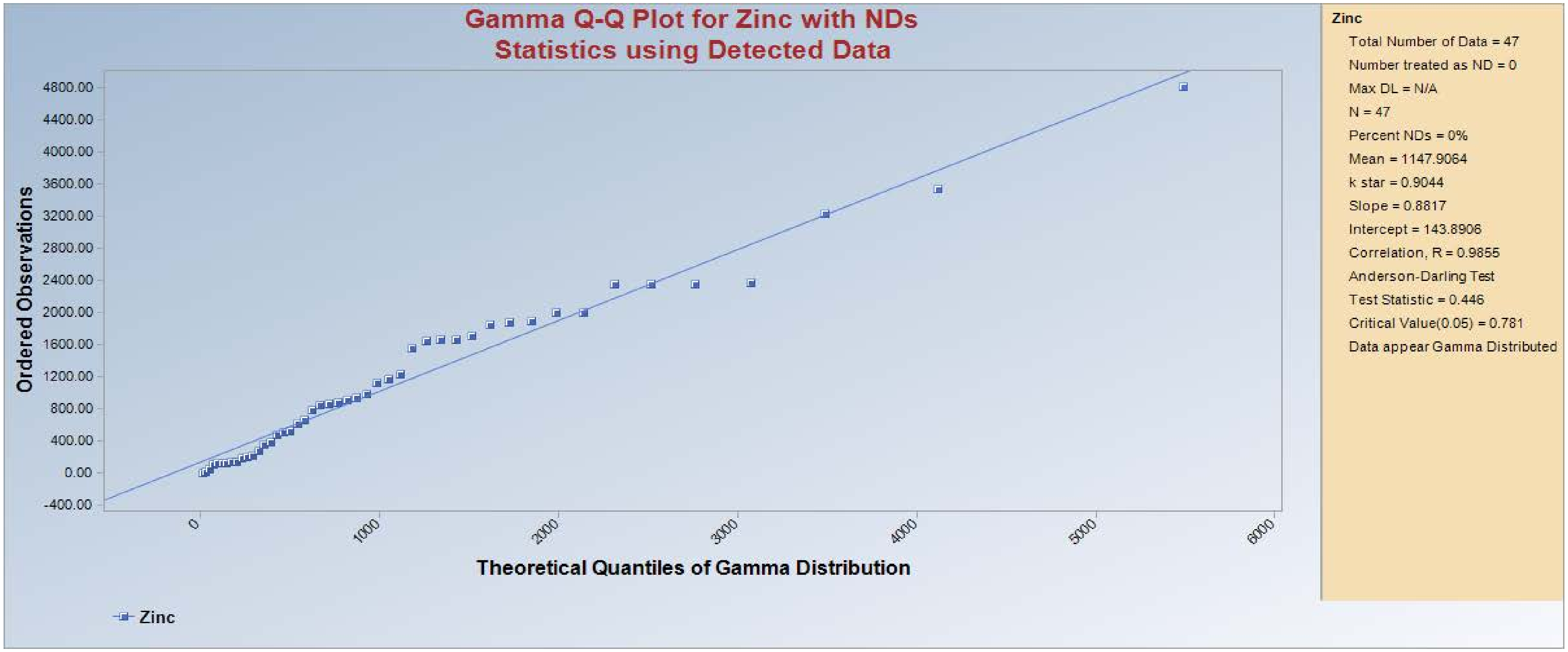

Normal Q-Q Plot for Manganese with NDs
Statistics using Detected Data
Ordered Observations
12000.00
11000.00
10000.00
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-1000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Manganese
Manganese
n = 47
Mean = 1799
Sd = 2234
Slope = 1868
Intercept = 1799
Correlation, R = 0.82
Shapiro-Wilk Test
Exact Test Value = 0.688
Critical Val(0.05) = 0.946
Data Not Normal
Approx. Test Value = 0.688
p-Value = 5.049E-12



Manganese
Total Number of Data = 47
Number treated as ND = 0
Max DL = N/A
N = 47
Percent NDs = 0%
Mean = 1799.3923
k star = 0.7540
Slope = 1.0721
Intercept = -111.5409
Correlation, R = 0.9603
Anderson-Darling Test
Test Statistic = 0.289
Critical Value(0.05) = 0.789
Data appear Gamma Distributed



Normal Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Standard Normal)
Zinc
Zinc
n = 47
Mean = 1148
Sd = 1048
Slope = 1001
Intercept = 1148
Correlation, R = 0.937
Shapiro-Wilk Test
Exact Test Value = 0.878
Critical Val(0.05) = 0.946
Data Not Normal
Approx. Test Value = 0.878
p-Value = 5.0891E-5



Gamma Q-Q Plot for Zinc with NDs
Statistics using Detected Data
Ordered Observations
4800.00
4400.00
4000.00
3600.00
3200.00
2800.00
2400.00
2000.00
1600.00
1200.00
800.00
400.00
0.00
-400.00
0
1000
2000
3000
4000
5000
6000
Theoretical Quantiles of Gamma Distribution
Zinc
Zinc
Total Number of Data = 47
Number treated as ND = 0
Max DL = N/A
N = 47
Percent NDs = 0%
Mean = 1147.9064
k star = 0.9044
Slope = 0.8817
Intercept = 143.8906
Correlation, R = 0.9855
Anderson-Darling Test
Test Statistic = 0.446
Critical Value(0.05) = 0.781
Data appear Gamma Distributed

Attachment A18
ProUCL Output for EU 13 Surface Water

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium

General Statistics

Number of Valid Data	44	Number of Detected Data	37
Number of Distinct Detected Data	37	Number of Non-Detect Data	7
		Percent Non-Detects	15.91%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.00011	Minimum Detected	-9.115
Maximum Detected	0.0342	Maximum Detected	-3.376
Mean of Detected	0.00441	Mean of Detected	-6.26
SD of Detected	0.00688	SD of Detected	1.351
Minimum Non-Detect	0.00008	Minimum Non-Detect	-9.433
Maximum Non-Detect	0.00008	Maximum Non-Detect	-9.433

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.608	Shapiro Wilk Test Statistic	0.979
5% Shapiro Wilk Critical Value	0.936	5% Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00371	Mean	-6.875
SD	0.0065	SD	1.891
95% DL/2 (t) UCL	0.00536	95% H-Stat (DL/2) UCL	0.017
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.00295	Mean in Log Scale	-6.752
SD	0.00723	SD in Log Scale	1.699
95% MLE (t) UCL	0.00478	Mean in Original Scale	0.00372
95% MLE (Tiku) UCL	0.00471	SD in Original Scale	0.00649
		95% t UCL	0.00537
		95% Percentile Bootstrap UCL	0.00539
		95% BCA Bootstrap UCL	0.00589
		95% H UCL	0.0115

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.68	Data appear Lognormal at 5% Significance Level	
Theta Star	0.00649		
nu star	50.31		
A-D Test Statistic	0.945	**Nonparametric Statistics**	
5% A-D Critical Value	0.791	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.791	Mean	0.00373
5% K-S Critical Value	0.151	SD	0.00642
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00098065
		95% KM (t) UCL	0.00537
Assuming Gamma Distribution		95% KM (z) UCL	0.00534
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00536
Minimum	0.000001	95% KM (bootstrap t) UCL	0.00657
Maximum	0.0342	95% KM (BCA) UCL	0.00562
Mean	0.00371	95% KM (Percentile Bootstrap) UCL	0.00552
Median	0.0014	95% KM (Chebyshev) UCL	0.008
SD	0.0065	97.5% KM (Chebyshev) UCL	0.00985
k star	0.35	99% KM (Chebyshev) UCL	0.0135
Theta star	0.0106		
Nu star	30.78	Potential UCLs to Use	
AppChi2	19.11	95% KM (Chebyshev) UCL	0.008
95% Gamma Approximate UCL (Use when n >= 40)	0.00597		
95% Adjusted Gamma UCL (Use when n < 40)	0.00607		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Copper

General Statistics

Number of Valid Data	44	Number of Detected Data	38
Number of Distinct Detected Data	23	Number of Non-Detect Data	6
		Percent Non-Detects	13.64%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.001	Minimum Detected	-6.908
Maximum Detected	0.886	Maximum Detected	-0.121
Mean of Detected	0.0647	Mean of Detected	-4.323
SD of Detected	0.177	SD of Detected	1.61
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.001	Maximum Non-Detect	-6.908

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.383	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.938	5% Shapiro Wilk Critical Value	0.938
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0559	Mean	-4.77
SD	0.166	SD	1.878
95% DL/2 (t) UCL	0.098	95% H-Stat (DL/2) UCL	0.135
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0382	Mean in Log Scale	-4.823
SD	0.18	SD in Log Scale	1.975
95% MLE (t) UCL	0.0837	Mean in Original Scale	0.0559
95% MLE (Tiku) UCL	0.0809	SD in Original Scale	0.166
		95% t UCL	0.098
		95% Percentile Bootstrap UCL	0.0986
		95% BCA Bootstrap UCL	0.121
		95% H UCL	0.169

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.398	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.163		
nu star	30.25		
A-D Test Statistic	3.546	**Nonparametric Statistics**	
5% A-D Critical Value	0.832	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.832	Mean	0.056
5% K-S Critical Value	0.153	SD	0.164
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0251
		95% KM (t) UCL	0.0981
Assuming Gamma Distribution		95% KM (z) UCL	0.0972
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0981
Minimum	0.000001	95% KM (bootstrap t) UCL	0.246
Maximum	0.886	95% KM (BCA) UCL	0.104
Mean	0.0559	95% KM (Percentile Bootstrap) UCL	0.101
Median	0.011	95% KM (Chebyshev) UCL	0.165
SD	0.166	97.5% KM (Chebyshev) UCL	0.213
k star	0.256	99% KM (Chebyshev) UCL	0.305
Theta star	0.218		
Nu star	22.53	Potential UCLs to Use	
AppChi2	12.74	97.5% KM (Chebyshev) UCL	0.213
95% Gamma Approximate UCL (Use when n >= 40)	0.0988		
95% Adjusted Gamma UCL (Use when n < 40)	0.101		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Iron

General Statistics

Number of Valid Data	44	Number of Detected Data	38
Number of Distinct Detected Data	24	Number of Non-Detect Data	6
		Percent Non-Detects	13.64%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	6.72	Maximum Detected	1.905
Mean of Detected	0.485	Mean of Detected	-1.783
SD of Detected	1.176	SD of Detected	1.262
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.4	Shapiro Wilk Test Statistic	0.904
5% Shapiro Wilk Critical Value	0.938	5% Shapiro Wilk Critical Value	0.938
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.423	Mean	-2.043
SD	1.102	SD	1.345
95% DL/2 (t) UCL	0.702	95% H-Stat (DL/2) UCL	0.566
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.286	Mean in Log Scale	-2.14
SD	1.213	SD in Log Scale	1.491
95% MLE (t) UCL	0.593	Mean in Original Scale	0.421
95% MLE (Tiku) UCL	0.578	SD in Original Scale	1.103
		95% t UCL	0.7
		95% Percentile Bootstrap UCL	0.727
		95% BCA Bootstrap UCL	0.901
		95% H UCL	0.703

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.556	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.872		
nu star	42.28		
A-D Test Statistic	3.815	Nonparametric Statistics	
5% A-D Critical Value	0.805	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.805	Mean	0.42
5% K-S Critical Value	0.151	SD	1.091
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.167
		95% KM (t) UCL	0.701
Assuming Gamma Distribution		95% KM (z) UCL	0.695
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.695
Minimum	0.000001	95% KM (bootstrap t) UCL	1.409
Maximum	6.72	95% KM (BCA) UCL	0.746
Mean	0.419	95% KM (Percentile Bootstrap) UCL	0.714
Median	0.11	95% KM (Chebyshev) UCL	1.147
SD	1.104	97.5% KM (Chebyshev) UCL	1.461
k star	0.27	99% KM (Chebyshev) UCL	2.078
Theta star	1.55		
Nu star	23.8	Potential UCLs to Use	
AppChi2	13.7	95% KM (Chebyshev) UCL	1.147
95% Gamma Approximate UCL (Use when n >= 40)	0.728		
95% Adjusted Gamma UCL (Use when n < 40)	0.742		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Data	44	Number of Detected Data	34
Number of Distinct Detected Data	27	Number of Non-Detect Data	10
		Percent Non-Detects	22.73%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0006	Minimum Detected	-7.419
Maximum Detected	0.0798	Maximum Detected	-2.528
Mean of Detected	0.00876	Mean of Detected	-5.588
SD of Detected	0.0159	SD of Detected	1.214
Minimum Non-Detect	0.0005	Minimum Non-Detect	-7.601
Maximum Non-Detect	0.0005	Maximum Non-Detect	-7.601

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.529	Shapiro Wilk Test Statistic	0.944
5% Shapiro Wilk Critical Value	0.933	5% Shapiro Wilk Critical Value	0.933
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00683	Mean	-6.203
SD	0.0144	SD	1.564
95% DL/2 (t) UCL	0.0105	95% H-Stat (DL/2) UCL	0.0143
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.00412	Mean in Log Scale	-6.233
SD	0.0168	SD in Log Scale	1.635
95% MLE (t) UCL	0.00838	Mean in Original Scale	0.00683
95% MLE (Tiku) UCL	0.00835	SD in Original Scale	0.0144
		95% t UCL	0.0105
		95% Percentile Bootstrap UCL	0.0105
		95% BCA Bootstrap UCL	0.0127
		95% H UCL	0.0165

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.666	Data appear Lognormal at 5% Significance Level	
Theta Star	0.0132		
nu star	45.3		
A-D Test Statistic	2.112	Nonparametric Statistics	
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.792	Mean	0.00691
5% K-S Critical Value	0.157	SD	0.0142
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00217
		95% KM (t) UCL	0.0106
Assuming Gamma Distribution		95% KM (z) UCL	0.0105
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0105
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0152
Maximum	0.0798	95% KM (BCA) UCL	0.0106
Mean	0.00677	95% KM (Percentile Bootstrap) UCL	0.0106
Median	0.00215	95% KM (Chebyshev) UCL	0.0164
SD	0.0144	97.5% KM (Chebyshev) UCL	0.0204
k star	0.279	99% KM (Chebyshev) UCL	0.0285
Theta star	0.0243		
Nu star	24.52	Potential UCLs to Use	
AppChi2	14.24	95% KM (Chebyshev) UCL	0.0164
95% Gamma Approximate UCL (Use when n >= 40)	0.0117		
95% Adjusted Gamma UCL (Use when n < 40)	0.0119		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Manganese

General Statistics

Number of Valid Data	44	Number of Detected Data	41
Number of Distinct Detected Data	39	Number of Non-Detect Data	3
		Percent Non-Detects	6.82%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.004	Minimum Detected	-5.521
Maximum Detected	2.12	Maximum Detected	0.751
Mean of Detected	0.39	Mean of Detected	-2.073
SD of Detected	0.527	SD of Detected	1.742
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.733	Shapiro Wilk Test Statistic	0.949
5% Shapiro Wilk Critical Value	0.941	5% Shapiro Wilk Critical Value	0.941
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.363	Mean	-2.341
SD	0.518	SD	1.954
95% DL/2 (t) UCL	0.494	95% H-Stat (DL/2) UCL	1.906
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.333	Mean in Log Scale	-2.327
SD	0.548	SD in Log Scale	1.933
95% MLE (t) UCL	0.472	Mean in Original Scale	0.363
95% MLE (Tiku) UCL	0.464	SD in Original Scale	0.518
		95% t UCL	0.494
		95% Percentile Bootstrap UCL	0.493
		95% BCA Bootstrap UCL	0.513
		95% H UCL	1.813

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.529	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.736		
nu star	43.37		
A-D Test Statistic	0.783	Nonparametric Statistics	
5% A-D Critical Value	0.808	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.808	Mean	0.363
5% K-S Critical Value	0.145	SD	0.512
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0781
		95% KM (t) UCL	0.495
Assuming Gamma Distribution		95% KM (z) UCL	0.492
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.494
Minimum	0.000001	95% KM (bootstrap t) UCL	0.529
Maximum	2.12	95% KM (BCA) UCL	0.493
Mean	0.363	95% KM (Percentile Bootstrap) UCL	0.494
Median	0.107	95% KM (Chebyshev) UCL	0.704
SD	0.518	97.5% KM (Chebyshev) UCL	0.851
k star	0.35	99% KM (Chebyshev) UCL	1.141
Theta star	1.036		
Nu star	30.84	Potential UCLs to Use	
AppChi2	19.15	95% KM (Chebyshev) UCL	0.704
95% Gamma Approximate UCL (Use when n >= 40)	0.584		
95% Adjusted Gamma UCL (Use when n < 40)	0.594		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Zinc

General Statistics

Number of Valid Data	44	Number of Detected Data	43
Number of Distinct Detected Data	33	Number of Non-Detect Data	1
		Percent Non-Detects	2.27%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	4.01	Maximum Detected	1.389
Mean of Detected	0.857	Mean of Detected	-1.087
SD of Detected	1.068	SD of Detected	1.644
Minimum Non-Detect	0.01	Minimum Non-Detect	-4.605
Maximum Non-Detect	0.01	Maximum Non-Detect	-4.605

UCL Statistics

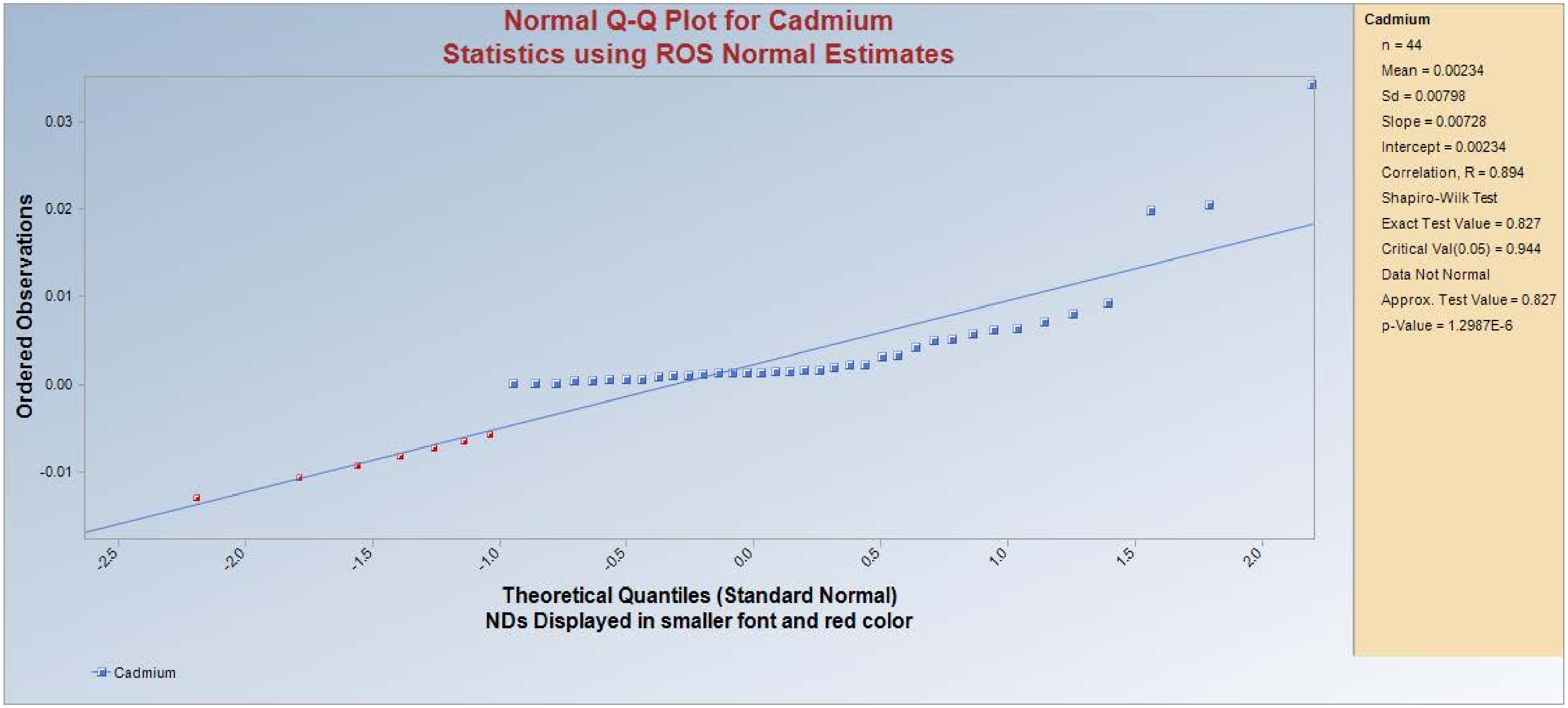
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.747	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.943	5% Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.838	Mean	-1.183
SD	1.063	SD	1.745
95% DL/2 (t) UCL	1.107	95% H-Stat (DL/2) UCL	3.391
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.824	Mean in Log Scale	-1.182
SD	1.069	SD in Log Scale	1.742
95% MLE (t) UCL	1.095	Mean in Original Scale	0.838
95% MLE (Tiku) UCL	1.074	SD in Original Scale	1.063
		95% t UCL	1.107
		95% Percentile Bootstrap UCL	1.123
		95% BCA Bootstrap UCL	1.154
		95% H UCL	3.373

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.624
Theta Star	1.374
nu star	53.65
A-D Test Statistic	0.323
5% A-D Critical Value	0.799
K-S Test Statistic	0.799
5% K-S Critical Value	0.141
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.000001
Maximum	4.01
Mean	0.838
Median	0.405
SD	1.063
k star	0.505
Theta star	1.659
Nu star	44.43
AppChi2	30.14
95% Gamma Approximate UCL (Use when n >= 40)	1.235
95% Adjusted Gamma UCL (Use when n < 40)	1.251

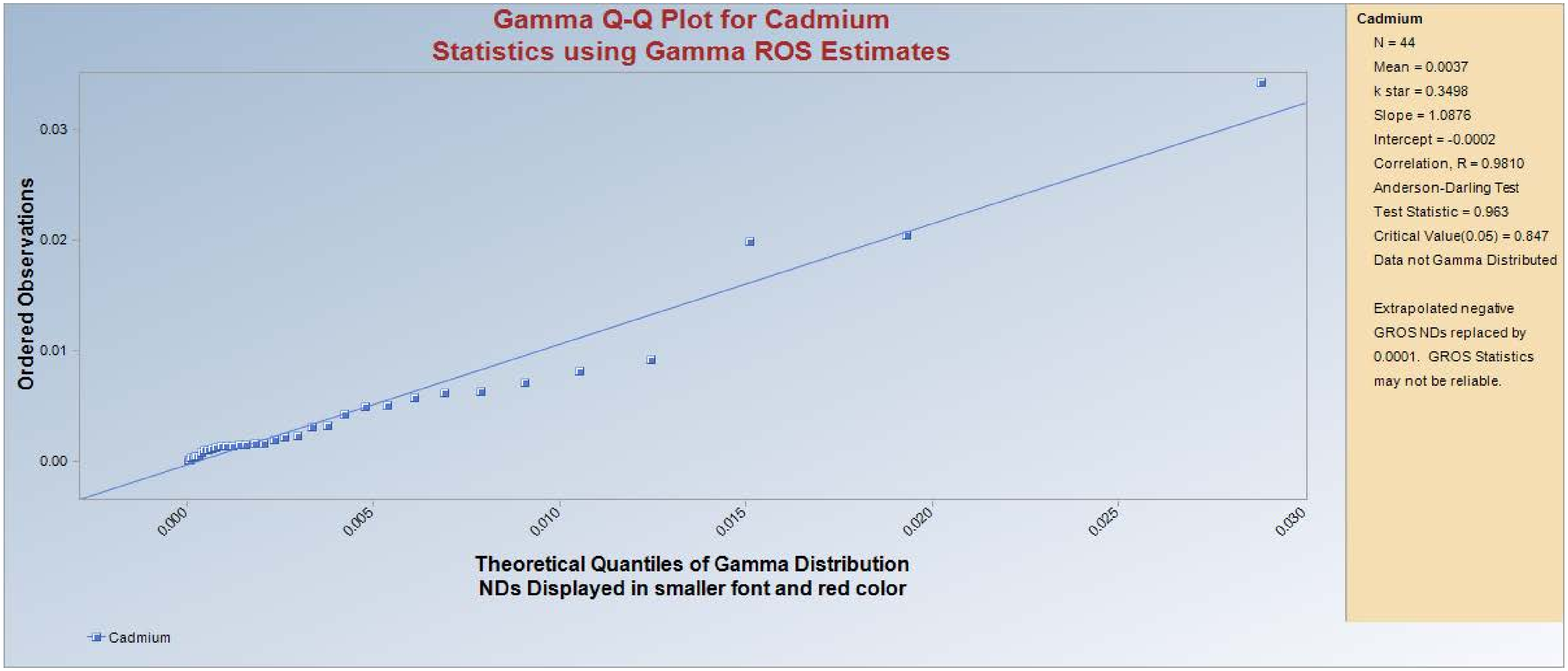
Note: DL/2 is not a recommended method.

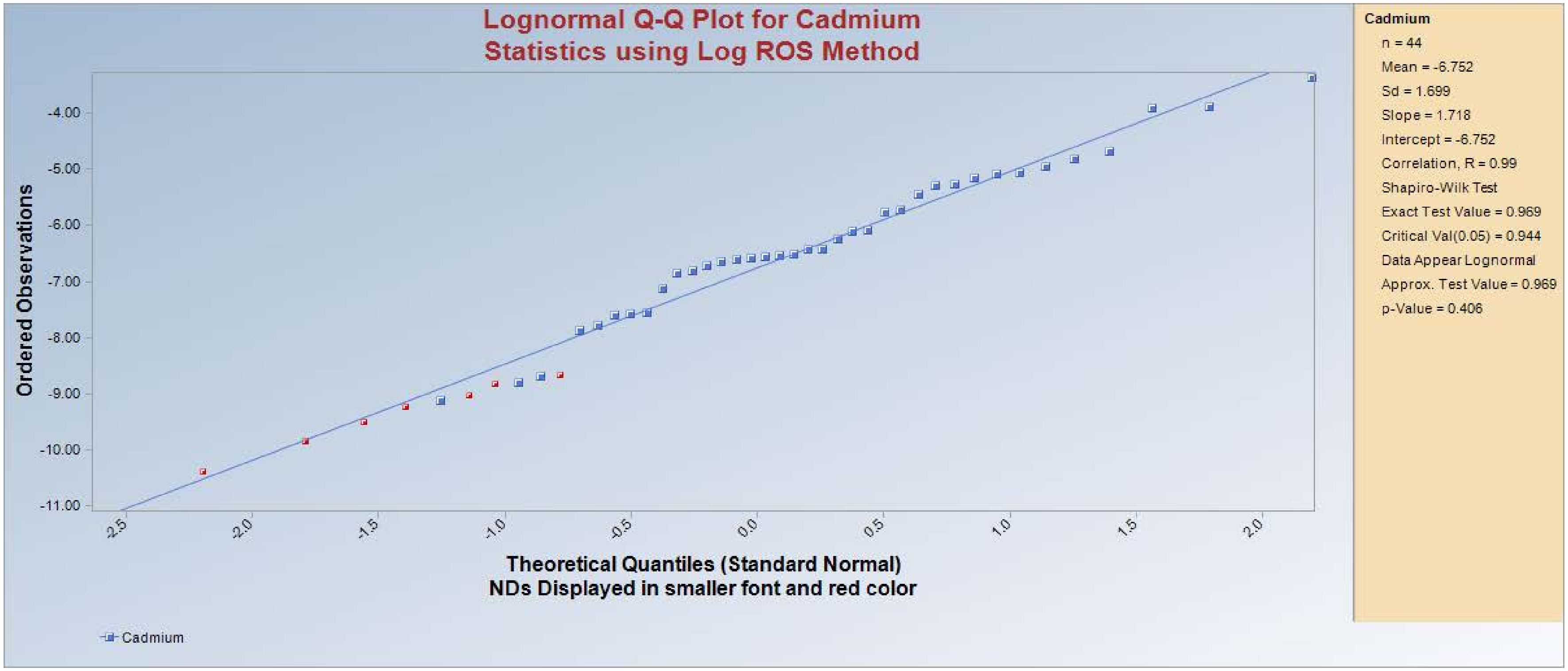
Data Distribution Test with Detected Values Only	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.838
SD	1.051
SE of Mean	0.16
95% KM (t) UCL	1.107
95% KM (z) UCL	1.101
95% KM (jackknife) UCL	1.107
95% KM (bootstrap t) UCL	1.179
95% KM (BCA) UCL	1.096
95% KM (Percentile Bootstrap) UCL	1.11
95% KM (Chebyshev) UCL	1.536
97.5% KM (Chebyshev) UCL	1.839
99% KM (Chebyshev) UCL	2.433
Potential UCLs to Use	
95% KM (Chebyshev) UCL	1.536

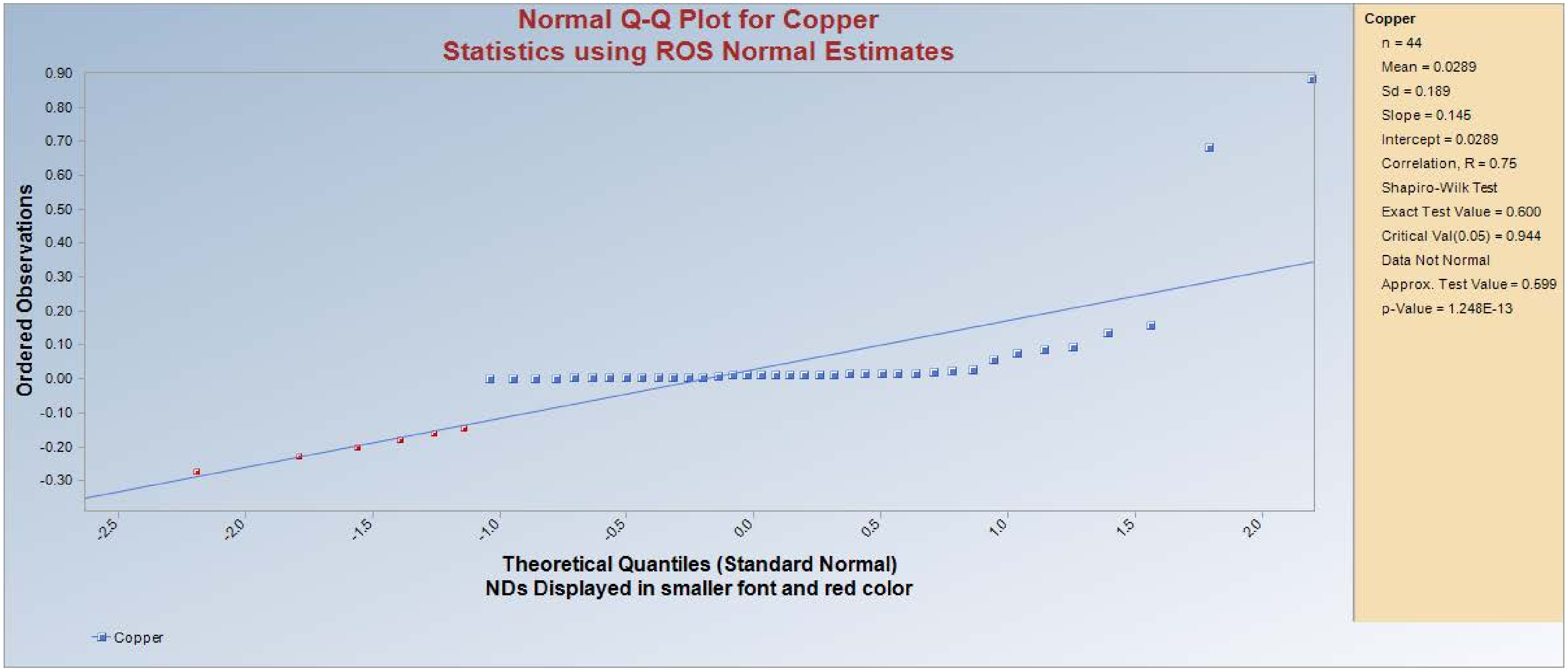
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

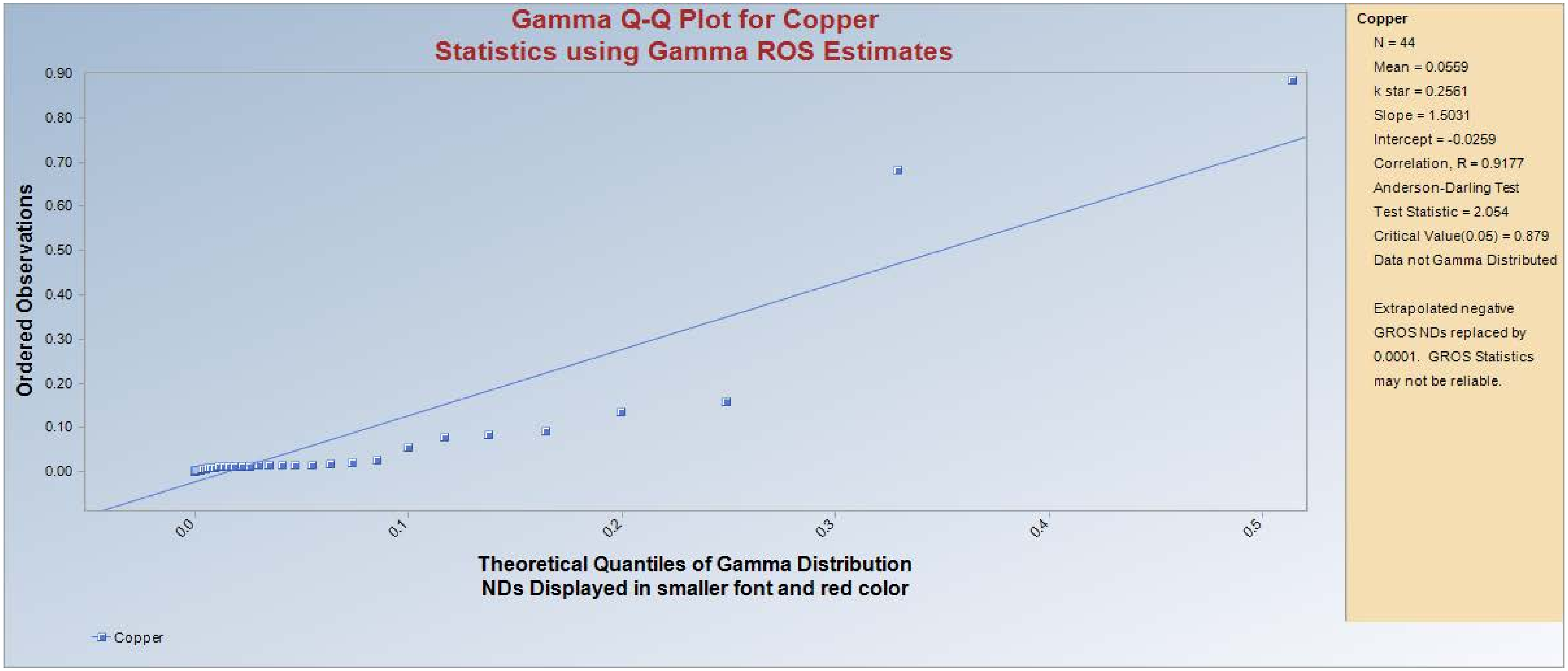


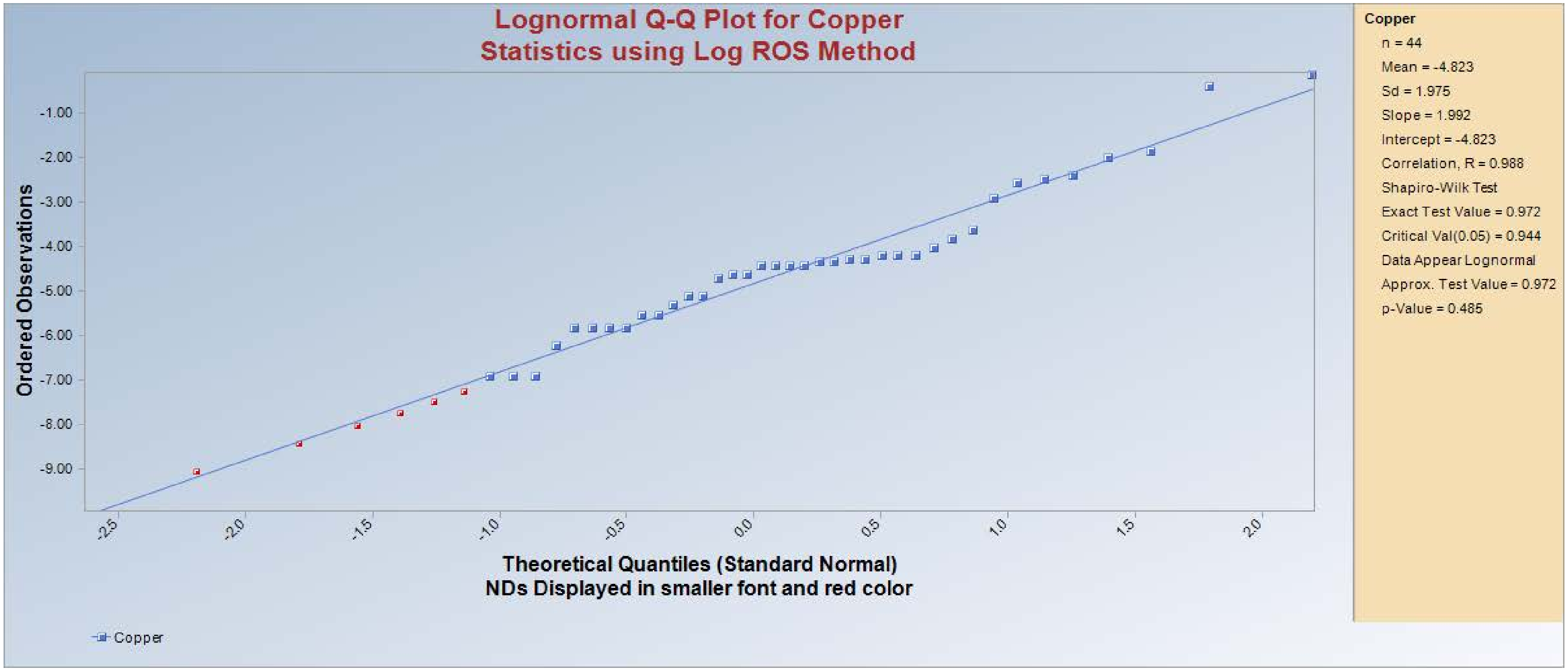
Normal Q-Q Plot for Cadmium
Statistics using ROS Normal Estimates
Ordered Observations
0.03
0.02
0.01
0.00
-0.01
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 44
Mean = 0.00234
Sd = 0.00798
Slope = 0.00728
Intercept = 0.00234
Correlation, R = 0.894
Shapiro-Wilk Test
Exact Test Value = 0.827
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.827
p-Value = 1.2987E-6

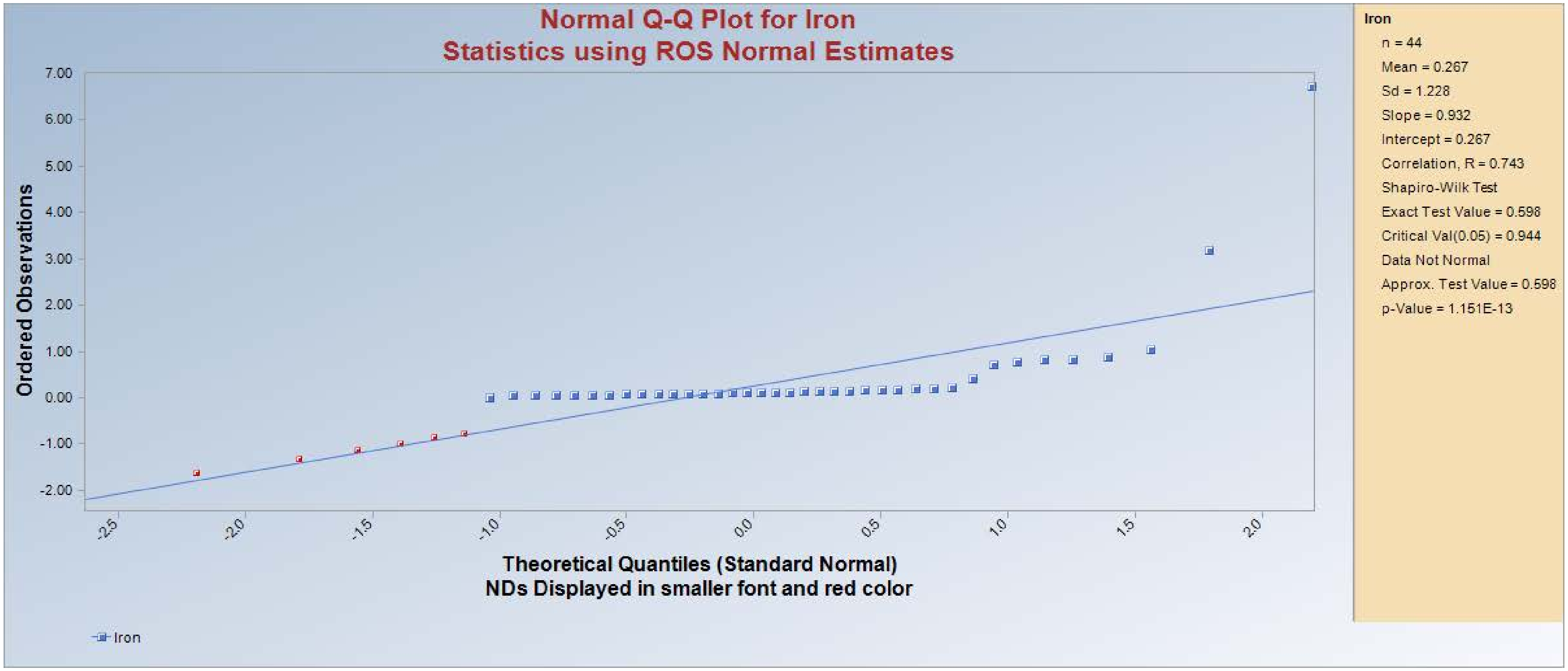

Gamma Q-Q Plot for Cadmium
Statistics using Gamma ROS Estimates
Ordered Observations
0.03
0.02
0.01
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Cadmium
Cadmium
N = 44
Mean = 0.0037
k star = 0.3498
Slope = 1.0876
Intercept = -0.0002
Correlation, R = 0.9810
Anderson-Darling Test
Test Statistic = 0.963
Critical Value(0.05) = 0.847
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.


Lognormal Q-Q Plot for Cadmium
Statistics using Log ROS Method
Ordered Observations
-4.00
-5.00
-6.00
-7.00
-8.00
-9.00
-10.00
-11.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Cadmium
Cadmium
n = 44
Mean = -6.752
Sd = 1.699
Slope = 1.718
Intercept = -6.752
Correlation, R = 0.99
Shapiro-Wilk Test
Exact Test Value = 0.969
Critical Val(0.05) = 0.944
Data Appear Lognormal
Approx. Test Value = 0.969
p-Value = 0.406

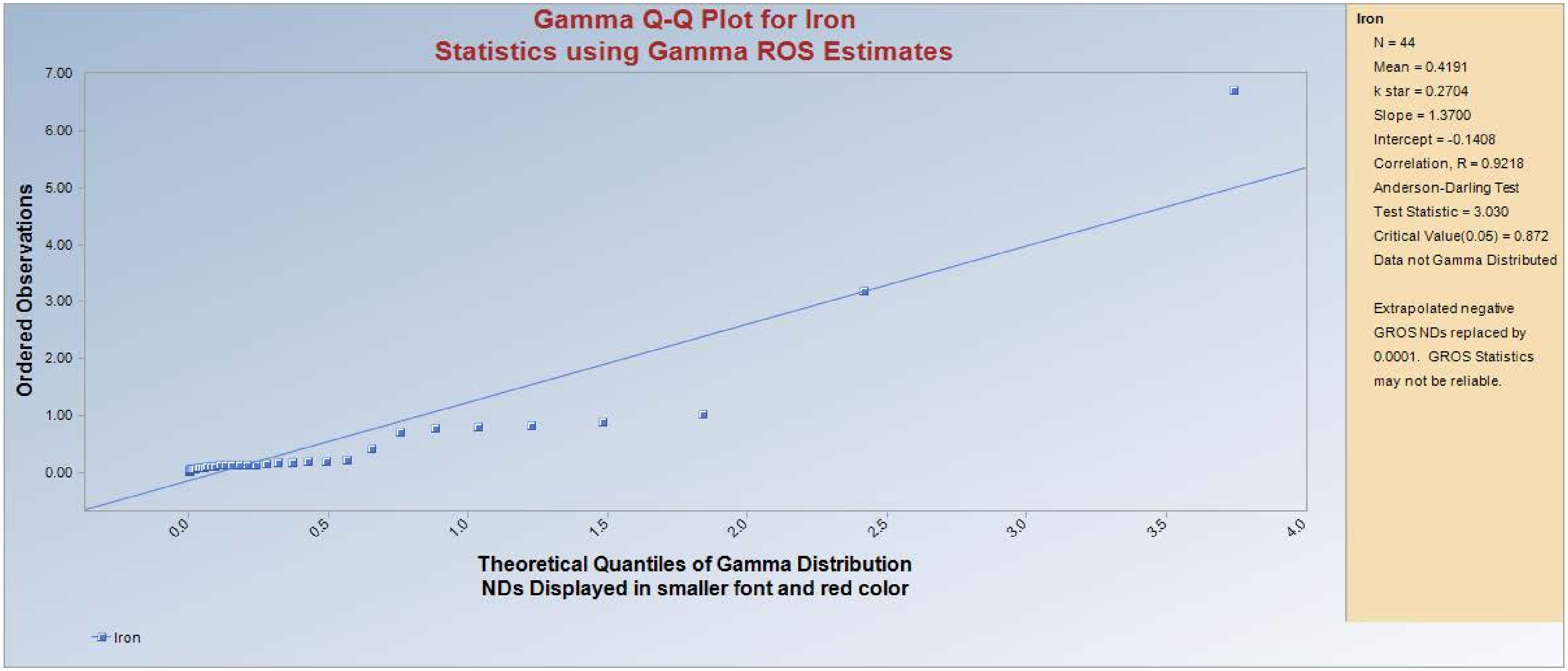

Normal Q-Q Plot for Copper
Statistics using ROS Normal Estimates
Ordered Observations
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 44
Mean = 0.0289
Sd = 0.189
Slope = 0.145
Intercept = 0.0289
Correlation, R = 0.75
Shapiro-Wilk Test
Exact Test Value = 0.600
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.599
p-Value = 1.248E-13


Gamma Q-Q Plot for Copper
Statistics using Gamma ROS Estimates
Ordered Observations
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
0.1
0.2
0.3
0.4
0.5
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Copper
Copper
N = 44
Mean = 0.0559
k star = 0.2561
Slope = 1.5031
Intercept = -0.0259
Correlation, R = 0.9177
Anderson-Darling Test
Test Statistic = 2.054
Critical Value(0.05) = 0.879
Data not Gamma Distributed
Extrapolated negative GROS NDs replaced by 0.0001. GROS Statistics may not be reliable.

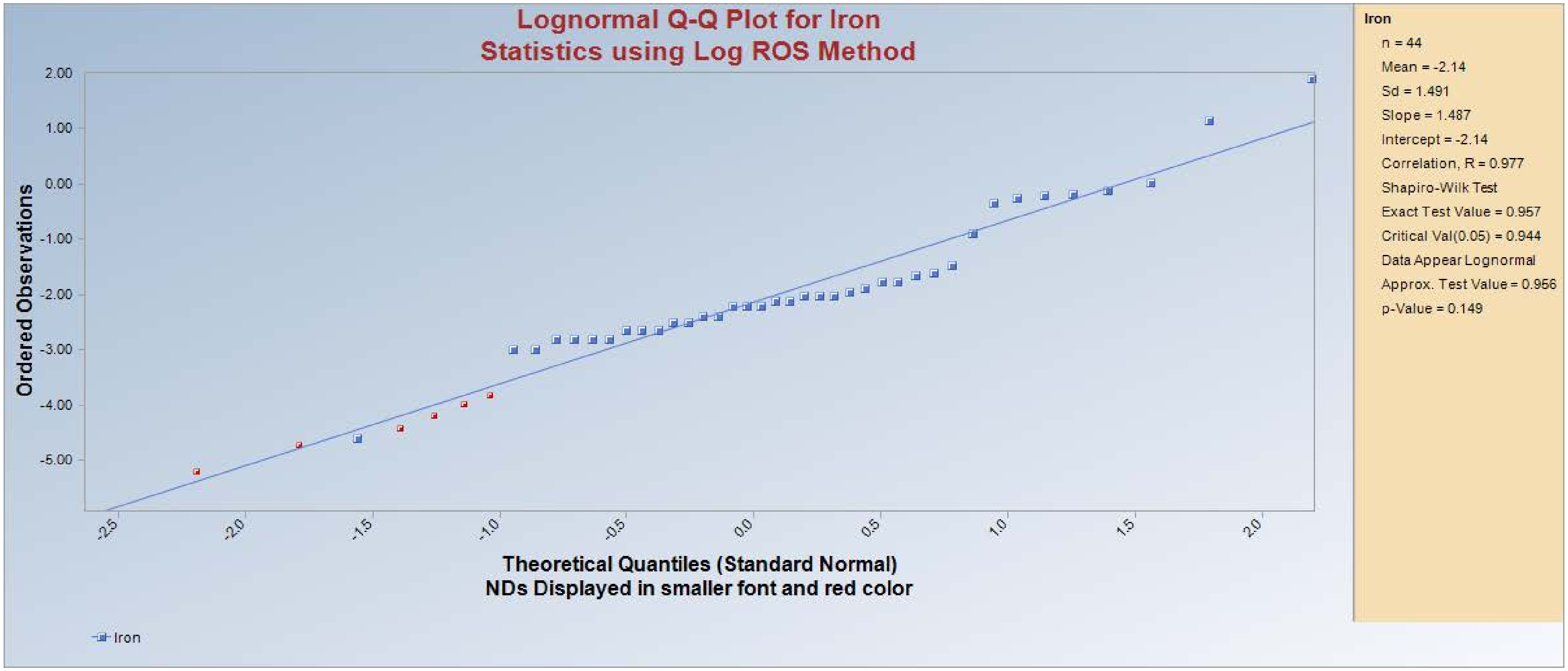

Lognormal Q-Q Plot for Copper
Statistics using Log ROS Method
Ordered Observations
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
-7.00
-8.00
-9.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Copper
Copper
n = 44
Mean = -4.823
Sd = 1.975
Slope = 1.992
Intercept = -4.823
Correlation, R = 0.988
Shapiro-Wilk Test
Exact Test Value = 0.972
Critical Val(0.05) = 0.944
Data Appear Lognormal
Approx. Test Value = 0.972
p-Value = 0.485



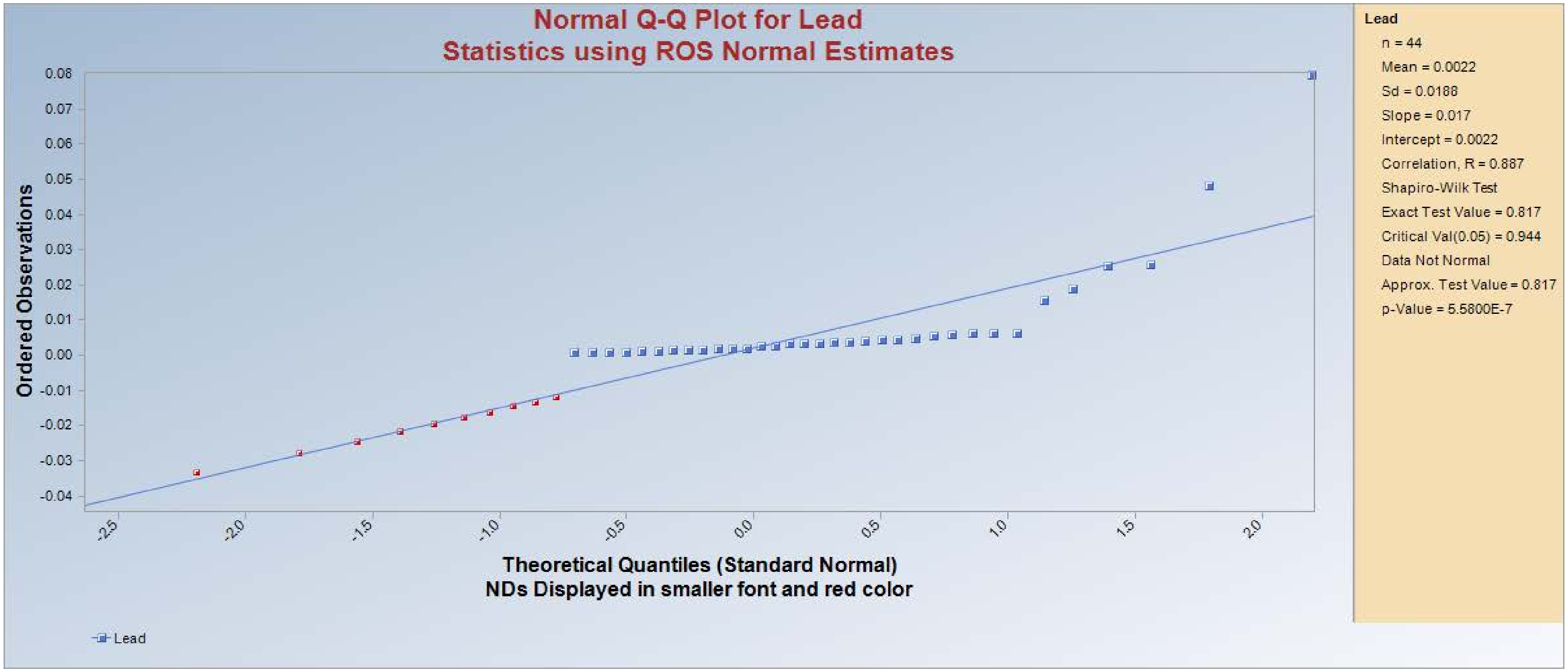
Normal Q-Q Plot for Iron
Statistics using ROS Normal Estimates
Ordered Observations
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Iron
Iron
n = 44
Mean = 0.267
Sd = 1.228
Slope = 0.932
Intercept = 0.267
Correlation, R = 0.743
Shapiro-Wilk Test
Exact Test Value = 0.598
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.598
p-Value = 1.151E-13



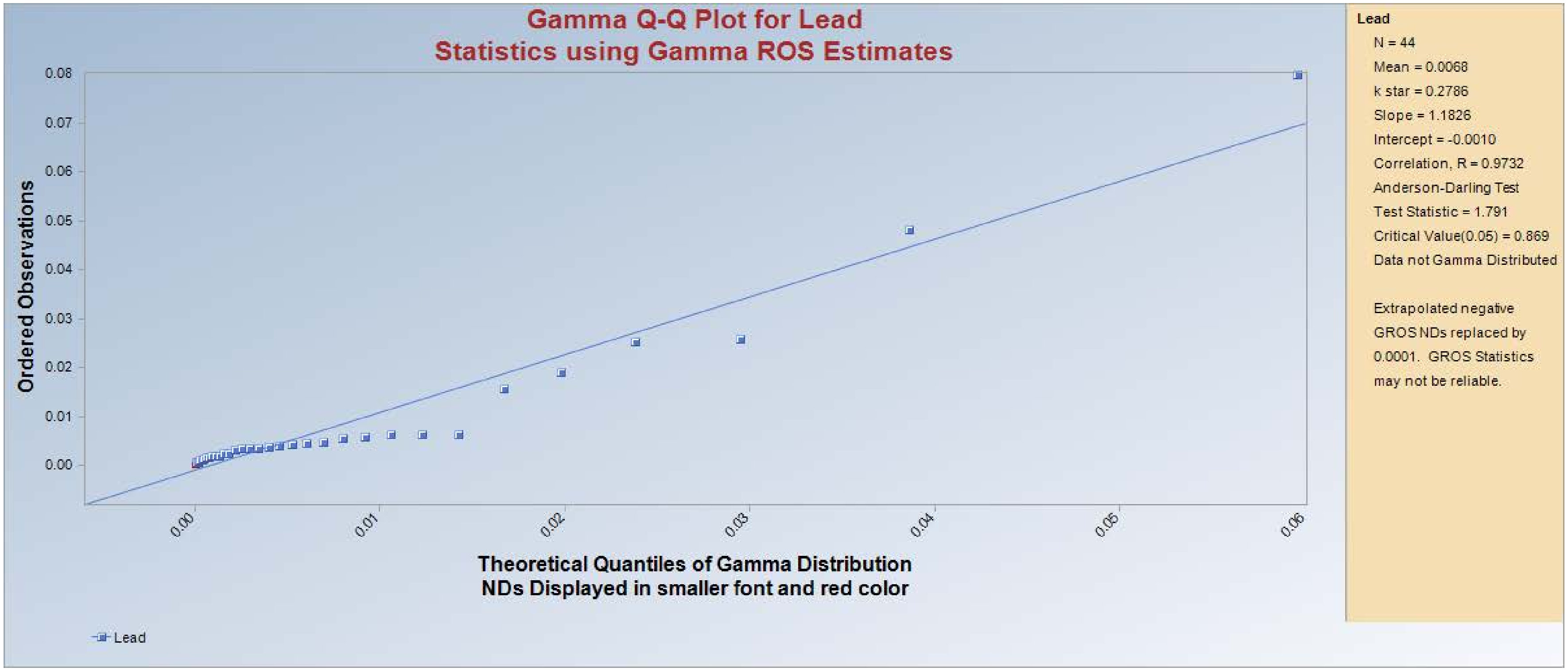
Gamma Q-Q Plot for Iron
Statistics using Gamma ROS Estimates
Ordered Observations
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Iron
Iron
N = 44
Mean = 0.4191
k star = 0.2704
Slope = 1.3700
Intercept = -0.1408
Correlation, R = 0.9218
Anderson-Darling Test
Test Statistic = 3.030
Critical Value(0.05) = 0.872
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

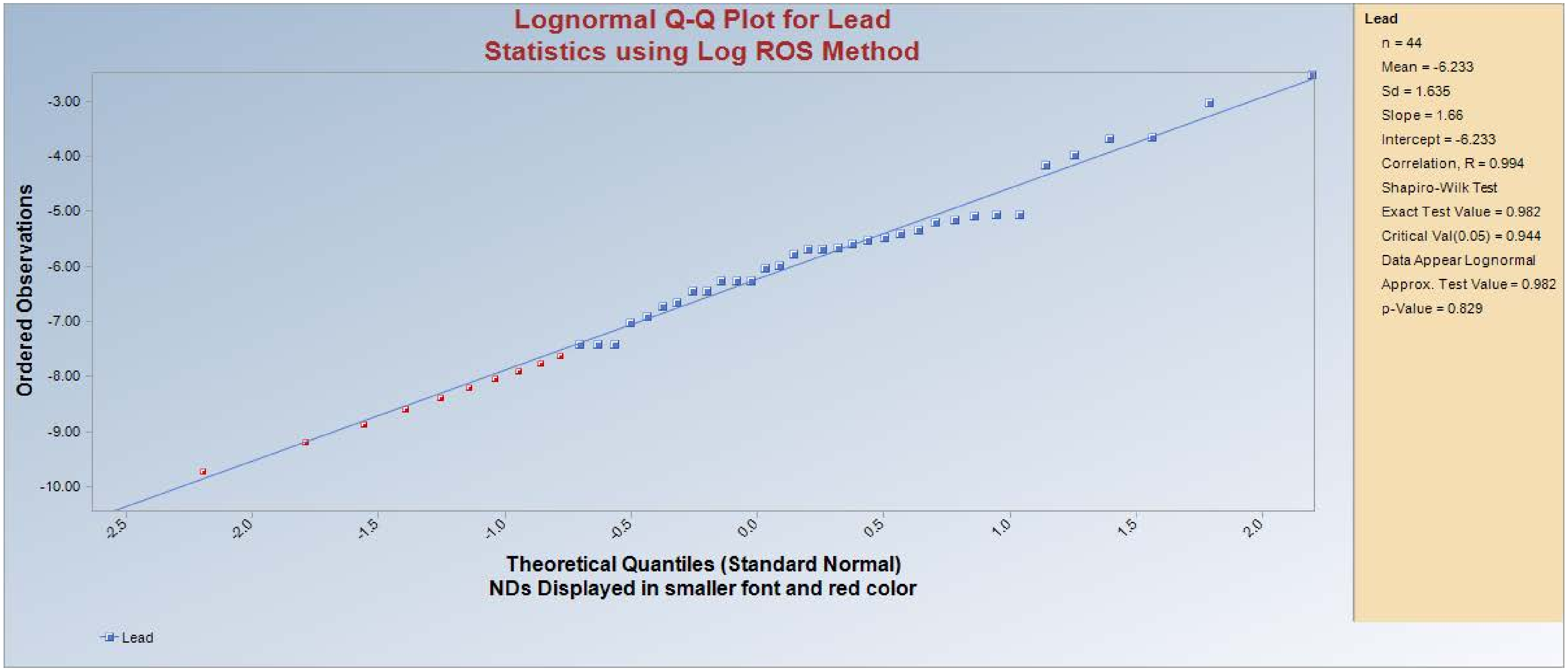


Lognormal Q-Q Plot for Iron
Statistics using Log ROS Method
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
Ordered Observations
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Iron
Iron
n = 44
Mean = -2.14
Sd = 1.491
Slope = 1.487
Intercept = -2.14
Correlation, R = 0.977
Shapiro-Wilk Test
Exact Test Value = 0.957
Critical Val(0.05) = 0.944
Data Appear Lognormal
Approx. Test Value = 0.956
p-Value = 0.149

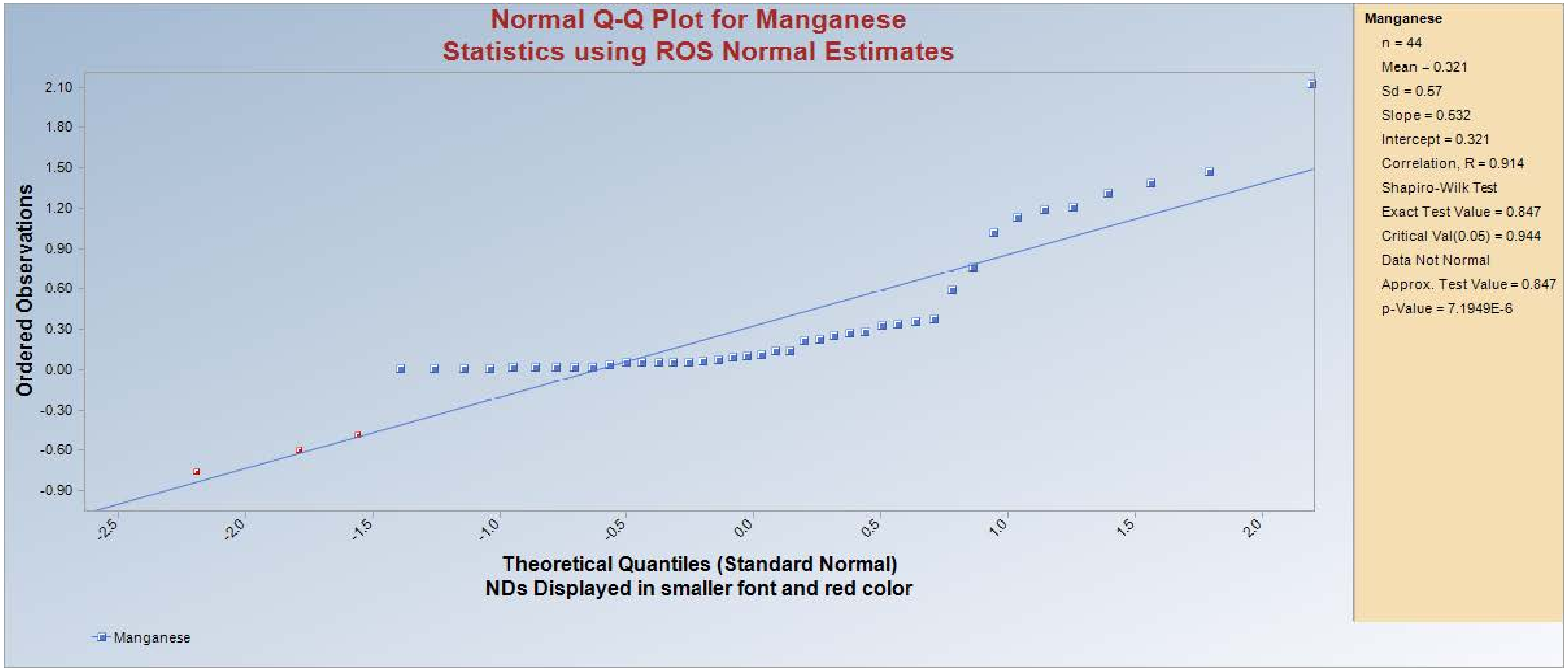


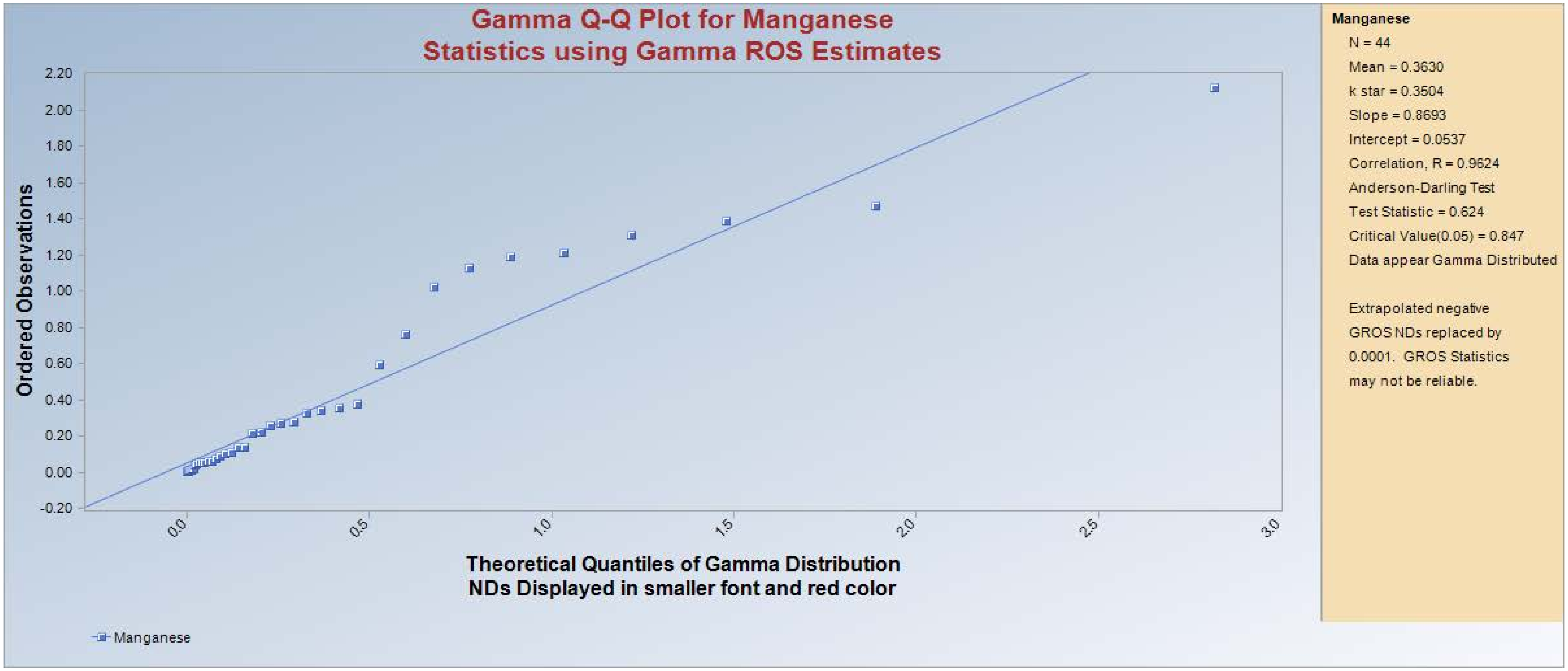
Normal Q-Q Plot for Lead
Statistics using ROS Normal Estimates
Ordered Observations
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Lead
Lead
n = 44
Mean = 0.0022
Sd = 0.0188
Slope = 0.017
Intercept = 0.0022
Correlation, R = 0.887
Shapiro-Wilk Test
Exact Test Value = 0.817
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.817
p-Value = 5.5800E-7


Gamma Q-Q Plot for Lead
Statistics using Gamma ROS Estimates
Ordered Observations
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.00
0.01
0.02
0.03
0.04
0.05
0.06
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Lead
Lead
N = 44
Mean = 0.0068
k star = 0.2786
Slope = 1.1826
Intercept = -0.0010
Correlation, R = 0.9732
Anderson-Darling Test
Test Statistic = 1.791
Critical Value(0.05) = 0.869
Data not Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

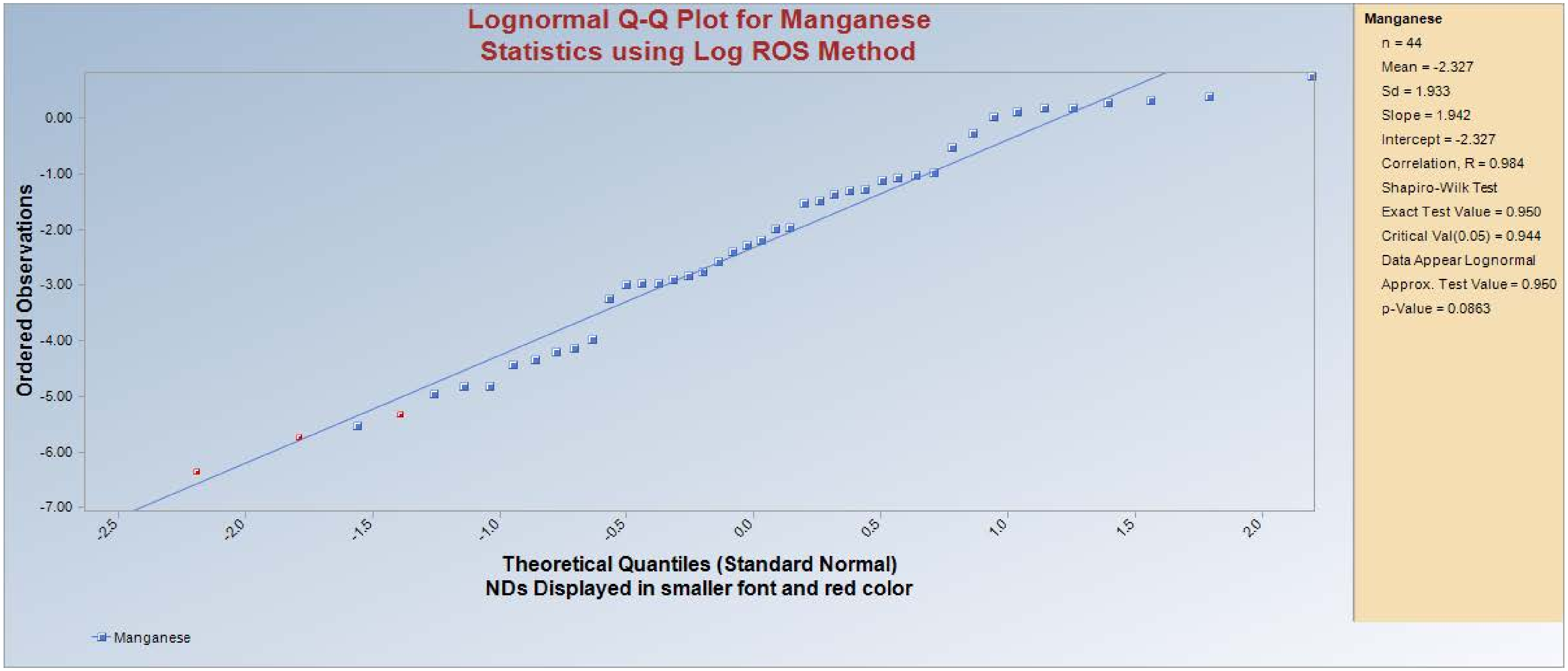


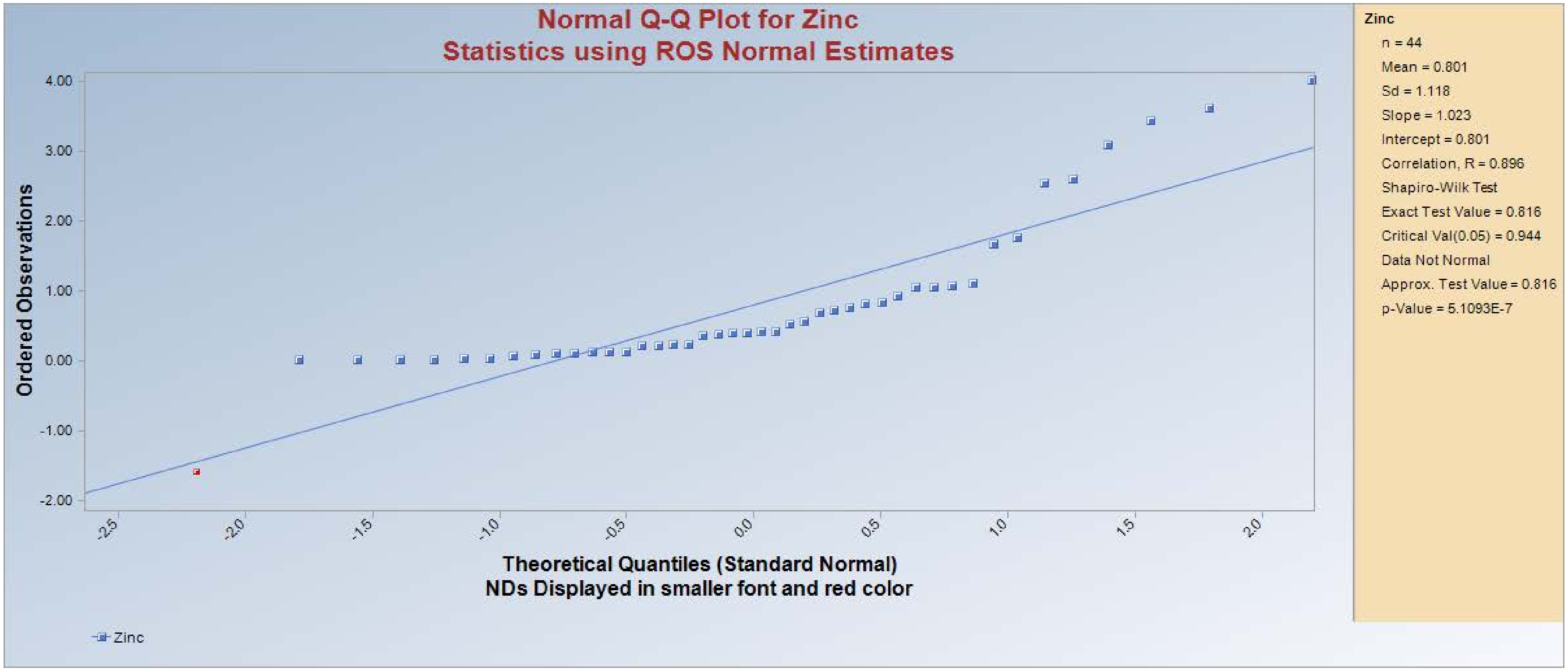
Lognormal Q-Q Plot for Lead
Statistics using Log ROS Method
Ordered Observations
-3.00
-4.00
-5.00
-6.00
-7.00
-8.00
-9.00
-10.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Lead
Lead
n = 44
Mean = -6.233
Sd = 1.635
Slope = 1.66
Intercept = -6.233
Correlation, R = 0.994
Shapiro-Wilk Test
Exact Test Value = 0.982
Critical Val(0.05) = 0.944
Data Appear Lognormal
Approx. Test Value = 0.982
p-Value = 0.829


Normal Q-Q Plot for Manganese
Statistics using ROS Normal Estimates
Ordered Observations
2.10
1.80
1.50
1.20
0.90
0.60
0.30
0.00
-0.30
-0.60
-0.90
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 44
Mean = 0.321
Sd = 0.57
Slope = 0.532
Intercept = 0.321
Correlation, R = 0.914
Shapiro-Wilk Test
Exact Test Value = 0.847
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.847
p-Value = 7.1949E-6

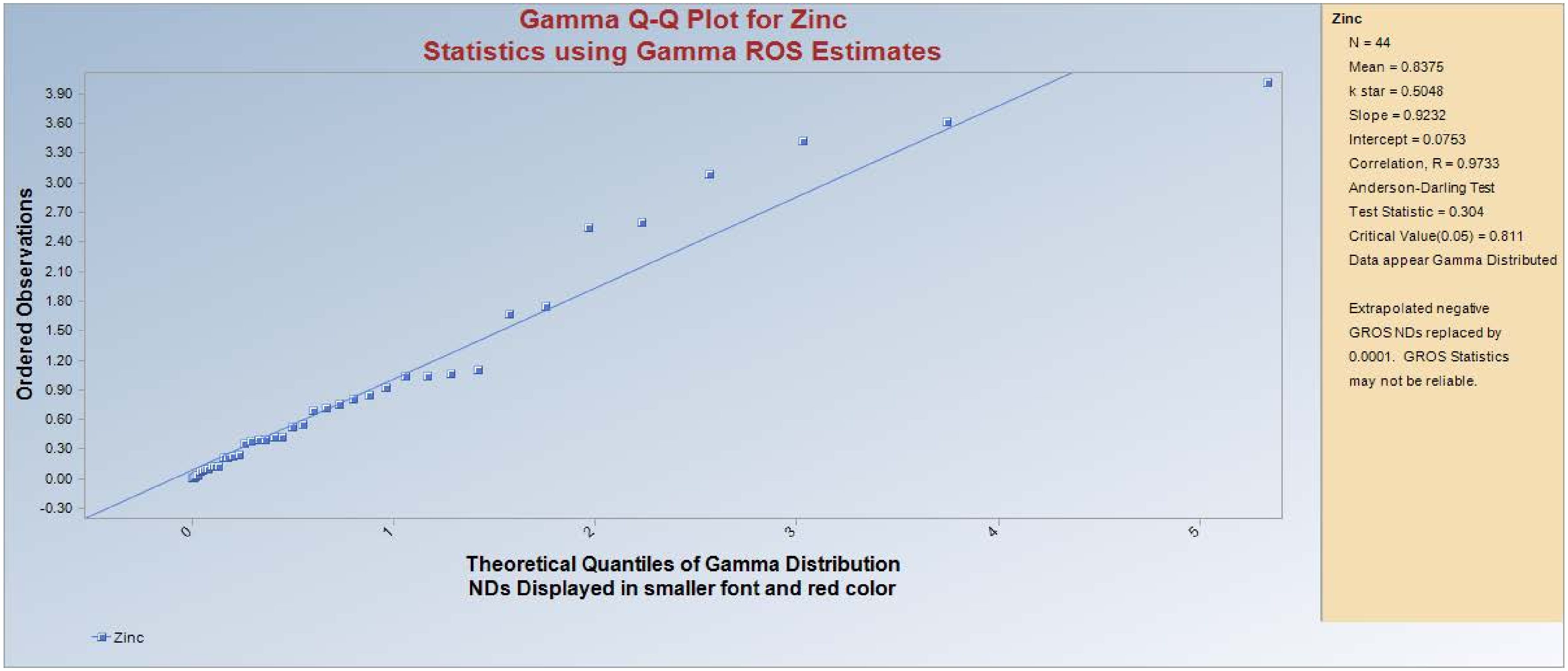


Gamma Q-Q Plot for Manganese
Statistics using Gamma ROS Estimates
Ordered Observations
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Manganese
Manganese
N = 44
Mean = 0.3630
k star = 0.3504
Slope = 0.8693
Intercept = 0.0537
Correlation, R = 0.9624
Anderson-Darling Test
Test Statistic = 0.624
Critical Value(0.05) = 0.847
Data appear Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.

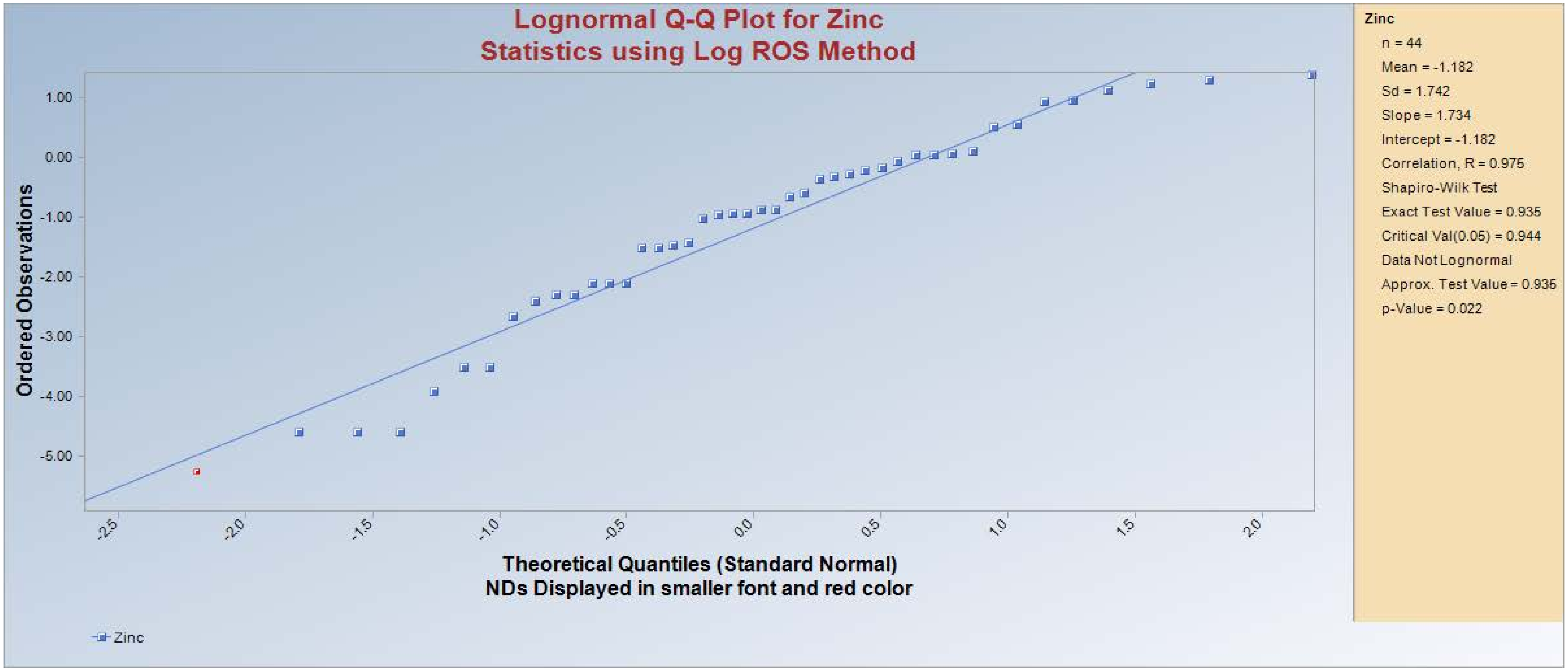

Lognormal Q-Q Plot for Manganese
Statistics using Log ROS Method
Ordered Observations
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
-7.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Manganese
Manganese
n = 44
Mean = -2.327
Sd = 1.933
Slope = 1.942
Intercept = -2.327
Correlation, R = 0.984
Shapiro-Wilk Test
Exact Test Value = 0.950
Critical Val(0.05) = 0.944
Data Appear Lognormal
Approx. Test Value = 0.950
p-Value = 0.0863



Normal Q-Q Plot for Zinc
Statistics using ROS Normal Estimates
Ordered Observations
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 44
Mean = 0.801
Sd = 1.118
Slope = 1.023
Intercept = 0.801
Correlation, R = 0.896
Shapiro-Wilk Test
Exact Test Value = 0.816
Critical Val(0.05) = 0.944
Data Not Normal
Approx. Test Value = 0.816
p-Value = 5.1093E-7



Gamma Q-Q Plot for Zinc
Statistics using Gamma ROS Estimates
Ordered Observations
3.90
3.60
3.30
3.00
2.70
2.40
2.10
1.80
1.50
1.20
0.90
0.60
0.30
0.00
-0.30
0
1
2
3
4
5
Theoretical Quantiles of Gamma Distribution
NDs Displayed in smaller font and red color
Zinc
Zinc
N = 44
Mean = 0.8375
k star = 0.5048
Slope = 0.9232
Intercept = 0.0753
Correlation, R = 0.9733
Anderson-Darling Test
Test Statistic = 0.304
Critical Value(0.05) = 0.811
Data appear Gamma Distributed
Extrapolated negative
GROS NDs replaced by
0.0001. GROS Statistics
may not be reliable.



Lognormal Q-Q Plot for Zinc
Statistics using Log ROS Method
Ordered Observations
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font and red color
Zinc
Zinc
n = 44
Mean = -1.182
Sd = 1.742
Slope = 1.734
Intercept = -1.182
Correlation, R = 0.975
Shapiro-Wilk Test
Exact Test Value = 0.935
Critical Val(0.05) = 0.944
Data Not Lognormal
Approx. Test Value = 0.935
p-Value = 0.022

APPENDIX B
BACKGROUND SCREENING APPROACH FOR METALS IN SOIL AND SEDIMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENT

ACRONYMS AND ABBREVIATIONS

BTV	Background threshold value
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
GOF	Goodness-of-fit
HHRA	Human health risk assessment
IQR	Interquartile range
Navy	Department of the Navy
ND	Nondetect (synonym for censored)
UBMC	Upper Blackfoot Mining Complex
UPL	Upper prediction limit
UTL	Upper tolerance limit

B1.0 INTRODUCTION

This appendix describes the qualitative approach used to compare site and background soil and sediment concentrations for selected metals in support of the baseline human health risk assessment (HHRA) at the Upper Blackfoot Mining Complex (UBMC) in Lewis and Clark County, Montana.

Background soil sample locations are shown in Figure 1-2 of the HHRA. Background sediment sample locations are shown in Figures 2-12 and 2-13 of the HHRA. The selection of background sampling locations is discussed in Section 5.1.2 of the HHRA.

The process used to provide an initial review of the background data sets and identify potential outlier concentrations is described in Section B2.0. The qualitative screening approach is described in Section B3.0. References are provided in Section B4.0, and are immediately followed by the tables and an attachment.

Statistical summaries for selected metals in UBMC background soil and sediment are provided in Tables B-1, B-2, and B-3. Calculation of statistical parameters followed recommendations in the U.S. Environmental Protection Agency's ProUCL software package (EPA 2010). The ProUCL output for the data sets is shown in Attachment B1.

B2.0 GOODNESS-OF-FIT TESTING AND OUTLIER IDENTIFICATION

Goodness-of-fit (GOF) tests were initially conducted to determine the underlying distribution for each data set and as a qualitative screen for outliers. Details of the GOF tests are provided in Section A2.3 of Appendix A and are briefly summarized below. Summary statistics and conclusions of the GOF testing are provided in Tables B-1, B-2 and B-3.

Three potential fits were evaluated using several well-established GOF tests: Shapiro-Wilk W (for normal and lognormal distributions), and the Kolmogorov-Smirnov and Anderson-Darling tests (for gamma distributions). Formal GOF tests were performed using the detected data only and for metals with at least six detected results. As a result of the low number of detections in sediments, Tables B-2 and B-3 do not include GOF results. A 5 percent significance level (equivalent to 95 percent confidence) was used to evaluate the null hypothesis that the data follow the assumed theoretical distribution. Data that did not follow either a normal, lognormal, or gamma distribution were treated as nonparametric. Graphical presentation (quantile probability plots [or Q-Q plots], outlier box plots, and frequency histograms) of the distributions and results of the GOF testing for soil and sediment are provided in Attachment B1.

An iterative, probability-plot partitioning technique was used to further evaluate the graphical presentations of the data provided in Attachment B1. Probability-plot partitioning is a commonly used approach for identifying outliers, as well as other patterns in data distributions, that could signify the presence of multiple statistical populations. For this reason, probability-plot partitioning is often used for "trimming" measurements in background evaluations that are not believed to be representative of the true background distribution. The underlying principle behind probability-plot partitioning is that a data set likely contains background concentrations of chemicals, as well as some level of contamination or non-background concentrations mixed in. The technique of partitioning polymodal distributions and extracting a single or "pure" distribution has been widely applied in environmental investigations, and additional details of the approach may be found in Sinclair (1974). The main steps of the approach followed for this background evaluation are summarized below.

Probability plots were examined for two features typically used to indicate the presence of multiple populations in the data: (1) inflection points (changes in the slope of the regression line shown on the plots), and (2) break points (discontinuities in the distribution of concentrations) in the fit of the observed data versus the expected quantiles for the theoretical distribution.

Inflection and break points are generally identified using professional judgment, so this part of the process contains an element of subjectivity. Single or multiple outliers can be identified using quantitative statistical methods (that is, formal statistical outlier tests) or operationally defined rules, such as concentrations that exceed the mean by some multiple of the standard deviation (for example, by 2 or 3 sigma). Outlier box plots are especially effective for visually comparing the "spread" of the data and for identifying outliers. Outlier box plots and quantile probability plots were the principal tools used for identifying outliers in this evaluation. The upper and lower bounds of the "whiskers" in an outlier box plot represent the lowest and highest values that are not considered outliers. Points falling above the "whiskers" are considered "high" outliers, operationally defined as values that exceed the 75th percentile (upper margin of the box) by 1.5 times the interquartile range (IQR). The IQR is the range of concentrations between the 25th and 75th percentiles (that is, the lower and upper margins of the box). Low outliers are measurements less than the 25th percentile by a factor of 1.5 times the IQR.

Outliers are usually removed in an iterative fashion. That is, after a single outlier or group of outliers is identified, they are removed, the data are re-plotted, and the GOF testing is repeated. This process continues until no additional outliers are identified and the trimmed data set can be described by a single distribution.

Although iterative removal of suspected outliers using graphical techniques and univariate statistical methods is a common practice, there are several limiting factors in this approach, most notable being the sample size. Large data sets consisting of random, independent measurements that provide even coverage of the site are preferred, as these data sets ensure the data are representative of the area being characterized. The minimum sample size requirements generally increase with increasing skewness of the underlying distribution for the unknown population. Smaller sample sizes tend to under-represent the tails of the distribution, which can result in biased estimates of upper percentiles or other estimates based on the extremes of the distribution.

Because of the relatively small sample-sizes for the soil and sediment background data ($n \leq 30$), a decision was ultimately made to apply conservative criteria in making decision to remove suspected high outliers. This decision was intended to minimize Type I (false positive) decision errors, which result when outliers are discarded, but where these values are actually samples from the tails of the unknown distribution. This problem is commonly seen with environmental data, as suspected outliers are often true background concentrations but simply represent results from the tails of the distribution, which are seen at much lower frequency (they are low-probability events) in small samples.

The best-fit distributions in Attachment B1 were examined to identify potential outliers. As discussed above, this examination included inspection of both the quantile probability plots and outlier box plots. Although the quantile probability plots showed inflection or break points for some metals, no results were identified as outliers in the outlier box plots. Therefore, no measurements were discarded, and all of the original results were considered representative of the background distribution.

B3.0 QUALITATIVE SCREENING APPROACH

There are several statistical approaches for conducting background screens that are incorporated in ProUCL (EPA 2010) and described in the guidance and technical literature (EPA 1989, 1994, 2002; Navy 2002, 2003; Helsel 2005; Gilbert 1987). The preferred approach is use of two-population statistical tests, as these tests use the full range of information in the site and background distributions and allow for quantification and better control of Type I (false positive) and Type II (false negative) decision errors (EPA 1994, 2010). In cases where only one or a small number of site measurements are compared with background, a point-to-point approach can be used, where individual site results are compared with a plausible upper limit established for the background distribution. Upper limits for background are referred to as background threshold values (BTV) in ProUCL and can be based on upper percentiles of the background distribution, or probabilistic estimates, such as upper tolerance limits (UTL) or upper prediction limits (UPL) (see EPA 2010 for discussion).

The typical two-population tests in environmental assessments are based on tests of location, as they are designed to evaluate the relative juxtaposition of two distributions. These include tests of central tendency (mean or median) as well as comparisons of the upper quantiles or right-hand tails of the site and background distributions. These tests are sometimes referred to as "frame-shift" statistics because the purpose of the tests is to determine whether one distribution is shifted higher (or lower) with respect to the second distribution.

However, these tests may have low power for discerning true differences in location in cases where only a small number of analytical results are available (or there is a disparity in the sample sizes between the two groups being compared). Similarly, calculation of BTVs also depends on relatively large sample sizes, especially since BTVs attempt to capture information from the upper tail of the unknown background distribution. There are no universal guidelines for establishing minimum requirements because the sample size depends on properties of the site or background distribution. Although the documentation for ProUCL generally recommends at least eight to 10 measurements for hypothesis tests and calculation of BTVs, larger sample sizes are preferred. Minimum sample size requirements generally increase with increasing skewness of the distributions evaluated.

A streamlined, qualitative approach was substituted because the background soil and sediment data sets for UBMC were near the lower acceptable size for conducting the recommended statistical comparisons. This approach consisted of a simple comparison of the maximum result for the site to the BTV for the background samples. Screens were conducted for metals collected at discrete depth intervals in individual exposure units (EU). Nonparametric estimates for the median and 95th percentiles were used for the screens. Robust, censored methods employing the Kaplan-Meier product limit estimator were used for samples having nondetect (ND) results with single or multiple detection limits (Helsel 2005, EPA 2010). EU 1 through 11 soil data were compared with the BTVs for soil (see Tables B-1 and B-4). EU 12 sediment data were compared with the BTVs for marsh sediments (see Tables B-2 and B-5). EU 13 sediment data were compared with the BTVs for marsh sediments (see Tables B-3 and B-6).

Unlike the two-population statistical tests, this type of qualitative screen does not control for decision errors, but is still a cost-effective and useful approach when site concentrations are high and expected to exceed (or greatly exceed) background for most chemicals. Tables B-4 through B-6 show only a small number of cases where metals in EU and depth groupings are likely to be within background based on the qualitative screen. This small subset of cases could be verified with formal statistical tests, although as noted caution should be exercised because of the small sample sizes for the background data and the disparity in size between the site and background samples.

B4.0 REFERENCES

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TABLES

TABLE B-1. SUMMARY STATISTICS FOR UBMC BACKGROUND SOIL

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Metal	Summary Statistics for Background Data										
	Distribution (a)	Detection Frequency	Range of Data: Censored (Nondetect) Min	Range of Data: Censored (Nondetect) Max	Range of Data: Detected Min	Range of Data: Detected Max	95UPL (b)	95UTL (c)	95th Percentile	Background Threshold Value: Value	Background Threshold Value: Statistic (d)
Aluminum	Lognormal	30 / 30	N/A	N/A	8,730	43,000	31,092	31,565	30,326	31,092	UPL (95)
Arsenic	Gamma	30 / 30	N/A	N/A	2	44.9	40.4	41.3	38.8	40.4	UPL (95)
Cadmium	Normal	30 / 30	N/A	N/A	0.284	4.8	4.98	50.47	4.87	4.8	Max
Copper	Gamma	30 / 30	N/A	N/A	12.1	339	275	284	262	275	UPL (95)
Iron	Lognormal	30 / 30	N/A	N/A	14,900	64,200	58,270	59,526	56,251	58,270	UPL (95)
Lead	Nonparametric	30 / 30	N/A	N/A	31	1,230	1,109	1,010	763	1,109	UPL (95)
Manganese	Lognormal	30 / 30	N/A	N/A	66	7,740	4,893	5,162	4,477	4,893	UPL (95)
Mercury	N/A	0 / 30	0.5	0.5	N/A	N/A	N/A	N/A	N/A	0.5	Highest nondetected value
Zinc	Gamma	30 / 30	N/A	N/A	34	756	551	567	523	551	UPL (95)

Notes: All concentrations in milligram per kilogram.
Methods follow EPA (2010).

a Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Anderson-Darling and Kolmogorov-Smirnov tests (gamma distributons). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.

b For Gamma distributed datasets, two 95UPLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UPL listed is the largest of the two 95UPLs unless one or both 95UPLs exceed the maximum detected value. In that case, the lower of the 95UPLs is listed.

c For Gamma distributed datasets, two 95UTLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UTL listed is the largest of the two 95UTLs unless one or both 95UTLs exceed the maximum detected value. In that case, the lower of the 95UTLs is listed.

d The BTV is the lesser of the UPL (95) and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results; no 95 UPLs, 95UTLs, or 95th percentiles are calculated. The maximum nondetect value is the default when there are no detected results.

bgs	Below ground surface	N/A	Not applicable
BTV	Background threshold value	RAGS	Risk Assessment Guidance for Superfund
EPA	U.S. Environmental Protection Agency	95UPL	One-sided 95 percent upper prediction limit of the mean.
Max	Maximum detected concentration	95UTL	One-sided 95 percent upper tolerance limit for the 90th percentile.

Reference:

EPA. 2010. “ProUCL Version 4.1.00 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. May.
Available online at: http://www.epa.gov/osp/hstl/tsc/ProUCL_v4.1_user.pdf

TABLE B-2. SUMMARY STATISTICS FOR UBMC BACKGROUND MARSH SEDIMENT

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Metal	Summary Statistics for Background Data										
	Distribution (a)	Detection Frequency	Range of Data				95UPL (b)	95UTL (c)	95th Percentile	Background Threshold Value	
			Censored (Nondetect)		Detected						
			Min	Max	Min	Max				Value	Statistic (d)
Aluminum	N/A	3 / 3	N/A	N/A	7,500	8,030	N/A	N/A	N/A	8,030	Max
Arsenic	N/A	9 / 9	N/A	N/A	9.12	32.3	32.3	32.3	29.2	32.3	Max
Cadmium	N/A	9 / 9	N/A	N/A	0.471	1.84	1.84	1.84	1.73	1.84	Max
Copper	N/A	9 / 9	N/A	N/A	22	67.4	67.4	67.4	62.4	67.4	Max
Iron	N/A	3 / 3	N/A	N/A	12,100	14,500	N/A	N/A	N/A	14,500	Max
Lead	N/A	9 / 9	N/A	N/A	55	174	174	174	149.6	174	Max
Manganese	N/A	9 / 9	N/A	N/A	88	696	696	696	652	696	Max
Mercury	N/A	0 / 9	0.5	0.5	N/A	N/A	N/A	N/A	N/A	0.5	Highest nondetected value
Zinc	N/A	9 / 9	N/A	N/A	97.8	275	275	275	270.2	275	Max

Notes: All concentrations in milligram per kilogram.
Methods follow EPA (2010).

a Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Anderson-Darling and Kolmogorov-Smirnov tests (gamma distributons). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.

b For Gamma distributed datasets, two 95UPLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UPL listed is the largest of the two 95UPLs unless one or both 95UPLs exceed the maximum detected value. In that case, the lower of the 95UPLs is listed.

c For Gamma distributed datasets, two 95UTLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UTL listed is the largest of the two 95UTLs unless one or both 95UTLs exceed the maximum detected value. In that case, the lower of the 95UTLs is listed.

d The BTV is the lesser of the UPL (95) and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results; no 95 UPLs, 95UTLs, or 95th percentiles are calculated. The maximum nondetect value is the default when there are no detected results.

bgs	Below ground surface	N/A	Not applicable
BTV	Background threshold value	RAGS	Risk Assessment Guidance for Superfund
EPA	U.S. Environmental Protection Agency	95UPL	One-sided 95 percent upper prediction limit of the mean.
Max	Maximum detected concentration	95UTL	One-sided 95 percent upper tolerance limit for the 90th percentile.

Reference:

EPA. 2010. “ProUCL Version 4.1.00 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. May
Available online at: http://www.epa.gov/osp/hstl/tsc/ProUCL_v4.1_user.pdf

TABLE B-3. SUMMARY STATISTICS FOR UBMC BACKGROUND STREAM SEDIMENT

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Metal	Summary Statistics for Background Data										
	Distribution (a)	Detection Frequency	Range of Data				95UPL (b)	95UTL (c)	95th Percentile	Background Threshold Value	
			Censored (Nondetect)		Detected						
			Min	Max	Min	Max				Value	Statistic (d)
Aluminum	N/A	1 / 1	N/A	N/A	8,980	8,980	N/A	N/A	N/A	8,980	Max
Arsenic	N/A	3 / 3	N/A	N/A	5.56	15.4	N/A	N/A	N/A	15.4	Max
Cadmium	N/A	0 / 3	0.5	0.5	N/A	N/A	N/A	N/A	N/A	0.5	Highest nondetected value
Copper	N/A	3 / 3	N/A	N/A	59.4	114	N/A	N/A	N/A	114	Max
Iron	N/A	1 / 1	N/A	N/A	23,900	23,900	N/A	N/A	N/A	23,900	Max
Lead	N/A	3 / 3	N/A	N/A	21.9	81.5	N/A	N/A	N/A	81.5	Max
Manganese	N/A	3 / 3	N/A	N/A	271	578	N/A	N/A	N/A	578	Max
Mercury	N/A	0 / 3	0.5	0.5	N/A	N/A	N/A	N/A	N/A	0.5	Highest nondetected value
Zinc	N/A	3 / 3	N/A	N/A	65.7	136	N/A	N/A	N/A	136	Max

Notes: All concentrations in milligram per kilogram.
Methods follow EPA (2010).

a Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Anderson-Darling and Kolmogorov-Smirnov tests (gamma distributons). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.

b For Gamma distributed datasets, two 95UPLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UPL listed is the largest of the two 95UPLs unless one or both 95UPLs exceed the maximum detected value. In that case, the lower of the 95UPLs is listed.

c For Gamma distributed datasets, two 95UTLs are calculated by ProUCL version 4.1 using the approximate gamma method; one following the Wilson-Hilferty approximation and the other following the Hawkins-Wixley approximations. The 95UTL listed is the largest of the two 95UTLs unless one or both 95UTLs exceed the maximum detected value. In that case, the lower of the 95UTLs is listed.

d The BTV is the lesser of the UPL (95) and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results; no 95 UPLs, 95UTLs, or 95th percentiles are calculated. The maximum nondetect value is the default when there are no detected results.

bgs Below ground surface
BTV Background threshold value
EPA U.S. Environmental Protection Agency
Max Maximum detected concentration
N/A Not applicable
RAGS Risk Assessment Guidance for Superfund
95UPL One-sided 95 percent upper prediction limit of the mean.
95UTL One-sided 95 percent upper tolerance limit for the 90th percentile.

Reference:

EPA. 2010. “ProUCL Version 4.1.00 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. May
Available online at: http://www.epa.gov/osp/hstl/tsc/ProUCL_v4.1_user.pdf

TABLE B-4. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND SOIL DISTRIBUTIONS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Depth (feet bgs)	Metal	Site Detection Frequency	Site Max Detected	Background Detection Frequency	Background BTV	Site Likely Exceeds Background Range?
1	0-2	Aluminum	9 / 9	18,200	30 / 30	31,092	**N**
		Arsenic	34 / 46	255	30 / 30	40.4	Y
		Cadmium	13 / 13	15.3	30 / 30	4.98	Y
		Copper	46 / 46	3,050	30 / 30	275	Y
		Iron	46 / 46	135,404	30 / 30	58,270	Y
		Lead	46 / 46	55,200	30 / 30	1,109	Y
		Manganese	45 / 46	3,256	30 / 30	4,893	**N**
		Zinc	46 / 46	3,200	30 / 30	551	Y
2	0-2	Aluminum	17 / 17	25,500	30 / 30	31,092	**N**
		Arsenic	374 / 444	1,057	30 / 30	40.4	Y
		Cadmium	69 / 69	161	30 / 30	4.98	Y
		Copper	444 / 444	4,246	30 / 30	275	Y
		Iron	441 / 441	201,203	30 / 30	58,270	Y
		Lead	444 / 444	38,839	30 / 30	1,109	Y
		Manganese	409 / 444	15,083	30 / 30	4,893	Y
		Zinc	426 / 444	26,000	30 / 30	551	Y
	2-10	Aluminum	10 / 10	21,000	30 / 30	31,092	**N**
		Arsenic	150 / 153	730	30 / 30	40.4	Y
		Cadmium	21 / 22	27.5	30 / 30	4.98	Y
		Copper	152 / 153	2,076	30 / 30	275	Y
		Iron	153 / 153	98,761	30 / 30	58,270	Y
		Lead	153 / 153	28,921	30 / 30	1,109	Y
		Manganese	151 / 153	14,749	30 / 30	4,893	Y
		Zinc	153 / 153	9,763	30 / 30	551	Y
3	0-2	Aluminum	6 / 6	14,900	30 / 30	31,092	**N**
		Arsenic	15 / 17	1,570	30 / 30	40.4	Y
		Cadmium	6 / 7	3.04	30 / 30	4.98	**N**
		Copper	18 / 18	759	30 / 30	275	Y
		Iron	18 / 18	224,789	30 / 30	58,270	Y
		Lead	18 / 18	2,270	30 / 30	1,109	Y
		Manganese	16 / 18	1,458	30 / 30	4,893	**N**
		Zinc	17 / 18	1,875	30 / 30	551	Y

TABLE B-4. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND SOIL DISTRIBUTIONS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Site		Background		
EU	**Depth (feet bgs)**	**Metal**	**Detection Frequency**	**Max Detected**	**Detection Frequency**	**BTV**	**Site Likely Exceeds Background Range?**
4	0-2	Aluminum	3 / 3	18,800	30 / 30	31,092	**N**
		Arsenic	9 / 29	28.3	30 / 30	40.4	**N**
		Cadmium	6 / 6	11.1	30 / 30	4.98	Y
		Copper	28 / 29	648	30 / 30	275	Y
		Iron	29 / 29	144,414	30 / 30	58,270	Y
		Lead	29 / 29	2,223	30 / 30	1,109	Y
		Manganese	29 / 29	14,145	30 / 30	4,893	Y
		Zinc	29 / 29	833	30 / 30	551	Y
5	0-2	Aluminum	2 / 2	12,200	30 / 30	31,092	**N**
		Arsenic	37 / 58	84.5	30 / 30	40.4	Y
		Cadmium	9 / 9	4.31	30 / 30	4.98	**N**
		Copper	57 / 58	1,354	30 / 30	275	Y
		Iron	58 / 58	170,776	30 / 30	58,270	Y
		Lead	58 / 58	1,380	30 / 30	1,109	Y
		Manganese	53 / 58	2,784	30 / 30	4,893	**N**
		Zinc	56 / 58	868	30 / 30	551	Y
6	0-2	Aluminum	8 / 8	27,000	30 / 30	31,092	**N**
		Arsenic	28 / 36	1,010	30 / 30	40.4	Y
		Cadmium	11 / 11	6.72	30 / 30	4.98	Y
		Copper	35 / 36	410	30 / 30	275	Y
		Iron	36 / 36	77,437	30 / 30	58,270	Y
		Lead	36 / 36	6,780	30 / 30	1,109	Y
		Manganese	35 / 36	1,996	30 / 30	4,893	**N**
		Zinc	36 / 36	914	30 / 30	551	Y
7	0-2	Aluminum	3 / 3	12,900	30 / 30	31,092	**N**
		Arsenic	5 / 8	116	30 / 30	40.4	Y
		Cadmium	2 / 3	0.9	30 / 30	4.98	**N**
		Copper	8 / 8	579	30 / 30	275	Y
		Iron	8 / 8	95,905	30 / 30	58,270	Y
		Lead	8 / 8	3,480	30 / 30	1,109	Y
		Manganese	8 / 8	902	30 / 30	4,893	**N**
		Zinc	8 / 8	525	30 / 30	551	**N**

TABLE B-4. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND SOIL DISTRIBUTIONS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Site		Background		
EU	Depth (feet bgs)	Metal	Detection Frequency	Max Detected	Detection Frequency	BTV	Site Likely Exceeds Background Range?
8	0-2	Aluminum	14 / 14	20,200	30 / 30	31,092	**N**
		Arsenic	84 / 106	667	30 / 30	40.4	Y
		Cadmium	20 / 20	15.9	30 / 30	4.98	Y
		Copper	100 / 106	2,882	30 / 30	275	Y
		Iron	106 / 106	221,158	30 / 30	58,270	Y
		Lead	105 / 105	30,700	30 / 30	1,109	Y
		Manganese	106 / 106	9,626	30 / 30	4,893	Y
		Zinc	106 / 106	3,840	30 / 30	551	Y
9	0-2	Aluminum	7 / 7	19,200	30 / 30	31,092	**N**
		Arsenic	5 / 14	20.6	30 / 30	40.4	**N**
		Cadmium	6 / 9	0.7	30 / 30	4.98	**N**
		Copper	14 / 14	608	30 / 30	275	Y
		Iron	14 / 14	73,228	30 / 30	58,270	Y
		Lead	14 / 14	741	30 / 30	1,109	**N**
		Manganese	14 / 14	762	30 / 30	4,893	**N**
		Zinc	14 / 14	161	30 / 30	551	**N**
	2-10	Aluminum	13 / 13	10,100	30 / 30	31,092	**N**
		Arsenic	13 / 13	1,370	30 / 30	40.4	Y
		Cadmium	2 / 13	0.218	30 / 30	4.98	**N**
		Copper	13 / 13	264	30 / 30	275	**N**
		Iron	13 / 13	218,000	30 / 30	58,270	Y
		Lead	13 / 13	422	30 / 30	1,109	**N**
		Manganese	13 / 13	216	30 / 30	4,893	**N**
		Zinc	13 / 13	53	30 / 30	551	**N**
10	0-2	Arsenic	15 / 30	52.7	30 / 30	40	Y
		Cadmium	3 / 3	1.36	30 / 30	4.98	**N**
		Copper	30 / 30	1,001	30 / 30	275	Y
		Iron	30 / 30	83,328	30 / 30	58,270	Y
		Lead	30 / 30	708	30 / 30	1,109	**N**
		Manganese	12 / 30	5,152	30 / 30	4,893	Y
		Zinc	13 / 30	713	30 / 30	551	Y

TABLE B-4. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND SOIL DISTRIBUTIONS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Depth (feet bgs)	Metal	Site		Background		Site Likely Exceeds Background Range?
			Detection Frequency	Max Detected	Detection Frequency	BTV	
11	0-2	Aluminum	9 / 9	11,500	30 / 30	31,092	**N**
		Arsenic	182 / 200	616	30 / 30	40.4	Y
		Cadmium	24 / 24	72.2	30 / 30	4.98	Y
		Copper	196 / 200	3,232	30 / 30	275	Y
		Iron	200 / 200	199,000	30 / 30	58,270	Y
		Lead	200 / 200	21,699	30 / 30	1,109	Y
		Manganese	195 / 200	23,700	30 / 30	4,893	Y
		Zinc	199 / 200	18,108	30 / 30	551	Y
	2-10	Aluminum	11 / 11	14,400	30 / 30	31,092	**N**
		Arsenic	110 / 114	518	30 / 30	40.4	Y
		Cadmium	10 / 11	120	30 / 30	4.98	Y
		Copper	113 / 114	5,809	30 / 30	275	Y
		Iron	114 / 114	142,983	30 / 30	58,270	Y
		Lead	113 / 114	24,892	30 / 30	1,109	Y
		Manganese	113 / 114	14,715	30 / 30	4,893	Y
		Zinc	113 / 114	9,544	30 / 30	551	Y

Notes: All units are milligrams per kilogram. Depths are feet below ground surface.

All percentiles estimated using nonparametric approaches. For chemicals with one or more censored results, estimates were provided using the KM method.

-- No data.
bgs Below ground surface.
BTV Background threshold value
EU Exposure unit.
KM Kaplan-Meier.
Max Maximum.
mg/kg Milligram per kilogram.
N/A Not applicable.
UBMC Upper Blackfoot Mining Complex
Y, N Yes, No. Final conclusions that the site is likely within the background range are shown in **boldface**.

TABLE B-5. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND MARSH SEDIMENT DISTRIBUTIONS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

			Site		Background		
EU	Depth (feet bgs)	Metal	Detection Frequency	Max Detected	Detection Frequency	BTV	Site Likely Exceeds Background Range?
12	0-2	Aluminum	56 / 56	23,500	3 / 3	8,030	Y
		Arsenic	289 / 293	507	9 / 9	32.3	Y
		Cadmium	120 / 129	78	9 / 9	1.84	Y
		Copper	293 / 293	2,760	9 / 9	67.4	Y
		Iron	220 / 220	199,000	3 / 3	14,500	Y
		Lead	293 / 293	30,867	9 / 9	174	Y
		Manganese	277 / 293	75,108	9 / 9	696	Y
		Zinc	292 / 293	36,572	9 / 9	275	Y
12	2-10	Aluminum	7 / 7	33,600	3 / 3	8,030	Y
		Arsenic	58 / 61	114	9 / 9	32.3	Y
		Cadmium	7 / 7	6.3	9 / 9	1.84	Y
		Copper	61 / 61	1,067	9 / 9	67.4	Y
		Iron	61 / 61	59,591	3 / 3	14,500	Y
		Lead	61 / 61	3,019	9 / 9	174	Y
		Manganese	55 / 61	6,040	9 / 9	696	Y
		Zinc	61 / 61	5,083	9 / 9	275	Y

Notes: All units are milligrams per kilogram. Depths are feet below ground surface.

All percentiles estimated using nonparametric approaches. For chemicals with one or more censored results, estimates were provided using the KM method.

(1) Evidence is marginal; site maximum below background maximum.

-- No data.

bgs Below ground surface.

BTV Background threshold value

EU Exposure unit.

KM Kaplan-Meier.

Max Maximum.

N/A Not applicable.

UBMC Upper Blackfoot Mining Complex

Y, N Yes, No. Final conclusions that the site is likely within the background range are shown in **boldface**.

TABLE B-6. COMPARISON OF MEASURES OF LOCATION FOR UBMC SITE AND BACKGROUND STREAMBED SEDIMENT DISTRIBUTIONS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Depth (feet bgs)	Metal	Site		Background		Site Likely Exceeds Background Range?
			Detection Frequency	Max Detected	Detection Frequency	BTV	
13	0-2	Aluminum	19 / 19	23,000	1 / 1	8,980	Y
		Arsenic	47 / 47	86.8	3 / 3	15.4	Y
		Cadmium	39 / 47	20.3	0 / 3	0.5	Y
		Copper	47 / 47	3,030	3 / 3	114	Y
		Iron	19 / 19	35,800	1 / 1	23,900	Y
		Lead	47 / 47	1,500	3 / 3	81.5	Y
		Manganese	47 / 47	11,300	3 / 3	578	Y
		Zinc	47 / 47	4,810	3 / 3	136	Y

Notes: All units are milligrams per kilogram. Depths are feet below ground surface.

All percentiles estimated using nonparametric approaches. For chemicals with one or more censored results, estimates were provided using the KM method.

(1) Evidence is marginal; site maximum below background maximum.

-- No data.

bgs Below ground surface.

BTV Background threshold value

EU Exposure unit.

KM Kaplan-Meier.

Max Maximum.

N/A Not applicable.

UBMC Upper Blackfoot Mining Complex

Y, N Yes, No. Final conclusions that the site is likely within the background range are shown in **boldface**.

ATTACHMENT B1
PROUCL OUTPUT

General Background Statistics for Full Data Sets

User Selected Options

From File	\\EMIS016FP1\Shared\Project\MDEQ\Upper Blackfoot\EPC Calculations 2012 - March\ProUCL Input.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Al

General Statistics

Total Number of Observations	30	Number of Distinct Observations	26
Tolerance Factor	1.777		

Raw Statistics		Log-Transformed Statistics	
Minimum	8730	Minimum	9.075
Maximum	43000	Maximum	10.67
Second Largest	28400	Second Largest	10.25
First Quartile	16025	First Quartile	9.682
Median	18500	Median	9.825
Third Quartile	22125	Third Quartile	10
Mean	19274	Mean	9.821
SD	6263	SD	0.303
Coefficient of Variation	0.325		
Skewness	1.787		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.872	Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	30404	95% UTL with 90% Coverage	31565
95% UPL (t)	30092	95% UPL (t)	31092
90% Percentile (z)	27301	90% Percentile (z)	27165
95% Percentile (z)	29576	95% Percentile (z)	30326
99% Percentile (z)	33844	99% Percentile (z)	37281

Gamma Distribution Test		Data Distribution Test	
k star	10.14	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1901		
MLE of Mean	19274		
MLE of Standard Deviation	6053		
nu star	608.4		

		Nonparametric Statistics	
A-D Test Statistic	0.431	90% Percentile	24560
5% A-D Critical Value	0.745	95% Percentile	26915
K-S Test Statistic	0.107	99% Percentile	38766
5% K-S Critical Value	0.16		
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	27324	95% UTL with 90% Coverage	28400
95% Percentile	30189	95% Percentile Bootstrap UTL with 90% Coverage	29860
99% Percentile	36068	95% BCA Bootstrap UTL with 90% Coverage	28400
		95% UPL	34970
		95% Chebyshev UPL	47026
95% WH Approx. Gamma UPL	30425	Upper Threshold Limit Based upon IQR	31275
95% HW Approx. Gamma UPL	30551		
95% WH Approx. Gamma UTL with 90% Coverage	30821		
95% HW Approx. Gamma UTL with 90% Coverage	30963		

As

General Statistics

Total Number of Observations	30	Number of Distinct Observations	22
Tolerance Factor	1.777		

Raw Statistics		Log-Transformed Statistics	
Minimum	2	Minimum	0.693
Maximum	44.9	Maximum	3.804
Second Largest	39	Second Largest	3.664
First Quartile	14	First Quartile	2.639
Median	18	Median	2.89
Third Quartile	23.43	Third Quartile	3.154
Mean	19.42	Mean	2.835
SD	9.434	SD	0.581
Coefficient of Variation	0.486		
Skewness	1.001		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.925	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	36.18	95% UTL with 90% Coverage	47.79
95% UPL (t)	35.71	95% UPL (t)	46.43
90% Percentile (z)	31.51	90% Percentile (z)	35.84
95% Percentile (z)	34.94	95% Percentile (z)	44.26
99% Percentile (z)	41.37	99% Percentile (z)	65.76

Gamma Distribution Test		Data Distribution Test	
k star	3.582	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5.421		
MLE of Mean	19.42		
MLE of Standard Deviation	10.26		
nu star	214.9		
A-D Test Statistic	0.479	**Nonparametric Statistics**	
5% A-D Critical Value	0.75	90% Percentile	30.63

K-S Test Statistic	0.12	95% Percentile	39
5% K-S Critical Value	0.161	99% Percentile	43.19

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile	33.18	95% UTL with 90% Coverage	39
95% Percentile	38.78	95% Percentile Bootstrap UTL with 90% Coverage	39.59
99% Percentile	50.81	95% BCA Bootstrap UTL with 90% Coverage	39.59
		95% UPL	41.66
		95% Chebyshev UPL	61.22
95% WH Approx. Gamma UPL	39.3	Upper Threshold Limit Based upon IQR	37.56
95% HW Approx. Gamma UPL	40.44		
95% WH Approx. Gamma UTL with 90% Coverage	40.09		
95% HW Approx. Gamma UTL with 90% Coverage	41.32		

Cd

General Statistics

Total Number of Observations	30	Number of Distinct Observations	27
Tolerance Factor	1.777		

Raw Statistics		Log-Transformed Statistics	
Minimum	0.284	Minimum	-1.259
Maximum	4.8	Maximum	1.569
Second Largest	4.7	Second Largest	1.548
First Quartile	2.125	First Quartile	0.754
Median	2.55	Median	0.936
Third Quartile	3.673	Third Quartile	1.301
Mean	2.678	Mean	0.789
SD	1.333	SD	0.747
Coefficient of Variation	0.498		
Skewness	-0.15		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.947	Shapiro Wilk Test Statistic	0.826
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	5.047	95% UTL with 90% Coverage	8.293
95% UPL (t)	4.98	95% UPL (t)	7.991
90% Percentile (z)	4.386	90% Percentile (z)	5.729
95% Percentile (z)	4.87	95% Percentile (z)	7.514
99% Percentile (z)	5.779	99% Percentile (z)	12.5

Gamma Distribution Test		Data Distribution Test	
k star	2.454	Data appear Normal at 5% Significance Level	
Theta Star	1.091		
MLE of Mean	2.678		
MLE of Standard Deviation	1.709		
nu star	147.2		

A-D Test Statistic	1.191	**Nonparametric Statistics**	
5% A-D Critical Value	0.754	90% Percentile	4.51
K-S Test Statistic	0.197	95% Percentile	4.655
5% K-S Critical Value	0.161	99% Percentile	4.771
Data not Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	4.7
90% Percentile	4.967	95% Percentile Bootstrap UTL with 90% Coverage	4.71
95% Percentile	5.962	95% BCA Bootstrap UTL with 90% Coverage	4.7
99% Percentile	8.142	95% UPL	4.745
		95% Chebyshev UPL	8.584
95% WH Approx. Gamma UPL	6.098	Upper Threshold Limit Based upon IQR	5.994
95% HW Approx. Gamma UPL	6.407		
95% WH Approx. Gamma UTL with 90% Coverage	6.241		
95% HW Approx. Gamma UTL with 90% Coverage	6.573		

Cu

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
Tolerance Factor	1.777		
Raw Statistics		**Log-Transformed Statistics**	
Minimum	12.1	Minimum	2.493
Maximum	339	Maximum	5.826
Second Largest	299	Second Largest	5.7
First Quartile	38.05	First Quartile	3.636
Median	69.7	Median	4.228
Third Quartile	149.3	Third Quartile	5.005
Mean	100.9	Mean	4.283
SD	85.06	SD	0.847
Coefficient of Variation	0.843		
Skewness	1.359		

Background Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.841	Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	252.1	95% UTL with 90% Coverage	326.5
95% UPL (t)	247.9	95% UPL (t)	313
90% Percentile (z)	209.9	90% Percentile (z)	214.6
95% Percentile (z)	240.8	95% Percentile (z)	291.9
99% Percentile (z)	298.8	99% Percentile (z)	520.1
Gamma Distribution Test		**Data Distribution Test**	
k star	1.51	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	66.83		

MLE of Mean	100.9
MLE of Standard Deviation	82.13
nu star	90.62

A-D Test Statistic	0.518	**Nonparametric Statistics**	
5% A-D Critical Value	0.762	90% Percentile	211.4
K-S Test Statistic	0.154	95% Percentile	273.4
5% K-S Critical Value	0.163	99% Percentile	327.4

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution		95% UTL with 90% Coverage	299
90% Percentile	210	95% Percentile Bootstrap UTL with 90% Coverage	299
95% Percentile	262.3	95% BCA Bootstrap UTL with 90% Coverage	299
99% Percentile	380.5	95% UPL	317
		95% Chebyshev UPL	477.8
95% WH Approx. Gamma UPL	267.9	Upper Threshold Limit Based upon IQR	316.1
95% HW Approx. Gamma UPL	275.1		
95% WH Approx. Gamma UTL with 90% Coverage	275.6		
95% HW Approx. Gamma UTL with 90% Coverage	283.7		

Fe

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
Tolerance Factor	1.777		

Raw Statistics		**Log-Transformed Statistics**	
Minimum	14900	Minimum	9.609
Maximum	64200	Maximum	11.07
Second Largest	63900	Second Largest	11.07
First Quartile	18950	First Quartile	9.849
Median	25200	Median	10.13
Third Quartile	39725	Third Quartile	10.59
Mean	30517	Mean	10.23
SD	14145	SD	0.428
Coefficient of Variation	0.464		
Skewness	1.062		

Background Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.866	Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	55652	95% UTL with 90% Coverage	59526
95% UPL (t)	54948	95% UPL (t)	58270
90% Percentile (z)	48644	90% Percentile (z)	48145
95% Percentile (z)	53783	95% Percentile (z)	56251
99% Percentile (z)	63423	99% Percentile (z)	75315

Gamma Distribution Test		Data Distribution Test	
k star	5.011	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	6090		
MLE of Mean	30517		
MLE of Standard Deviation	13632		
nu star	300.7		
A-D Test Statistic	0.843	Nonparametric Statistics	
5% A-D Critical Value	0.746	90% Percentile	51800
K-S Test Statistic	0.138	95% Percentile	58455
5% K-S Critical Value	0.16	99% Percentile	64113
Data follow Appx. Gamma Distribution at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	63900
90% Percentile	48767	95% Percentile Bootstrap UTL with 90% Coverage	63930
95% Percentile	55836	95% BCA Bootstrap UTL with 90% Coverage	63900
99% Percentile	70773	95% UPL	64035
		95% Chebyshev UPL	93192
95% WH Approx. Gamma UPL	56549	Upper Threshold Limit Based upon IQR	70888
95% HW Approx. Gamma UPL	56901		
95% WH Approx. Gamma UTL with 90% Coverage	57546		
95% HW Approx. Gamma UTL with 90% Coverage	57953		

General Background Statistics for Full Data Sets

User Selected Options

From File	\\EMIS016FP1\Shared\Project\MDEQ\Upper Blackfoot\EPC Calculations 2012 - March\ProUCL Input.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Mn

General Statistics

Total Number of Observations	30	Number of Distinct Observations	29
Tolerance Factor	1.777		
Raw Statistics		Log-Transformed Statistics	
Minimum	66	Minimum	4.19
Maximum	7740	Maximum	8.954
Second Largest	3050	Second Largest	8.023
First Quartile	499.5	First Quartile	6.214
Median	967.5	Median	6.875
Third Quartile	1328	Third Quartile	7.191
Mean	1255	Mean	6.635
SD	1463	SD	1.077
Coefficient of Variation	1.166		
Skewness	3.24		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.668	Shapiro Wilk Test Statistic	0.968
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	3854	95% UTL with 90% Coverage	5162
95% UPL (t)	3781	95% UPL (t)	4893
90% Percentile (z)	3129	90% Percentile (z)	3027
95% Percentile (z)	3660	95% Percentile (z)	4477
99% Percentile (z)	4657	99% Percentile (z)	9329

Gamma Distribution Test		Data Distribution Test	
k star	1.047	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1198		
MLE of Mean	1255		
MLE of Standard Deviation	1226		
nu star	62.82		
A-D Test Statistic	0.394	Nonparametric Statistics	
5% A-D Critical Value	0.772	90% Percentile	2571
K-S Test Statistic	0.117	95% Percentile	2839
5% K-S Critical Value	0.164	99% Percentile	6380
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
		95% UTL with 90% Coverage	3050
90% Percentile	2856	95% Percentile Bootstrap UTL with 90% Coverage	3519
95% Percentile	3698	95% BCA Bootstrap UTL with 90% Coverage	3087
99% Percentile	5646	95% UPL	5161
		95% Chebyshev UPL	7735
95% WH Approx. Gamma UPL	3730	Upper Threshold Limit Based upon IQR	2570
95% HW Approx. Gamma UPL	3867		
95% WH Approx. Gamma UTL with 90% Coverage	3852		
95% HW Approx. Gamma UTL with 90% Coverage	4008		

Pb

General Statistics

Total Number of Observations	30	Number of Distinct Observations	30
Tolerance Factor	1.777		

Raw Statistics		Log-Transformed Statistics	
Minimum	31	Minimum	3.434
Maximum	1230	Maximum	7.115
Second Largest	1010	Second Largest	6.918
First Quartile	60.75	First Quartile	4.107
Median	84.3	Median	4.43
Third Quartile	181.5	Third Quartile	5.199
Mean	192.8	Mean	4.729
SD	274	SD	0.937

Coefficient of Variation 1.421
Skewness 2.956

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.575	Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	679.6	95% UTL with 90% Coverage	598
95% UPL (t)	666	95% UPL (t)	570.7
90% Percentile (z)	543.9	90% Percentile (z)	376
95% Percentile (z)	643.4	95% Percentile (z)	528.4
99% Percentile (z)	830.2	99% Percentile (z)	1000

Gamma Distribution Test		Data Distribution Test	
k star	0.99	Data do not follow a Discernable Distribution (0.05)	
Theta Star	194.8		
MLE of Mean	192.8		
MLE of Standard Deviation	193.8		
nu star	59.39		
A-D Test Statistic	1.886	**Nonparametric Statistics**	
5% A-D Critical Value	0.774	90% Percentile	354
K-S Test Statistic	0.187	95% Percentile	763.4
5% K-S Critical Value	0.165	99% Percentile	1166
Data not Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	1010
90% Percentile	445	95% Percentile Bootstrap UTL with 90% Coverage	1032
95% Percentile	579.6	95% BCA Bootstrap UTL with 90% Coverage	1010
99% Percentile	892.4	95% UPL	1109
		95% Chebyshev UPL	1407
95% WH Approx. Gamma UPL	571	Upper Threshold Limit Based upon IQR	362.6
95% HW Approx. Gamma UPL	565.9		
95% WH Approx. Gamma UTL with 90% Coverage	590.3		
95% HW Approx. Gamma UTL with 90% Coverage	586.5		

Zn

General Statistics

Total Number of Observations	30	Number of Distinct Observations	30
Tolerance Factor	1.777		
Raw Statistics		**Log-Transformed Statistics**	
Minimum	34	Minimum	3.526
Maximum	756	Maximum	6.628
Second Largest	559	Second Largest	6.326
First Quartile	89.05	First Quartile	4.489
Median	180.5	Median	5.189

Third Quartile	281.3	Third Quartile	5.639
Mean	208	Mean	5.04
SD	163.9	SD	0.819
Coefficient of Variation	0.788		
Skewness	1.623		

Background Statistics

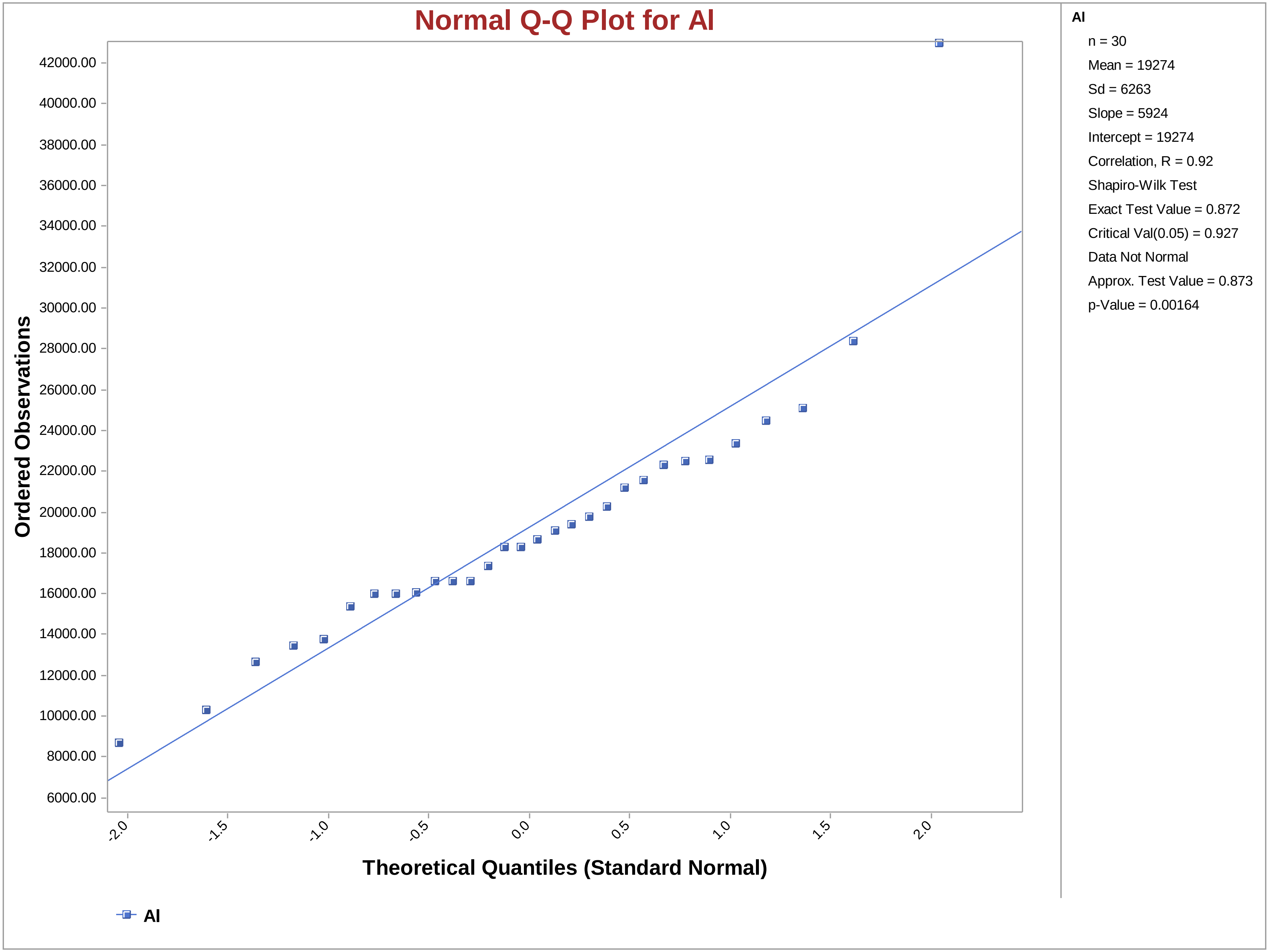
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.853	Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

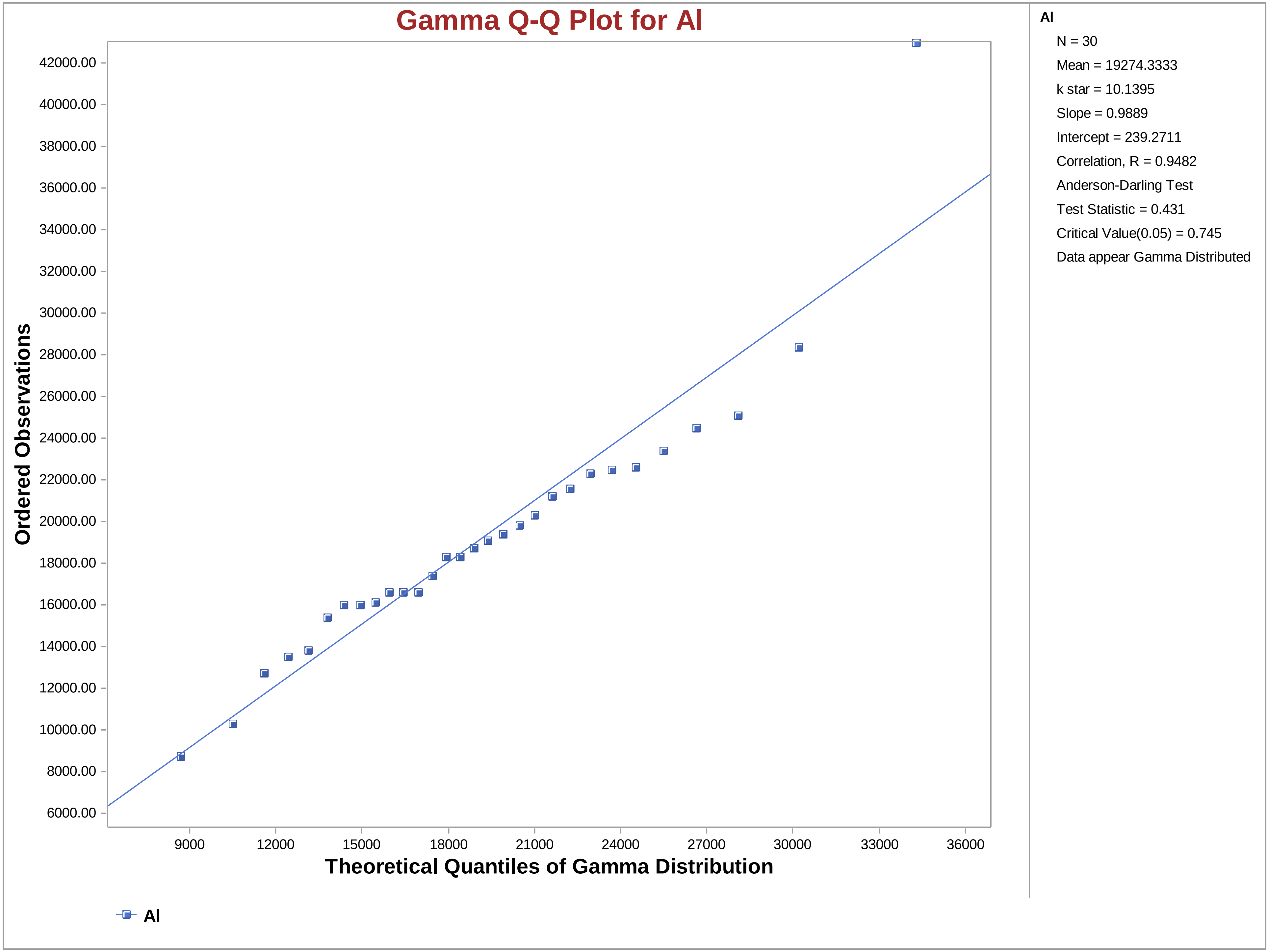
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	499.3	95% UTL with 90% Coverage	662.2
95% UPL (t)	491.2	95% UPL (t)	635.7
90% Percentile (z)	418.1	90% Percentile (z)	441.3
95% Percentile (z)	477.7	95% Percentile (z)	594.3
99% Percentile (z)	589.4	99% Percentile (z)	1039

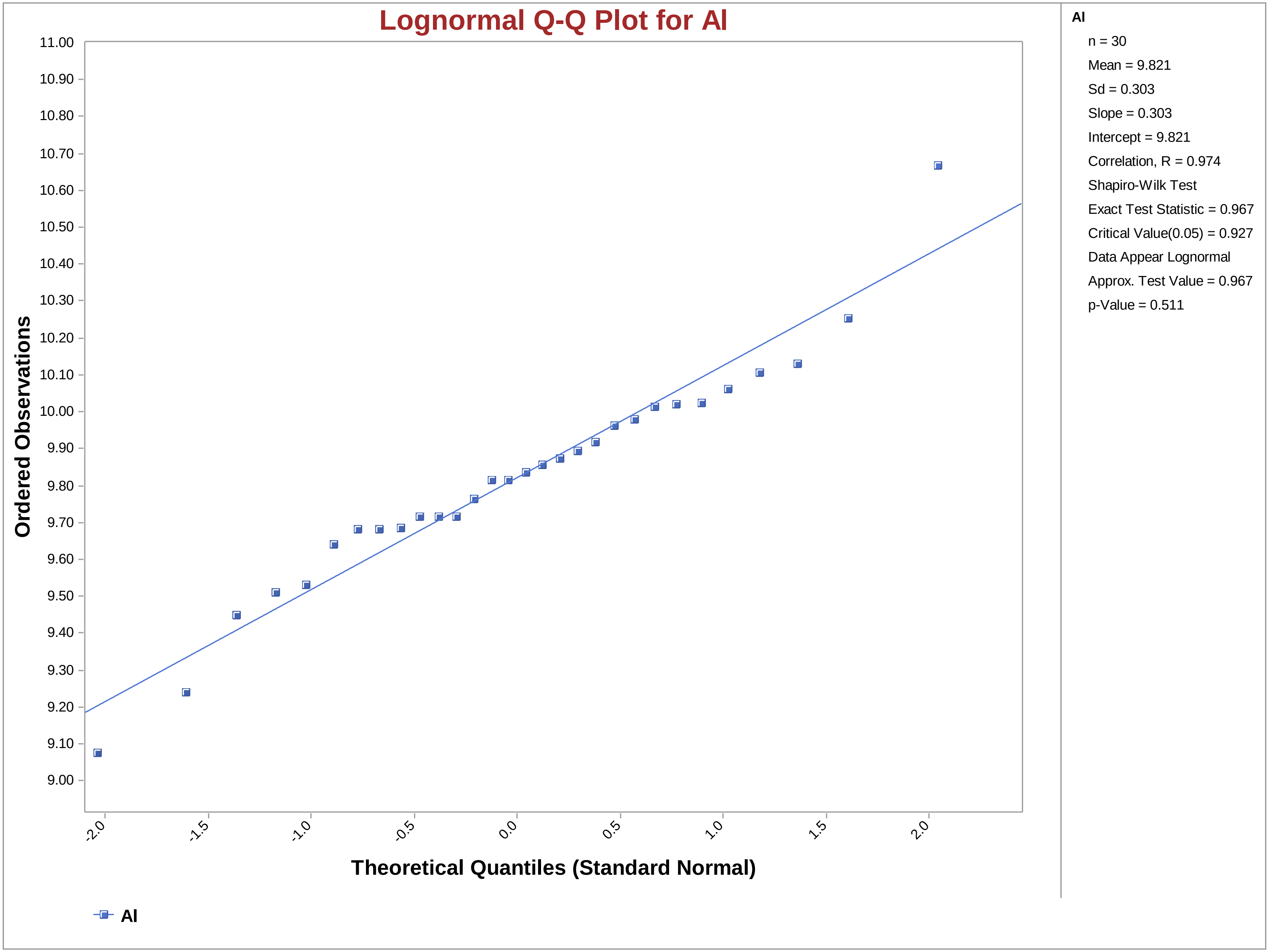
Gamma Distribution Test		Data Distribution Test	
k star	1.668	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	124.7		
MLE of Mean	208		
MLE of Standard Deviation	161		
nu star	100.1		

		Nonparametric Statistics	
A-D Test Statistic	0.307	90% Percentile	345.3
5% A-D Critical Value	0.76	95% Percentile	512.7
K-S Test Statistic	0.0806	99% Percentile	698.9
5% K-S Critical Value	0.162		
Data appear Gamma Distributed at 5% Significance Level			

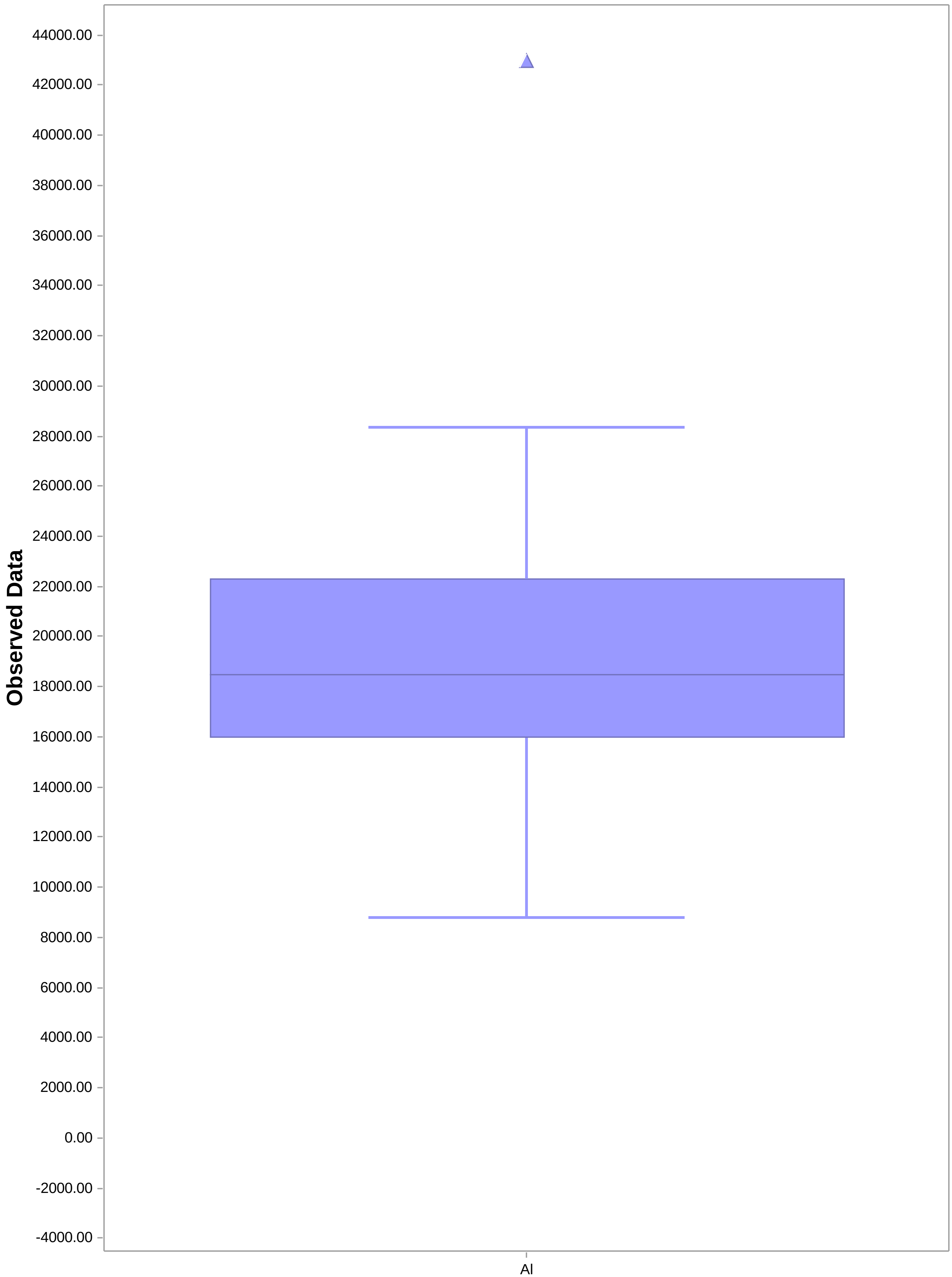
Assuming Gamma Distribution			
		95% UTL with 90% Coverage	559
90% Percentile	422.4	95% Percentile Bootstrap UTL with 90% Coverage	559
95% Percentile	523.1	95% BCA Bootstrap UTL with 90% Coverage	578.7
99% Percentile	748.9	95% UPL	647.7
		95% Chebyshev UPL	934.4
95% WH Approx. Gamma UPL	534.6	Upper Threshold Limit Based upon IQR	569.6
95% HW Approx. Gamma UPL	550.9		
95% WH Approx. Gamma UTL with 90% Coverage	549.3		
95% HW Approx. Gamma UTL with 90% Coverage	567.4		

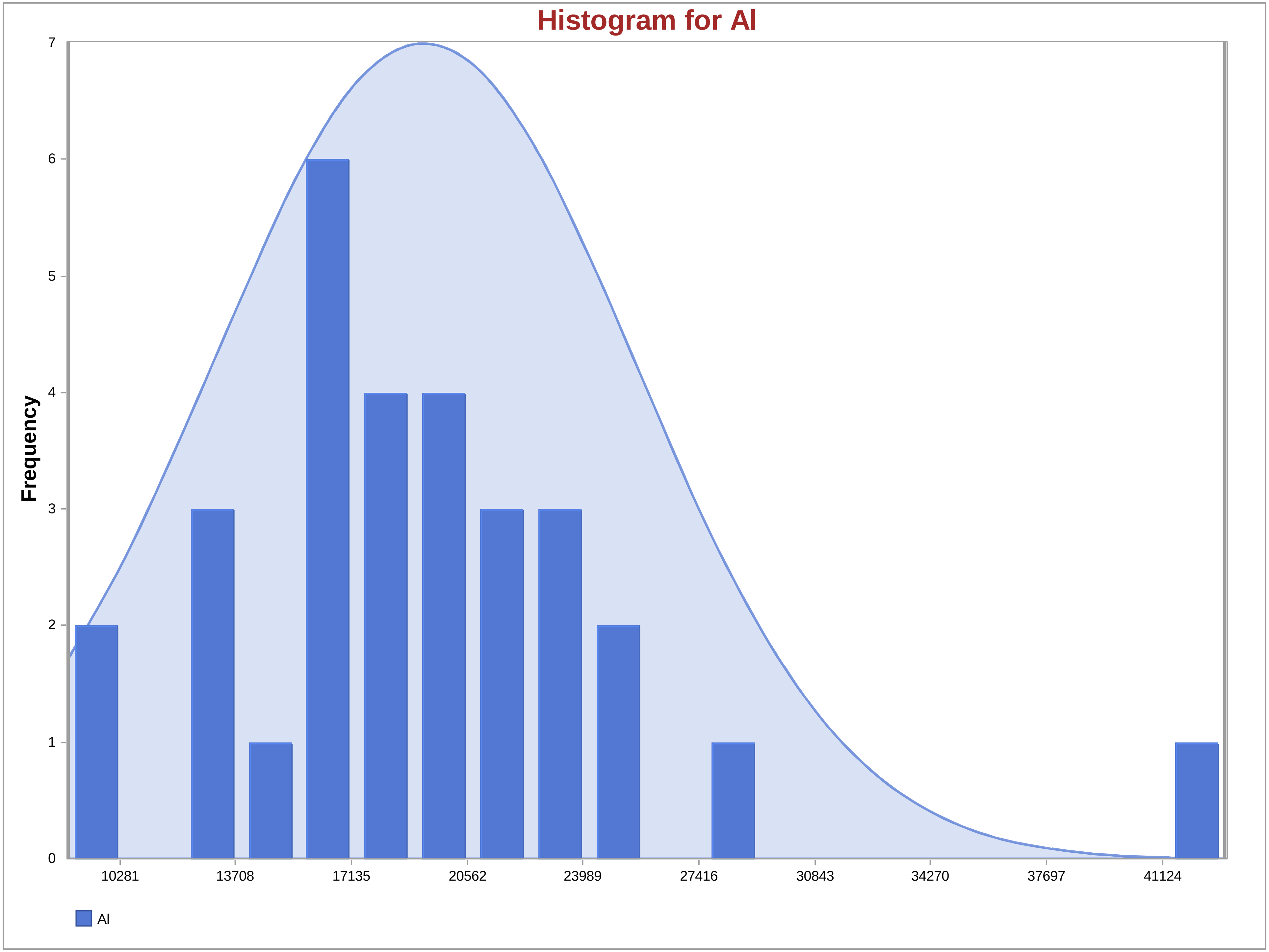

Normal Q-Q Plot for Al
Ordered Observations
42000.00
40000.00
38000.00
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Al
Al
n = 30
Mean = 19274
Sd = 6263
Slope = 5924
Intercept = 19274
Correlation, R = 0.92
Shapiro-Wilk Test
Exact Test Value = 0.872
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.873
p-Value = 0.00164


Gamma Q-Q Plot for Al
Ordered Observations
Theoretical Quantiles of Gamma Distribution
42000.00
40000.00
38000.00
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
9000
12000
15000
18000
21000
24000
27000
30000
33000
36000
Al
Al
N = 30
Mean = 19274.3333
k star = 10.1395
Slope = 0.9889
Intercept = 239.2711
Correlation, R = 0.9482
Anderson-Darling Test
Test Statistic = 0.431
Critical Value(0.05) = 0.745
Data appear Gamma Distributed


Lognormal Q-Q Plot for Al
11.00
10.90
10.80
10.70
10.60
10.50
10.40
10.30
10.20
10.10
10.00
9.90
9.80
9.70
9.60
9.50
9.40
9.30
9.20
9.10
9.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Al
Al
n = 30
Mean = 9.821
Sd = 0.303
Slope = 0.303
Intercept = 9.821
Correlation, R = 0.974
Shapiro-Wilk Test
Exact Test Statistic = 0.967
Critical Value(0.05) = 0.927
Data Appear Lognormal
Approx. Test Value = 0.967
p-Value = 0.511

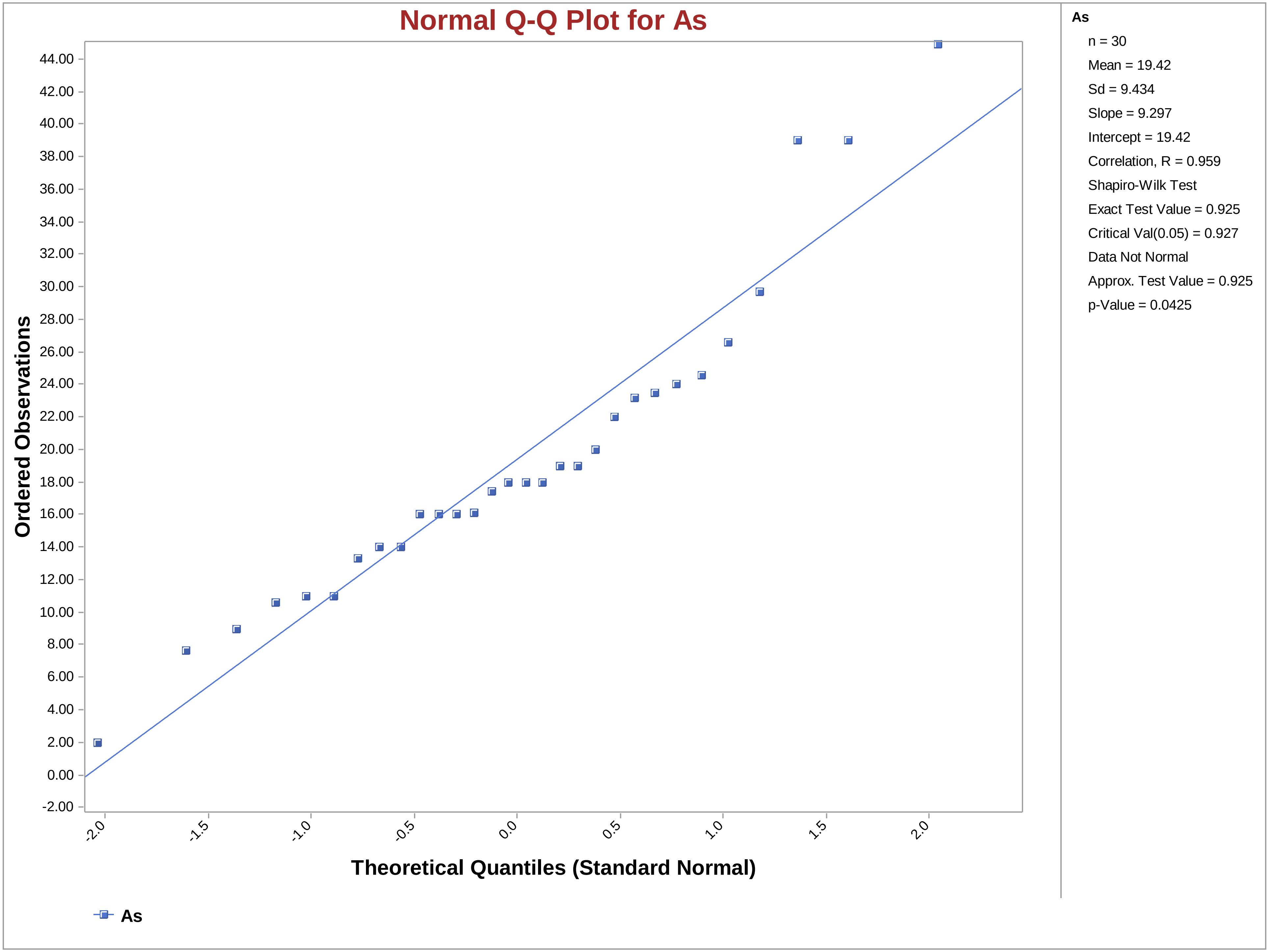
Box Plot for Al

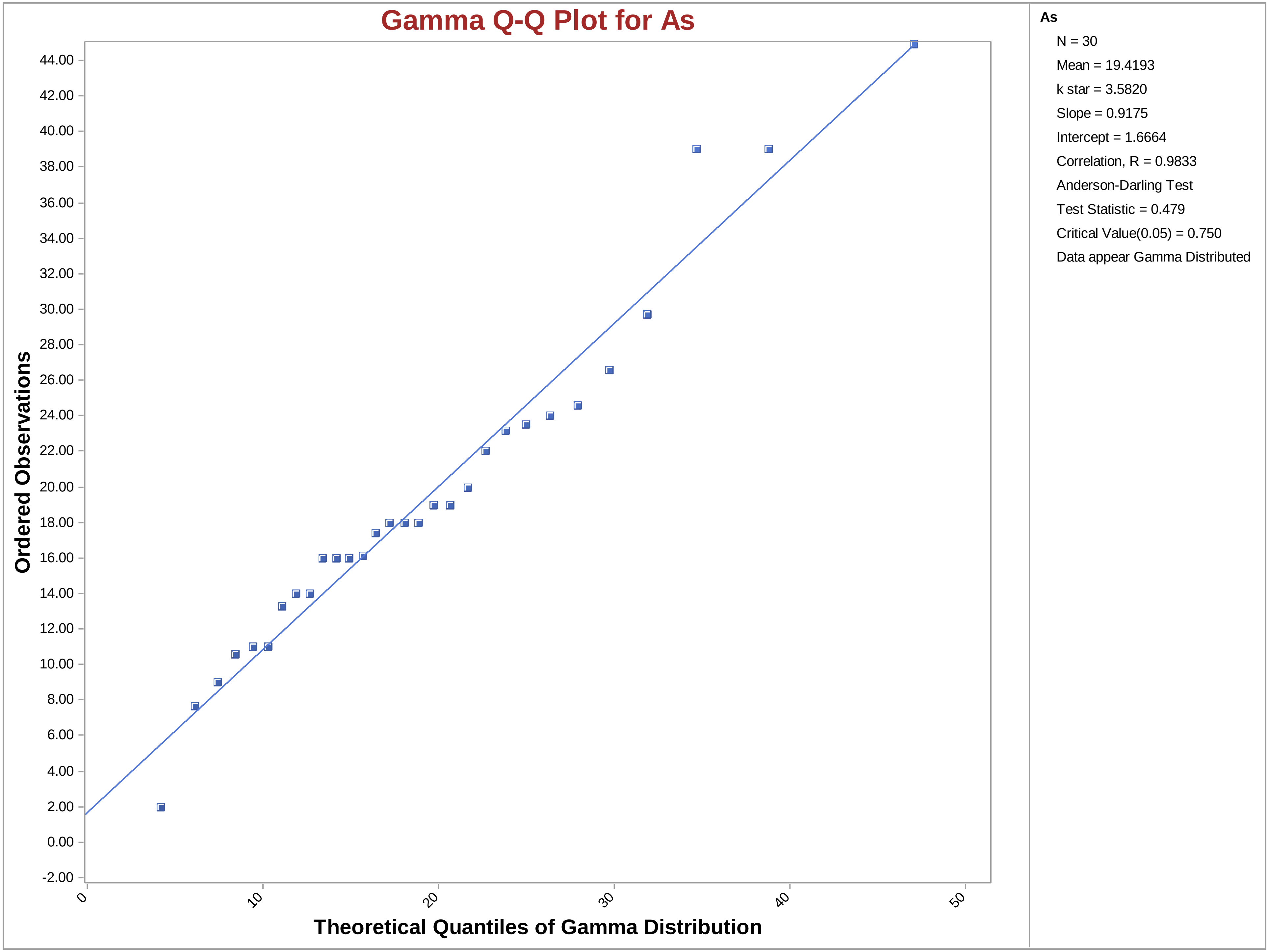




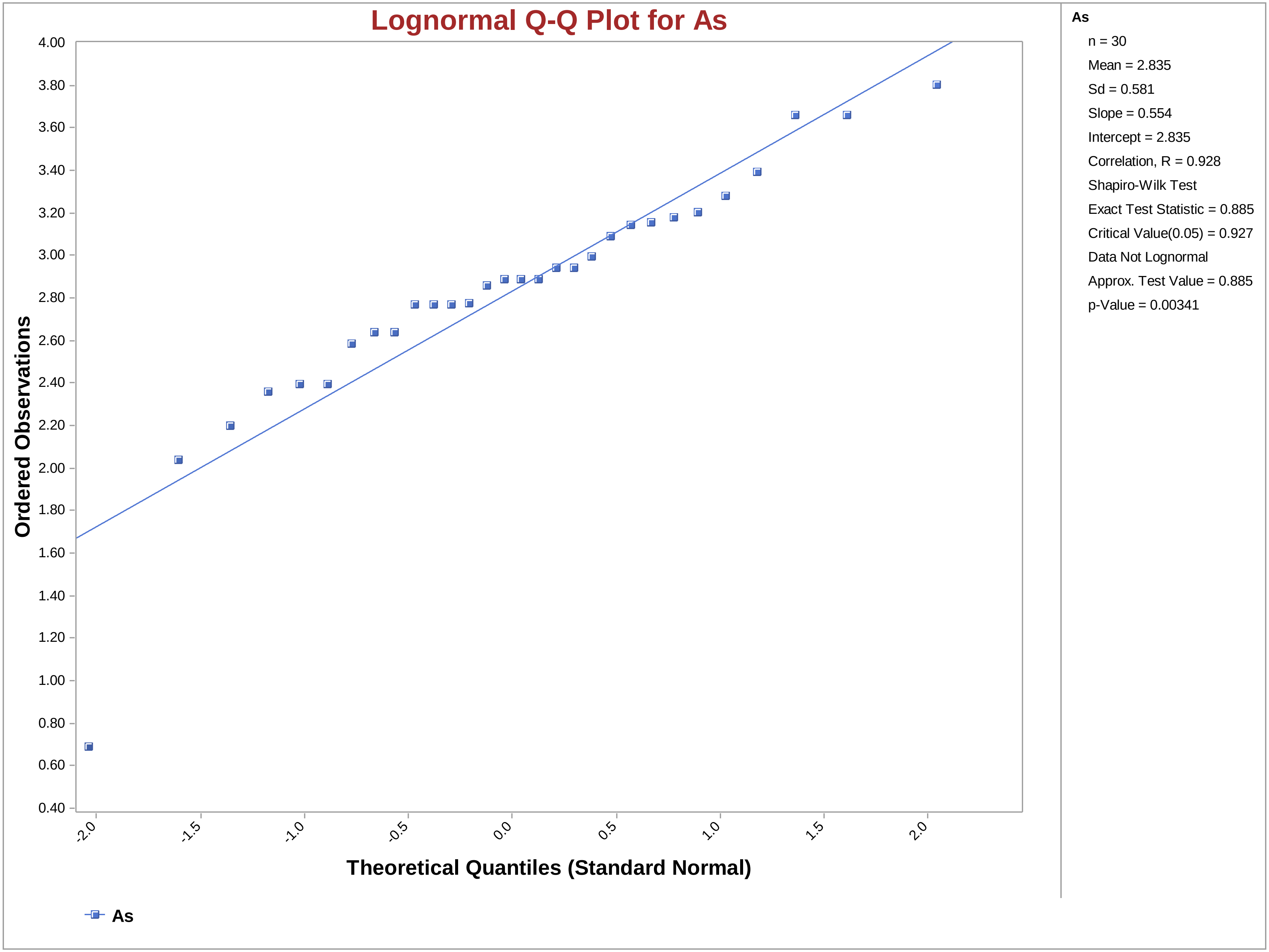
Histogram for Al
Frequency
0
1
2
3
4
5
6
7
10281
13708
17135
20562
23989
27416
30843
34270
37697
41124
Al

B1-14

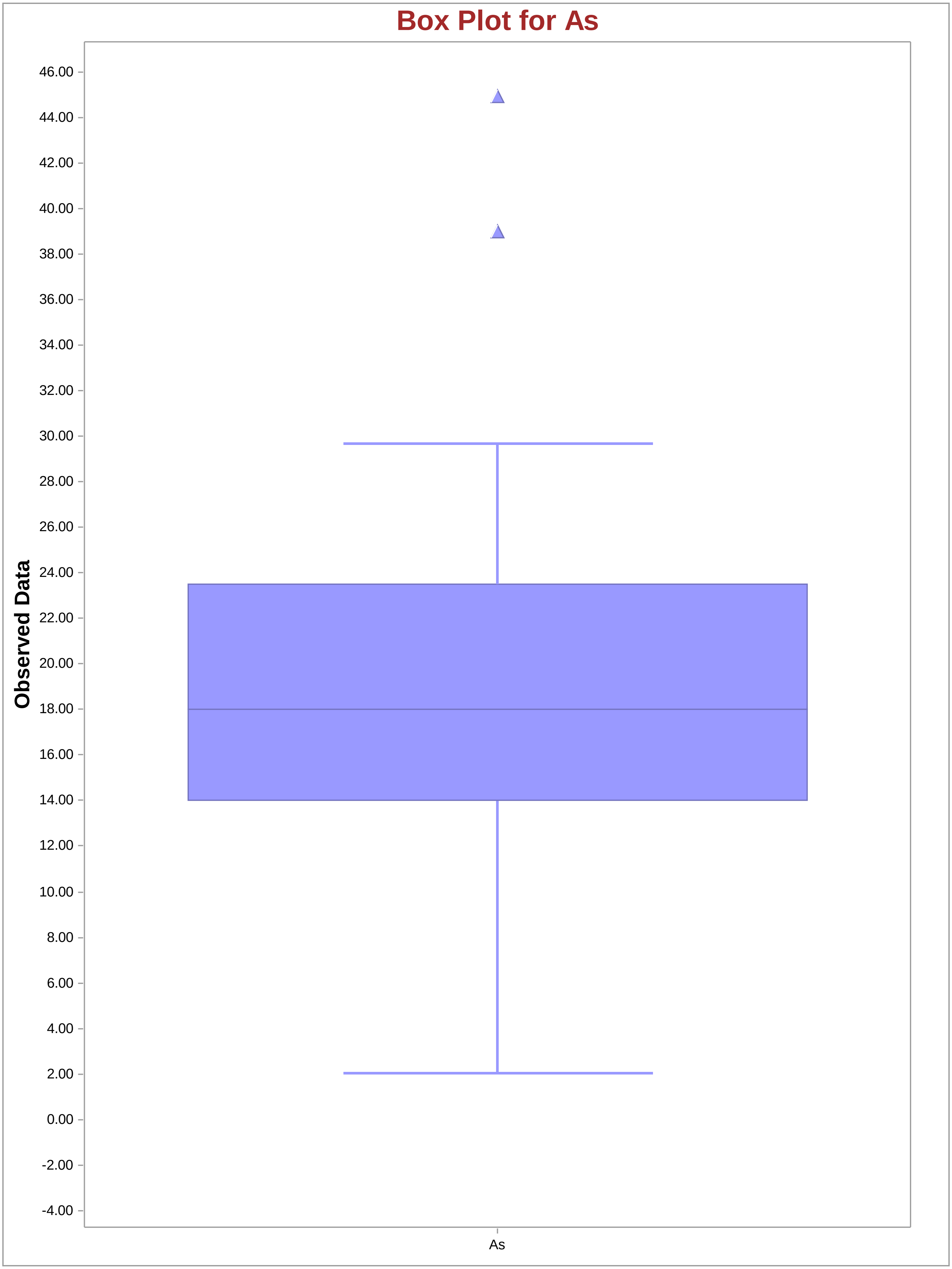

Normal Q-Q Plot for As
Ordered Observations
44.00
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
As
As
n = 30
Mean = 19.42
Sd = 9.434
Slope = 9.297
Intercept = 19.42
Correlation, R = 0.959
Shapiro-Wilk Test
Exact Test Value = 0.925
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.925
p-Value = 0.0425

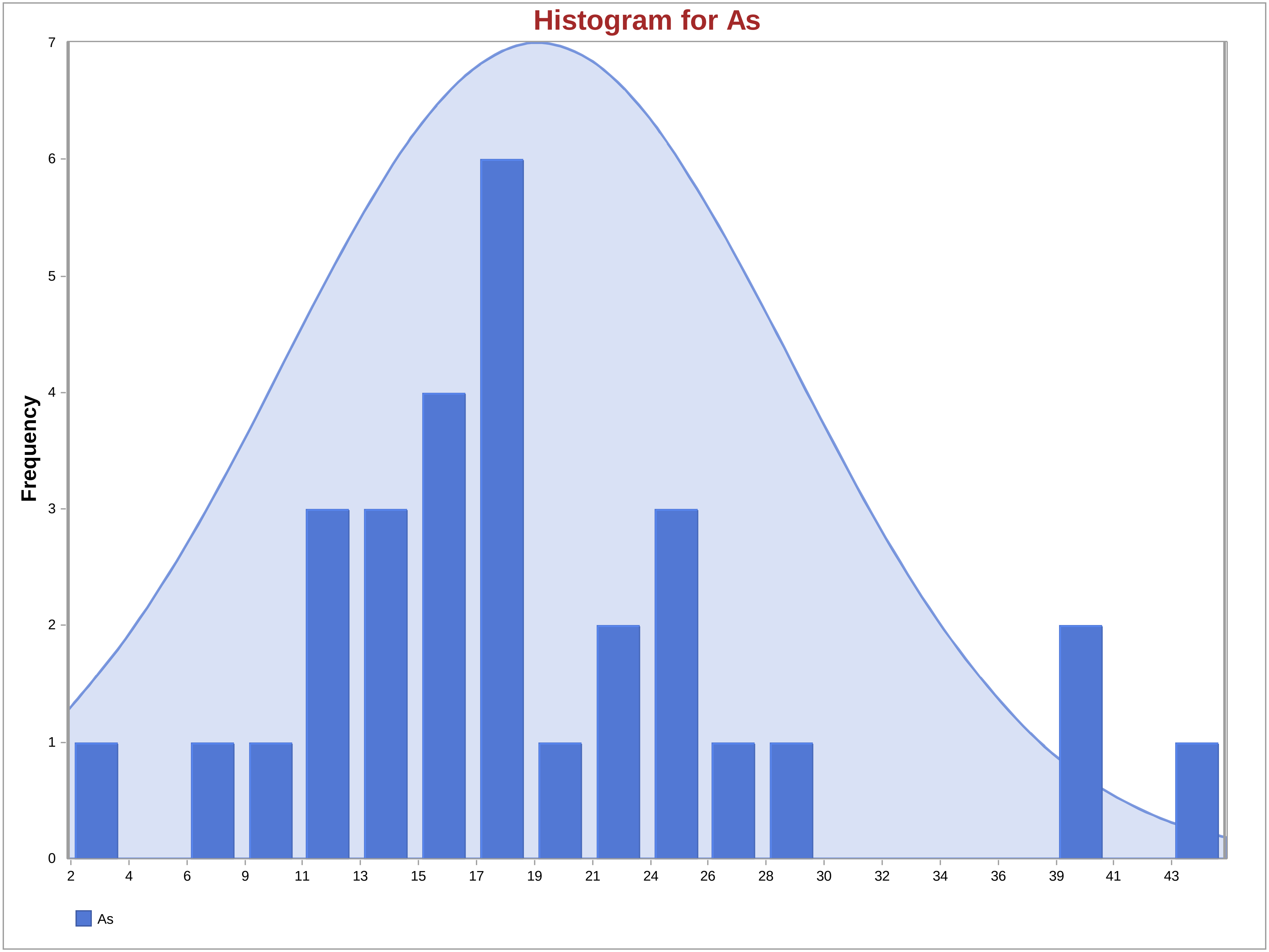


Gamma Q-Q Plot for As
Ordered Observations
44.00
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
0
10
20
30
40
50
Theoretical Quantiles of Gamma Distribution
As
N = 30
Mean = 19.4193
k star = 3.5820
Slope = 0.9175
Intercept = 1.6664
Correlation, R = 0.9833
Anderson-Darling Test
Test Statistic = 0.479
Critical Value(0.05) = 0.750
Data appear Gamma Distributed



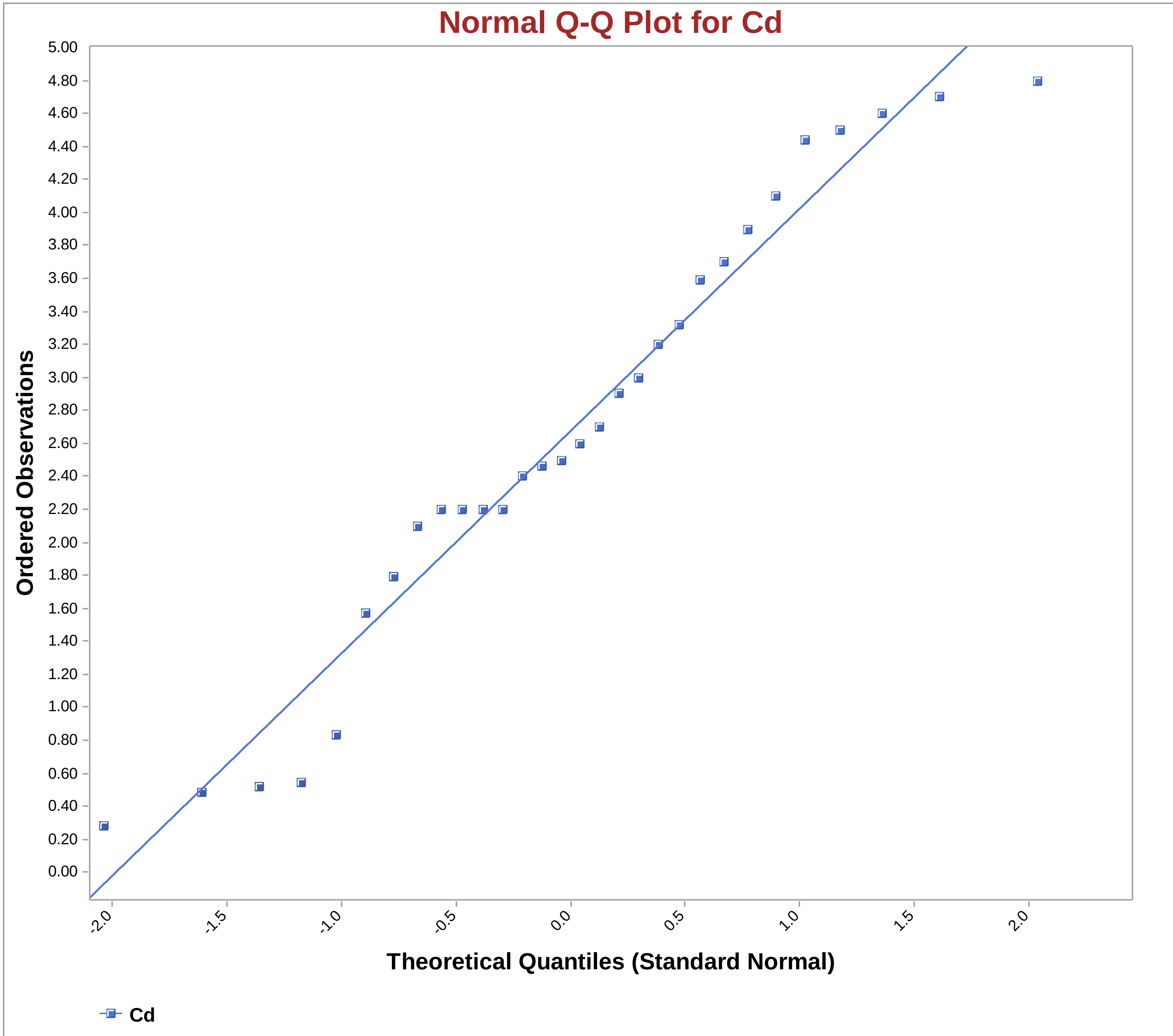
Lognormal Q-Q Plot for As
Ordered Observations
Theoretical Quantiles (Standard Normal)
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
As
As
n = 30
Mean = 2.835
Sd = 0.581
Slope = 0.554
Intercept = 2.835
Correlation, R = 0.928
Shapiro-Wilk Test
Exact Test Statistic = 0.885
Critical Value(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.885
p-Value = 0.00341


Box Plot for As
46.00
44.00
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
Observed Data
As



Histogram for As
Frequency
0
1
2
3
4
5
6
7
2
4
6
9
11
13
15
17
19
21
24
26
28
30
32
34
36
39
41
43
As

B1-19



Cd

n = 30

Mean = 2.678

Sd = 1.333

Slope = 1.346

Intercept = 2.678

Correlation, R = 0.982

Shapiro-Wilk Test

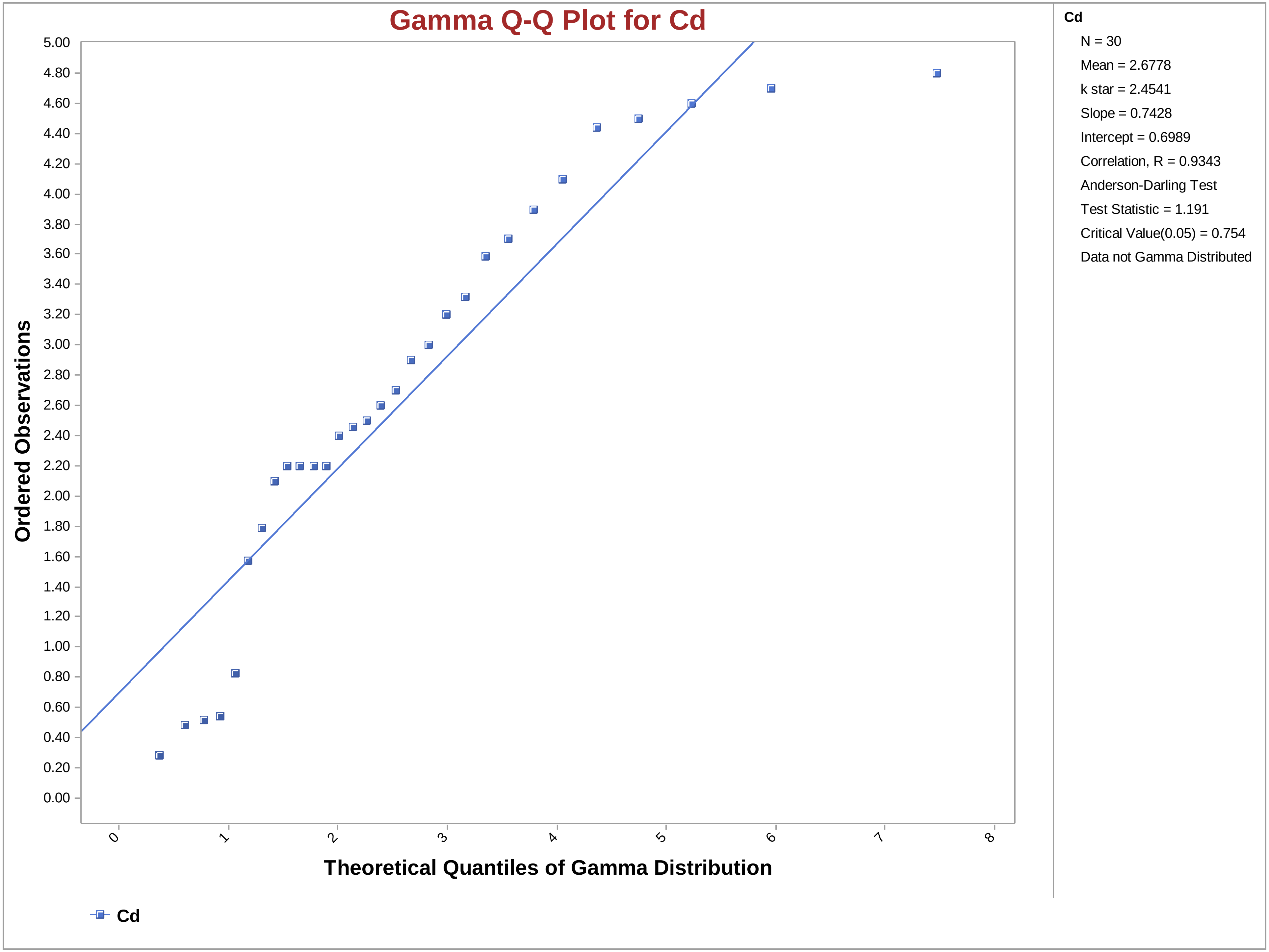
Exact Test Value = 0.947

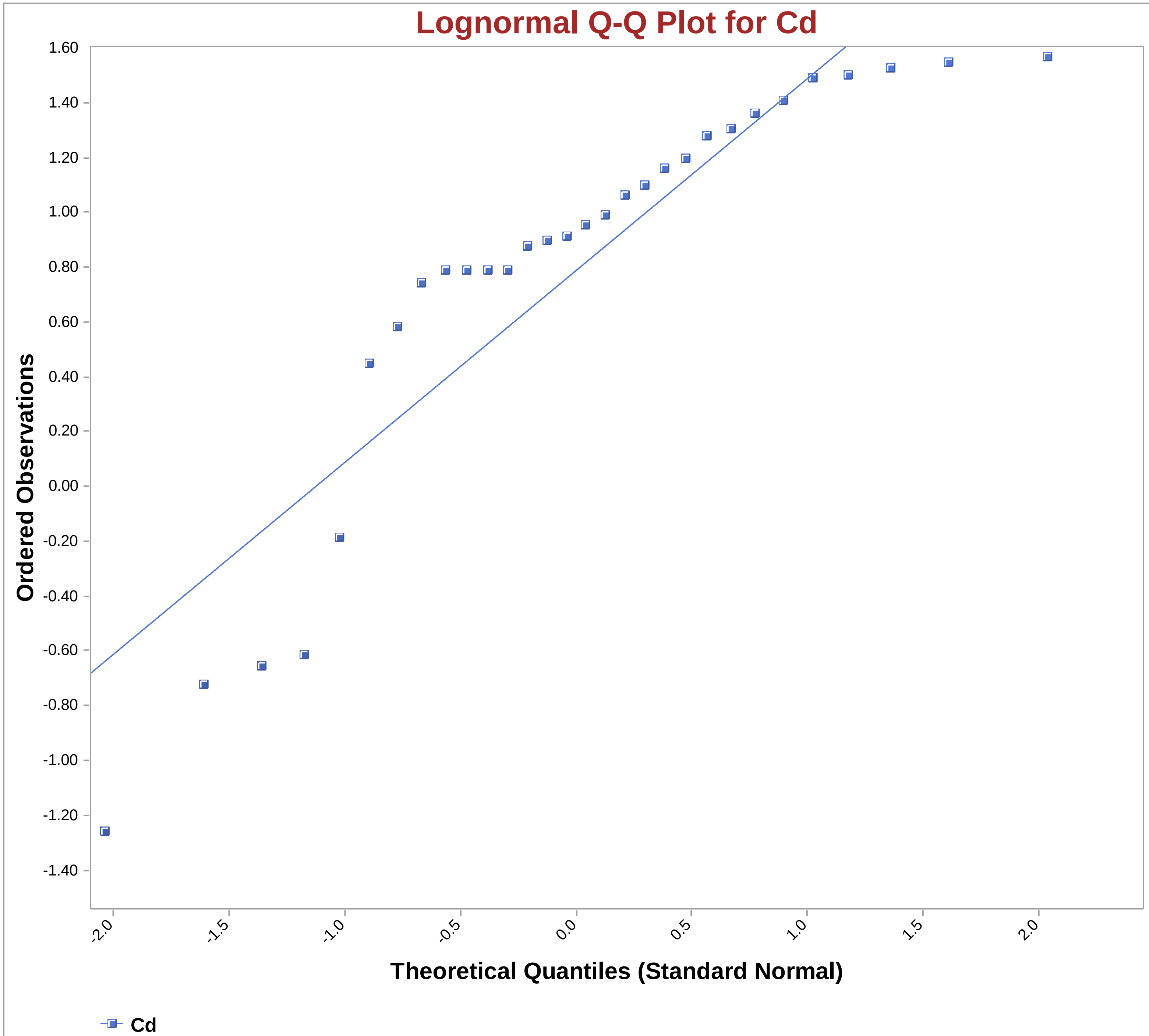
Critical Val(0.05) = 0.927

Data Appear Normal

Approx. Test Value = 0.947

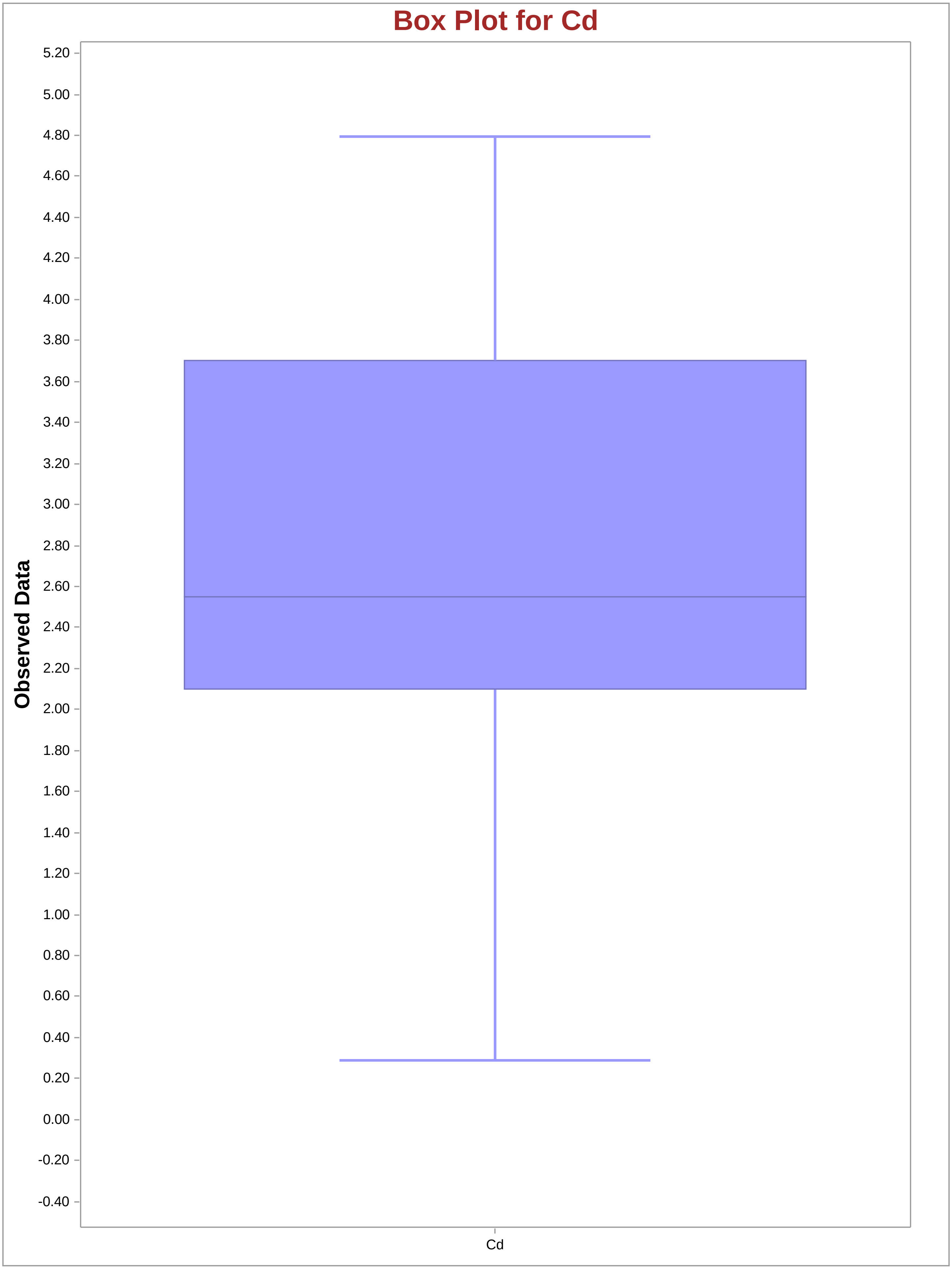
p-Value = 0.165

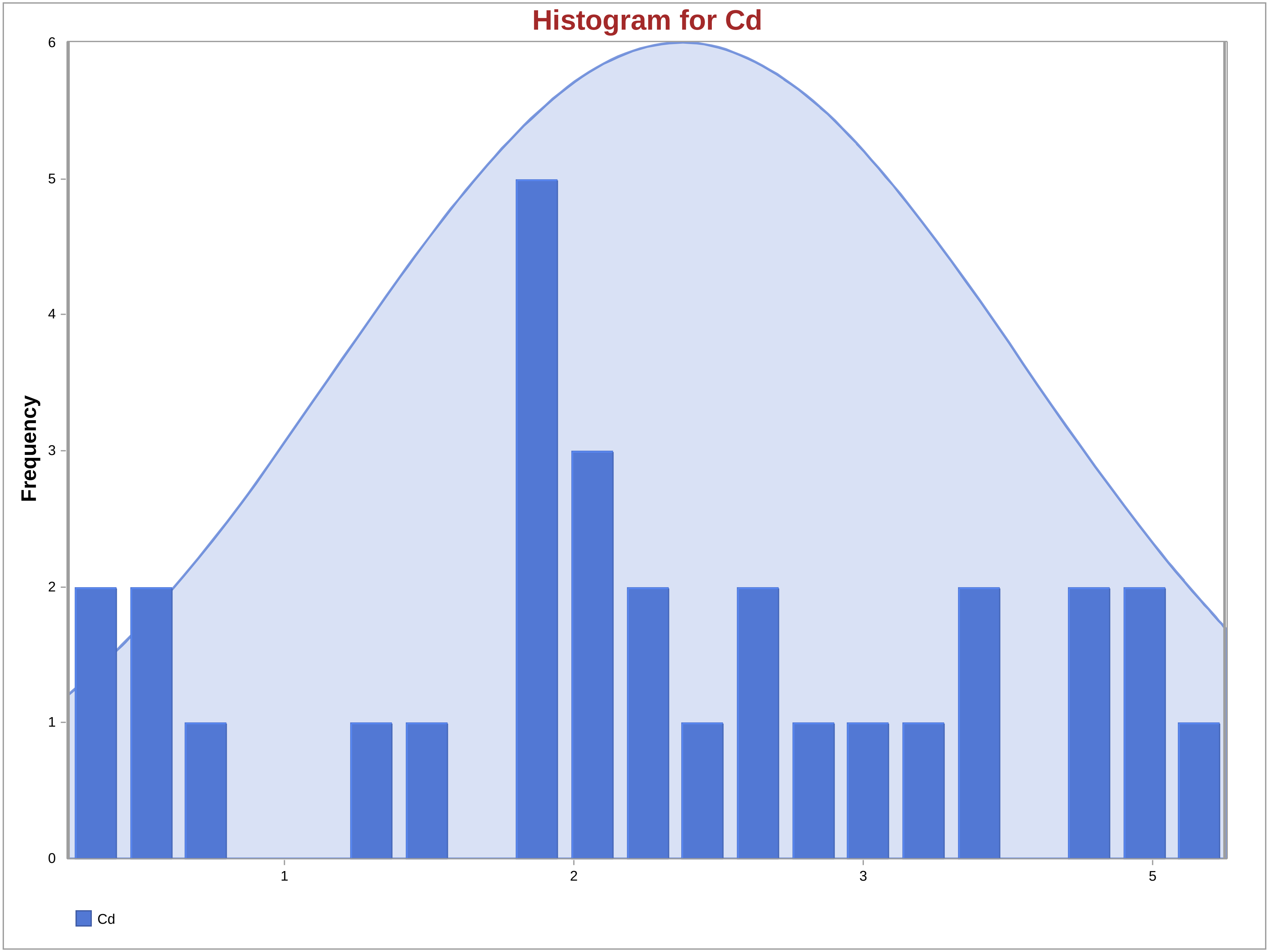

Gamma Q-Q Plot for Cd
Ordered Observations
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
1
2
3
4
5
6
7
8
Theoretical Quantiles of Gamma Distribution
Cd
Cd
N = 30
Mean = 2.6778
k star = 2.4541
Slope = 0.7428
Intercept = 0.6989
Correlation, R = 0.9343
Anderson-Darling Test
Test Statistic = 1.191
Critical Value(0.05) = 0.754
Data not Gamma Distributed



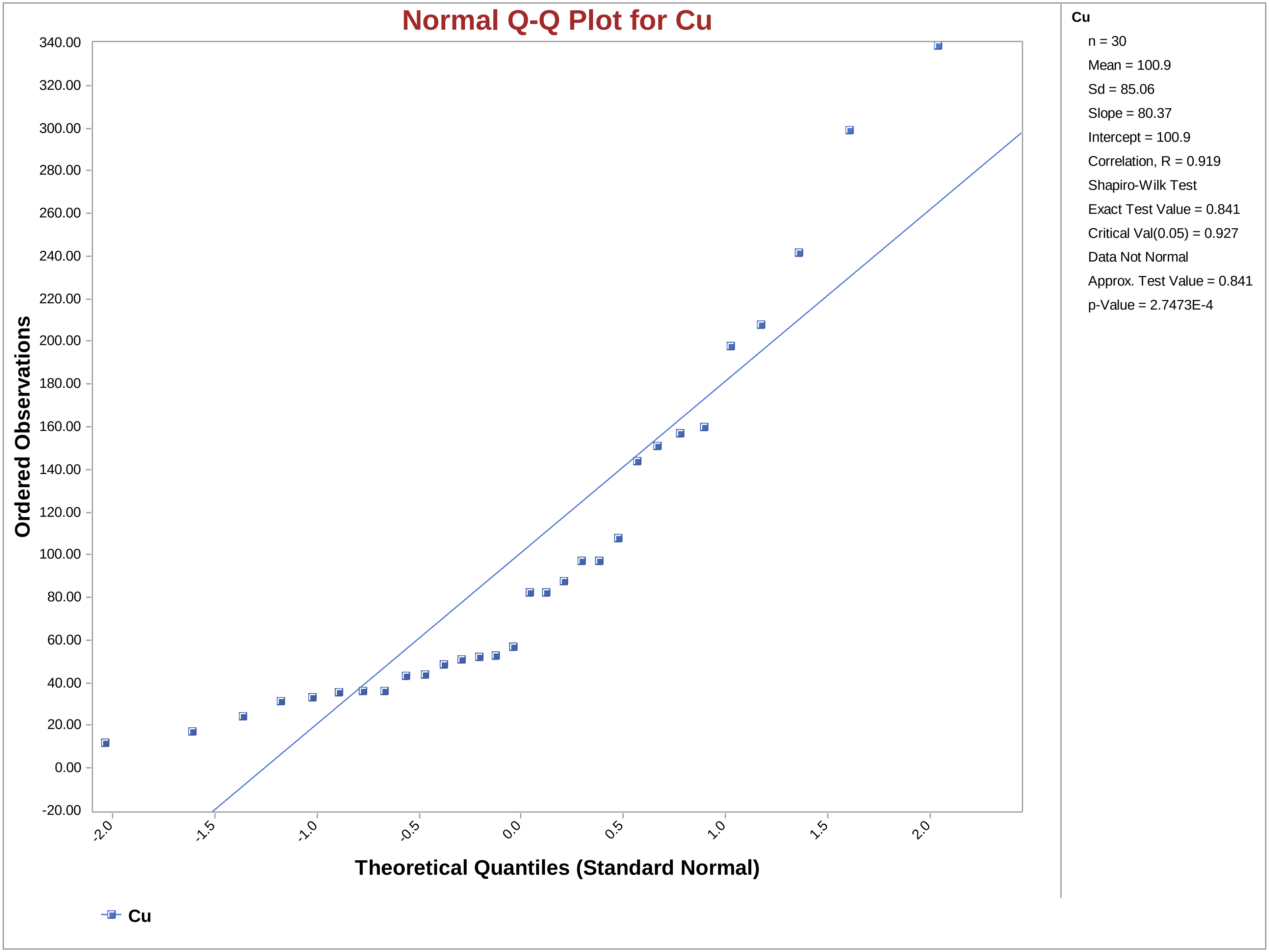
Cd

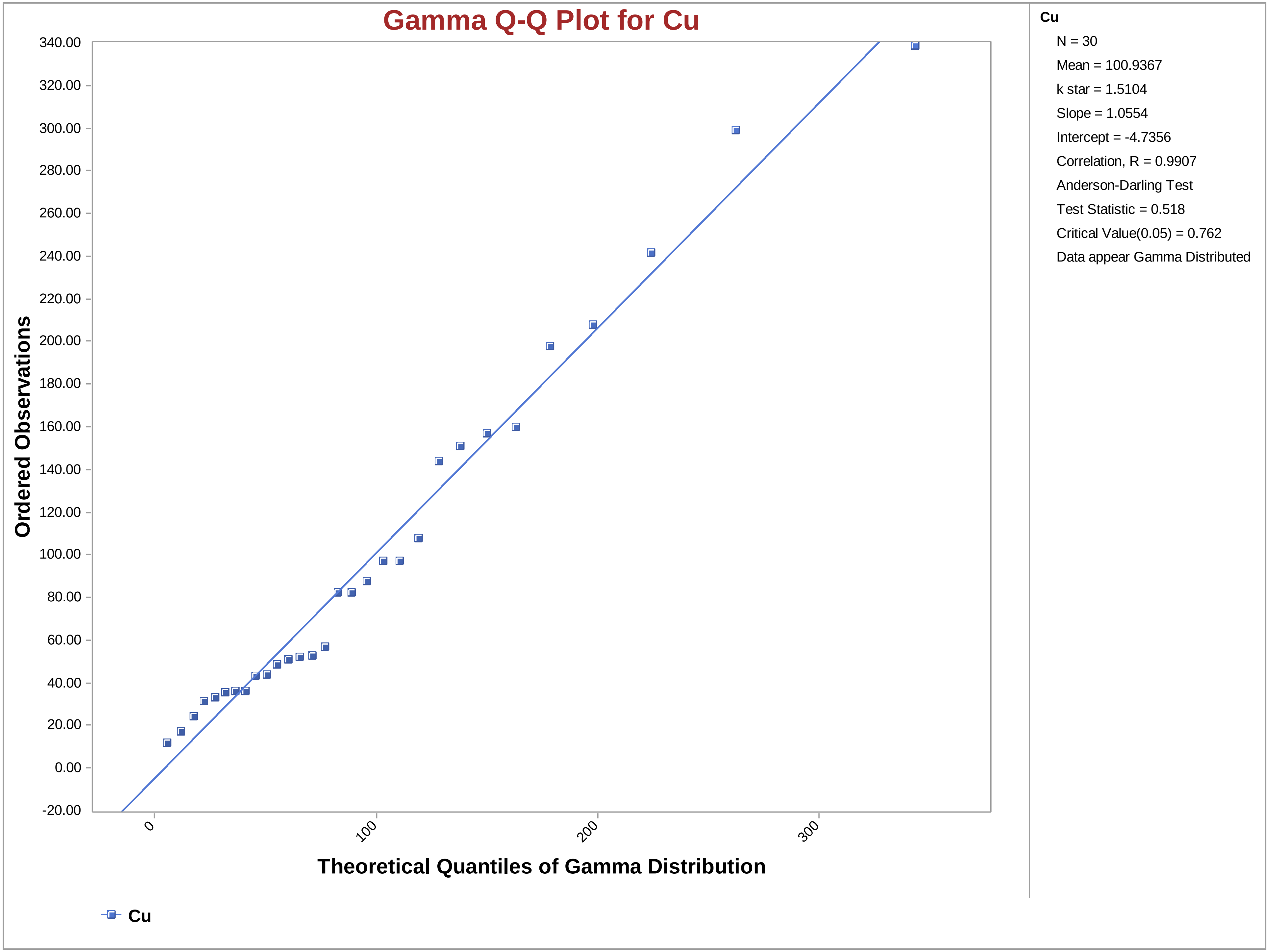
n = 30
Mean = 0.789
Sd = 0.747
Slope = 0.699
Intercept = 0.789
Correlation, R = 0.911
Shapiro-Wilk Test
Exact Test Statistic = 0.826
Critical Value(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.826
p-Value = 1.2033E-4

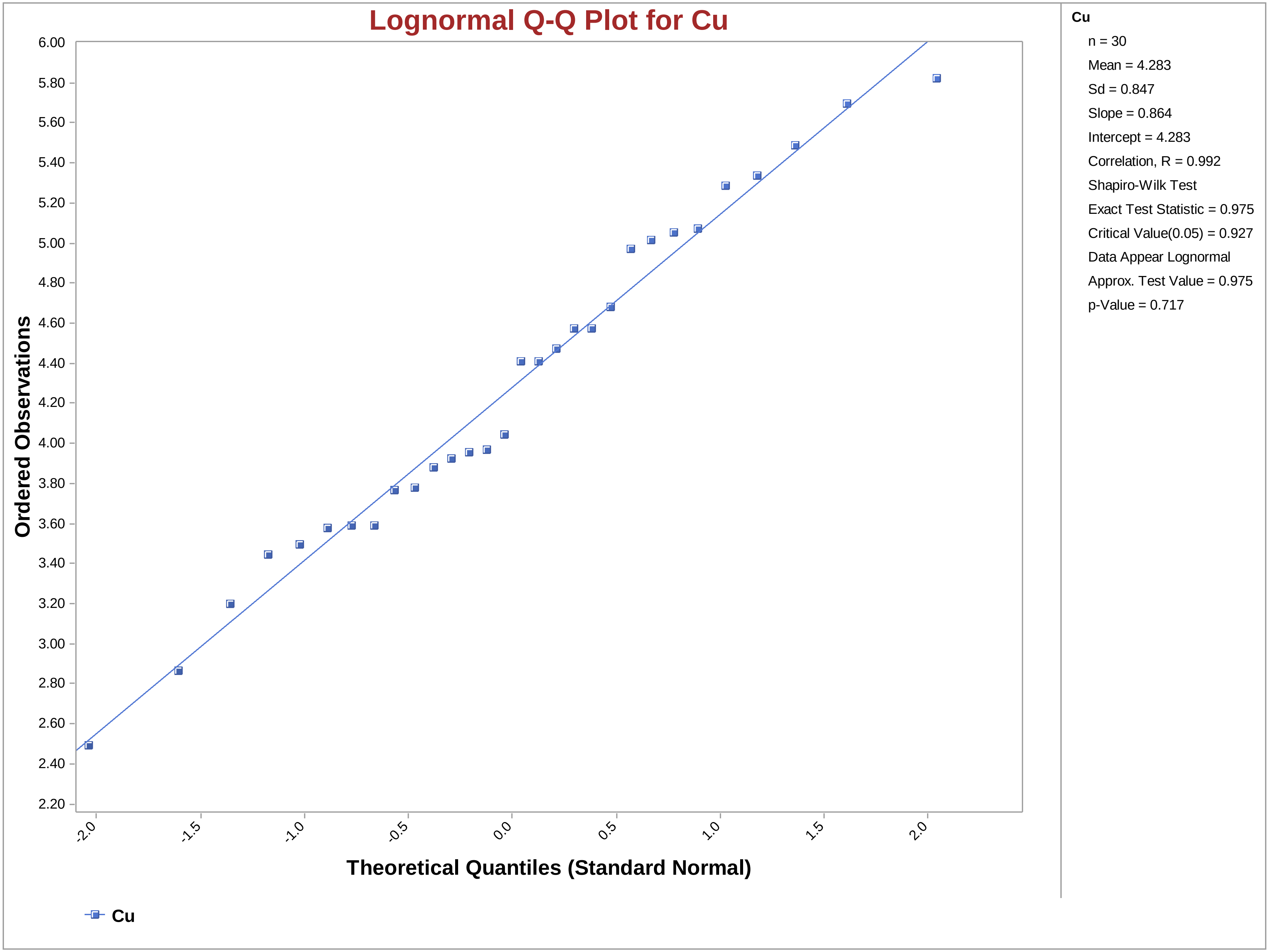

Box Plot for Cd
Observed Data
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
Cd



B1-24

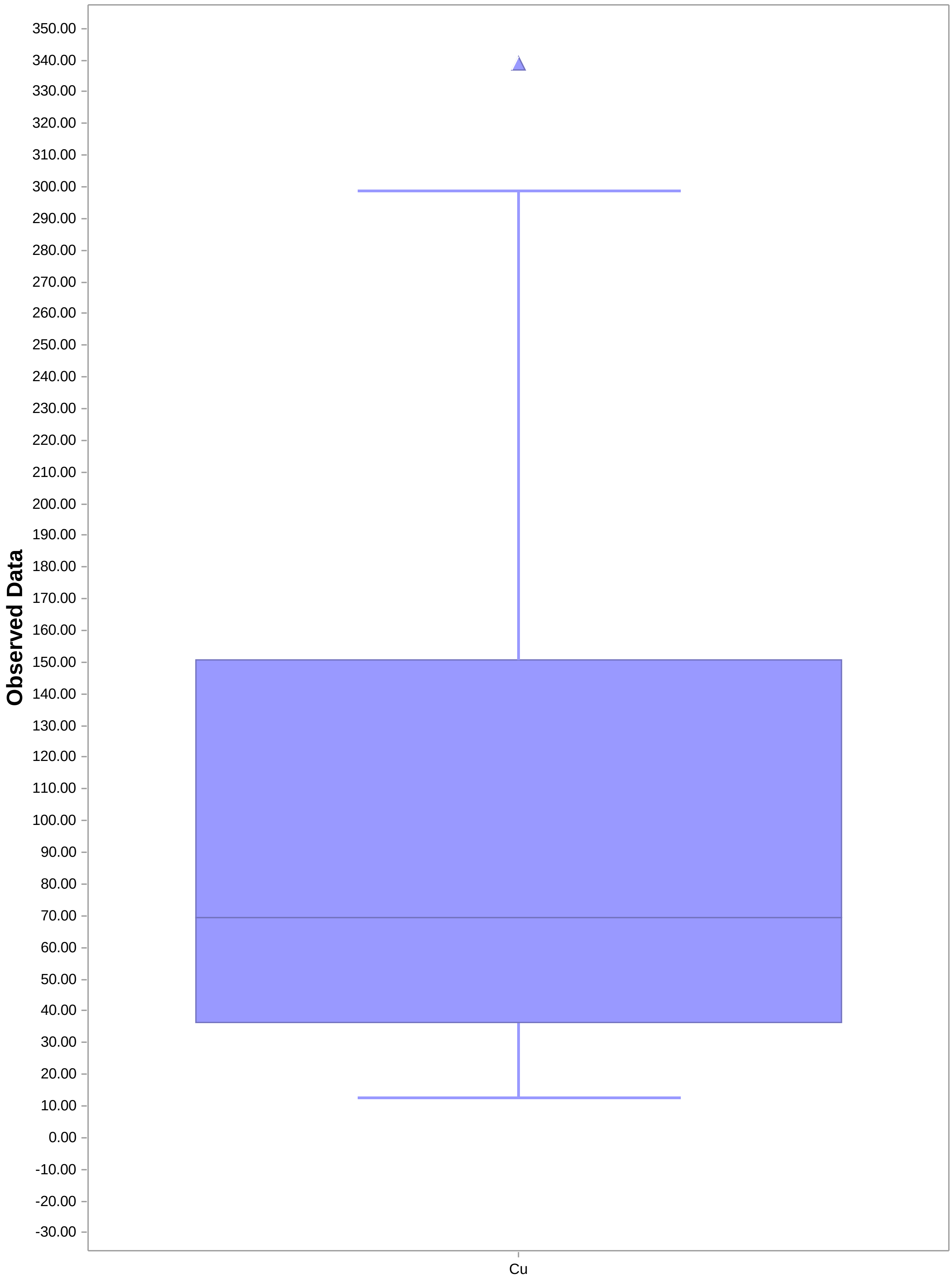

Normal Q-Q Plot for Cu
Ordered Observations
340.00
320.00
300.00
280.00
260.00
240.00
220.00
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Cu
Cu
n = 30
Mean = 100.9
Sd = 85.06
Slope = 80.37
Intercept = 100.9
Correlation, R = 0.919
Shapiro-Wilk Test
Exact Test Value = 0.841
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.841
p-Value = 2.7473E-4

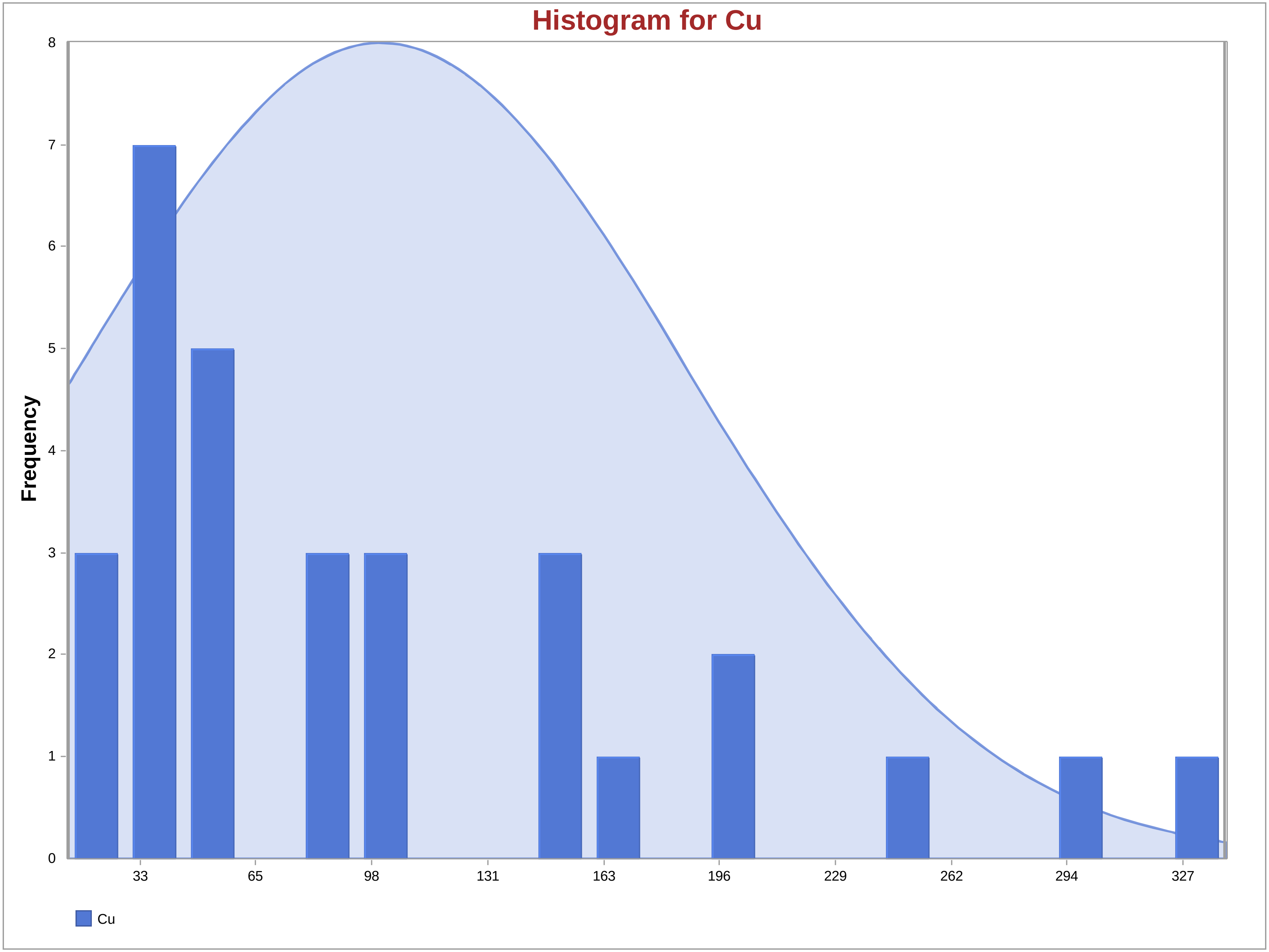

Gamma Q-Q Plot for Cu
340.00
320.00
300.00
280.00
260.00
240.00
220.00
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
Ordered Observations
0
100
200
300
Theoretical Quantiles of Gamma Distribution
Cu
Cu
N = 30
Mean = 100.9367
k star = 1.5104
Slope = 1.0554
Intercept = -4.7356
Correlation, R = 0.9907
Anderson-Darling Test
Test Statistic = 0.518
Critical Value(0.05) = 0.762
Data appear Gamma Distributed



Lognormal Q-Q Plot for Cu
Ordered Observations
Theoretical Quantiles (Standard Normal)
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Cu
Cu
n = 30
Mean = 4.283
Sd = 0.847
Slope = 0.864
Intercept = 4.283
Correlation, R = 0.992
Shapiro-Wilk Test
Exact Test Statistic = 0.975
Critical Value(0.05) = 0.927
Data Appear Lognormal
Approx. Test Value = 0.975
p-Value = 0.717

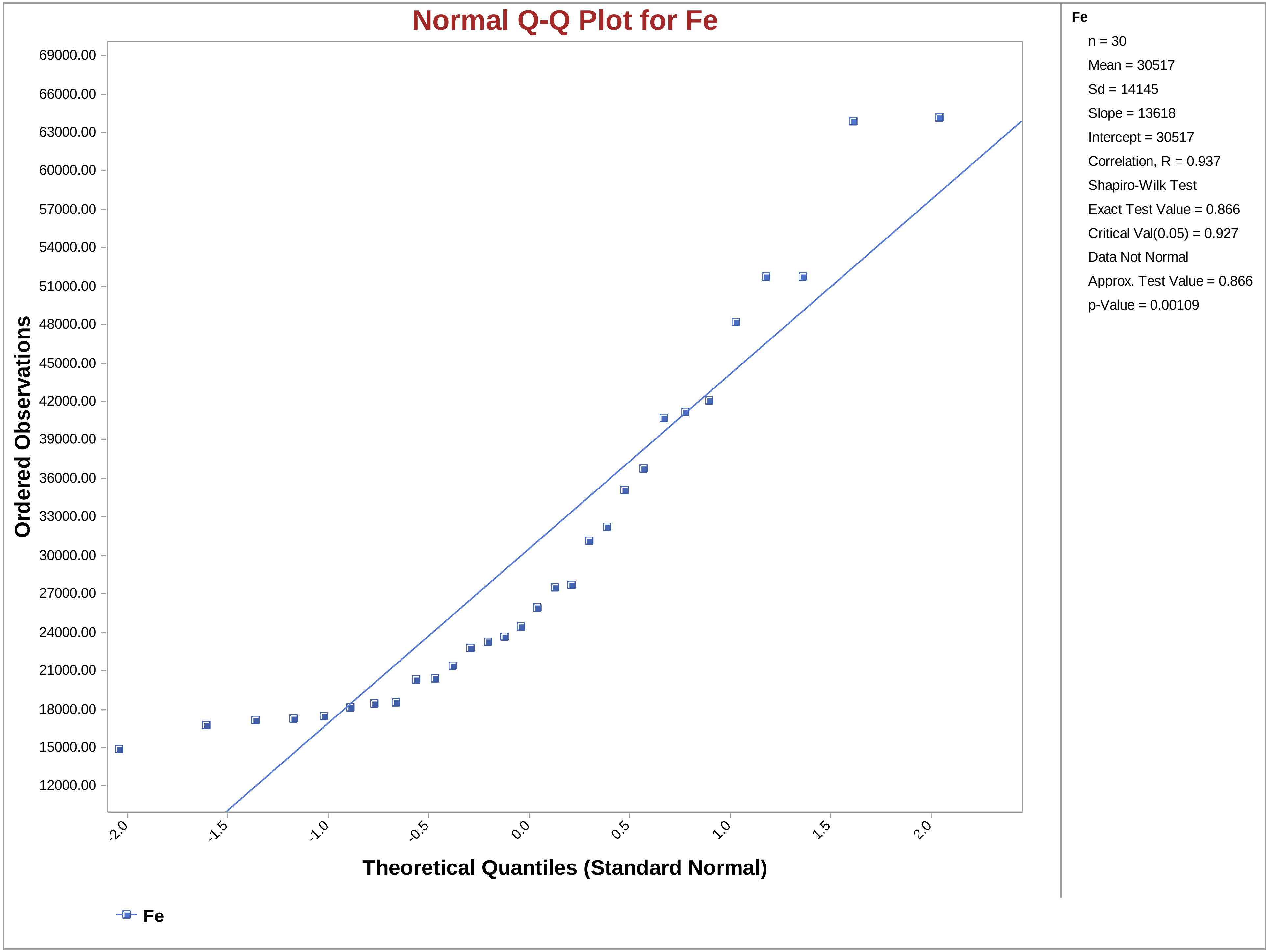
Box Plot for Cu



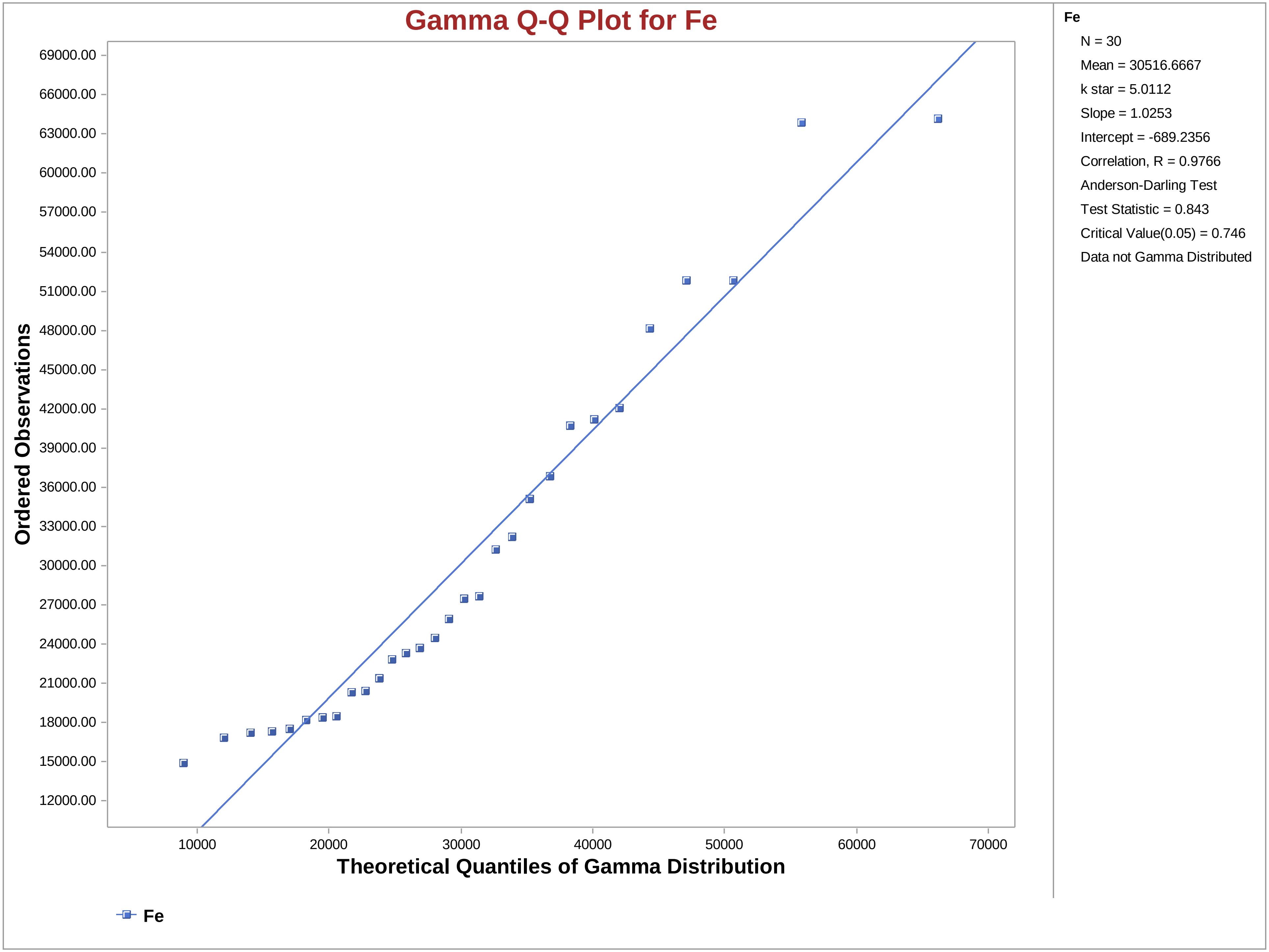


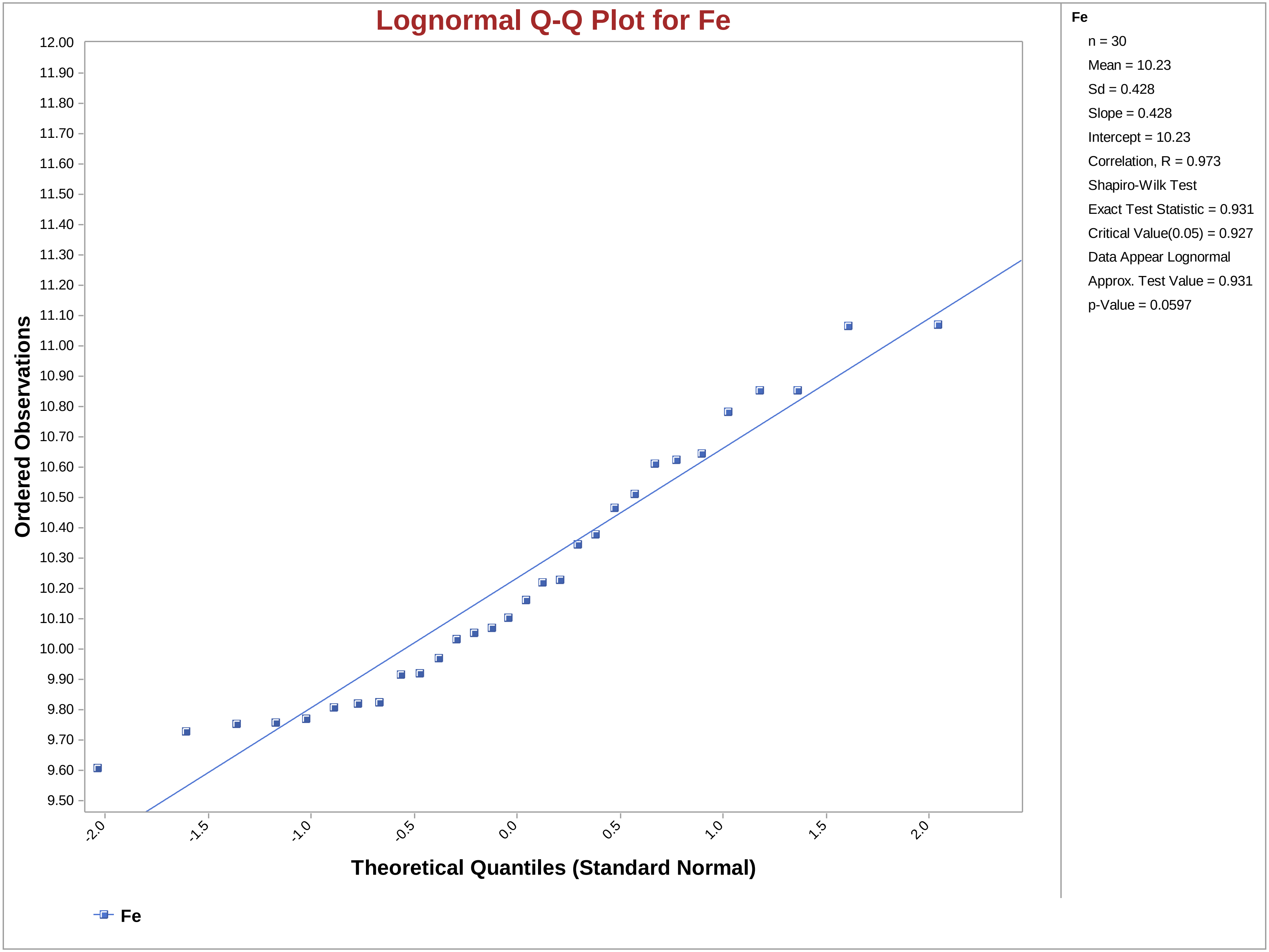
Histogram for Cu
Frequency
0
1
2
3
4
5
6
7
8
33
65
98
131
163
196
229
262
294
327
Cu

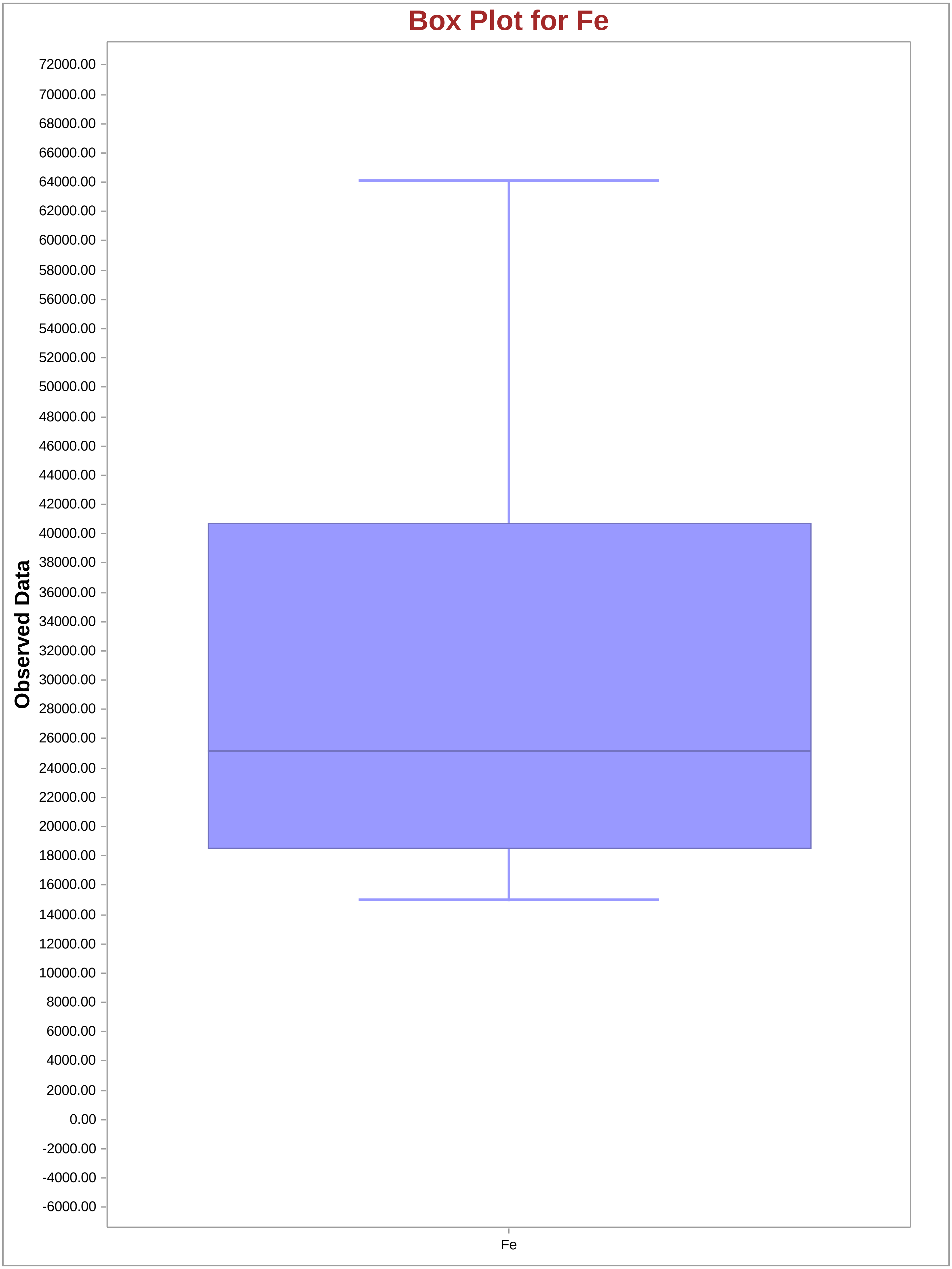
B1-29

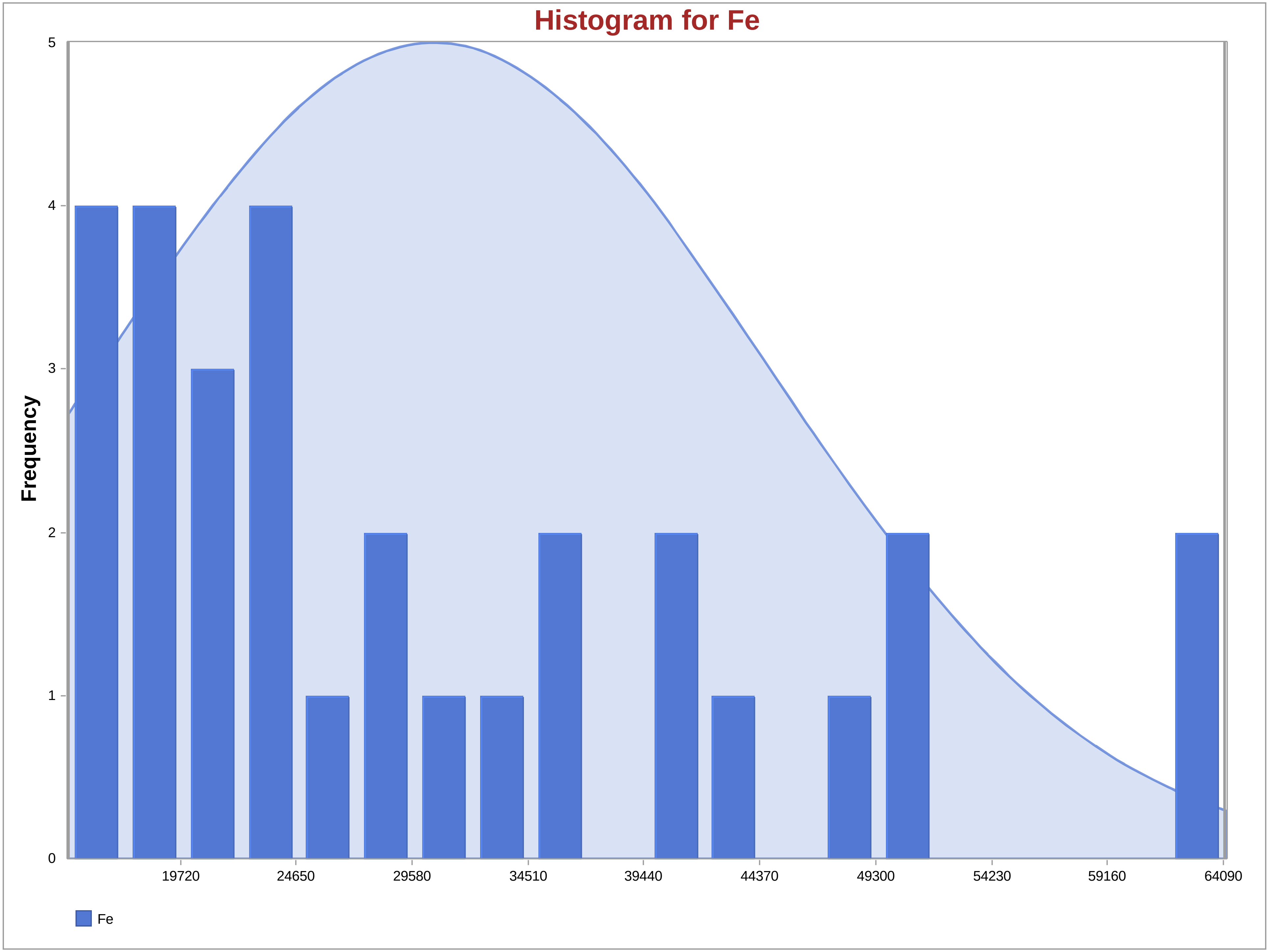


Normal Q-Q Plot for Fe
Ordered Observations
69000.00
66000.00
63000.00
60000.00
57000.00
54000.00
51000.00
48000.00
45000.00
42000.00
39000.00
36000.00
33000.00
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Fe
Fe
n = 30
Mean = 30517
Sd = 14145
Slope = 13618
Intercept = 30517
Correlation, R = 0.937
Shapiro-Wilk Test
Exact Test Value = 0.866
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.866
p-Value = 0.00109

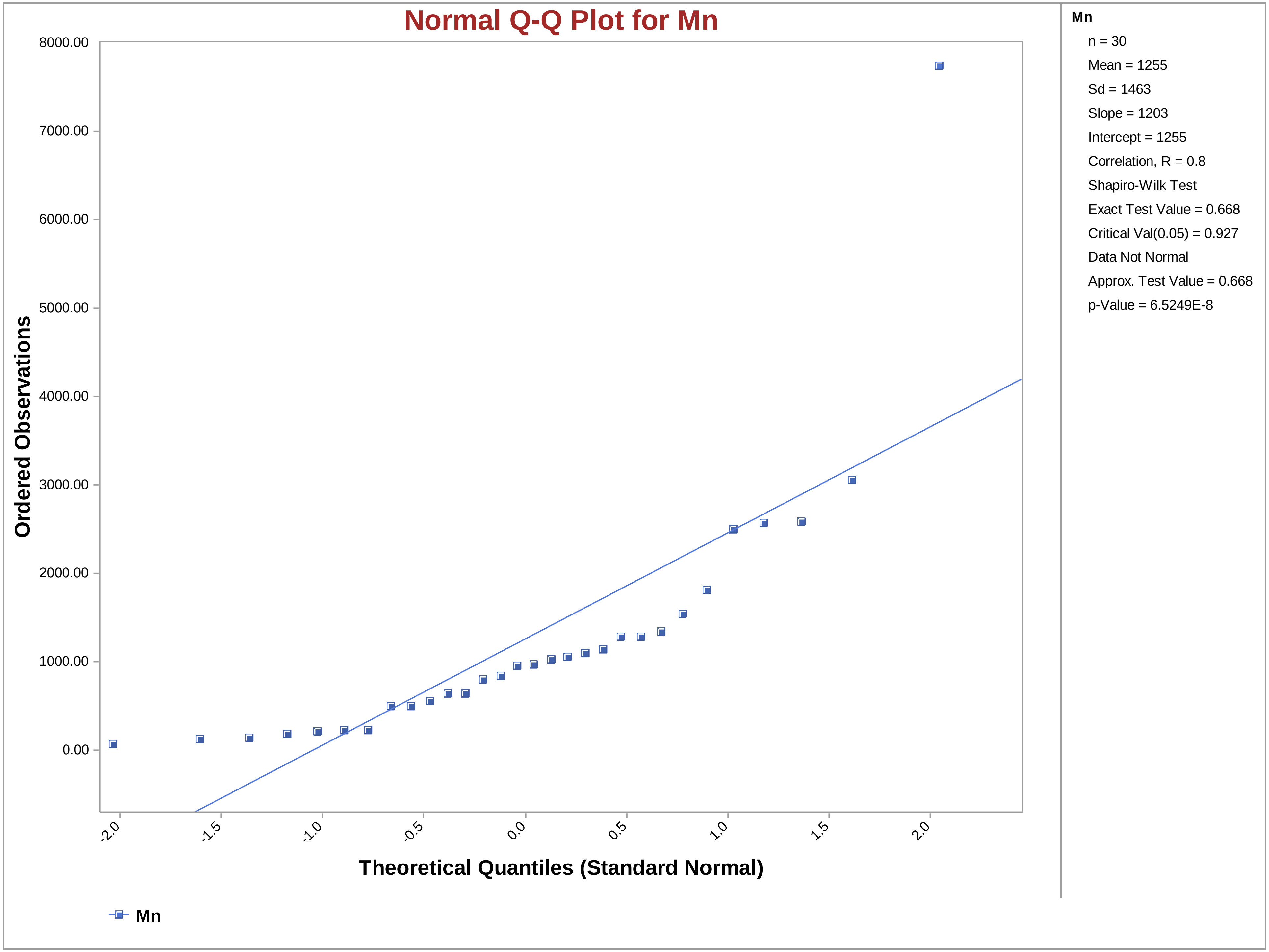

Gamma Q-Q Plot for Fe
Ordered Observations
69000.00
66000.00
63000.00
60000.00
57000.00
54000.00
51000.00
48000.00
45000.00
42000.00
39000.00
36000.00
33000.00
30000.00
27000.00
24000.00
21000.00
18000.00
15000.00
12000.00
10000
20000
30000
40000
50000
60000
70000
Theoretical Quantiles of Gamma Distribution
Fe
Fe
N = 30
Mean = 30516.6667
k star = 5.0112
Slope = 1.0253
Intercept = -689.2356
Correlation, R = 0.9766
Anderson-Darling Test
Test Statistic = 0.843
Critical Value(0.05) = 0.746
Data not Gamma Distributed

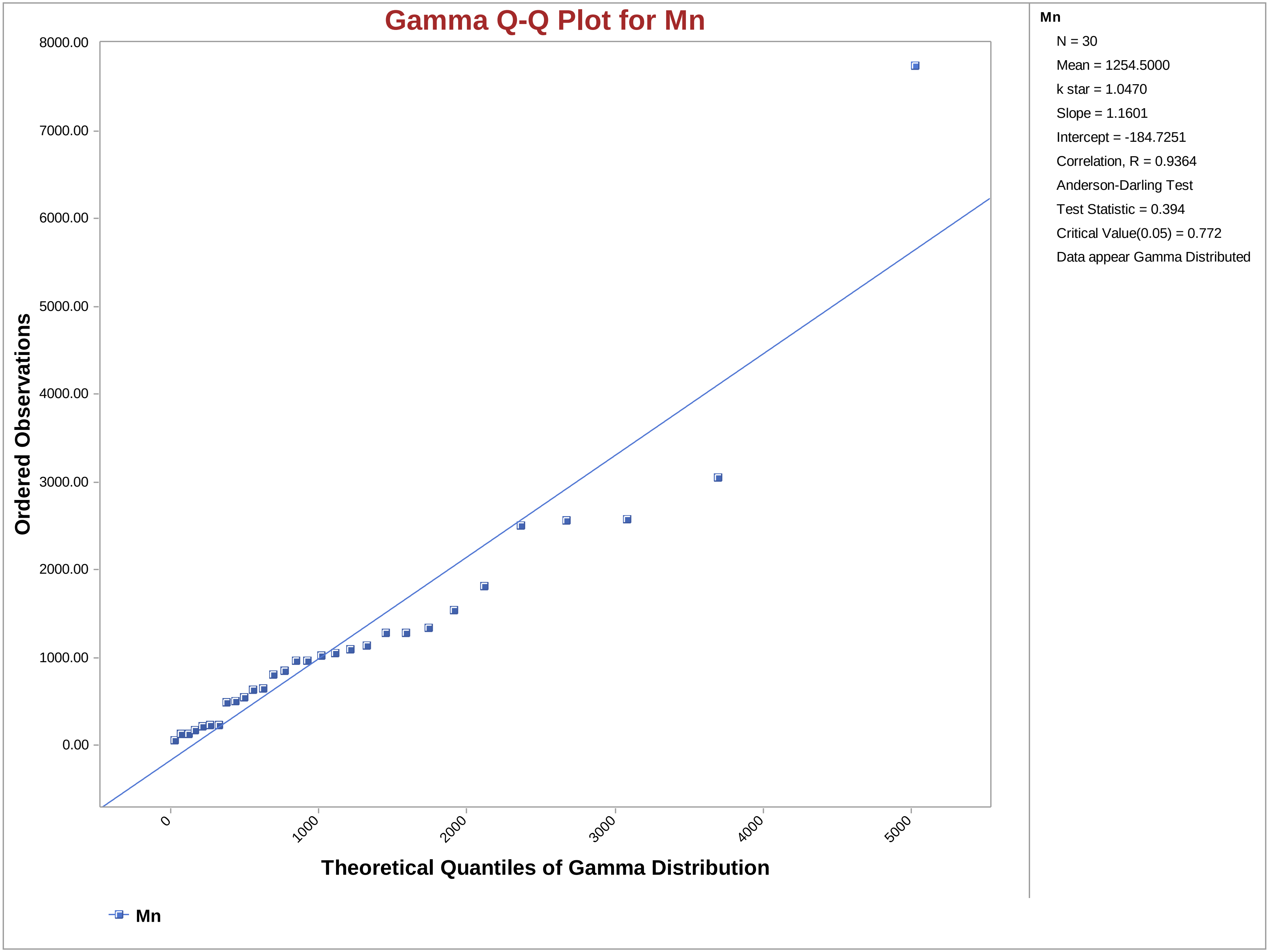

Lognormal Q-Q Plot for Fe
12.00
11.90
11.80
11.70
11.60
11.50
11.40
11.30
11.20
11.10
11.00
10.90
10.80
10.70
10.60
10.50
10.40
10.30
10.20
10.10
10.00
9.90
9.80
9.70
9.60
9.50
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Fe
Fe
n = 30
Mean = 10.23
Sd = 0.428
Slope = 0.428
Intercept = 10.23
Correlation, R = 0.973
Shapiro-Wilk Test
Exact Test Statistic = 0.931
Critical Value(0.05) = 0.927
Data Appear Lognormal
Approx. Test Value = 0.931
p-Value = 0.0597

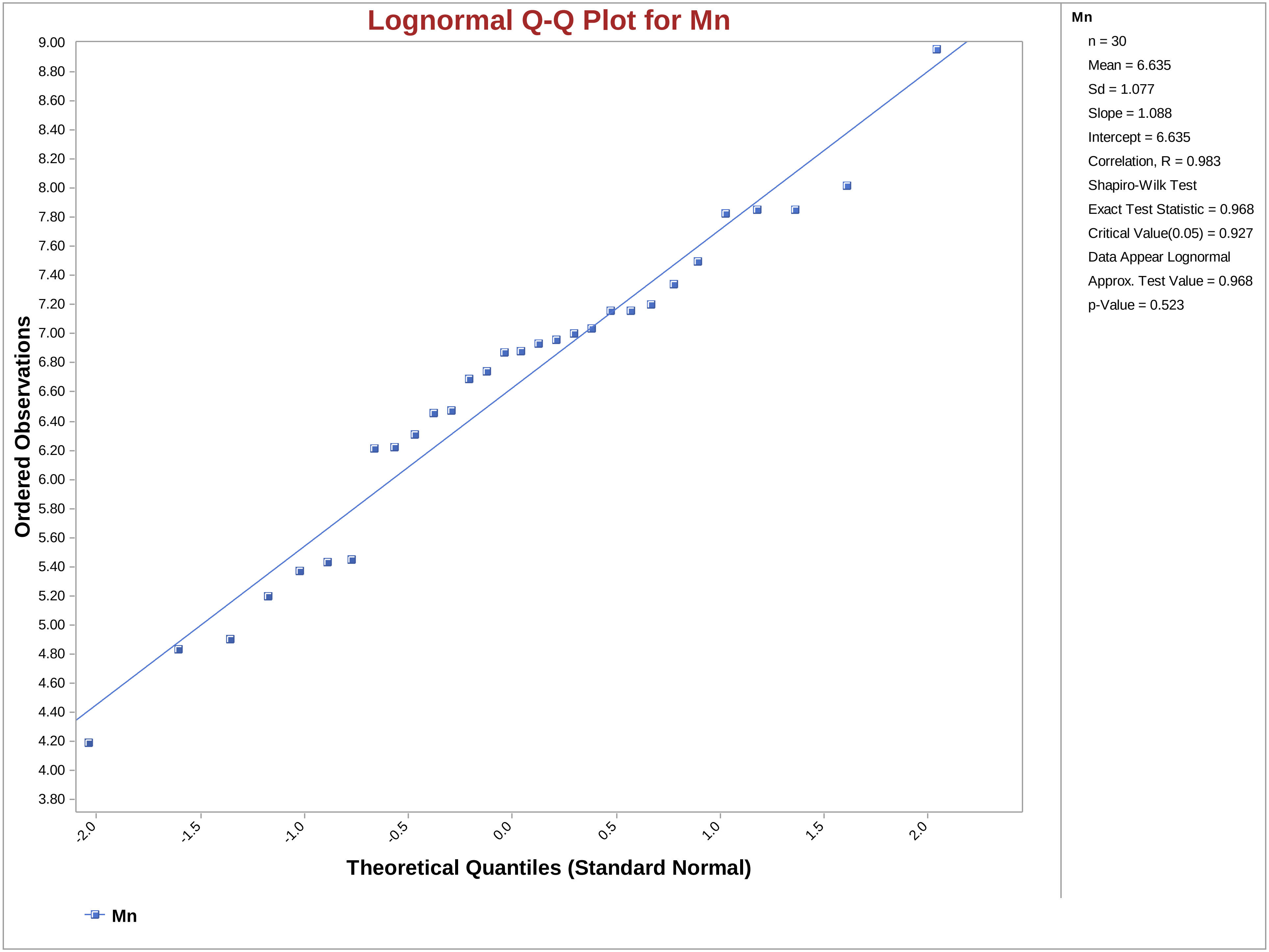

Box Plot for Fe
Observed Data
72000.00
70000.00
68000.00
66000.00
64000.00
62000.00
60000.00
58000.00
56000.00
54000.00
52000.00
50000.00
48000.00
46000.00
44000.00
42000.00
40000.00
38000.00
36000.00
34000.00
32000.00
30000.00
28000.00
26000.00
24000.00
22000.00
20000.00
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
-2000.00
-4000.00
-6000.00
Fe

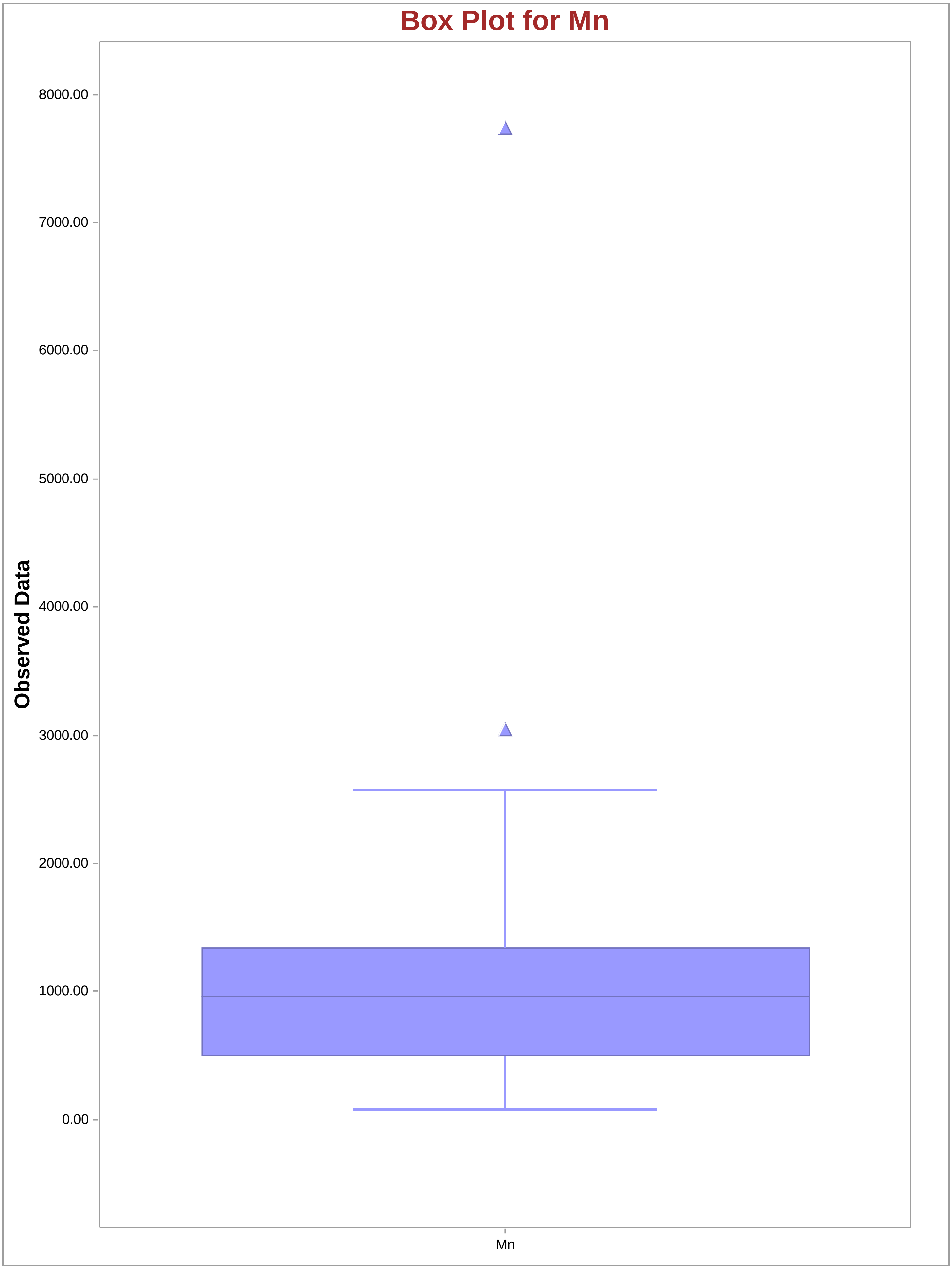

Histogram for Fe
Frequency
0
1
2
3
4
5
19720
24650
29580
34510
39440
44370
49300
54230
59160
64090
Fe

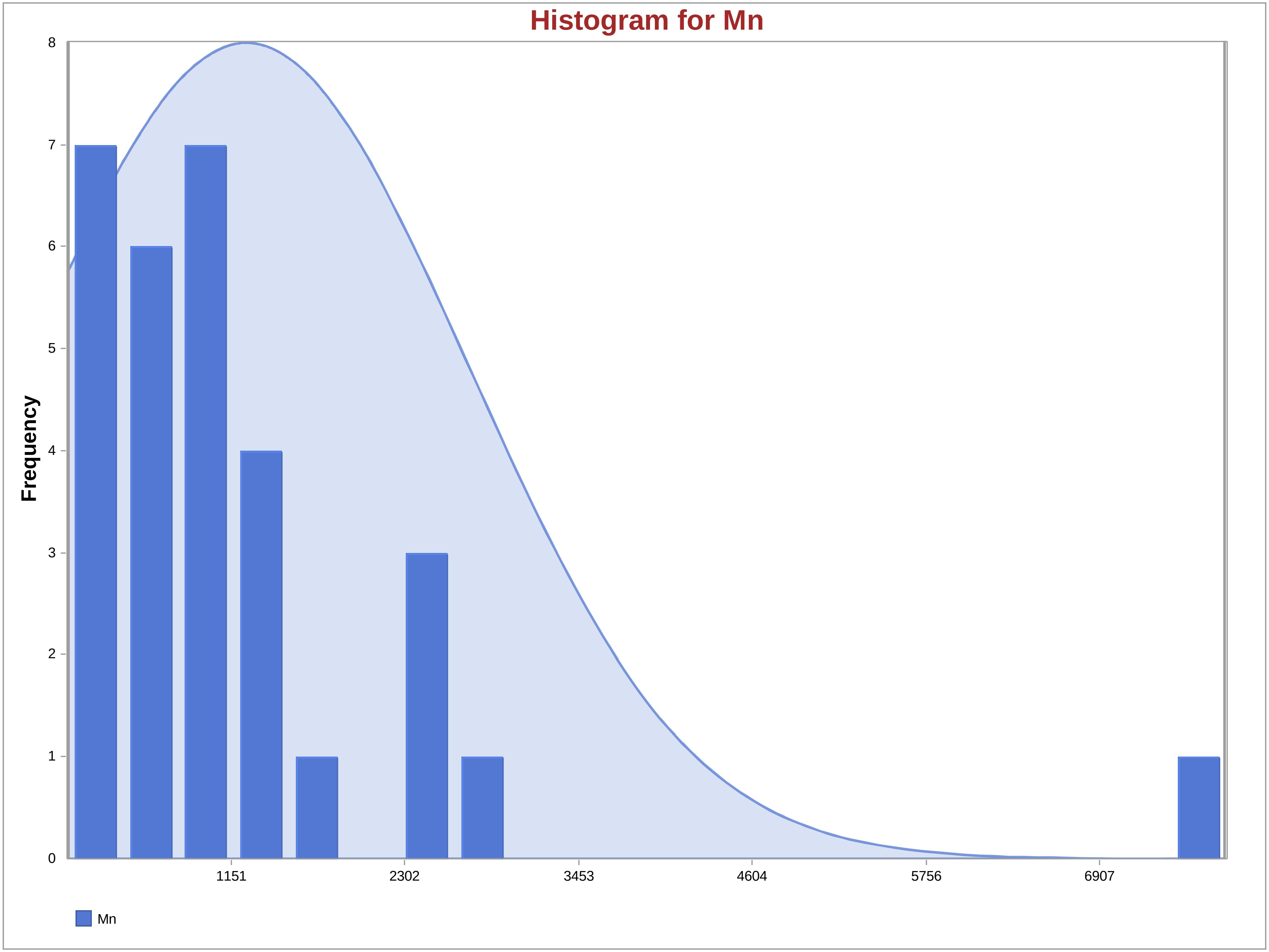
B1-34

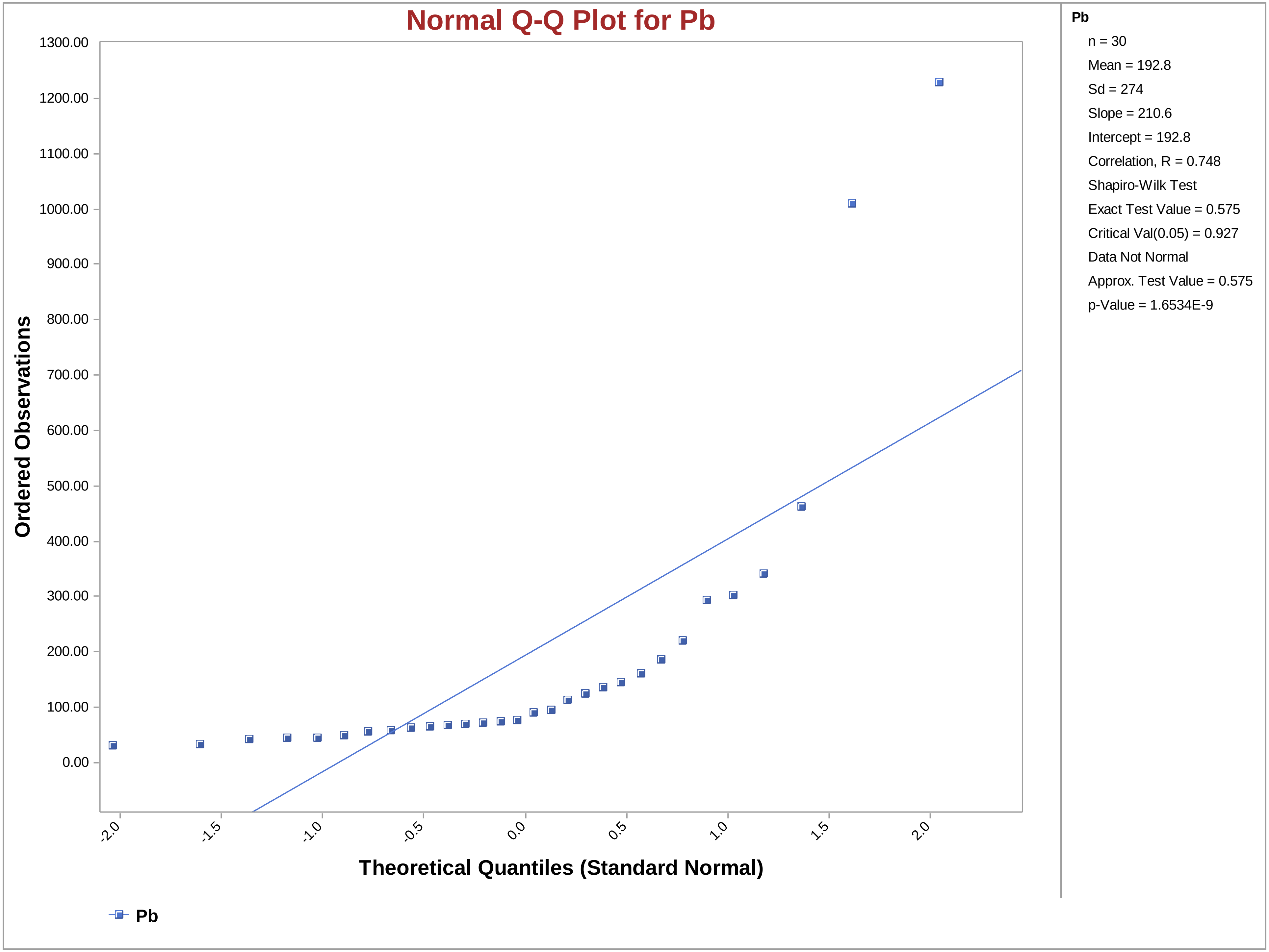

Normal Q-Q Plot for Mn
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Mn
Mn
n = 30
Mean = 1255
Sd = 1463
Slope = 1203
Intercept = 1255
Correlation, R = 0.8
Shapiro-Wilk Test
Exact Test Value = 0.668
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.668
p-Value = 6.5249E-8

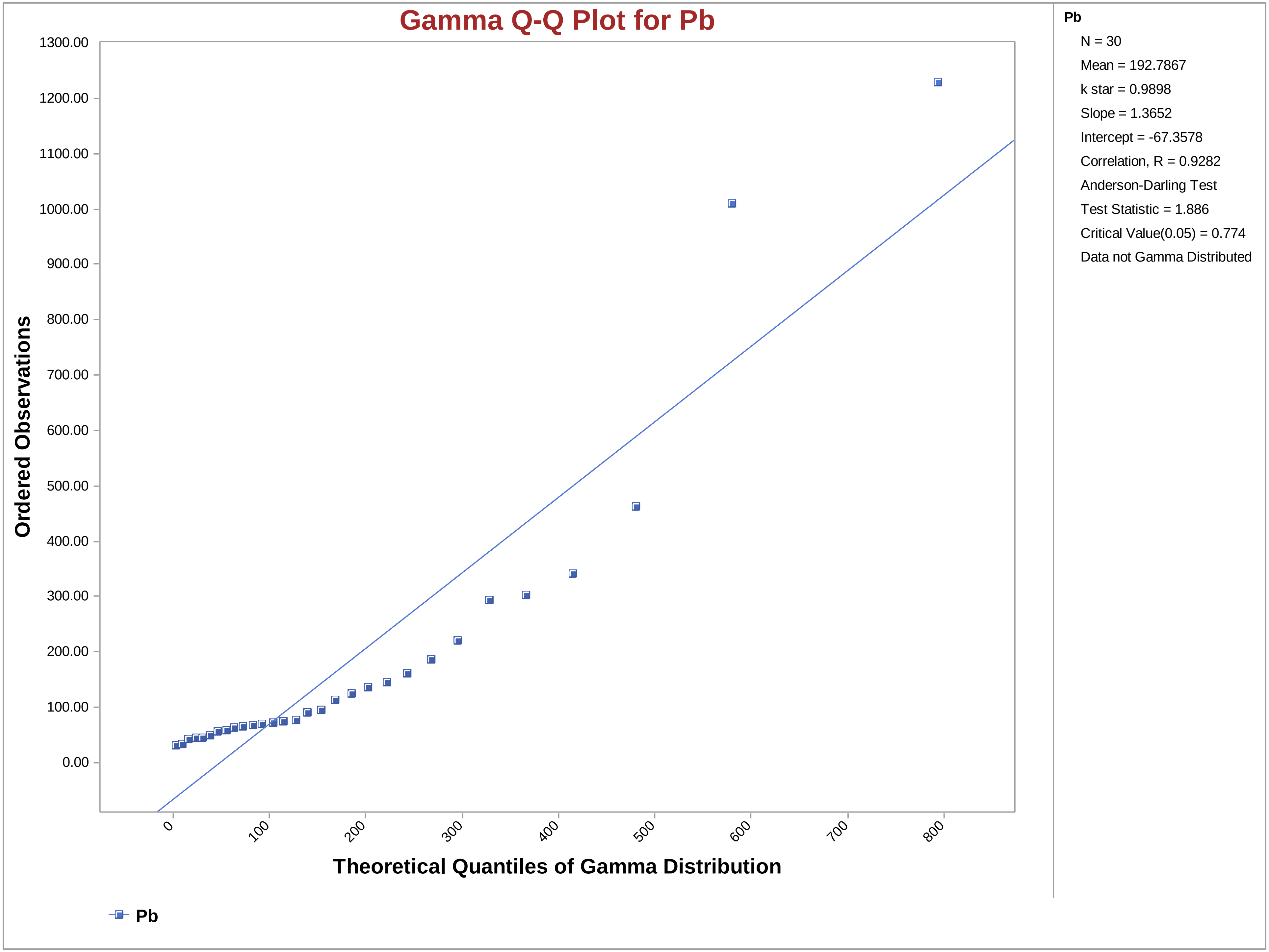

Gamma Q-Q Plot for Mn
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Ordered Observations
0
1000
2000
3000
4000
5000
Theoretical Quantiles of Gamma Distribution
Mn
Mn
N = 30
Mean = 1254.5000
k star = 1.0470
Slope = 1.1601
Intercept = -184.7251
Correlation, R = 0.9364
Anderson-Darling Test
Test Statistic = 0.394
Critical Value(0.05) = 0.772
Data appear Gamma Distributed

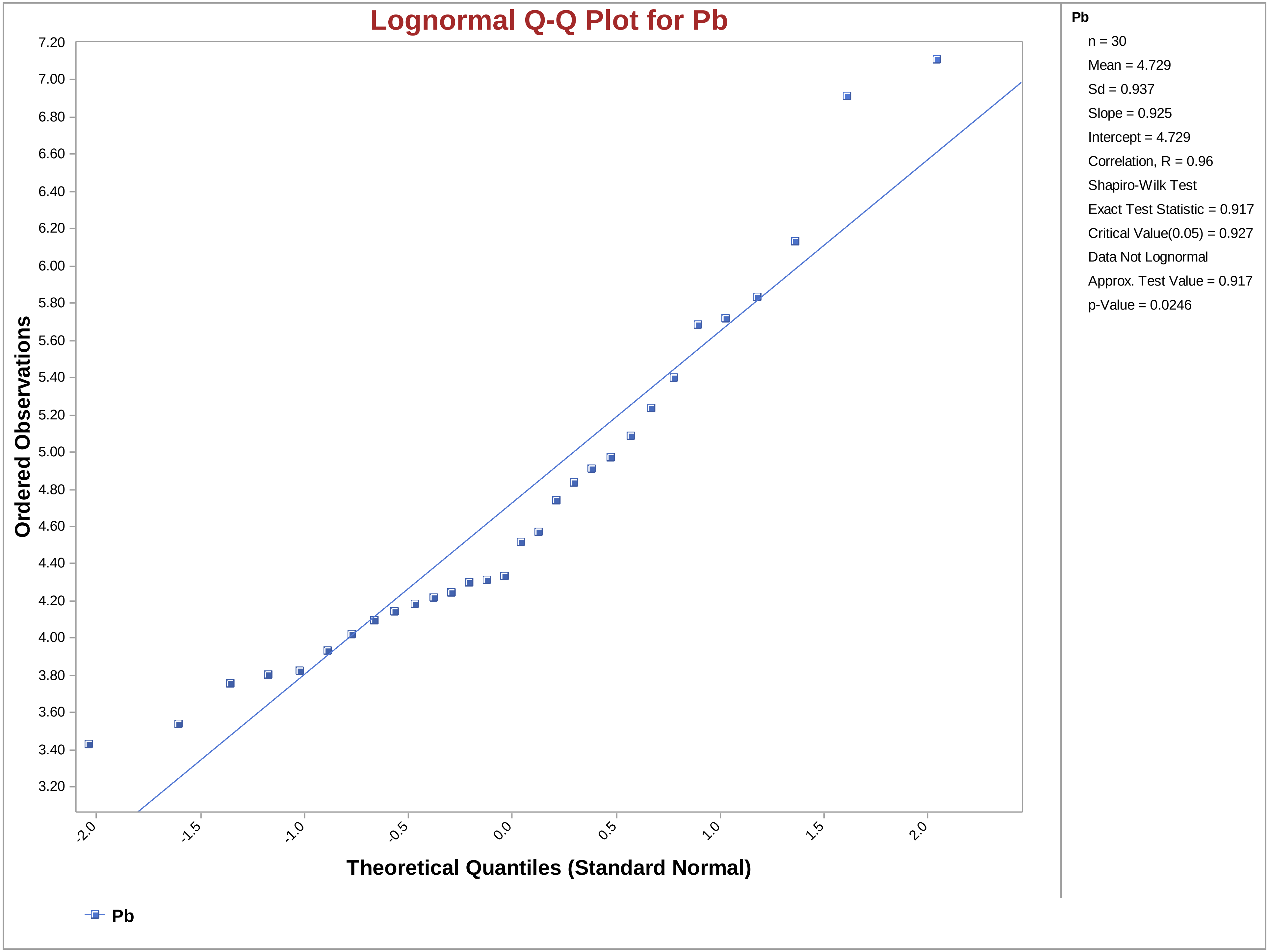

Lognormal Q-Q Plot for Mn
Ordered Observations
Theoretical Quantiles (Standard Normal)
Mn
Mn
n = 30
Mean = 6.635
Sd = 1.077
Slope = 1.088
Intercept = 6.635
Correlation, R = 0.983
Shapiro-Wilk Test
Exact Test Statistic = 0.968
Critical Value(0.05) = 0.927
Data Appear Lognormal
Approx. Test Value = 0.968
p-Value = 0.523


Box Plot for Mn
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Observed Data
Mn

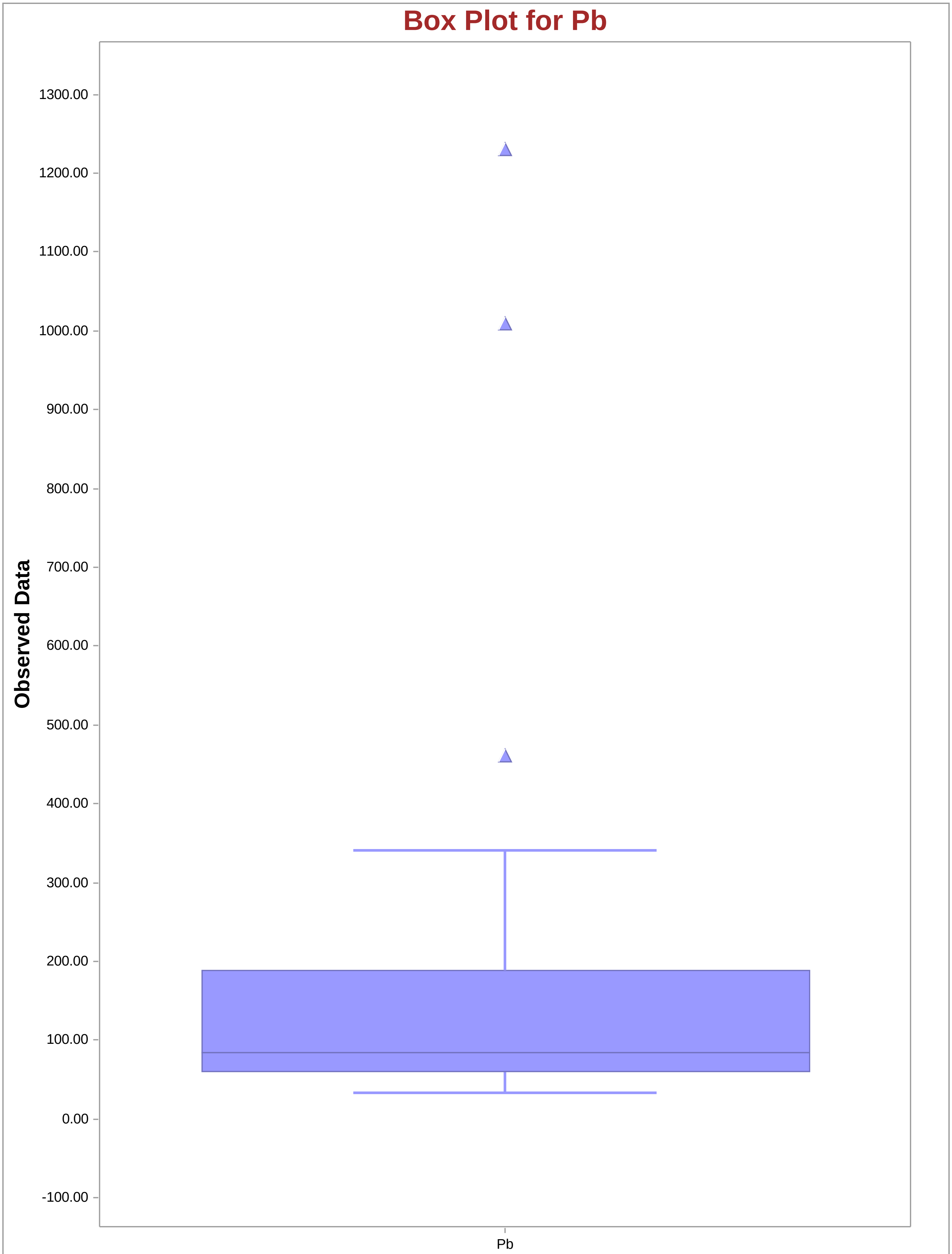

Histogram for Mn
Frequency
8
7
6
5
4
3
2
1
0
1151
2302
3453
4604
5756
6907
Mn
B1-39

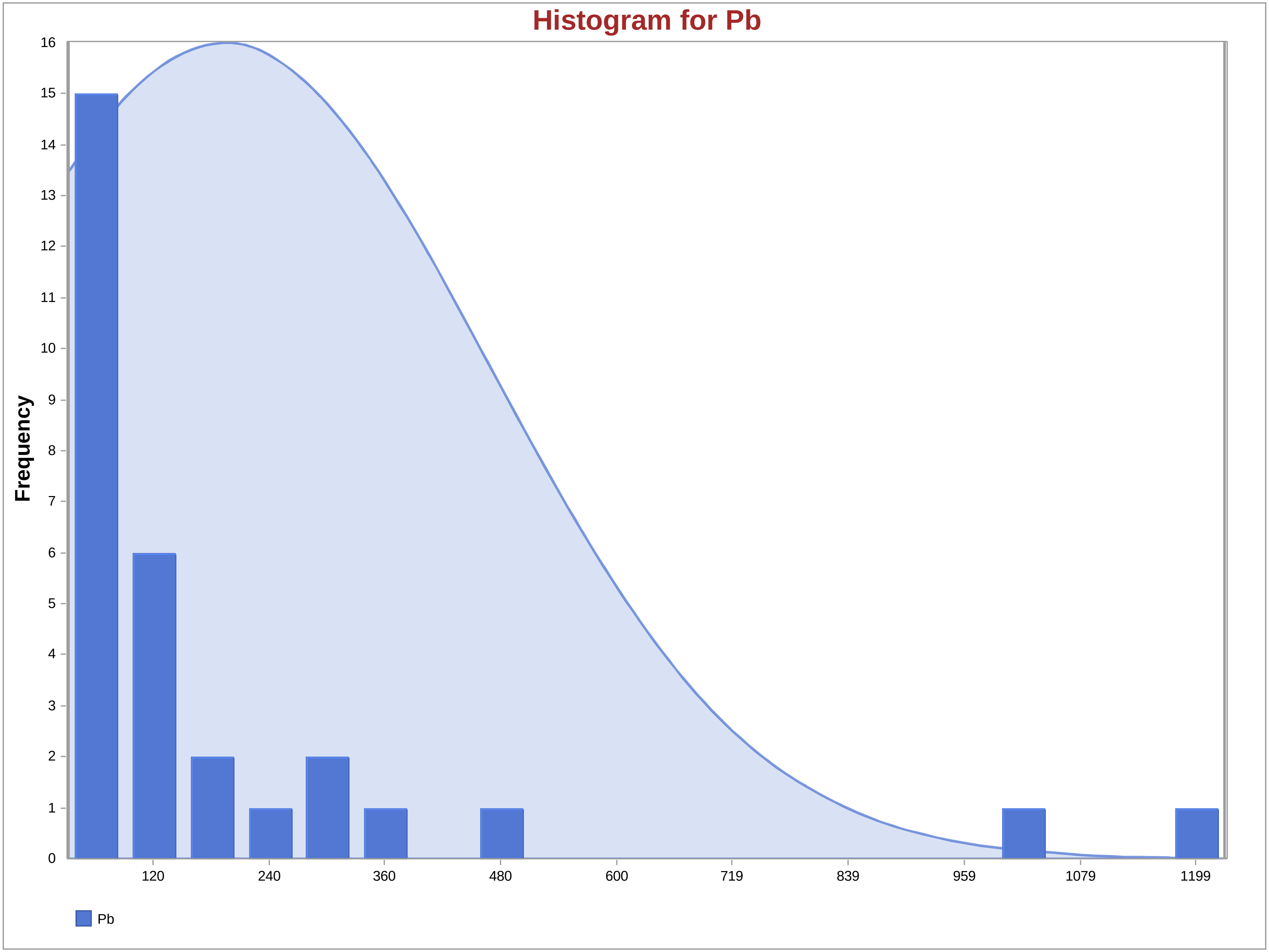

Normal Q-Q Plot for Pb
Ordered Observations
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Pb
Pb
n = 30
Mean = 192.8
Sd = 274
Slope = 210.6
Intercept = 192.8
Correlation, R = 0.748
Shapiro-Wilk Test
Exact Test Value = 0.575
Critical Val(0.05) = 0.927
Data Not Normal
Approx. Test Value = 0.575
p-Value = 1.6534E-9


Gamma Q-Q Plot for Pb
Ordered Observations
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0
100
200
300
400
500
600
700
800
Theoretical Quantiles of Gamma Distribution
Pb
Pb
N = 30
Mean = 192.7867
k star = 0.9898
Slope = 1.3652
Intercept = -67.3578
Correlation, R = 0.9282
Anderson-Darling Test
Test Statistic = 1.886
Critical Value(0.05) = 0.774
Data not Gamma Distributed

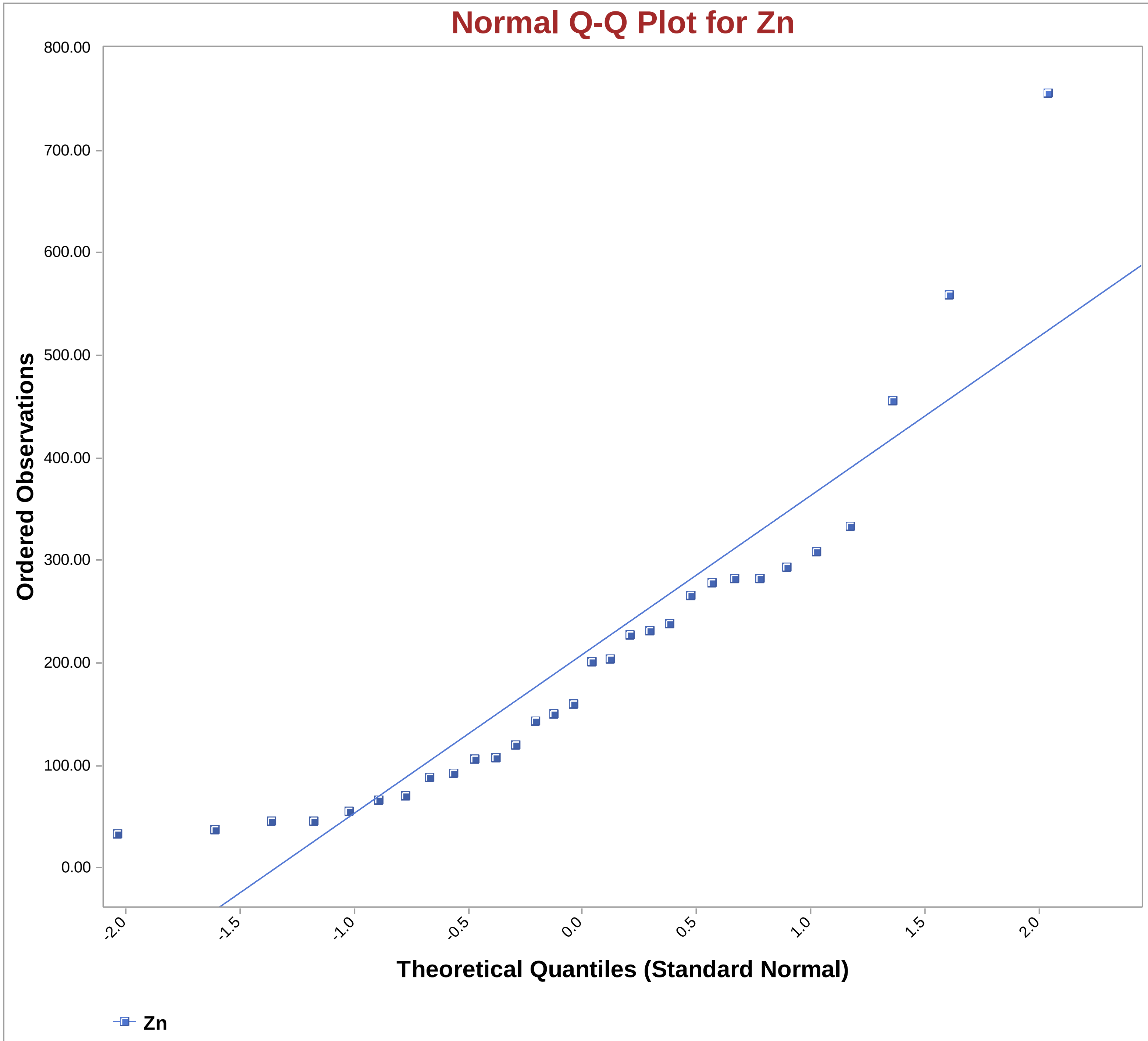


Lognormal Q-Q Plot for Pb
Ordered Observations
7.20
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Pb
Pb
n = 30
Mean = 4.729
Sd = 0.937
Slope = 0.925
Intercept = 4.729
Correlation, R = 0.96
Shapiro-Wilk Test
Exact Test Statistic = 0.917
Critical Value(0.05) = 0.927
Data Not Lognormal
Approx. Test Value = 0.917
p-Value = 0.0246


Box Plot for Pb
Observed Data
1300.00
1200.00
1100.00
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
Pb



Histogram for Pb
Frequency
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
120
240
360
480
600
719
839
959
1079
1199
Pb



Zn

n = 30

Mean = 208

Sd = 163.9

Slope = 155.1

Intercept = 208

Correlation, R = 0.92

Shapiro-Wilk Test

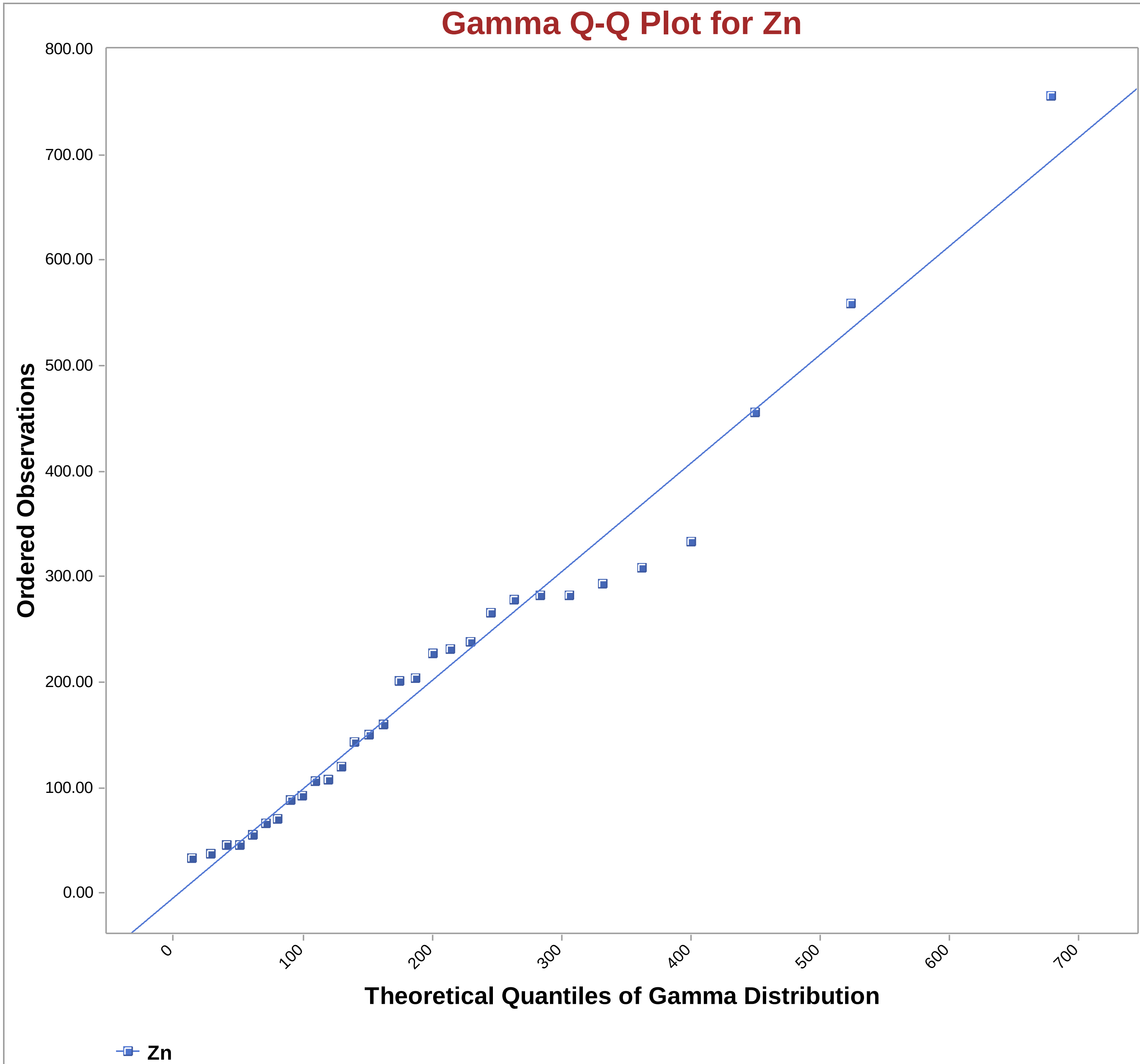
Exact Test Value = 0.853

Critical Val(0.05) = 0.927

Data Not Normal

Approx. Test Value = 0.853

p-Value = 5.3002E-4



Zn

N = 30

Mean = 207.9967

k star = 1.6681

Slope = 1.0316

Intercept = -4.9898

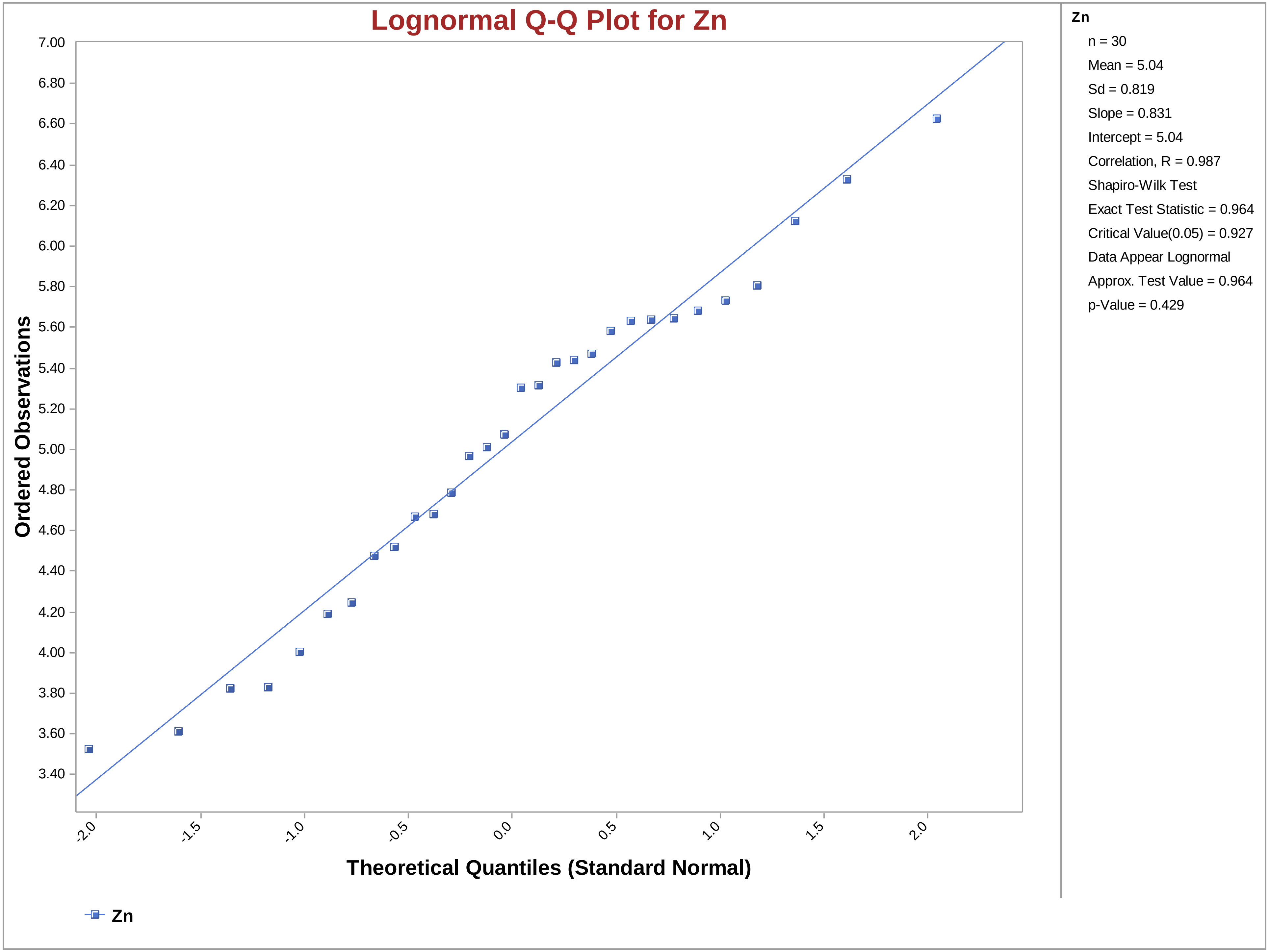
Correlation, R = 0.9872

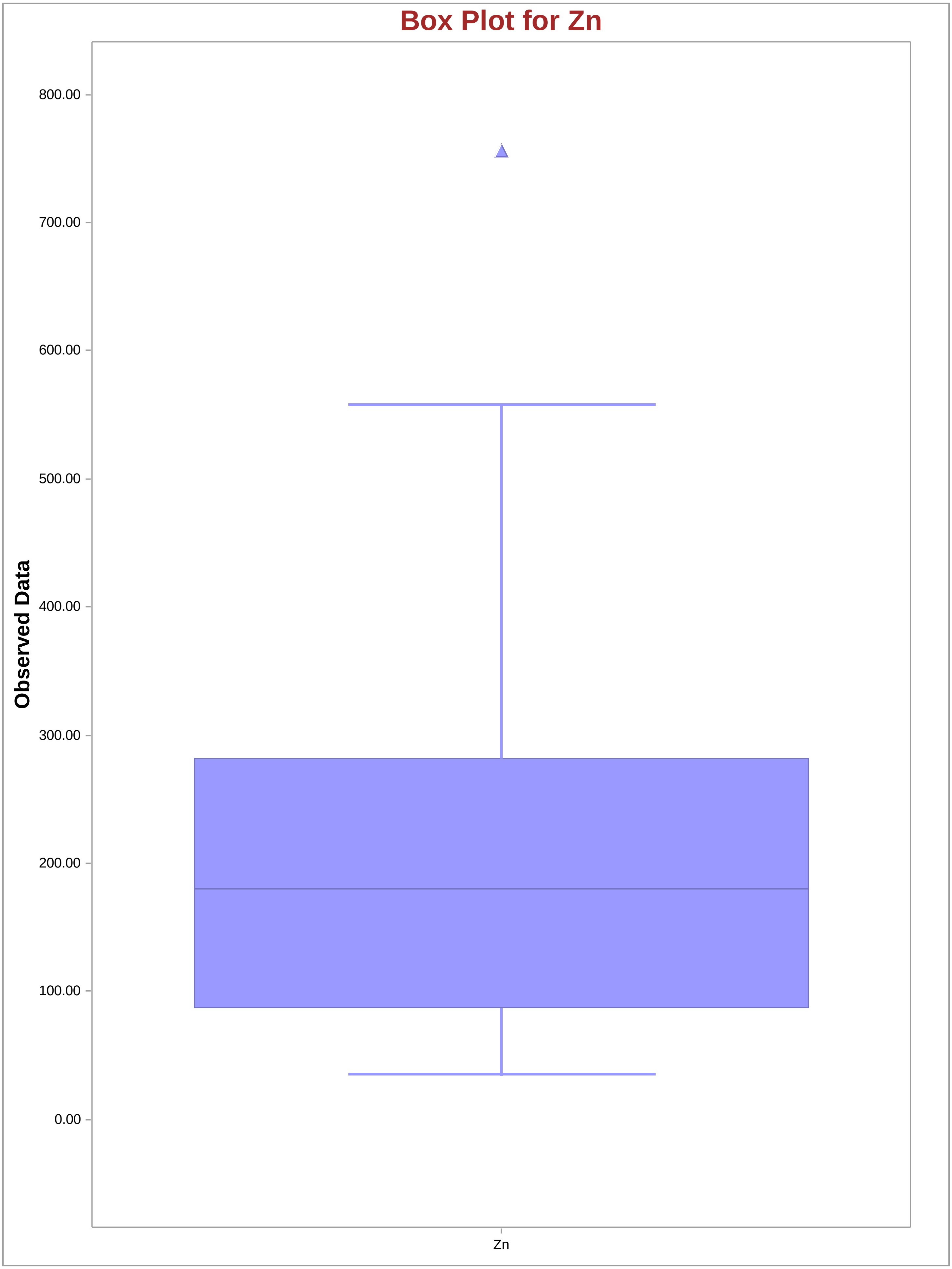
Anderson-Darling Test

Test Statistic = 0.307

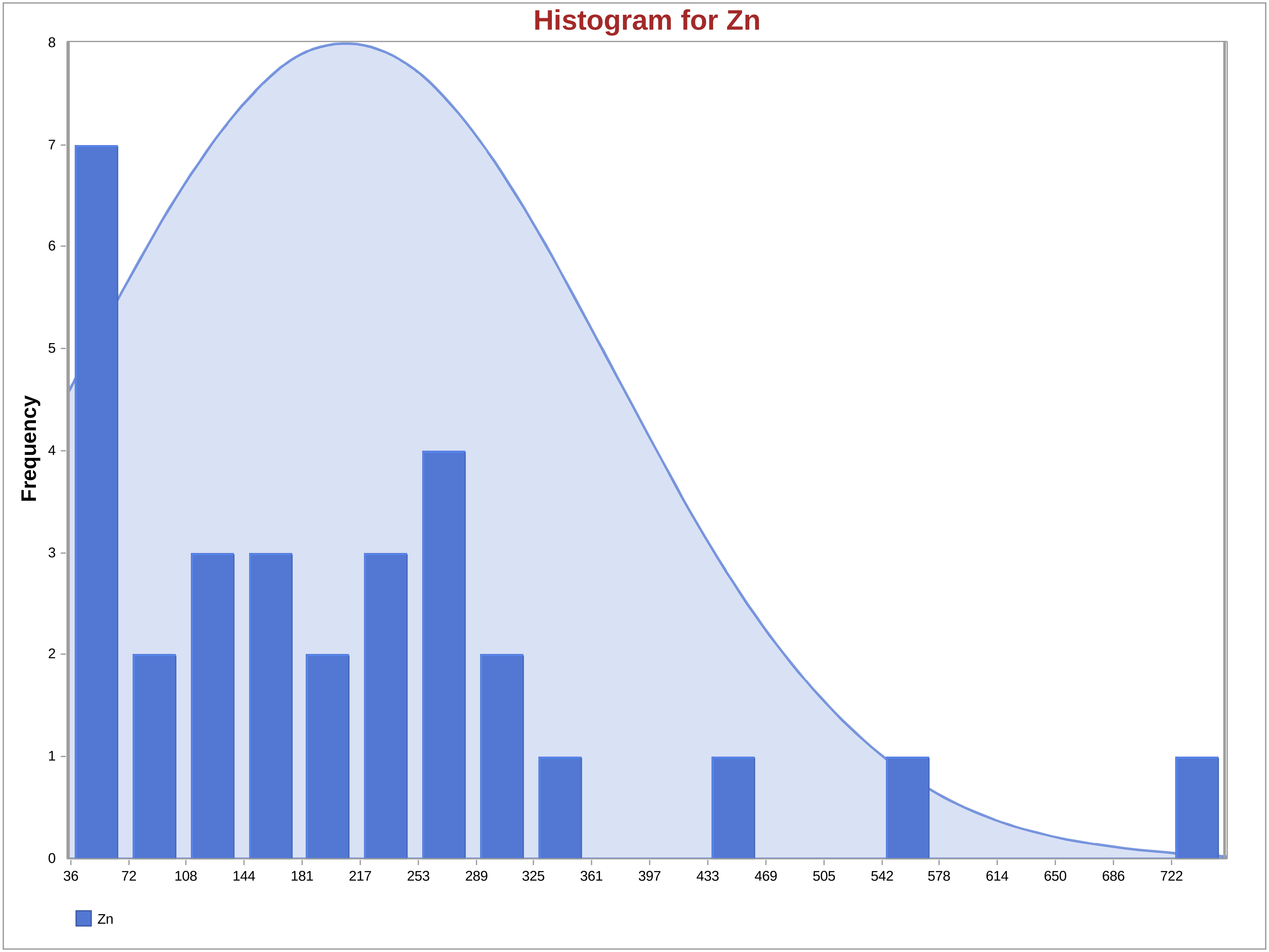
Critical Value(0.05) = 0.760

Data appear Gamma Distributed


Lognormal Q-Q Plot for Zn
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
Ordered Observations
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Standard Normal)
Zn
Zn
n = 30
Mean = 5.04
Sd = 0.819
Slope = 0.831
Intercept = 5.04
Correlation, R = 0.987
Shapiro-Wilk Test
Exact Test Statistic = 0.964
Critical Value(0.05) = 0.927
Data Appear Lognormal
Approx. Test Value = 0.964
p-Value = 0.429



Box Plot for Zn
Observed Data
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Zn



Histogram for Zn
Frequency
8
7
6
5
4
3
2
1
0
36
72
108
144
181
217
253
289
325
361
397
433
469
505
542
578
614
650
686
722
Zn

APPENDIX C
EPA RAGS PART D TABLES 1 THROUGH 10

TABLES

ATTACHMENTS

EPA RAGS Part D Tables 7, 9, and 10 – Risk Evaluation Tables (there is no Table 8 for each EU because there is no radiation exposure to assess)

ATTACHMENTS (CONTINUED)

TABLE C-1.1: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SOIL AND MINE WASTE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	On-Site Soil / Mine Waste	Soil / Mine Waste	EUs 1 and 3 thru 10	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities are on-going at on-site areas.
				Industrial Worker	Adult		None	No industrial facilities are currently operated on-site.
				Resident	Adult and Child		None	No residences are currently on-site.
		Outdoor Air	EUs 1 and 3 thru 10	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities are on-going at off-site areas.
				Industrial Worker	Adult		None	No industrial facilities are currently operated on-site.
				Resident	Adult and Child		None	No residences are currently on-site.
	Off-Site Soil / Mine Waste	Soil / Mine Waste	EUs 2 and 11	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities are on-going at off-site areas.
				Industrial Worker	Adult		Quant.	One industrial facility is currently operated at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in the areas surrounding the UBMC.
		Outdoor Air	EUs 2 and 11	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities are on-going at off-site areas.
				Industrial Worker	Adult		Quant.	One industrial facility is currently operated at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in the areas surrounding the UBMC.

TABLE C-1.1: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SOIL AND MINE WASTE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	On-Site Soil / Mine Waste	Soil / Mine Waste	EUs 1 and 3 thru 10	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities may occur in the future in in on-site areas.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at on-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential land use may occur in the future at on-site EUs.
		Outdoor Air	EUs 1 and 3 thru 10	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction activities may occur in the future in in on-site areas.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at on-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential land use may occur in the future at on-site EUs.
	Off-Site Soil / Mine Waste	Soil / Mine Waste	EUs 2 and 11	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction may occur in the future at off-site areas.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in areas surrounding the UBMC, and is expected to continue in the future.
		Outdoor Air	EUs 2 and 11	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same.
				Recreational Fisherman	Adult		Quant.	
				Recreational Rock Hound	Adult and Child		Quant.	
				Recreational Hunter	Adult		Quant.	
				Construction Worker	Adult		Quant.	Construction may occur in the future at off-site areas.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in areas surrounding the UBMC, and is expected to continue in the future.

Notes:

ATV	All-terrain vehicle	RAGS	Risk Assessment Guidance for Superfund
EU	Exposure unit	UMBC	Upper Blackfoot Mining Complex
Quant.	Quantitative; this scenario was quantitatively assessed in the human health risk assessment		

TABLE C-1.2: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SEDIMENT

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Off-Site Sediment	Sediment	EUs 12 and 13	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to ATV/motorcycle riders is assumed to be comparatively less.
				Recreational Fisherman (a)	Adult		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Fishing occurs in areas with impacted sediment.
				Recreational Rock Hound	Adult and Child		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Rock collecting occurs in areas with impacted sediment.
				Recreational Hunter	Adult		Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to hunters is assumed to be comparatively less.
				Construction Worker	Adult		Qual.	Sediment exposure is quantitatively evaluated for residents. Sediments to construction workers is expected to be comparatively less.
				Industrial Worker	Adult		None	No industrial facilities are currently operated in off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in areas surrounding the UBMC; residents may access EUs with impacted sediments.
		Outdoor Air	EUs 12 and 13	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to ATV/motorcycle riders is assumed to be comparatively less.
				Recreational Fisherman	Adult		None	Sediments in areas used for fishing are expected to be submerged in or saturated with surface water.
				Recreational Rock Hound	Adult and Child		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Rock collecting occurs in areas with impacted sediment; out-of-stream sediments may be piled and dried, and may be dispersed by wind erosion.
				Recreational Hunter	Adult		Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to hunters is assumed to be comparatively less.
				Construction Worker	Adult		Qual.	Sediment exposure is quantitatively evaluated for residents. Sediments to construction workers is expected to be comparatively less.
				Industrial Worker	Adult		None	No industrial facilities are currently operated in off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential use currently occurs in the areas surrounding the UBMC; residents may access EUs with impacted sediments.

TABLE C-1.2: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Off-Site Sediment	Sediment	EUs 12 and 13	Recreational ATV/Motorcycle Rider	Adult	Ingestion and Dermal	Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to hunters is assumed to be comparatively less.
				Recreational Fisherman	Adult		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Fishing occurs in areas with impacted sediment.
				Recreational Rock Hound	Adult and Child		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Rock collecting occurs in areas with impacted sediment.
				Recreational Hunter	Adult		Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Sediment exposure is quantitatively evaluated for future fishermen and rock hounds. Sediment exposure to future hunters is assumed to be comparatively less.
				Construction Worker	Adult		Quant.	Construction work may occur in the future at off-site EUs.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential land use may occur in the future at on-site EUs; residents may access EUs with impacted sediments.
		Outdoor Air	EUs 12 and 13	Recreational ATV/Motorcycle Rider	Adult	Inhalation	Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Sediment exposure is quantitatively evaluated for future fishermen and rock hounds. Sediment exposure to future ATV/motorcycle riders is assumed to be comparatively less.
				Recreational Fisherman	Adult		None	Sediments in areas used for fishing are expected to be submerged in or saturated with surface water.
				Recreational Rock Hound	Adult and Child		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Rock collecting occurs in areas with impacted sediment.
				Recreational Hunter	Adult		Qual.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. Sediment exposure is quantitatively evaluated for fishermen and rock hounds. Sediment exposure to hunters is assumed to be comparatively less.
				Construction Worker	Adult		Quant.	Construction work may occur in the future at off-site EUs.
				Industrial Worker	Adult		Quant.	Industrial land use may occur in the future at off-site EUs.
				Resident	Adult and Child		Quant.	Dispersed residential land use may occur in the future at on-site EUs; residents may access EUs with impacted sediments.

TABLE C-1.2: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway

Notes:

ATV	All-terrain vehicle
EU	Exposure unit
Qual.	Qualitative; this scenario was qualitatively assessed in the human health risk assessment
Quant.	Quantitative; this scenario was quantitatively assessed in the human health risk assessment
RAGS	Risk Assessment Guidance for Superfund
UMBC	Upper Blackfoot Mining Complex

TABLE C-1.3: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SURFACE WATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Water	Fish Tissue	UBMC (a)	Recreational ATV/Motorcycle Rider	Adult	Ingestion	None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; if this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman receptor will address it.
				Recreational Fisherman (a)	Adult		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; use includes fishing.
				Recreational Rock Hound	Adult and Child		None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; ; if this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman receptor will address it.
				Recreational Hunter	Adult		None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; ; if this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman receptor will address it.
				Construction Worker	Adult		None	Construction workers are not expected to fish while working.
				Industrial Worker	Adult		None	No industrial facilities are currently operated in off-site EUs.
				Resident	Adult and Child		Qual.	Dispersed residential use currently occurs in the areas surrounding the UBMC (b). If this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman will address it.
Future	Off-Site Sediment	Fish Tissue	UBMC (a)	Recreational ATV/Motorcycle Rider	Adult	Ingestion	None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. If this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman will address it.
				Recreational Fisherman	Adult		Quant.	Dispersed recreational use currently occurs at the UBMC and surrounding areas; use includes fishing. Future land use is expected to remain the same.
				Recreational Rock Hound	Adult and Child		None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. If this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman will address it.
				Recreational Hunter	Adult		None	Dispersed recreational use currently occurs at the UBMC and surrounding areas; future land use is expected to remain the same. If this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman will address it.
				Construction Worker	Adult		None	Future construction workers are not expected to fish while working.
				Industrial Worker	Adult		None	Industrial use may occur at the UBMC in the future; however, workers are not expected to fish while working.
				Resident	Adult and Child		Qual.	Dispersed residential use currently occurs in the areas surrounding the UBMC; future land use is expected to be similar. If this receptor is engaged in fishing, the quantitative evaluation of the Recreational Fisherman will address it.

Notes:

TABLE C-1.3: EPA RAGS PART D TABLE 1, SELECTION OF EXPOSURE PATHWAYS FOR SURFACE WATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway

a Ingestion of fish tissue is evaluated on a UBMC-wide basis because fish are unlikely to be confined in a single exposure unit.

ATV	All-terrain vehicle	RAGS	Risk Assessment Guidance for Superfund
EU	Exposure unit	UMBC	Upper Blackfoot Mining Complex
Qual.	Qualitative; this scenario was qualitatively assessed in the human health risk assessment		
Quant.	Quantitative; this scenario was quantitatively assessed in the human health risk assessment		

TABLE C-2.1: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SOIL

Baseline Human Health Risk Assessment

Exposure Unit	Depth Interval (feet bgs)	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion
1	0-2	7429-90-5	Aluminum	1,400	18,200	UAW5-500+50 (0-6")	9/9	--	31,092	7,700 N	No	BB
1	0-2	7440-38-2	Arsenic	16.3	255	UAW1-100 (0-6")	34/46	12.26 - 29.06	40.4	22 C	Yes	ASL
1	0-2	7440-43-9	Cadmium	0.4	15.30	UAW3-COMP 1 (0-6")	13/13	--	4.8	7 N	Yes	ASL
1	0-2	7440-50-8	Copper	37.4	3,050	UAW1-COMP 1 (0-6")	46/46	--	275	310 N	Yes	ASL
1	0-2	7439-89-6	Iron	15,724	135,404	UAW5-500 (0-6")	46/46	--	58,270	5,500 N	Yes	ASL
1	0-2	7439-92-1	Lead	41.8	55,200	UAW1-COMP 1 (0-6")	46/46	--	1,109	400 N	Yes	ASL
1	0-2	7439-96-5	Manganese	38.7	3,256	UAW2-100+250 (0-6")	45/46	162.28 - 162.28	4,893	180 N	No	BB
1	0-2	7440-66-6	Zinc	57.7	3,200	UAW3-COMP 1 (0-6")	46/46	--	551	2,300 N	Yes	ASL
2	0-2	7429-90-5	Aluminum	3,140	25,500	BREOT-S32+300 (0-6")	17/17	-	31,092	7,700 N	No	BB
2	0-2	7440-38-2	Arsenic	6.63	1,057	BREOT-N13-0 (0-6")	371/440	8.12 - 52.38	40.4	22 C	Yes	ASL
2	0-2	7440-43-9	Cadmium	0.16	161 JM2	UBDT-TP-6 (12-24")	69/69	-	4.8	7 N	Yes	ASL
2	0-2	7440-50-8	Copper	37.4	4,246	BREOT-N10-0 (0-6")	440/440	-	275	310 N	Yes	ASL
2	0-2	7439-89-6	Iron	7,856	201,203	BREOT-S64+25 (0-6")	437/437	-	58,270	5,500 N	Yes	ASL
2	0-2	7439-92-1	Lead	33.9	38,839	TP-FP-45(1.8-2.0)	440/440	-	1,109	400 N	Yes	ASL
2	0-2	7439-96-5	Manganese	37.2	15,083	BREOT-S24-0 (0-6")	405/440	47.13 - 237.05	4,893	180 N	Yes	ASL
2	0-2	7440-66-6	Zinc	27.8 JM7	26,000 JM3	UBDT-TP-6 (12-24")	422/440	24.17 - 56.88	551	2,300 N	Yes	ASL
2	2-10	7429-90-5	Aluminum	10,200	21,000	TP-FP-50A(8.5-9.0)	10/10	--	31,092	7,700 N	No	BB
2	2-10	7440-38-2	Arsenic	3.67	730	TP-FP-38A(2.5-3.0)	150/153	2.18 - 3.90	40.4	22 C	Yes	ASL
2	2-10	7440-43-9	Cadmium	0.6	27.50	UBDT-TP-1 (24-36")	21/22	0.20 - 0.20	4.8	7 N	Yes	ASL
2	2-10	7440-50-8	Copper	11.5	2,076	TP-FP-55(2.0-2.3)	152/153	7.74 - 7.74	275	310 N	Yes	ASL
2	2-10	7439-89-6	Iron	18,139	98,761	TP-FP-35(4.0-4.3)	153/153	--	58,270	5,500 N	Yes	ASL
2	2-10	7439-92-1	Lead	26.5	28,921	TP-FP-38A(2.5-3.0)	153/153	--	1,109	400 N	Yes	ASL
2	2-10	7439-96-5	Manganese	37.4	14,749	TP-FP-30(7.5-8.0)	151/153	34.89 - 65.17	4,893	180 N	Yes	ASL
2	2-10	7440-66-6	Zinc	35	9,763	TP-FP-45(2.0-2.3)	153/153	--	551	2,300 N	Yes	ASL
3	0-2	7429-90-5	Aluminum	2,850	14,900	CMWA-0+12.5 (0-6")	6/6	--	31,092	7,700 N	No	BB
3	0-2	7440-38-2	Arsenic	14.2	1,570	CMWA-COMP 1 (0-6")	15/17	11.73 - 35.18	40.4	22 C	Yes	ASL
3	0-2	7440-43-9	Cadmium	0.611	3.04	CMWA-COMP 1 (0-6")	6/7	0.50 - 0.50	4.8	7 N	No	BB
3	0-2	7440-50-8	Copper	56.7	759	CMWA-50 (0-6")	18/18	--	275	310 N	Yes	ASL
3	0-2	7439-89-6	Iron	21,806	224,789	CMWA-200 (0-6")	18/18	--	58,270	5,500 N	Yes	ASL
3	0-2	7439-92-1	Lead	125	2,270	CMWA-COMP 2 (0-6")	18/18	--	1,109	400 N	Yes	ASL
3	0-2	7439-96-5	Manganese	178	1,458	CMWA-50 (0-6")	16/18	170.69 - 242.09	4,893	180 N	No	BB
3	0-2	7440-66-6	Zinc	105	1,875	CMWA-100 (0-6")	17/18	46.48 - 46.48	551	2,300 N	No	BSL

TABLE C-2.1: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SOIL

Baseline Human Health Risk Assessment

Exposure Unit	Depth Interval (feet bgs)	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion
4	0-2	7429-90-5	Aluminum	15,000	18,800	CARM-100+25 (0-6")	3/3	--	31,092	7,700 N	No	BB
4	0-2	7440-38-2	Arsenic	11.8	28.30	CARM-1150 (0-6")	9/29	6.35 - 48.94	40.4	22 C	No	BB
4	0-2	7440-43-9	Cadmium	3.43	11.10	CARM-400 (0-6")	6/6	--	4.8	7 N	Yes	ASL
4	0-2	7440-50-8	Copper	27.2	648	CARM-800 (0-6")	28/29	33.00 - 33.00	275	310 N	Yes	ASL
4	0-2	7439-89-6	Iron	6,983	144,414	CARM-1000 (0-6")	29/29	--	58,270	5,500 N	Yes	ASL
4	0-2	7439-92-1	Lead	23.8	2,223	CARM-1050 (0-6")	29/29	--	1,109	400 N	Yes	ASL
4	0-2	7439-96-5	Manganese	105	14,145	CARM-1000 (0-6")	29/29	--	4,893	180 N	Yes	ASL
4	0-2	7440-66-6	Zinc	36.0	833	CARM-1050+6.25 (0-6")	29/29	--	551	2,300 N	No	BSL
5	0-2	7429-90-5	Aluminum	12,100	12,200	CEA1-3-COMP 1 (0-6")	2/2	--	31,092	7,700 N	No	BB
5	0-2	7440-38-2	Arsenic	8.07	84.50	CEA1-3-COMP 3 (0-6")	37/58	7.47 - 21.84	40.4	22 C	Yes	ASL
5	0-2	7440-43-9	Cadmium	0.248	4.31	CEA1-3-COMP 3 (0-6")	9/9	--	4.8	7 N	No	BB
5	0-2	7440-50-8	Copper	37.3	1,354	CEA1-3-600 (0-6")	57/58	31.16 - 31.16	275	310 N	Yes	ASL
5	0-2	7439-89-6	Iron	15,424	170,776	CEA4-00 (0-6")	58/58	--	58,270	5,500 N	Yes	ASL
5	0-2	7439-92-1	Lead	21.2	1,380	CEA1-3-COMP 3 (0-6")	58/58	--	1,109	400 N	Yes	ASL
5	0-2	7439-96-5	Manganese	54.9	2,784	WEA1-COMP 2 (0-6")	53/58	93.71 - 265.18	4,893	180 N	No	BB
5	0-2	7440-66-6	Zinc	31.4	868	CEA1-3-COMP 3 (0-6")	56/58	47.95 - 51.78	551	2,300 N	No	BSL
6	0-2	7429-90-5	Aluminum	11,700	27,000	CONM-50+50 (0-6")	8/8	--	31,092	7,700 N	No	BB
6	0-2	7440-38-2	Arsenic	11.1	1,010	CONM-250 (0-6")	28/36	15.42 - 67.48	40.4	22 C	Yes	ASL
6	0-2	7440-43-9	Cadmium	0.605	6.72	CONM-750 (0-6")	11/11	--	4.8	7 N	No	BSL
6	0-2	7440-50-8	Copper	4.046	410	CONM-COMP 1 (0-6")	35/36	26.92 - 26.92	275	310 N	Yes	ASL
6	0-2	7439-89-6	Iron	11,792	77,437	CONM-250 (0-6")	36/36	--	58,270	5,500 N	Yes	ASL
6	0-2	7439-92-1	Lead	109	6,780	CONM-Pile 1 (0-6")	36/36	--	1,109	400 N	Yes	ASL
6	0-2	7439-96-5	Manganese	153	1,996	CONM-350+50 (0-6")	35/36	116.55 - 116.55	4,893	180 N	No	BB
6	0-2	7440-66-6	Zinc	109	914	CONM-COMP 2 (0-6")	36/36	--	551	2,300 N	No	BSL
7	0-2	7429-90-5	Aluminum	7,170	12,900	MPWA-0 (0-6")	3/3	--	31,092	7,700 N	No	BB
7	0-2	7440-38-2	Arsenic	26.5	116	MPWA-75+20 (0-6")	5/8	14.23 - 60.82	40.4	22 C	Yes	ASL
7	0-2	7440-43-9	Cadmium	0.578	0.90	MPWA-0 (0-6")	2/3	0.50 - 0.50	4.8	7 N	No	BB
7	0-2	7440-50-8	Copper	88.3	579	MPWA-0 (0-6")	8/8	--	275	310 N	Yes	ASL
7	0-2	7439-89-6	Iron	28,400	95,905	MPWA-0 (0-6")	8/8	--	58,270	5,500 N	Yes	ASL
7	0-2	7439-92-1	Lead	123	3,480	MPWA-0 (0-6")	8/8	--	1,109	400 N	Yes	ASL
7	0-2	7439-96-5	Manganese	190	902	MPWA-230+25 (0-6")	8/8	--	4,893	180 N	No	BB
7	0-2	7440-66-6	Zinc	83.6	525	MPWA-50+39 (0-6")	8/8	--	551	2,300 N	No	BB

TABLE C-2.1: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SOIL

Baseline Human Health Risk Assessment

Exposure Unit	Depth Interval (feet bgs)	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion
8	0-2	7429-90-5	Aluminum	6,170	20,200	UMH1-400+12.5 (0-6")	14/14	-	31,092	7,700 N	No	BB
8	0-2	7440-38-2	Arsenic	13.7	952	UMH-C3	158/180	13.13 - 68.40	40.4	22 C	Yes	ASL
8	0-2	7440-43-9	Cadmium	0.347	33.40	UMH-C3	25/28	1.00 - 1.00	4.8	7 N	Yes	ASL
8	0-2	7440-50-8	Copper	19.2	4,940	UMH-C3	174/180	22.73 - 34.78	275	310 N	Yes	ASL
8	0-2	7439-89-6	Iron	6,928	221,158	MHCS-525-W15 (0-6")	106/106	-	58,270	5,500 N	Yes	ASL
8	0-2	7439-92-1	Lead	43.1	30,700	UMH3-COMP 3 (0-6")	179/179	-	1,109	400 N	Yes	ASL
8	0-2	7439-96-5	Manganese	186	9,626	MHCS-700-W10 (0-6")	180/180	-	4,893	180 N	Yes	ASL
8	0-2	7440-66-6	Zinc	104	7,824	UMH-A1	180/180	-	551	2,300 N	Yes	ASL
9	0-2	7429-90-5	Aluminum	13,600	19,200	PMWA1-100+25 (0-6")	7/7	--	31,092	7,700 N	No	BB
9	0-2		Arsenic	10.1	20.60	PMWA2-150 (0-6")	5/14	14.01 - 39.70	40.4	22 C	No	BB
9	0-2	7440-43-9	Cadmium	0.446	0.70	PMWA2-200+25 (0-6")	6/9	0.50 - 0.50	4.8	7 N	No	BB
9	0-2	7440-50-8	Copper	89.9	608	PMWA2-100 (0-6")	14/14	--	275	310 N	Yes	ASL
9	0-2	7439-89-6	Iron	23,977	73,228	PMWA1-200 (0-6")	14/14	--	58,270	5,500 N	Yes	ASL
9	0-2	7439-92-1	Lead	134	741	PMWA1-200 (0-6")	14/14	--	1,109	400 N	No	BB
9	0-2	7439-96-5	Manganese	143	762	PMWA2-50 (0-6")	14/14	--	4,893	180 N	No	BB
9	0-2	7440-66-6	Zinc	67.8	161	PMWA2-50 (0-6")	14/14	--	551	2,300 N	No	BB
9	2-10	7429-90-5	Aluminum	3,550	10,100	PAYRD-1 (0-6")	13/13	--	31,092	7,700 N	No	BB
9	2-10	7440-38-2	Arsenic	18.6	1,370	PAYCW-3 (0-6")	13/13	--	40.4	22 C	Yes	ASL
9	2-10	7440-43-9	Cadmium	0.169	0.22	PAYCW-2 (0-6")	2/13	0.15 - 0.15	4.8	7 N	No	BB
9	2-10	7440-50-8	Copper	114	264	PAYRD-1 (0-6")	13/13	--	275	310 N	No	BB
9	2-10	7439-89-6	Iron	45,900	218,000	PAYCW-2 (12-24")	13/13	--	58,270	5,500 N	Yes	ASL
9	2-10	7439-92-1	Lead	43.4	422	PAYCW-1 (0-6")	13/13	--	1,109	400 N	No	BB
9	2-10	7439-96-5	Manganese	26.8	216	PAYCW-1 (12-24")	13/13	--	4,893	180 N	No	BB
9	2-10	7440-66-6	Zinc	24.1	53.20	PAYCW-1 (0-6")	13/13	--	551	2,300 N	No	BB
10	0-2	7440-38-2	Arsenic	11	52.73	N3TA-700 (0-6")	15/30	8.92 - 47.55	40.4	22 C	Yes	ASL
10	0-2	7440-43-9	Cadmium	0.22	1.36	N3TA-750 (0-6")	3/3	--	4.8	7 N	No	BB
10	0-2	7440-50-8	Copper	75.9	1,001	N3TA-Pile #1 (0-6")	30/30	--	275	310 N	Yes	ASL
10	0-2	7439-89-6	Iron	17,139	83,328	N3TA-750 (0-6")	30/30	--	58,270	5,500 N	Yes	ASL
10	0-2	7439-92-1	Lead	37.1	708	N3TA-COMP 3 (0-6")	30/30	--	1,109	400 N	No	BB
10	0-2	7439-96-5	Manganese	167	5,152	N3TA-Pile #1 (0-6")	12/30	98.25 - 216.12	4,893	180 N	Yes	ASL
10	0-2	7440-66-6	Zinc	41.8	713	N3TA-800 (0-6")	13/30	3.07 - 46.18	551	2,300 N	No	BSL

TABLE C-2.1: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SOIL

Baseline Human Health Risk Assessment

Exposure Unit	Depth Interval (feet bgs)	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion
11	0-2	7429-90-5	Aluminum	2,480	11,500	BCEOT-E22+70 (0-6")	9/9	--	31,092	7,700 N	No	BB
11	0-2	7440-38-2	Arsenic	9.25	616	BCEOT-E17-12.5 (0-6")	182/200	8.48 - 24.22	40.4	22 C	Yes	ASL
11	0-2	7440-43-9	Cadmium	0.238 BJ	72.20 BJ	BCEOT-W22-12.5 (0-6")	24/24	--	4.8	7 N	Yes	ASL
11	0-2	7440-50-8	Copper	16.6	3,232	BCEOT-E17-12.5 (0-6")	196/200	33.30 - 36.58	275	310 N	Yes	ASL
11	0-2	7439-89-6	Iron	10,216	199,000	BCSD-202	200/200	--	58,270	5,500 N	Yes	ASL
11	0-2	7439-92-1	Lead	26.4	21,699	BCEOT-E17-12.5 (0-6")	200/200	--	1,109	400 N	Yes	ASL
11	0-2	7439-96-5	Manganese	75.4	23,700 JM2	BCEOT-W22-12.5 (0-6")	195/200	104.45 - 154.92	4,893	180 N	Yes	ASL
11	0-2	7440-66-6	Zinc	65.8	18,108	BCEOT-E17-12.5 (0-6")	199/200	27.61 - 27.61	551	2,300 N	Yes	ASL
11	2-10	7429-90-5	Aluminum	5,780	14,400	TP-FP-15A(8.5-9.0)	11/11	--	31,092	7,700 N	No	BB
11	2-10	7440-38-2	Arsenic	6.55	518	TP-FP-12(2.0-2.3)	110/114	21.07 - 630.25	40.4	22 C	Yes	ASL
11	2-10	7440-43-9	Cadmium	1.3	120	TP-FP-09(3.2-3.3)	10/11	1.00 - 1.00	4.8	7 N	Yes	ASL
11	2-10	7440-50-8	Copper	12.7	5,809	TP-FP-16(4.2-4.3)	113/114	836.31 - 836.31	275	310 N	Yes	ASL
11	2-10	7439-89-6	Iron	5,663	142,983	TP-FP-09(2.7-3.0)	114/114	--	58,270	5,500 N	Yes	ASL
11	2-10	7439-92-1	Lead	29.0	24,892	TP-FP-21A(3.4-3.7)	113/114	506.96 - 506.96	1,109	400 N	Yes	ASL
11	2-10	7439-96-5	Manganese	87.4	14,715	TP-FP-08(4.0-4.5)	113/114	1,552.46 - 1,552.46	4,893	180 N	Yes	ASL
11	2-10	7440-66-6	Zinc	148	9,544	TP-FP-04(9.0-10.0)	113/114	633.83 - 633.83	551	2,300 N	Yes	ASL

Notes: All concentrations in mg/kg.

(1) The range of values in parentheses following the location name is the sample depth in inches bgs.

(2) The range of detection limits is provided for nondetected samples only. A value of -- indicates that the analyte was detected in all samples.

(3) See Appendix B for background threshold values used for background screening.

(4) Maximum concentrations for all chemicals were compared with EPA (2012) RSLs for residential soil to identify COPCs. For carcinogenic chemicals, the RSL was used as the screening level without modification. For noncarcinogenic chemicals, the RSL was divided by 10 (DEQ 2012).

Definitions:

--	Not applicable
ASL	Above screening level
B	Chemical detected in the associated method blank, as well as the sample
bgs	below ground surface
BSL	Below screening level
C	Carcinogen
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
J	Estimated value
mg/kg	Milligram per kilogram
N	Noncarcinogen
NA	Not applicable
RAGS	Risk Assessment Guidance for Superfund
RSL	Remediation screening level

TABLE C-2.1: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SOIL
Baseline Human Health Risk Assessment

Exposure Unit	Depth Interval (feet bgs)	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion

References:

DEQ. 2005. "Montana Department of Environmental Quality Remediation Division, Action Level for Arsenic in Surface Soil." December 26. Available on-line at: http://www.deq.state.mt.us/StateSuperfund/PDFs/BackgroundConcentrationsForInorganicInSoil.pdf

DEQ. 2009. Soil Screening Process. December. Available on-line at: http://www.deq.state.mt.us/StateSuperfund/VCRA_Guide/ss_flowchart.pdf

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at: http://www.epa.gov/region09/superfund/prg/

TABLE C-2.2: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SEDIMENT

Human Health Risk Assessment for Upper Blackfoot Mine Complex, Lincoln, Montana

Exposure Unit	Depth Interval	CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Background Value (3)	Screening Value (4)	COPC? (Yes/No)	Rationale for Selection or Deletion
12	0-2	7429-90-5	Aluminum	1,090	23,500	BRSD-11 (0-2")	56/56	--	8,030	7,700 N	Yes	ASL
12	0-2	7440-38-2	Arsenic	0.954	507	BRSD-16 (2-6")	289/293	6.41 - 43.6	32.3	40 C	Yes	ASL
12	0-2	7440-43-9	Cadmium	0.152	78 J	UM-0N-500E (2-6")	120/129	0.15 - 0.2	1.84	7 N	Yes	ASL
12	0-2	7440-50-8	Copper	1.52 J	2,760 J	UM-0N-500E (2-6")	293/293	--	67.4	310 N	Yes	ASL
12	0-2	7439-89-6	Iron	5,582	199,000	BRSD-16 (2-6")	220/220	--	14,500	5,500 N	Yes	ASL
12	0-2	7439-92-1	Lead	1.86 J	30,867	TP-MS-116(1.0-1.5)	293/293	--	174	400 N	Yes	ASL
12	0-2	7439-96-5	Manganese	12.3	75,108	TP-MS-10B(0.0-0.5)	277/293	10 - 22.2	696	180 N	Yes	ASL
12	0-2	7440-66-6	Zinc	4.38 J	36,572	TP-MS-11B(0.0-0.5)	292/293	2 - 2	275	2,300 N	Yes	ASL
12	2-10	7429-90-5	Aluminum	17,100	33,600	TP-MS-07(2.75-3.5)	7/7	--	8,030	7,700 N	Yes	ASL
12	2-10	7440-38-2	Arsenic	3.45	114	Tp-Ms-106(2.0-2.5)	58/61	2.03 - 3.03	32.3	40 C	Yes	ASL
12	2-10	7440-43-9	Cadmium	0.2	6.3	TP-MS-11C(2.0-3.0)	7/7	--	1.84	7 N	No	BSL
12	2-10	7440-50-8	Copper	61.8	1,067	Tp-Ms-106(2.0-2.5)	61/61	--	67.4	310 N	Yes	ASL
12	2-10	7439-89-6	Iron	5,030	59,591	TP-MS-19(2.0-3.0)	61/61	--	14,500	5,500 N	Yes	ASL
12	2-10	7439-92-1	Lead	43.4	3,019	Tp-Ms-106(2.0-2.5)	61/61	--	174	400 N	Yes	ASL
12	2-10	7439-96-5	Manganese	33.2	6,040	TP-MS-10CRETEST(2.0-3.0)	55/61	14.1 - 21.4	696	180 N	Yes	ASL
12	2-10	7440-66-6	Zinc	104	5,083	Tp-Ms-106(2.0-2.5)	61/61	--	275	2,300 N	Yes	ASL
13	0-2	7429-90-5	Aluminum	3,920	23,000	BRSW-104 SE (2008) (2-6)	19/19	--	8,980	7,700 N	Yes	ASL
13	0-2	7440-38-2	Arsenic	3.03	86.8	BRSW-13 SE (2007) (2-6)	47/47	--	15.4	40 C	Yes	ASL
13	0-2	7440-43-9	Cadmium	0.5	20.3	BRSW-104 SE (2008) (2-6)	39/47	0.5 - 0.5	0.5	7 N	Yes	ASL
13	0-2	7440-50-8	Copper	26.9	3,030	BRSW-104 SE (2008) (2-6)	47/47	--	114	310 N	Yes	ASL
13	0-2	7439-89-6	Iron	9,650	35,800	BRSW-104 SE (2008) (2-6)	19/19	--	23,900	5,500 N	Yes	ASL
13	0-2	7439-92-1	Lead	7.5	1,500 J	BRSW-36 SE (2007) (0-2)	47/47	--	81.5	400 N	Yes	ASL
13	0-2	7439-96-5	Manganese	8.24	11,300	BRSW-104 SE (2008) (2-6)	47/47	--	578	180 N	Yes	ASL
13	0-2	7440-66-6	Zinc	8.5	4,810 J	BRSW-9 SE (2007) (0-2)	47/47	--	136	2,300 N	Yes	ASL

Notes: All concentrations in milligram per kilogram.

(1) The range of values in parentheses at the end of the location name is the sample in inches bgs. For some locations, the year the sample was collected is listed in parentheses immediately prior to the sample depth.

(2) The range of detection limits is provided for nondetected samples only. A value of -- indicates that the analyte was detected in all samples.

(3) See Appendix B for background threshold values used for background screening.

(4) Maximum concentrations for all chemicals were compared with EPA (2009) RSLs for residential soil to identify COPCs. For carcinogenic chemicals, the RSL was used as the screening level without modification. For noncarcinogenic chemicals, the RSL was divided by 10 (DEQ 2009).

Definitions:

--	Not applicable
ASL	Above screening level
BB	Below background
BSL	Below screening level
C	Carcinogen
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
J	Estimated value
mg/kg	Milligram per kilogram
N	Noncarcinogen
N/A	Not applicable - see Section 5.1.2 for discussion of background data
RAGS	Risk Assessment Guidance for Superfund

References:

DEQ. 2005. “Montana Department of Environmental Quality Remediation Division, Action Level for Arsenic in Surface Soil.” December 26. Available on-line at: http://www.deq.state.mt.us/StateSuperfund/PDFs/BackgroundConcentrationsForInorganicInSoil.pdf

DEQ. 2009. Soil Screening Process. December. Available on-line at: http://www.deq.state.mt.us/StateSuperfund/VCRA_Guide/ss_flowchart.pdf

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at: http://www.epa.gov/region09/superfund/prg/

TABLE C-2.3: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR GROUNDWATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

CAS Number	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits	Maximum Background Concentration	Screening Value (2)	COPC? (Yes/No) (2)
Alluvial Groundwater									
7429-90-5	Aluminum	0.03	58.5	UMHMW-1S (2008)	29/53	0.03 - 0.03	4.51	16	Yes
7440-38-2	Arsenic	0.003	0.04	PGPZ-1 (2008)	7/53	0.0002 - 0.002	--	0.01	Yes
7440-43-9	Cadmium	0.00008 J	1.21	UMHMW-2S (2007)	46/53	0.00008 - 0.00008	0.00156	0.005	Yes
7440-50-8	Copper	0.001	50.4	UMHMW-2S (2007)	43/53	0.001 - 0.001	0.043	1.3	Yes
7439-89-6	Iron	0.03	47.0	LCMW-12S (2008)	35/53	0.03 - 0.03	14.96	11	Yes
7439-92-1	Lead	0.0005	1.19	UMHMW-2S (2007)	27/53	0.0005 - 0.0005	0.0013	0.015	Yes
7439-96-5	Manganese	0.005	149	UMHMW-1S (2008)	49/53	0.005 - 0.005	0.897	0.32	Yes
7440-66-6	Zinc	0.01	195	UMHMW-1S (2008)	50/53	0.01 - 0.01	0.27	2	Yes
Bedrock Groundwater									
7429-90-5	Aluminum	0.04	21.1	UCMW-11 (2008)	13/29	0.03 - 0.03	6.63	16	Yes
7440-38-2	Arsenic	0.003	0.01	UMHMW-1D (2007)	5/29	0.0020 - 0.002	0.003	0.01	No
7440-43-9	Cadmium	0.0002	0.249	UMHMW-2D (2008)	22/29	0.00008 - 0.00008	--	0.005	Yes
7440-50-8	Copper	0.001	2.87	PMGW-119 (2007)	24/29	0.001 - 0.001	0.275	1.3	Yes
7439-89-6	Iron	0.03	21.3	PMGW-120 (2007)	19/29	0.03 - 0.03	12.73	11	Yes
7439-92-1	Lead	0.0006	0.0296	UMHMW-2D (2008)	13/29	0.0005 - 0.0005	0.0007	0.015	Yes
7439-96-5	Manganese	0.007	62.9	UCMW-11 (2007)	27/29	0.005 - 0.005	0.376	0.32	Yes
7440-66-6	Zinc	0.01	62.1	UMHMW-2D (2008)	24/29	0.01 - 0.01	0.26	2	Yes

Notes: All concentrations in milligram per liter

(1) The value in parentheses following the location name is the year the sample was collected.

(2) Groundwater data were evaluated qualitatively by comparing results to Montana numeric groundwater quality criteria (DEQ 2012) or EPA tapwater RSL (for aluminum, iron, and manganese).

Definitions:

--	Not applicable
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
J	Estimated value
RAGS	Risk Assessment Guidance for Superfund

References:

DEQ. 2012. Circular DEQ-7, Montana Numeric Water Quality Standards. October. Available on-line at:
http://www.deq.mt.gov/wqinfo/Standards/PDF/DEQ7/FinalApprovedDEQ7.pdf

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at:
http://www.epa.gov/region09/superfund/prg/

TABLE C-2.4: EPA RAGS PART D TABLE 2, DATA SUMMARY FOR SURFACE WATER

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

CAS Number	Chemical	Minimum Concentration (qualifier)		Maximum Concentration (qualifier)	Location of Maximum Concentration (1)	Detection Frequency	Range of Detection Limits (2)	Maximum Background Concentration	Screening Value (3)	COPC? (Yes/No) (3,4)
7429-90-5	Aluminum	0.05		0.08	BRSW-4A (2008)	2/38	0.03 - 0.03	0.03	16	No
7440-43-9	Cadmium	0.00011		0.034	BRSW-4 (2007)	37/44	0.0001 - 0.00008	--	0.01	Yes
7440-50-8	Copper	0.001		0.886	BRSW-4A (2008)	38/44	0.001 - 0.001	0.00012	0.005	Yes
7439-89-6	Iron	0.01	BJ	6.72	BRSW-13 (2007)	38/44	0.05 - 0.05	0.007	1.3	Yes
7439-92-1	Lead	0.0006	BJ	0.0798	BRSW-4A (2008)	34/44	0.0005 - 0.0005	--	0.015	Yes
7439-96-5	Manganese	0.004		2.1	BRSW-39A (2007)	41/44	0.005 - 0.005	0.303	0.32	Yes
7440-66-6	Zinc	0.01		4.0	BRSW-4 (2007)	43/44	0.01 - 0.01	0.06	2	Yes

Notes: All concentrations in milligram per liter

(1) The value in parentheses following the location name is the year the sample was collected.

(2) The range of detection limits is provided for nondetected samples only. A value of -- indicates that the analyte was detected in all samples.

(3) Surface water data were evaluated qualitatively by comparing results to Montana numeric surface water quality criteria (DEQ 2012) or or EPA tapwater RSLs (for aluminum, iron, and manganese).

(4) Surface water data were used to evaluate health risks for fish ingestion.

Definitions:

-- Not applicable

B Chemical detected in the associated method blank, as well as the sample

bgs below ground surface

CAS Chemical Abstract Service

COPC Chemical of potential concern

EPA U.S. Environmental Protection Agency

J Estimated value

RAGS Risk Assessment Guidance for Superfund

References:

DEQ. 2012. Circular DEQ-7, Montana Numeric Water Quality Standards. October. Available on-line at: http://www.deq.mt.gov/wqinfo/Standards/PDF/DEQ7/FinalApprovedDEQ7.pdf

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at: http://www.epa.gov/region09/superfund/prg/

TABLE C-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SOIL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)
1	0-2	Arsenic	34 / 46	0	5.96E+01	7.72E+01 LN	2.55E+02	7.72E+01	95 UCL	(6)
1	0-2	Cadmium	13 / 13	0	4.22E+00	7.04E+00 G	1.53E+01	7.04E+00	95 UCL	(3)
1	0-2	Copper	46 / 46	0	3.11E+02	4.12E+02 LN	3.05E+03	4.12E+02	95 UCL	(10)
1	0-2	Iron	46 / 46	0	4.20E+04	6.05E+04 NP	1.35E+05	6.05E+04	95 UCL	(11)
1	0-2	Lead	46 / 46	0	4.09E+03	1.15E+04 NP	5.52E+04	1.15E+04	95 UCL	(11)
1	0-2	Zinc	46 / 46	0	5.51E+02	8.55E+02 NP	3.20E+03	8.55E+02	95 UCL	(11)
2	0-2	Arsenic	371 / 440	0	9.35E+01	1.03E+02 NP	1.06E+03	1.03E+02	95 UCL	(6)
2	0-2	Cadmium	69 / 69	0	1.46E+01	3.56E+01 NP	1.61E+02 JM27	3.56E+01	97.5 UCL	(12)
2	0-2	Copper	440 / 440	0	4.90E+02	6.22E+02 NP	4.25E+03	6.22E+02	95 UCL	(11)
2	0-2	Iron	437 / 437	0	5.10E+04	5.70E+04 NP	2.01E+05	5.70E+04	95 UCL	(11)
2	0-2	Lead	440 / 440	0	2.55E+03	3.67E+03 NP	3.88E+04	3.67E+03	95 UCL	(11)
2	0-2	Manganese	405 / 440	0	1.51E+03	1.92E+03 NP	1.51E+04	1.92E+03	95 UCL	(9)
2	0-2	Zinc	422 / 440	0	1.74E+03	2.46E+03 NP	2.60E+04 JM31	2.46E+03	95 UCL	(9)
2	>2	Arsenic	150 / 153	0	2.97E+01	3.94E+01 NP	7.30E+02	3.94E+01	95 UCL	(6)
2	>2	Cadmium	21 / 22	0	6.21E+00	1.20E+01 LN	2.75E+01	1.20E+01	95 UCL	(9)
2	>2	Copper	152 / 153	0	3.45E+02	3.91E+02 LN	2.08E+03	3.91E+02	95 UCL	(6)
2	>2	Iron	153 / 153	0	4.05E+04	4.25E+04 NP	9.88E+04	4.25E+04	95 UCL	(2)
2	>2	Lead	153 / 153	0	7.25E+02	1.58E+03 NP	2.89E+04	1.58E+03	95 UCL	(11)
2	>2	Manganese	151 / 153	0	1.40E+03	2.04E+03 LN	1.47E+04	2.04E+03	95 UCL	(9)
2	>2	Zinc	153 / 153	0	1.14E+03	1.40E+03 LN	9.76E+03	1.40E+03	95 UCL	(10)

TABLE C-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SOIL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)
3	0-2	Arsenic	15 / 17	0	2.45E+02	6.84E+02 LN	1.57E+03	6.84E+02	95 UCL	(11)
3	0-2	Copper	18 / 18	0	2.97E+02	3.79E+02 N	7.59E+02	3.79E+02	95 UCL	(2)
3	0-2	Iron	18 / 18	0	6.04E+04	1.20E+05 NP	2.25E+05	1.20E+05	95 UCL	(11)
3	0-2	Lead	18 / 18	0	7.87E+02	1.18E+03 G	2.27E+03	1.18E+03	95 UCL	(3)
4	0-2	Cadmium	6 / 6	0	1.11E+01	N/A N/A	1.11E+01	1.11E+01	Max	(1)
4	0-2	Copper	28 / 29	0	3.36E+02	3.93E+02 N	6.48E+02	3.93E+02	95 UCL	(8)
4	0-2	Iron	29 / 29	0	6.69E+04	7.90E+04 N	1.44E+05	7.90E+04	95 UCL	(2)
4	0-2	Lead	29 / 29	0	3.23E+02	4.41E+02 G	2.22E+03	4.41E+02	95 UCL	(3)
5	0-2	Arsenic	37 / 58	0	1.61E+01	1.99E+01 NP	8.45E+01	1.99E+01	95 UCL	(6)
5	0-2	Copper	57 / 58	0	1.82E+02	3.15E+02 NP	1.35E+03	3.15E+02	95 UCL	(9)
5	0-2	Iron	58 / 58	0	3.32E+04	3.94E+04 NP	1.71E+05	3.94E+04	95 UCL	(2)
5	0-2	Lead	58 / 58	0	1.45E+02	2.48E+02 NP	1.38E+03	2.48E+02	95 UCL	(11)
6	0-2	Arsenic	28 / 36	0	9.34E+01	3.06E+02 NP	1.01E+03	3.06E+02	97.5 UCL	(14)
6	0-2	Copper	35 / 36	0	1.51E+02	2.31E+02 N	4.10E+02	2.31E+02	95 UCL	(9)
6	0-2	Iron	36 / 36	0	3.33E+04	3.83E+04 G	7.74E+04	3.83E+04	95 UCL	(3)
6	0-2	Lead	36 / 36	0	9.19E+02	1.94E+03 NP	6.78E+03	1.94E+03	95 UCL	(11)
7	0-2	Arsenic	5 / 8	0	N/A	N/A N/A	1.16E+02	1.16E+02	Max	(1)
7	0-2	Copper	8 / 8	0	3.49E+02	6.50E+02 NP	5.79E+02	5.79E+02	Max	(1)
7	0-2	Iron	8 / 8	0	5.68E+04	7.11E+04 NP	9.59E+04	7.11E+04	95 UCL	(2)
7	0-2	Lead	8 / 8	0	7.09E+02	N/A N/A	3.48E+03	3.48E+03	Max	(1)

TABLE C-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SOIL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)
8	0-2	Arsenic	158 / 180	0	1.75E+02	2.34E+02 NP	9.52E+02	2.34E+02	95 UCL	(9)
8	0-2	Cadmium	25 / 28	0	4.91E+00	1.06E+01 LN	3.34E+01	1.06E+01	95 UCL	(9)
8	0-2	Copper	174 / 180	0	7.38E+02	1.01E+03 NP	4.94E+03	1.01E+03	95 UCL	(9)
8	0-2	Iron	106 / 106	0	2.98E+04	3.40E+04 NP	2.21E+05	3.40E+04	95 UCL	(2)
8	0-2	Lead	179 / 179	0	3.74E+03	5.18E+03 NP	3.07E+04	5.18E+03	95 UCL	(11)
8	0-2	Manganese	180 / 180	0	1.97E+03	2.49E+03 LN	9.63E+03	2.49E+03	95 UCL	(11)
8	0-2	Zinc	180 / 180	0	1.25E+03	1.39E+03 LN	7.82E+03	1.39E+03	95 UCL	(2)
9	0-2	Copper	14 / 14	0	3.28E+02	3.85E+02 N	6.08E+02	3.85E+02	95 UCL	(2)
9	0-2	Iron	14 / 14	0	5.19E+04	5.80E+04 N	7.32E+04	5.80E+04	95 UCL	(2)
9	>2	Arsenic	13 / 13	0	5.40E+02	7.46E+02 N	1.37E+03	7.46E+02	95 UCL	(2)
9	>2	Iron	13 / 13	0	1.25E+05	1.57E+05 N	2.18E+05	1.57E+05	95 UCL	(2)
10	0-2	Arsenic	15 / 30	0	1.73E+01	2.06E+01 NP	5.27E+01	2.06E+01	95 UCL	(8)
10	0-2	Copper	30 / 30	0	2.56E+02	4.53E+02 NP	1.00E+03	4.53E+02	95 UCL	(11)
10	0-2	Iron	30 / 30	0	3.36E+04	3.83E+04 NP	8.33E+04	3.83E+04	95 UCL	(2)
10	0-2	Manganese	12 / 30	0	6.16E+02	1.01E+03 NP	5.15E+03	1.01E+03	95 UCL	(6)
11	0-2	Arsenic	182 / 200	0	1.02E+02	1.36E+02 NP	6.16E+02	1.36E+02	95 UCL	(9)
11	0-2	Cadmium	24 / 24	0	7.48E+00	2.14E+01 LN	7.22E+01	2.14E+01	95 UCL	(11)
11	0-2	Copper	196 / 200	0	2.85E+02	3.33E+02 LN	3.23E+03	3.33E+02	95 UCL	(6)
11	0-2	Iron	200 / 200	0	5.26E+04	6.29E+04 NP	1.99E+05	6.29E+04	95 UCL	(11)
11	0-2	Lead	200 / 200	0	1.29E+03	2.04E+03 NP	2.17E+04	2.04E+03	95 UCL	(11)
11	0-2	Manganese	195 / 200	0	1.51E+03	2.28E+03 NP	2.37E+04	2.28E+03	95 UCL	(9)
11	0-2	Zinc	199 / 200	0	1.03E+03	1.69E+03 NP	1.81E+04	1.69E+03	95 UCL	(9)

TABLE C-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SOIL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)
11	2-10	Arsenic	110 / 114	0	7.34E+01	8.84E+01 NP	5.18E+02	8.84E+01	95 UCL	(6)
11	2-10	Cadmium	10 / 11	0	2.68E+01	7.44E+01 N	1.20E+02	7.44E+01	95 UCL	(9)
11	2-10	Copper	113 / 114	0	4.83E+02	7.91E+02 LN	5.81E+03	7.91E+02	95 UCL	(9)
11	2-10	Iron	114 / 114	0	4.30E+04	4.67E+04 NP	1.43E+05	4.67E+04	95 UCL	(2)
11	2-10	Lead	113 / 114	0	2.26E+03	4.54E+03 NP	2.49E+04	4.54E+03	97.5 UCL	(14)
11	2-10	Manganese	113 / 114	0	2.52E+03	3.65E+03 LN	1.47E+04	3.65E+03	95 UCL	(9)
11	2-10	Zinc	113 / 114	0	2.35E+03	3.22E+03 NP	9.54E+03	3.22E+03	95 UCL	(9)

Notes: All concentrations in milligram per kilogram.

BCa Bias-corrected accelerated
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EPC Exposure point concentration
KM Kaplan-Meier product limit estimator
Max Maximum detected concentration
RAGS Risk Assessment Guidance for Superfund
95UCL One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2009), this may be estimated by either a 95, 97.5, or 99 percent UCL depending on sample size, skewness, and degree of censorship.
a Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W^2 test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.
Distribution Codes: G= gamma, LN= lognormal, N= normal, NP= nonparametric
c The EPC is the lesser of the UCL and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results.
d All methods follow EPA (2002, 2009).

TABLE C-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SOIL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)

<u>Method (Statistic) Codes are defined as follows</u>:

(1) Maximum detected concentration
(2) 95 percent UCL calculated using Student's t distribution
(3) 95 percent UCL calculated using the approximate gamma method
(4) 95 percent UCL calculated using the adjusted gamma method
(5) 95 percent UCL calculated using the Hall's Bootstrap (or Bootstrap t) method
(6) 95 percent UCL calculated using the KM mean and a BCA bootstrap to estimate the UCL
(7) 95 percent UCL calculated using the KM mean and a percentile bootstrap to estimate the UCL
(8) 95 percent UCL calculated using the KM mean and Student's t cutoff for the UCL
(9) 95 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(10) 95 percent UCL calculated using Land's H statistic
(11) 95 percent UCL calculated using the nonparametric Chebyshev method
(12) 97.5 percent UCL calculated using the nonparametric Chebyshev method
(13) 99 percent UCL calculated using the nonparametric Chebyshev method
(14) 97.5 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(15) 99 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL

References:

EPA. 2002. “Calculating Exposure Point Concentrations at Hazardous Waste Sites.” OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.
EPA. 2009. “ProUCL Version 4.00.04 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. February.

TABLE C-3.2: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)		Maximum Concentration (qualifier)		Exposure Point Concentration		
										Value	Statistic (c)	Method (d)
12	0-2	Aluminum	56 / 56	0	1.01E+04	1.14E+04	G	2.35E+04		1.14E+04	95 UCL	(2)
12	0-2	Arsenic	289 / 293	0	5.48E+01	6.95E+01	NP	5.07E+02		6.95E+01	95 UCL	(9)
12	0-2	Cadmium	120 / 129	0	7.28E+00	1.11E+01	NP	7.80E+01	J	1.11E+01	95 UCL	(9)
12	0-2	Copper	293 / 293	0	5.34E+02	6.68E+02	NP	2.76E+03	J	6.68E+02	95 UCL	(9)
12	0-2	Iron	220 / 220	0	4.26E+04	4.60E+04	LN	1.99E+05		4.60E+04	95 UCL	(10)
12	0-2	Lead	293 / 293	0	1.56E+03	2.22E+03	NP	3.09E+04		2.22E+03	95 UCL	(11)
12	0-2	Manganese	277 / 293	0	3.25E+03	5.84E+03	NP	7.51E+04		5.84E+03	95 UCL	(12)
12	0-2	Zinc	292 / 293	0	2.82E+03	4.52E+03	NP	3.66E+04		4.52E+03	95 UCL	(12)
12	2-10	Aluminum	7 / 7	0	2.16E+04	N/A	N/A	3.36E+04		3.36E+04	Max	(1)
12	2-10	Arsenic	58 / 61	0	1.79E+01	3.10E+01	NP	1.14E+02		3.10E+01	95 UCL	(9)
12	2-10	Copper	61 / 61	0	2.88E+02	3.30E+02	LN	1.07E+03		3.30E+02	95 UCL	(10)
12	2-10	Iron	61 / 61	0	3.00E+04	3.28E+04	G	5.96E+04		3.28E+04	95 UCL	(3)
12	2-10	Lead	61 / 61	0	3.57E+02	6.56E+02	NP	3.02E+03		6.56E+02	95 UCL	(11)
12	2-10	Manganese	55 / 61	0	5.54E+02	1.22E+03	NP	6.04E+03		1.22E+03	95 UCL	(9)
12	2-10	Zinc	61 / 61	0	6.77E+02	1.17E+03	NP	5.08E+03		1.17E+03	95 UCL	(11)
13	0-2	Aluminum	19 / 19	0	8.11E+03	1.36E+04	NP	2.30E+04		1.36E+04	95 UCL	(11)
13	0-2	Arsenic	47 / 47	0	1.63E+01	1.98E+01	G	8.68E+01		1.98E+01	95 UCL	(3)
13	0-2	Cadmium	39 / 47	0	5.41E+00	6.73E+00	N	2.03E+01		6.73E+00	95 UCL	(6)
13	0-2	Copper	47 / 47	0	2.91E+02	6.45E+02	NP	3.03E+03		6.45E+02	95 UCL	(11)
13	0-2	Iron	19 / 19	0	2.05E+04	2.38E+04	N	3.58E+04		2.38E+04	95 UCL	(2)
13	0-2	Lead	47 / 47	0	2.48E+02	3.37E+02	G	1.50E+03	J	3.37E+02	95 UCL	(3)
13	0-2	Manganese	47 / 47	0	1.80E+03	2.43E+03	G	1.13E+04		2.43E+03	95 UCL	(3)
13	0-2	Zinc	47 / 47	0	1.15E+03	1.51E+03	G	4.81E+03	J	1.51E+03	95 UCL	(3)

Notes: All concentrations are in milligram per kilogram.

TABLE C-3.2: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)

EPA U.S. Environmental Protection Agency
EPC Exposure point concentration
J Estimated value
KM Kaplan-Meier product limit estimator
N/A Not applicable, no estimate provided because there were fewer than 6 detected results
Max Maximum detected concentration
RAGS Risk Assessment Guidance for Superfund
95UCL One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2009), this may be estimated by either a 95, 97.5, or 99 percent UCL depending on sample size, skewness, and degree of censorship.
a Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W^2 test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.
Distribution Codes: G= gamma, LN= lognormal, N= normal, NP= nonparametric
c The EPC is the lesser of the UCL and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results.
d All methods follow EPA (2002, 2009).
Method (Statistic) Codes are defined as follows:
(1) Maximum detected concentration
(2) 95 percent UCL calculated using Student's *t* distribution
(3) 95 percent UCL calculated using the approximate gamma method
(4) 95 percent UCL calculated using the adjusted gamma method
(5) 95 percent UCL calculated using the Hall's Bootstrap (or Bootstrap t) method
(6) 95 percent UCL calculated using the KM mean and a BCA bootstrap to estimate the UCL
(7) 95 percent UCL calculated using the KM mean and a percentile bootstrap to estimate the UCL
(8) 95 percent UCL calculated using the KM mean and Student's t cutoff for the UCL
(9) 95 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL

TABLE C-3.2: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SEDIMENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

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

Exposure Unit	Depth Interval (feet bgs)	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)

(10) 95 percent UCL calculated using Land's H statistic
(11) 95 percent UCL calculated using the nonparametric Chebyshev method
(12) 97.5 percent UCL calculated using the nonparametric Chebyshev method
(13) 99 percent UCL calculated using the nonparametric Chebyshev method
(14) 97.5 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(15) 99 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL

References:

EPA. 2002. “Calculating Exposure Point Concentrations at Hazardous Waste Sites.” OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2009. “ProUCL Version 4.00.04 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. February.

TABLE C-3.3: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SURFACE WATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

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

Exposure Unit	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)		Maximum Concentration (qualifier)	Exposure Point Concentration		
								Value	Statistic (c)	Method (d)
Surface Water	Aluminum	2 / 38	0	N/A	N/A	N/A	8.00E-02	8.00E-02	Max	(1)
Surface Water	Cadmium	37 / 44	0	3.73E-03	8.00E-03	LN	3.42E-02	8.00E-03	95 UCL	(9)
Surface Water	Copper	38 / 44	0	5.60E-02	2.13E-01	LN	8.86E-01	2.13E-01	97.5 UCL	(14)
Surface Water	Iron	38 / 44	0	4.20E-01	1.15E+00	LN	6.72E+00	1.15E+00	95 UCL	(9)
Surface Water	Lead	34 / 44	0	6.91E-03	1.64E-02	LN	7.98E-02	1.64E-02	95 UCL	(9)
Surface Water	Manganese	41 / 44	0	3.63E-01	7.04E-01	LN	2.12E+00	7.04E-01	95 UCL	(9)
Surface Water	Zinc	43 / 44	0	8.38E-01	1.54E+00	NP	4.01E+00	1.54E+00	95 UCL	(9)

Notes: All concentrations are in milligram per liter.
Surface water EPCs were only used to evaluate health risks for fish ingestion. Other exposures to surface water were assessed using point comparisons of concentrations to standards.

EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
J	Estimated value
KM	Kaplan-Meier product limit estimator
N/A	Not applicable, no estimate provided because there were fewer than 6 detected results
Max	Maximum detected concentration
RAGS	Risk Assessment Guidance for Superfund
95UCL	One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2009), this may be estimated by either a 95, 97.5, or 99 percent UCL depending on sample size, skewness, and degree of censorship.
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b	Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W^2 test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least 10 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.

TABLE C-3.3: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SURFACE WATER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex

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

Exposure Unit	Chemical of Potential Concern	Detection Frequency	Number of High Censored Results (a)	Mean	95 UCL Distribution (b)	Maximum Concentration (qualifier)	Exposure Point Concentration		
							Value	Statistic (c)	Method (d)

Distribution Codes: G= gamma, LN= lognormal, N= normal, NP= nonparametric

c The EPC is the lesser of the UCL and the maximum detected result. The maximum detected result is the default when there are fewer than six detected results.

d All methods follow EPA (2002, 2009).

Method (Statistic) Codes are defined as follows:

(1) Maximum detected concentration
(2) 95 percent UCL calculated using Student's *t* distribution
(3) 95 percent UCL calculated using the approximate gamma method
(4) 95 percent UCL calculated using the adjusted gamma method
(5) 95 percent UCL calculated using the Hall's Bootstrap (or Bootstrap t) method
(6) 95 percent UCL calculated using the KM mean and a BCA bootstrap to estimate the UCL
(7) 95 percent UCL calculated using the KM mean and a percentile bootstrap to estimate the UCL
(8) 95 percent UCL calculated using the KM mean and Student's t cutoff for the UCL
(9) 95 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(10) 95 percent UCL calculated using Land's H statistic
(11) 95 percent UCL calculated using the nonparametric Chebyshev method
(12) 97.5 percent UCL calculated using the nonparametric Chebyshev method
(13) 99 percent UCL calculated using the nonparametric Chebyshev method
(14) 97.5 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(15) 99 percent UCL calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL

References:

EPA. 2002. “Calculating Exposure Point Concentrations at Hazardous Waste Sites.” OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.
EPA. 2009. “ProUCL Version 4.00.04 Technical Guide (Draft).” Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. February.

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Industrial Worker	Adult	UBMC	CS	Chemical Concentration	Sample result	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	100	mg/day	EPA 2014	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	165	days/year	Assumes a standard 5-day work week, 4 months (December through March) of snow cover or frozen ground, and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	25	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	9,125	days	ED x 365 days/year (DEQ 2013a)	
	Construction Worker	Adult	UBMC	CS	Chemical Concentration	Sample result	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	330	mg/day	EPA 2004; DEQ 2013a	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	124	days/year	Assumes 4 months of open excavation (DEQ 2009, 2012a).	
				ED	Exposure Duration	1	years	EPA 2004; DEQ 2013a	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	365	days	ED x 365 days/year (DEQ 2013a)	
	Resident	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	100	mg/day	EPA 2014	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	20	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion (Continued)	Resident (Continued)	Child	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	200	mg/day	EPA 2014	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	6	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (DEQ 2013a)	
	Recreational Fisherman	Adult	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	50	mg/day	One-half default intake for residential exposure (EPA 2014, Tetra Tech 1996)	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	
	Recreational Hunter	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	50	mg/day	One-half default intake for residential exposure (EPA 2014. Tetra Tech 1996)	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	16	days/year	Based on length of season (8 weeks during September and October) with a visitation rate of 2 days per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	Standard adult body weight (DEQ 2013a)	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion (Continued)	Recreational Rock Hound	Adult	UBMC	CS	Chemical Concentration	EPC	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	165	mg/day	One-half of soil ingestion rate for excavation worker (EPA 2002, Tetra Tech 1996) (2)	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EAP 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
		Child	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	100	mg/day	One-half of standard default ingestion rate for children (EPA 2014, Tetra Tech 1996)	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	6	years	Upperbound time estimate for residing in one location (EPA 2014, Tetra Tech 1996)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	Standard child body weight (EPA 2014, 2013; DEQ 2013a)	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	
	Recreational ATV/Motorcycle Rider	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	165	mg/day	One-half of soil ingestion rate for excavation worker (EPA 2002, Tetra Tech 1996) (2)	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	12	days/year	Based on length of season (24 weeks during May through October) and a visitation rate of 1 day every two weeks (DEQ 2013b)	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Industrial Worker	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	3,470	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	0.12	mg/cm^2	EPA 2014	
				EF	Exposure Frequency	165	days/year	Assumes a standard 5-day work week, 4 months (December through March) of snow cover or frozen ground, and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	25	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	9,125	days	ED x 365 days/year (DEQ 2013a)	
	Construction Worker	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	3,470	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	0.2056	mg/cm^2	EPA 2011	
				EF	Exposure Frequency	124	days/year	Assumes 4 months of open excavation (DEQ 2009, 2012a).	
				ED	Exposure Duration	1	years	DEQ 2013a	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	365	days	ED x 365 days/year (DEQ 2013a)	
	Resident	Adult	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	6,032	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	0.07	mg/cm^2	EPA 2014	
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	20	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal (continued)	Resident	Child	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	2,690	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	EPA 2014	
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	6	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	Standard child body weight (EPA 2014, 2013; DEQ 2013a)	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (DEQ 2013a)	
	Recreational Fisherman	Adult	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	6,032	cm^2	Exposed heads, hands, forearms, and lower legs; standard default value for adult residents is 25% of body surface (EPA 2014) (2)	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Reasonable maximum value (EPA 2014, Tetra Tech 1996) (2)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	
	Recreational Hunter	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	EPA 2013	
				SA	Exposed Skin Surface Area	6,032	cm^2	Exposed heads, hands, forearms, and lower legs; standard default value for adult residents is 25% of body surface (EPA 2014) (2)	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Reasonable maximum value (EPA 2014, Tetra Tech 1996) (2)	
				EF	Exposure Frequency	16	days/year	Based on length of season (8 weeks during September and October) with a visitation rate of 2 days per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (DEQ 2013a)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal (continued)	Recreational Rock Hound	Adult	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	EPA 2013	
				SA	Exposed Skin Surface Area	6,032	cm^2	Exposed heads, hands, forearms, and lower legs; standard default value for adult residents is 25% of body surface (EPA 2014) (2)	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Reasonable maximum value (EPA 2014, Tetra Tech 1996) (2)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
	Recreational Rock Hound	Child	UBMC	CS	Chemical Concentration	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	EPA 2013	
				SA	Exposed Skin Surface Area	2,690	cm^2	Exposed heads, hands, forearms, and lower legs; 25% of body surface of a young child (EPA 2014) (2)	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Reasonable maximum value (EPA 2014, Tetra Tech 1996) (2)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	6	years	Upperbound time estimate for residing in one location (EPA 2014, Tetra Tech 1996)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	Standard child body weight (EPA 2014; DEQ 2013a)	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	
	Recreational ATV/Motorcycle Rider	Adult	UBMC	CS	Chemical Concentration in Soil	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	EPA 2013	
				SA	Exposed Skin Surface Area	6,032	cm^2	Exposed heads, hands, forearms, and lower legs; standard default value for adult residents is 25% of body surface (EPA 2014) (2)	
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Reasonable maximum value (EPA 2014, Tetra Tech 1996) (2)	
				EF	Exposure Frequency	12	days/year	Based on length of season (24 weeks during May through October) and a visitation rate of 1 day every two weeks (DEQ 2013b)	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Industrial Worker	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) =
				CS	Chemical Concentration in Soil	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	(CA x ET x EF x ED) / AT
				ET	Exposure Time	8	hours/day	EPA 2014	where CA= CS / PEF for particulates
				EF	Exposure Frequency	165	days/year	Assumes a standard 5-day work week, 4 months (December through March) of snow cover or frozen ground, and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	25	years	EPA 2014	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	219,000	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
	Construction Worker	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) =
				CS	Chemical Concentration in Soil	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	(CA x ET x EF x ED) / AT
				ET	Exposure Time	8	hours/day	EPA 2002	where CA= CS / PEF for particulates
				EF	Exposure Frequency	124	days/year	Assumes 4 months of open excavation (DEQ 2009, 2012a).	
				ED	Exposure Duration	1	years	DEQ 2013a	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	8,760	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
	Resident	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) =
				CS	Chemical Concentration	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	(CA x ET x EF x ED) / AT
				ET	Exposure Time	24	hours/day	EPA 2014	where CA= CS / PEF for particulates
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	20	years	EPA 2014	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
		Child	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) =
				CS	Chemical Concentration	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	(CA x ET x EF x ED) / AT
				ET	Exposure Time	24	hours/day	EPA 2014	where CA= CS / PEF for particulates
				EF	Exposure Frequency	230	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	6	years	EPA 2014	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	52,560	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation (continued)	Recreational Fisherman	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	4	hours/day	(EPA 1989, EPA 1991, Tetra Tech 1996)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	175,200	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
	Recreational Hunter	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration in Soil	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	4	hours/day	(EPA 1989, EPA 1991, Tetra Tech 1996)	
				EF	Exposure Frequency	16	days/year	Based on length of season (8 weeks during September and October) with a visitation rate of 2 days per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	175,200	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
	Recreational Rock Hound	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA = CS / PEF for particulates, and CA = CS / VF for volatiles
				CS	Chemical Concentration	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	8	hours/day	(EPA 1989, EPA 1991, Tetra Tech 1996)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	
		Child	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	8	hours/day	Child exposure time assumed to be similar to adult (EPA 1989, EPA 1991, Tetra Tech 1996)	
				EF	Exposure Frequency	24	days/year	Based on length of season (24 weeks during May through October) with a visitation rate of 1 day per week (DEQ 2013b).	
				ED	Exposure Duration	6	years	Upperbound time estimate for residing in one location (EPA 2014, Tetra Tech 1996)	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	52,560	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2013	

TABLE C-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL AND SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Soil and Sediment
Exposure Medium:	Soil, Sediment, and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation (continued)	Recreational ATV/Motorcycle Rider	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration in Soil	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	4	hours/day	(EPA 1989, EPA 1991, Tetra Tech 1996)	
				EF	Exposure Frequency	12	days/year	Based on length of season (24 weeks during May through October) and a visitation rate of 1 day every two weeks (DEQ 2013b)	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	175,200	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,310,000	m^3/kg	Tetra Tech 1996; see Section 6.2.2.2	

Notes:

(1) See Section 6.2 for discussion of intake assumptions.

(2) The value shown was updated from the recommended exposure value provided in Tetra Tech (1996), based on more recent EPA or DEQ risk assessment guidance.

Definitions:

cm^2	Square centimeter	mg/kg-day	Milligram per kilogram per day
DEQ	Montana Department of Environmental Quality	mg/kg	Milligram per kilogram
EPA	U.S. Environmental Protection Agency	mg/m^3	Milligram per cubic meter
EPC	Exposure point concentration	$m^3/hour$	Cubic meter per hour
kg	Kilogram	m^3/kg	Cubic meter of air per kg soil (reduced from mg/m^3-air per mg/kg-soil)
kg/mg	Kilogram per milligram	PEF	Particulate emission factor
mg/cm^2	Milligram per square centimeter	RAGS	Risk Assessment Guidance for Superfund
mg/day	Milligram per day	RME	Reasonable maximum exposure

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TABLE C-4.1a: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME MODIFIED RESIDENTIAL SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Resident	Adult	UBMC	CS	Chemical Concentration in Sediment	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	100	mg/day	EPA 2014	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	50	days/year	Assumes residents have more exposure to sediments than recreators but that exposure is not daily	
				ED	Exposure Duration	20	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (DEQ 2013a)	
	Resident	Child	UBMC	CS	Chemical Concentration in Sediment	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate - Soil	200	mg/day	EPA 2014	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	50	days/year	Assumes residents have more exposure to sediments than recreators but that exposure is not daily	
				ED	Exposure Duration	6	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (DEQ 2013a)	
Dermal	Resident	Adult	UBMC	CS	Chemical Concentration in Sediment	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	6,032	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	0.17	mg/cm^2	EPA 2011	
				EF	Exposure Frequency	50	days/year	Assumes residents have more exposure to sediments than recreators but that exposure is not daily	
				ED	Exposure Duration	20	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	7,300	days	ED x 365 days/year (DEQ 2013a)	

TABLE C-4.1a: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME MODIFIED RESIDENTIAL SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Resident	Child	UBMC	CS	Chemical Concentration in Sediment	EPC	mg/kg	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	See Section 6.2.2.3	
				SA	Exposed Skin Surface Area	2,690	cm^2	EPA 2014	
				AF	Soil to Skin Adherence Factor	4.7	mg/cm^2	EPA 2011	
				EF	Exposure Frequency	50	days/year	Assumes residents have more exposure to sediments than recreators but that exposure is not daily	
				ED	Exposure Duration	6	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013a)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (DEQ 2013a)	
Inhalation	Resident	Adult	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration in Sediment	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	24	hours/day	EPA 2014	
				EF	Exposure Frequency	50	days/year	Assumes 4 months (December through March) of snow cover or frozen ground and a 2-week vacatlion (DEQ 2013b).	
				ED	Exposure Duration	20	years	EPA 2014	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	175,200	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2009b	
		Child	UBMC	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/m3) = (CA x ET x EF x ED) / AT where CA= CS / PEF for particulates
				CS	Chemical Concentration in Sediment	Chemical-specific	mg/kg	RAGS Part D Table 3 series for each site will document the rationale.	
				ET	Exposure Time	24	hours/day	EPA 2014	
				EF	Exposure Frequency	50	days/year	Assumes residents have more exposure to sediments than recreators but that exposure is not daily	
				ED	Exposure Duration	6	years	EPA 2014	
				AT-C	Averaging Time - Cancer	683,280	hours	DEQ 2013a	
				AT-NC	Averaging Time - Noncancer	52,560	hours	EPA 2009a	
				PEF	Particulate Emission Factor	1,360,000,000	m^3/kg	EPA 2009b	

TABLE C-4.1a: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME MODIFIED RESIDENTIAL SEDIMENT EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment and Outdoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)

Notes:

(1) See Section 6.2 for discussion of intake assumptions.

(2) The value shown was updated from the recommended exposure value provided in Tetra Tech (1996), based on more recent EPA or DEQ risk assessment guidance.

Definitions:

cm^2	Square centimeter	mg/kg-day	Milligram per kilogram per day
DEQ	Montana Department of Environmental Quality	mg/kg	Milligram per kilogram
EPA	U.S. Environmental Protection Agency	mg/m^3	Milligram per cubic meter
EPC	Exposure point concentration	m^3/hour	Cubic meter per hour
kg	Kilogram	m^3/kg	Cubic meter of air per kg soil (reduced from mg/m^3-air per mg/kg-soil)
kg/mg	Kilogram per milligram	PEF	Particulate emission factor
mg/cm^2	Milligram per square centimeter	RAGS	Risk Assessment Guidance for Superfund
mg/day	Milligram per day	RME	Reasonable maximum exposure

References:

DEQ. 2009. Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases. September.

DEQ. 2013a. Frequently Asked State Superfund Questions. Accessed May 30. Available Online at: http://www.deq.state.mt.us/StateSuperfund/FrequentlyAskedQuestions.asp

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EPA. 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final." Office of Emergency and Remedial Response. EPA/540/1-89/002. December. Available Online at: http://www.epa.gov/oswer/riskassessment/ragsa/index.htm

EPA. 1991. Memorandum Regarding the "Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors." From Timothy Fields, Jr. Acting Director Office of Solid Waste and Emergency Response (OSWER). To All Region Directors (Regions I through X). March 25.

EPA. 2002. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Interim Guidance." OSWER. OSWER 9355.4-24. December. Available Online at: http://www.epa.gov/superfund/resources/soil/ssg_main.pdf

EPA. 2004. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)." Final. EPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation. July. Available Online at: http://www.epa.gov/oswer/riskassessment/ragse/pdf/part_e_final_revision_7-27-06.pdf

EPA. 2009a. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Final. EPA/540/R/070/002. January. Available Online at: http://rais.ornl.gov/homepage/RAGS_F_EPA540R070002.pdf

EPA. 2009b. Integrated Risk Information System (IRIS). Online Database. Office of Research and Development, National Center for Environmental Assessment. Available Online at: http://www.epa.gov/iris. May 19.

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Tetra Tech. 1996. Risk-based Cleanup Guidelines for Abandoned Mine Sites. Final report. February.

TABLE C-4.2: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SURFACE WATER EXPOSURES

Human Health Risk Assessment for Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Fish Ingestion	Recreational Fisherman	Adult	UBMC	CW	Chemical Concentration in Surface Water	EPC	µg/L	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CW x BCF x FI x IRF x EF x ED x MCF) / (BW x AT)
				BCF	Bioconcentration Factor	Chemical-specific	L/kg	See Section 6.1.2	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				IRF	Ingestion Rate - Fish	0.113	kg/meal	50th percentile for fin fish ingestion (EPA 1989 and 1997)	
				EF	Exposure Frequency	24	meals/year	Exposure assumed to occur at rates similar to fishing visits (EPA 1997)	
				ED	Exposure Duration	20	years	Upperbound time estimate for residing in one location (EPA 2014)	
				MCF	Mass Conversion Factor	1E-03	µg/mg	Not applicable	
				BW	Body Weight	80	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013)	
Fish Ingestion	Recreational Fisherman	Child	UBMC	CW	Chemical Concentration in Surface Water	EPC	µg/L	The RAGS Part D Table 3 series for each EU will document the rationale.	Intake (mg/kg-day) = (CW x BCF x FI x IRF x EF x ED x MCF) / (BW x AT)
				BCF	Bioconcentration Factor	Chemical-specific	L/kg	See Section 6.1.2	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				IRF	Ingestion Rate - Fish	0.0956	kg/meal	50th percentile for fin fish ingestion (EPA 1989 and 1997)	
				EF	Exposure Frequency	24	meals/year	Exposure assumed to occur at rates similar to fishing visits (EPA 1997)	
				ED	Exposure Duration	6	years	EPA 2014	
				MCF	Mass Conversion Factor	1E-03	µg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2014	
				AT-C	Averaging Time - Cancer	28,470	days	78 years x 365 days/year (DEQ 2013)	
				AT-NC	Averaging Time - Noncancer	2,190	days	ED x 365 days/year (EPA 1989, Tetra Tech 1996)	

Notes:

(1) See Section 6.2 for discussion of intake assumptions.

(2) The value shown was updated from the recommended exposure value provided in Tetra Tech (1996), based on more recent EPA or DEQ risk assessment guidance.

Definitions:

cm^2	Square centimeter	L/kg	Liters per kilogram
DEQ	Montana Department of Environmental Quality	µg/L	Micrograms per liter
EPA	U.S. Environmental Protection Agency	µg/mg	Micrograms per milligram
EPC	Exposure point concentration	mg/kg-day	Milligram per kilogram per day
kg	Kilogram	RAGS	Risk Assessment Guidance for Superfund
kg/meal	Kilogram per meal	RME	Reasonable maximum exposure

References:

DEQ. 2013. Frequently Asked State Superfund Questions. Accessed May 30. Available Online at: http://www.deq.state.mt.us/StateSuperfund/FrequentlyAskedQuestions.asp

EPA. 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final." Office of Emergency and Remedial Response. EPA/540/1-89/002. December. Available Online at: http://www.epa.gov/oswer/riskassessment/ragsa/index.htm

EPA. 1997. "Exposure Factors Handbook." Office of Health and Environmental Assessment. EPA/600/8-89/043. August. Available Online at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12464

EPA. 2014 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Final. OSWER Directive 9200.1-120. February.

Tetra Tech. 1996. Risk-based Cleanup Guidelines for Abandoned Mine Sites. Final report. February.

TABLE C-5.1: EPA RAGS PART D TABLE 5, FEDERAL NON-CANCER TOXICITY DATA - ORAL / DERMAL

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (a)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/ Modifying Factors	Oral Reference Dose	
		Value	Units		Value	Units			Source(s)	Date(s)
Aluminum	Chronic	1.0E+00	mg/kg-day	100%	1.0E+00	mg/kg-day	Central Nervous System	100	PPRTV	05/22/2013
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	IRIS	05/22/2013
Cadmium [b]	Chronic	5.0E-04	mg/kg-day	100%	5.0E-04	mg/kg-day	Kidney	10	IRIS	05/22/2013
Copper	Chronic	4.0E-02	mg/kg-day	100%	4.0E-02	mg/kg-day	Gastrointestinal	--	HEAST	05/22/2013
Iron	Chronic	7.0E-01	mg/kg-day	100%	7.0E-01	mg/kg-day	Gastrointestinal	1	PPRTV	05/22/2013
Lead	Chronic	--	--	--	--	--	--	--	--	--
Manganese [c]	Chronic	2.4E-02	mg/kg-day	100%	2.4E-02	mg/kg-day	Central Nervous System	1	IRIS	05/22/2013
Zinc	Chronic	3.0E-01	mg/kg-day	100%	3.0E-01	mg/kg-day	Blood	3	IRIS	05/22/2013

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

b The toxicity value for cadmuim is a diet-based RfD for assessment of exposure to soil.

c The toxicity value for manganese excludes dietary contribution, and assumes homegrown produce ingestion is not an exposure pathway.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
PPRTV	Provisional Peer Reviewed Toxicity Value (PPRTV) as shown in EPA RSL Table (EPA 2013a).
HEAST	EPA Health Effects Assessment Summary Tables (EPA 1997)
IRIS	EPA Integrated Risk Information System (EPA 2013b)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RSL	Remediation screenin level

References:

EPA. 1997. “Health Effects Assessment Summary Tables.” Office of Research and Development.

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at: http://epa-prgs.ornl.gov/chemicals/download.shtml

EPA. 2013b. Integrated Risk Information System (IRIS). Online Database. Office of Research and Development, National Center for Environmental Assessment. Available online at: http://www.epa.gov/iris. Accessed May 22.

TABLE C-5.2: EPA RAGS PART D TABLE 5, FEDERAL NON-CANCER TOXICITY DATA - INHALATION

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Inhalation Reference Concentration	
		Value	Units			Source(s)	Date(s)
Aluminum	Chronic	5.0E-03	mg/m^3	Central Nervous System	300	EPA-NCEA	05/22/2013
Arsenic	Chronic	1.5E-05	mg/m^3	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	1,000	OEHHA	05/22/2013
Cadmium	Chronic	2.0E-05	mg/m^3	Kidney, Respiratory	30	OEHHA	05/22/2013
Copper	Chronic	--	--	--	--	--	--
Iron	Chronic	--	--	--	--	--	--
Lead	Chronic	--	--	--	--	--	--
Manganese	Chronic	5.0E-05	mg/m^3	Central Nervous System	1,000	IRIS	05/22/2013
Zinc	Chronic	--	--	--	--	--	--

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2013)
mg/m^3	Milligram per cubic meter
OEHHA	California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Chronic Reference Exposure Level (REL) Values (OEHHA 2012)
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference concentration
RSL	Remediation screening level

References:

OEHHA. 2012. “Chronic Reference Exposure Levels.” February Available Online at: http://www.oehha.ca.gov/air/allrels.html

EPA. 2013a. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May. Available Online at: http://epa-prgs.ornl.gov/chemicals/download.shtml

EPA. 2013b. Integrated Risk Information System (IRIS). Online Database. Office of Research and Development, National Center for Environmental Assessment. Available online at: http://www.epa.gov/iris. Accessed May 22.

TABLE C-6.1: EPA RAGS PART D TABLE 6, FEDERAL CANCER TOXICITY DATA - ORAL / DERMAL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (a)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral Cancer Slope Factor	
	Value	Units		Value	Units		Source(s)	Date(s)
Aluminum	--	--	--	--	--	--	--	--
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	100%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	05/22/2013
Cadmium	--	--	--	--	--	B1	IRIS	05/22/2013
Copper	--	--	--	--	--	D	IRIS	05/22/2013
Iron	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	B2	IRIS	05/22/2013
Manganese	--	--	--	--	--	D	IRIS	05/22/2013
Zinc	--	--	--	--	--	D	IRIS	05/22/2013

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2013)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund

References:

EPA. 2013b. Integrated Risk Information System (IRIS). Online Database. Office of Research and Development, National Center for Environmental Assessment. Available online at: http://www.epa.gov/iris. Accessed May 22.

TABLE C-6.2: EPA RAGS PART D TABLE 6, FEDERAL CANCER TOXICITY DATA - INHALATION

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Chemical of Potential Concern	Unit Risk		Weight of Evidence/ Cancer Guideline Description	Unit Risk: Inhalation Cancer Slope Factor	
	Value	Units		Source(s)	Date(s)
Aluminum	--	--	--	--	--
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	A	IRIS	05/22/2013
Cadmium	1.8E-03	$(\mu g/m^3)^{-1}$	B1	IRIS	05/22/2013
Copper	--	--	D	IRIS	05/22/2013
Iron	--	--	--	--	--
Lead	--	--	B2	IRIS	05/22/2013
Manganese	--	--	D	IRIS	05/22/2013
Zinc	--	--	D	IRIS	05/22/2013

Definitions:

-- Not available; not applicable
$\mu g/m^3$ Micrograms per cubic meter
EPA U.S. Environmental Protection Agency
IRIS EPA Integrated Risk Information System (EPA 2013)
RAGS Risk Assessment Guidance for Superfund

References:

EPA. 2013b. Integrated Risk Information System (IRIS). Online Database. Office of Research and Development, National Center for Environmental Assessment. Available online at http://www.epa.gov/iris. Accessed May 22.

TABLE C1-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	8.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	3.1E-06	mg/kg-day	3.0E-04	mg/kg-day	1.0E-02
				Cadmium	7.0E+00	mg/kg	1.2E-07	mg/kg-day	--	--	--	4.8E-07	mg/kg-day	5.0E-04	mg/kg-day	9.5E-04
				Copper	4.1E+02	mg/kg	7.2E-06	mg/kg-day	--	--	--	2.8E-05	mg/kg-day	4.0E-02	mg/kg-day	7.0E-04
				Iron	6.1E+04	mg/kg	1.1E-03	mg/kg-day	--	--	--	4.1E-03	mg/kg-day	7.0E-01	mg/kg-day	5.9E-03
				Lead	1.2E+04	mg/kg	2.0E-04	mg/kg-day	--	--	--	7.8E-04	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.8E-05	mg/kg-day	3.0E-01	mg/kg-day	1.9E-04
			Exposure Route Total								1.2E-06					1.8E-02
			Dermal	Arsenic	7.7E+01	mg/kg	2.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.4E-07	1.1E-06	mg/kg-day	3.0E-04	mg/kg-day	3.8E-03
				Cadmium	7.0E+00	mg/kg	9.0E-10	mg/kg-day	--	--	--	3.5E-09	mg/kg-day	5.0E-04	mg/kg-day	7.0E-06
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								4.4E-07					3.8E-03
		Exposure Point Total									1.6E-06					2.2E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	8.3E-08	mg/m3	4.3E-03	(µg/m3)-1	3.6E-07	3.2E-07	mg/m3	1.5E-05	mg/m3	2.2E-02
				Cadmium	7.0E+00	mg/kg	7.6E-09	mg/m3	1.8E-03	(µg/m3)-1	1.4E-08	3.0E-08	mg/m3	2.0E-05	mg/m3	1.5E-03
				Copper	4.1E+02	mg/kg	4.4E-07	mg/m3	--	--	--	1.7E-06	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	6.5E-05	mg/m3	--	--	--	2.5E-04	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	1.2E-05	mg/m3	--	--	--	4.8E-05	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	9.2E-07	mg/m3	--	--	--	3.6E-06	mg/m3	--	--	--
			Exposure Route Total								3.7E-07					2.3E-02
		Exposure Point Total									3.7E-07					2.3E-02
	Exposure Medium Total										2.0E-06					4.5E-02
Medium Total											2.0E-06					4.5E-02

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C1-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 1 - UPPER ANACONDA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.2E-06	--	4.4E-07	1.6E-06	Skin	1.0E-02	--	3.8E-03	1.4E-02
			Cadmium	--	--	--	--	Kidney	9.5E-04	--	7.0E-06	9.6E-04
			Copper	--	--	--	--	Gastrointestinal	7.0E-04	--	--	7.0E-04
			Iron	--	--	--	--	Gastrointestinal	5.9E-03	--	--	5.9E-03
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	1.9E-04	--	--	1.9E-04
			Chemical Total	1.2E-06	--	4.4E-07	1.6E-06		1.8E-02	--	3.8E-03	2.2E-02
		Exposure Point Total					1.6E-06					2.2E-02
		Outdoor Air (Particulates)	Arsenic	--	3.6E-07	--	3.6E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.2E-02	--	2.2E-02
			Cadmium	--	1.4E-08	--	1.4E-08	Kidney, Respiratory	--	1.5E-03	--	1.5E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.7E-07	--	3.7E-07		--	2.3E-02	--	2.3E-02
		Exposure Point Total					3.7E-07					2.3E-02
	Exposure Medium Total						2.0E-06					4.5E-02
Medium Total							2.0E-06					4.5E-02

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.9E-04
Cardiovascular	2.2E-02
Central Nervous System	2.2E-02
Developmental	2.2E-02
Gastrointestinal	6.6E-03
Kidney	2.4E-03
Lung	2.2E-02
Respiratory	1.5E-03
Skin	3.6E-02
Maximum	3.6E-02

TABLE C1-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	4.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.3E-07	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	6.3E-03
				Cadmium	7.0E+00	mg/kg	7.4E-08	mg/kg-day	--	--	--	2.9E-07	mg/kg-day	5.0E-04	mg/kg-day	5.8E-04
				Copper	4.1E+02	mg/kg	4.3E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	4.0E-02	mg/kg-day	4.2E-04
				Iron	6.1E+04	mg/kg	6.4E-04	mg/kg-day	--	--	--	2.5E-03	mg/kg-day	7.0E-01	mg/kg-day	3.6E-03
				Lead	1.2E+04	mg/kg	1.2E-04	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	9.0E-06	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	3.0E-01	mg/kg-day	1.2E-04
			Exposure Route Total								7.3E-07					1.1E-02
			Dermal	Arsenic	7.7E+01	mg/kg	5.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.8E-07	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	7.7E-03
				Cadmium	7.0E+00	mg/kg	1.8E-09	mg/kg-day	--	--	--	7.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								8.8E-07					7.7E-03
		Exposure Point Total									1.6E-06					1.9E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	1.6E-10	mg/m3	4.3E-03	(µg/m3)-1	6.9E-10	6.2E-10	mg/m3	1.5E-05	mg/m3	4.1E-05
				Cadmium	7.0E+00	mg/kg	1.5E-11	mg/m3	1.8E-03	(µg/m3)-1	2.6E-11	5.7E-11	mg/m3	2.0E-05	mg/m3	2.8E-06
				Copper	4.1E+02	mg/kg	8.5E-10	mg/m3	--	--	--	3.3E-09	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	1.3E-07	mg/m3	--	--	--	4.9E-07	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	2.4E-08	mg/m3	--	--	--	9.3E-08	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	1.8E-09	mg/m3	--	--	--	6.9E-09	mg/m3	--	--	--
			Exposure Route Total								7.1E-10					4.4E-05
		Exposure Point Total									7.1E-10					4.4E-05
	Exposure Medium Total										1.6E-06					1.9E-02
Medium Total											1.6E-06					1.9E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C1-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	7.3E-07	--	8.8E-07	1.6E-06	Skin	6.3E-03	--	7.7E-03	1.4E-02
			Cadmium	--	--	--	--	Kidney	5.8E-04	--	1.4E-05	5.9E-04
			Copper	--	--	--	--	Gastrointestinal	4.2E-04	--	--	4.2E-04
			Iron	--	--	--	--	Gastrointestinal	3.6E-03	--	--	3.6E-03
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	1.2E-04	--	--	1.2E-04
			Chemical Total	7.3E-07	--	8.8E-07	1.6E-06		1.1E-02	--	7.7E-03	1.9E-02
		Exposure Point Total					1.6E-06					1.9E-02
		Outdoor Air (Particulates)	Arsenic	--	6.9E-10	--	6.9E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.1E-05	--	4.1E-05
			Cadmium	--	2.6E-11	--	2.6E-11	Kidney, Respiratory	--	2.8E-06	--	2.8E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.1E-10	--	7.1E-10		--	4.4E-05	--	4.4E-05
		Exposure Point Total					7.1E-10					4.4E-05
	Exposure Medium Total						1.6E-06					1.9E-02
Medium Total							1.6E-06					1.9E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.2E-04
Cardiovascular	4.1E-05
Central Nervous System	4.1E-05
Developmental	4.1E-05
Gastrointestinal	4.0E-03
Kidney	6.0E-04
Lung	4.1E-05
Respiratory	2.8E-06
Skin	1.4E-02
Maximum	1.4E-02

TABLE C1-2.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-3.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	3.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.8E-06	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	6.8E-02
				Cadmium	7.0E+00	mg/kg	4.8E-07	mg/kg-day	--	--	--	3.1E-06	mg/kg-day	5.0E-04	mg/kg-day	6.2E-03
				Copper	4.1E+02	mg/kg	2.8E-05	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	4.0E-02	mg/kg-day	4.5E-03
				Iron	6.1E+04	mg/kg	4.1E-03	mg/kg-day	--	--	--	2.7E-02	mg/kg-day	7.0E-01	mg/kg-day	3.8E-02
				Lead	1.2E+04	mg/kg	7.9E-04	mg/kg-day	--	--	--	5.1E-03	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	5.9E-05	mg/kg-day	--	--	--	3.7E-04	mg/kg-day	3.0E-01	mg/kg-day	1.2E-03
			Exposure Route Total								4.8E-06					1.2E-01
			Dermal	Arsenic	7.7E+01	mg/kg	9.8E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.5E-06	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1.8E-02
				Cadmium	7.0E+00	mg/kg	3.0E-09	mg/kg-day	--	--	--	1.7E-08	mg/kg-day	5.0E-04	mg/kg-day	3.3E-05
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.5E-06					1.8E-02
		Exposure Point Total									6.2E-06					1.4E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	4.1E-10	mg/m3	4.3E-03	(µg/m3)-1	1.8E-09	1.2E-09	mg/m3	1.5E-05	mg/m3	8.3E-05
				Cadmium	7.0E+00	mg/kg	3.8E-11	mg/m3	1.8E-03	(µg/m3)-1	6.8E-11	1.1E-10	mg/m3	2.0E-05	mg/m3	5.7E-06
				Copper	4.1E+02	mg/kg	2.2E-09	mg/m3	--	--	--	6.6E-09	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	3.3E-07	mg/m3	--	--	--	9.8E-07	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	6.2E-08	mg/m3	--	--	--	1.9E-07	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	4.6E-09	mg/m3	--	--	--	1.4E-08	mg/m3	--	--	--
			Exposure Route Total								1.9E-09					8.9E-05
		Exposure Point Total									1.9E-09					8.9E-05
	Exposure Medium Total										6.2E-06					1.4E-01
Medium Total											6.2E-06					1.4E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C1-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.8E-06	--	1.5E-06	6.2E-06	Skin	6.8E-02	--	1.8E-02	8.6E-02
			Cadmium	--	--	--	--	Kidney	6.2E-03	--	3.3E-05	6.2E-03
			Copper	--	--	--	--	Gastrointestinal	4.5E-03	--	--	4.5E-03
			Iron	--	--	--	--	Gastrointestinal	3.8E-02	--	--	3.8E-02
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	1.2E-03	--	--	1.2E-03
			Chemical Total	4.8E-06	--	1.5E-06	6.2E-06		1.2E-01	--	1.8E-02	1.4E-01
		Exposure Point Total					6.2E-06					1.4E-01
		Outdoor Air (Particulates)	Arsenic	--	1.8E-09	--	1.8E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	8.3E-05	--	8.3E-05
			Cadmium	--	6.8E-11	--	6.8E-11	Kidney, Respiratory	--	5.7E-06	--	5.7E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.9E-09	--	1.9E-09		--	8.9E-05	--	8.9E-05
		Exposure Point Total					1.9E-09					8.9E-05
	Exposure Medium Total						6.2E-06					1.4E-01
Medium Total							6.2E-06					1.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	1.2E-03
Cardiovascular	8.3E-05
Central Nervous System	8.3E-05
Developmental	8.3E-05
Gastrointestinal	4.2E-02
Kidney	6.2E-03
Lung	8.3E-05
Respiratory	5.7E-06
Skin	8.6E-02
Maximum	8.6E-02

TABLE C1-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, HUNTER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.9E-07	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	4.2E-03
				Cadmium	7.0E+00	mg/kg	4.9E-08	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	5.0E-04	mg/kg-day	3.9E-04
				Copper	4.1E+02	mg/kg	2.9E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	2.8E-04
				Iron	6.1E+04	mg/kg	4.3E-04	mg/kg-day	--	--	--	1.7E-03	mg/kg-day	7.0E-01	mg/kg-day	2.4E-03
				Lead	1.2E+04	mg/kg	8.1E-05	mg/kg-day	--	--	--	3.2E-04	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	6.0E-06	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	3.0E-01	mg/kg-day	7.8E-05
			Exposure Route Total								4.9E-07					7.3E-03
			Dermal	Arsenic	7.7E+01	mg/kg	3.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.9E-07	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	5.1E-03
				Cadmium	7.0E+00	mg/kg	1.2E-09	mg/kg-day	--	--	--	4.7E-09	mg/kg-day	5.0E-04	mg/kg-day	9.3E-06
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								5.9E-07					5.1E-03
		Exposure Point Total									1.1E-06					1.2E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	1.1E-10	mg/m3	4.3E-03	(µg/m3)-1	4.6E-10	4.1E-10	mg/m3	1.5E-05	mg/m3	2.8E-05
				Cadmium	7.0E+00	mg/kg	9.7E-12	mg/m3	1.8E-03	(µg/m3)-1	1.7E-11	3.8E-11	mg/m3	2.0E-05	mg/m3	1.9E-06
				Copper	4.1E+02	mg/kg	5.7E-10	mg/m3	--	--	--	2.2E-09	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	8.3E-08	mg/m3	--	--	--	3.3E-07	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	1.6E-08	mg/m3	--	--	--	6.2E-08	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	1.2E-09	mg/m3	--	--	--	4.6E-09	mg/m3	--	--	--
			Exposure Route Total								4.7E-10					3.0E-05
		Exposure Point Total									4.7E-10					3.0E-05
	Exposure Medium Total										1.1E-06					1.2E-02
Medium Total											1.1E-06					1.2E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C1-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, HUNTER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.9E-07	--	5.9E-07	1.1E-06	Skin	4.2E-03	--	5.1E-03	9.3E-03
			Cadmium	--	--	--	--	Kidney	3.9E-04	--	9.3E-06	4.0E-04
			Copper	--	--	--	--	Gastrointestinal	2.8E-04	--	--	2.8E-04
			Iron	--	--	--	--	Gastrointestinal	2.4E-03	--	--	2.4E-03
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	7.8E-05	--	--	7.8E-05
			Chemical Total	4.9E-07	--	5.9E-07	1.1E-06		7.3E-03	--	5.1E-03	1.2E-02
		Exposure Point Total					1.1E-06					1.2E-02
		Outdoor Air (Particulates)	Arsenic	--	4.6E-10	--	4.6E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.8E-05	--	2.8E-05
			Cadmium	--	1.7E-11	--	1.7E-11	Kidney, Respiratory	--	1.9E-06	--	1.9E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.7E-10	--	4.7E-10		--	3.0E-05	--	3.0E-05
		Exposure Point Total					4.7E-10					3.0E-05
	Exposure Medium Total						1.1E-06					1.2E-02
Medium Total							1.1E-06					1.2E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	7.8E-05
Cardiovascular	2.8E-05
Central Nervous System	2.8E-05
Developmental	2.8E-05
Gastrointestinal	2.7E-03
Kidney	4.0E-04
Lung	2.8E-05
Respiratory	1.9E-06
Skin	9.4E-03
Maximum	9.4E-03

TABLE C1-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, HUNTER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	8.4E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-05	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	8.7E-02
				Cadmium	7.0E+00	mg/kg	1.3E-06	mg/kg-day	--	--	--	4.0E-06	mg/kg-day	5.0E-04	mg/kg-day	8.0E-03
				Copper	4.1E+02	mg/kg	7.5E-05	mg/kg-day	--	--	--	2.3E-04	mg/kg-day	4.0E-02	mg/kg-day	5.8E-03
				Iron	6.1E+04	mg/kg	1.1E-02	mg/kg-day	--	--	--	3.4E-02	mg/kg-day	7.0E-01	mg/kg-day	4.9E-02
				Lead	1.2E+04	mg/kg	2.1E-03	mg/kg-day	--	--	--	6.5E-03	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	1.5E-04	mg/kg-day	--	--	--	4.8E-04	mg/kg-day	3.0E-01	mg/kg-day	1.6E-03
			Exposure Route Total								1.3E-05					1.5E-01
			Dermal	Arsenic	7.7E+01	mg/kg	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.6E-06	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1.8E-02
				Cadmium	7.0E+00	mg/kg	5.3E-09	mg/kg-day	--	--	--	1.7E-08	mg/kg-day	5.0E-04	mg/kg-day	3.3E-05
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.6E-06					1.8E-02
		Exposure Point Total									1.5E-05					1.7E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	7.7E+01	mg/kg	2.7E-09	mg/m3	4.3E-03	(μg/m3)-1	1.2E-08	8.6E-09	mg/m3	1.5E-05	mg/m3	5.7E-04
				Cadmium	7.0E+00	mg/kg	2.5E-10	mg/m3	1.8E-03	(μg/m3)-1	4.5E-10	7.8E-10	mg/m3	2.0E-05	mg/m3	3.9E-05
				Copper	4.1E+02	mg/kg	1.5E-08	mg/m3	--	--	--	4.6E-08	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	2.1E-06	mg/m3	--	--	--	6.7E-06	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	4.1E-07	mg/m3	--	--	--	1.3E-06	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	3.0E-08	mg/m3	--	--	--	9.5E-08	mg/m3	--	--	--
			Exposure Route Total								1.2E-08					6.1E-04
		Exposure Point Total									1.2E-08					6.1E-04
	Exposure Medium Total										1.5E-05					1.7E-01
Medium Total											1.5E-05					1.7E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(μg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C1-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-05	--	2.6E-06	1.5E-05	Skin	8.7E-02	--	1.8E-02	1.1E-01
			Cadmium	--	--	--	--	Kidney	8.0E-03	--	3.3E-05	8.0E-03
			Copper	--	--	--	--	Gastrointestinal	5.8E-03	--	--	5.8E-03
			Iron	--	--	--	--	Gastrointestinal	4.9E-02	--	--	4.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	1.6E-03	--	--	1.6E-03
			Chemical Total	1.3E-05	--	2.6E-06	1.5E-05		1.5E-01	--	1.8E-02	1.7E-01
		Exposure Point Total					1.5E-05					1.7E-01
		Outdoor Air (Particulates)	Arsenic	--	1.2E-08	--	1.2E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.7E-04	--	5.7E-04
			Cadmium	--	4.5E-10	--	4.5E-10	Kidney, Respiratory	--	3.9E-05	--	3.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.2E-08	--	1.2E-08		--	6.1E-04	--	6.1E-04
		Exposure Point Total					1.2E-08					6.1E-04
	Exposure Medium Total						1.5E-05					1.7E-01
Medium Total							1.5E-05					1.7E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	1.6E-03
Cardiovascular	5.7E-04
Central Nervous System	5.7E-04
Developmental	5.7E-04
Gastrointestinal	5.5E-02
Kidney	8.0E-03
Lung	5.7E-04
Respiratory	3.9E-05
Skin	1.1E-01
Maximum	1.1E-01

TABLE C1-5.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-05	--	2.6E-06	1.5E-05	--	--	--	--	--
			Chemical Total	1.3E-05	--	2.6E-06	1.5E-05		--	--	--	--
		Exposure Point Total					1.5E-05					--
		Outdoor Air (Particulates)	Arsenic	--	1.2E-08	--	1.2E-08	--	--	--	--	--
			Chemical Total	--	1.2E-08	--	1.2E-08		--	--	--	--
		Exposure Point Total					1.2E-08					--
	Exposure Medium Total						--					--
Medium Total							2E-05					--

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-6.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	8.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	6.5E-05	mg/kg-day	3.0E-04	mg/kg-day	2.2E-01
				Cadmium	7.0E+00	mg/kg	1.3E-07	mg/kg-day	--	--	--	9.9E-06	mg/kg-day	5.0E-04	mg/kg-day	2.0E-02
				Copper	4.1E+02	mg/kg	7.4E-06	mg/kg-day	--	--	--	5.8E-04	mg/kg-day	4.0E-02	mg/kg-day	1.4E-02
				Iron	6.1E+04	mg/kg	1.1E-03	mg/kg-day	--	--	--	8.5E-02	mg/kg-day	7.0E-01	mg/kg-day	1.2E-01
				Lead	1.2E+04	mg/kg	2.1E-04	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	3.0E-01	mg/kg-day	4.0E-03
			Exposure Route Total								1.2E-06					3.8E-01
			Dermal	Arsenic	7.7E+01	mg/kg	9.0E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-07	7.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Cadmium	7.0E+00	mg/kg	2.7E-10	mg/kg-day	--	--	--	2.1E-08	mg/kg-day	5.0E-04	mg/kg-day	4.3E-05
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.3E-07					2.3E-02
		Exposure Point Total									1.4E-06					4.0E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	8.2E-11	mg/m3	4.3E-03	(µg/m3)-1	3.5E-10	6.4E-09	mg/m3	1.5E-05	mg/m3	4.3E-04
				Cadmium	7.0E+00	mg/kg	7.5E-12	mg/m3	1.8E-03	(µg/m3)-1	1.4E-11	5.9E-10	mg/m3	2.0E-05	mg/m3	2.9E-05
				Copper	4.1E+02	mg/kg	4.4E-10	mg/m3	--	--	--	3.4E-08	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	6.5E-08	mg/m3	--	--	--	5.0E-06	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	1.2E-08	mg/m3	--	--	--	9.6E-07	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	9.1E-10	mg/m3	--	--	--	7.1E-08	mg/m3	--	--	--
			Exposure Route Total								3.7E-10					4.6E-04
		Exposure Point Total									3.7E-10					4.6E-04
	Exposure Medium Total										1.4E-06					4.0E-01
Medium Total											1.4E-06					4.0E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C1-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.2E-06	--	1.3E-07	1.4E-06	Skin	2.2E-01	--	2.3E-02	2.4E-01
			Cadmium	--	--	--	--	Kidney	2.0E-02	--	4.3E-05	2.0E-02
			Copper	--	--	--	--	Gastrointestinal	1.4E-02	--	--	1.4E-02
			Iron	--	--	--	--	Gastrointestinal	1.2E-01	--	--	1.2E-01
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	4.0E-03	--	--	4.0E-03
			Chemical Total	1.2E-06	--	1.3E-07	1.4E-06		3.8E-01	--	2.3E-02	4.0E-01
		Exposure Point Total					1.4E-06					4.0E-01
		Outdoor Air (Particulates)	Arsenic	--	3.5E-10	--	3.5E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.3E-04	--	4.3E-04
			Cadmium	--	1.4E-11	--	1.4E-11	Kidney, Respiratory	--	2.9E-05	--	2.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.7E-10	--	3.7E-10		--	4.6E-04	--	4.6E-04
		Exposure Point Total					3.7E-10					4.6E-04
	Exposure Medium Total						1.4E-06					4.0E-01
Medium Total							1.4E-06					4.0E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	4.0E-03
Cardiovascular	4.3E-04
Central Nervous System	4.3E-04
Developmental	4.3E-04
Gastrointestinal	1.4E-01
Kidney	2.0E-02
Lung	4.3E-04
Respiratory	2.9E-05
Skin	2.4E-01
Maximum	2.4E-01

TABLE C1-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C1-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	7.7E+01	mg/kg	3.9E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.9E-05	3.9E-04	mg/kg-day	3.0E-04	mg/kg-day	1.3E+00
				Cadmium	7.0E+00	mg/kg	6.0E-06	mg/kg-day	--	--	--	5.9E-05	mg/kg-day	5.0E-04	mg/kg-day	1.2E-01
				Copper	4.1E+02	mg/kg	3.5E-04	mg/kg-day	--	--	--	3.5E-03	mg/kg-day	4.0E-02	mg/kg-day	8.7E-02
				Iron	6.1E+04	mg/kg	5.1E-02	mg/kg-day	--	--	--	5.1E-01	mg/kg-day	7.0E-01	mg/kg-day	7.3E-01
				Lead	1.2E+04	mg/kg	9.8E-03	mg/kg-day	--	--	--	9.7E-02	mg/kg-day	--	--	--
				Zinc	8.5E+02	mg/kg	7.3E-04	mg/kg-day	--	--	--	7.2E-03	mg/kg-day	3.0E-01	mg/kg-day	2.4E-02
			Exposure Route Total								5.9E-05					2.3E+00
			Dermal	Arsenic	7.7E+01	mg/kg	6.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	9.0E-06	5.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1.7E-01
				Cadmium	7.0E+00	mg/kg	1.8E-08	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	5.0E-04	mg/kg-day	3.2E-04
				Copper	4.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+04	mg/kg	--	--	--	--	--	--	--	--	--	--
				Zinc	8.5E+02	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								9.0E-06					1.7E-01
		Exposure Point Total									6.8E-05					2.4E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.7E+01	mg/kg	1.2E-08	mg/m3	4.3E-03	(µg/m3)-1	5.1E-08	3.6E-08	mg/m3	1.5E-05	mg/m3	2.4E-03
				Cadmium	7.0E+00	mg/kg	1.1E-09	mg/m3	1.8E-03	(µg/m3)-1	2.0E-09	3.3E-09	mg/m3	2.0E-05	mg/m3	1.6E-04
				Copper	4.1E+02	mg/kg	6.4E-08	mg/m3	--	--	--	1.9E-07	mg/m3	--	--	--
				Iron	6.1E+04	mg/kg	9.3E-06	mg/m3	--	--	--	2.8E-05	mg/m3	--	--	--
				Lead	1.2E+04	mg/kg	1.8E-06	mg/m3	--	--	--	5.3E-06	mg/m3	--	--	--
				Zinc	8.5E+02	mg/kg	1.3E-07	mg/m3	--	--	--	4.0E-07	mg/m3	--	--	--
			Exposure Route Total								5.3E-08					2.5E-03
		Exposure Point Total									5.3E-08					2.5E-03
	Exposure Medium Total										6.8E-05					2.4E+00
Medium Total											6.8E-05					2.4E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C1-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.9E-05	--	9.0E-06	6.8E-05	Skin	1.3E+00	--	1.7E-01	1.5E+00
			Cadmium	--	--	--	--	Kidney	1.2E-01	--	3.2E-04	1.2E-01
			Copper	--	--	--	--	Gastrointestinal	8.7E-02	--	--	8.7E-02
			Iron	--	--	--	--	Gastrointestinal	7.3E-01	--	--	7.3E-01
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	Blood	2.4E-02	--	--	2.4E-02
			Chemical Total	5.9E-05	--	9.0E-06	6.8E-05		2.3E+00	--	1.7E-01	2.4E+00
		Exposure Point Total					6.8E-05					2.4E+00
		Outdoor Air (Particulates)	Arsenic	--	5.1E-08	--	5.1E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.4E-03	--	2.4E-03
			Cadmium	--	2.0E-09	--	2.0E-09	Kidney, Respiratory	--	1.6E-04	--	1.6E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.3E-08	--	5.3E-08		--	2.5E-03	--	2.5E-03
		Exposure Point Total					5.3E-08					2.5E-03
	Exposure Medium Total						6.8E-05					2.4E+00
Medium Total							6.8E-05					2.4E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	2.4E-02
Cardiovascular	2.4E-03
Central Nervous System	2.4E-03
Developmental	2.4E-03
Gastrointestinal	8.1E-01
Kidney	1.2E-01
Lung	2.4E-03
Respiratory	1.6E-04
Skin	**1.5E+00**
Maximum	**1.5E+00**

TABLE C1-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.9E-05	--	9.0E-06	6.8E-05	Skin	1.3E+00	--	1.7E-01	1.5E+00
			Chemical Total	5.9E-05	--	9.0E-06	6.8E-05		1.3E+00	--	1.7E-01	1.5E+00
		Exposure Point Total					6.8E-05					1.5E+00
		Outdoor Air (Particulates)	Arsenic	--	5.1E-08	--	5.1E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.4E-03	--	2.4E-03
			Chemical Total	--	5.1E-08	--	5.1E-08		--	2.4E-03	--	2.4E-03
		Exposure Point Total					5.1E-08					2.4E-03
	Exposure Medium Total						6.8E-05					1.5E+00
Medium Total							6.8E-05					1.5E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-1: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 1 - UPPER ANACONDA MINE WASTE REMOVAL AREAS AND WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	1E-06	4E-07	4E-07	2E-06	0.02	0.004	0.02	0.05	0.04	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	30.6
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	7E-07	9E-07	7E-10	2E-06	0.011	0.008	0.00004	0.02	0.01	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	19.5
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	5E-06	1E-06	2E-09	6E-06	0.1	0.02	0.00009	0.1	0.09	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	32.5
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	5E-07	6E-07	5E-10	1E-06	0.007	0.005	0.00003	0.012	0.009	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	36.6
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	1E-05	3E-06	1E-08	2E-05	0.15	0.02	0.0006	0.2	0.11	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	74.3
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	1E-06	1E-07	4E-10	1E-06	0.4	0.02	0.0005	0.4	0.2	Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	74.3
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	6E-05	9E-06	5E-08	7E-05	2	0.2	0.003	2	1	Arsenic	C, NC	34/46	16.30 - 255	7.7E+01	7E-05	1	--
												Lead	PbB	46/46	41.76 - 55,200	2.1E+04	--	--	132

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C2-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.6E-06	4.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.4E-02
				Cadmium	3.6E+01	mg/kg	6.2E-07	mg/kg-day	--	--	--	2.4E-06	mg/kg-day	5.0E-04	mg/kg-day	4.8E-03
				Copper	6.2E+02	mg/kg	1.1E-05	mg/kg-day	--	--	--	4.2E-05	mg/kg-day	4.0E-02	mg/kg-day	1.1E-03
				Iron	5.7E+04	mg/kg	9.9E-04	mg/kg-day	--	--	--	3.9E-03	mg/kg-day	7.0E-01	mg/kg-day	5.5E-03
				Lead	3.7E+03	mg/kg	6.4E-05	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	3.3E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	2.4E-02	mg/kg-day	5.4E-03
				Zinc	2.5E+03	mg/kg	4.3E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	3.0E-01	mg/kg-day	5.6E-04
			Exposure Route Total								1.6E-06					3.1E-02
			Dermal	Arsenic	1.0E+02	mg/kg	3.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.9E-07	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	5.1E-03
				Cadmium	3.6E+01	mg/kg	4.5E-09	mg/kg-day	--	--	--	1.8E-08	mg/kg-day	5.0E-04	mg/kg-day	3.5E-05
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								5.9E-07					5.1E-03
		Exposure Point Total									2.2E-06					3.6E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	1.1E-07	mg/m3	4.3E-03	(µg/m3)-1	4.8E-07	4.3E-07	mg/m3	1.5E-05	mg/m3	2.9E-02
				Cadmium	3.6E+01	mg/kg	3.8E-08	mg/m3	1.8E-03	(µg/m3)-1	6.9E-08	1.5E-07	mg/m3	2.0E-05	mg/m3	7.5E-03
				Copper	6.2E+02	mg/kg	6.7E-07	mg/m3	--	--	--	2.6E-06	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	6.1E-05	mg/m3	--	--	--	2.4E-04	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	4.0E-06	mg/m3	--	--	--	1.5E-05	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	2.1E-06	mg/m3	--	--	--	8.1E-06	mg/m3	5.0E-05	mg/m3	1.6E-01
				Zinc	2.5E+03	mg/kg	2.6E-06	mg/m3	--	--	--	1.0E-05	mg/m3	--	--	--
			Exposure Route Total								5.4E-07					2.0E-01
		Exposure Point Total									5.4E-07					2.0E-01
	Exposure Medium Total										2.7E-06					2.3E-01
Medium Total											2.7E-06					2.3E-01

TABLE C2-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C2-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 2 - BLACKFOOT
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.6E-06	--	5.9E-07	2.2E-06	Skin	1.4E-02	--	5.1E-03	1.9E-02
			Cadmium	--	--	--	--	Kidney	4.8E-03	--	3.5E-05	4.9E-03
			Copper	--	--	--	--	Gastrointestinal	1.1E-03	--	--	1.1E-03
			Iron	--	--	--	--	Gastrointestinal	5.5E-03	--	--	5.5E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	5.4E-03	--	--	5.4E-03
			Zinc	--	--	--	--	Blood	5.6E-04	--	--	5.6E-04
			Chemical Total	1.6E-06	--	5.9E-07	2.2E-06		3.1E-02	--	5.1E-03	3.6E-02
		Exposure Point Total					2.2E-06					3.6E-02
		Outdoor Air (Particulates)	Arsenic	--	4.8E-07	--	4.8E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.9E-02	--	2.9E-02
			Cadmium	--	6.9E-08	--	6.9E-08	Kidney, Respiratory	--	7.5E-03	--	7.5E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.6E-01	--	1.6E-01
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.4E-07	--	5.4E-07		--	2.0E-01	--	2.0E-01
		Exposure Point Total					5.4E-07					2.0E-01
	Exposure Medium Total						2.7E-06					2.3E-01
Medium Total							2.7E-06					2.3E-01

Notes:

-- Not available or not applicable
ATV All terrain vehicle
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	5.6E-04
Cardiovascular	2.9E-02
Central Nervous System	2.0E-01
Developmental	2.9E-02
Gastrointestinal	6.6E-03
Kidney	1.2E-02
Lung	2.9E-02
Respiratory	7.5E-03
Skin	4.8E-02
Maximum	2.0E-01

TABLE C2-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	6.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	9.7E-07	2.5E-06	mg/kg-day	3.0E-04	mg/kg-day	8.4E-03
				Cadmium	3.6E+01	mg/kg	3.8E-07	mg/kg-day	--	--	--	1.5E-06	mg/kg-day	5.0E-04	mg/kg-day	2.9E-03
				Copper	6.2E+02	mg/kg	6.6E-06	mg/kg-day	--	--	--	2.6E-05	mg/kg-day	4.0E-02	mg/kg-day	6.4E-04
				Iron	5.7E+04	mg/kg	6.0E-04	mg/kg-day	--	--	--	2.3E-03	mg/kg-day	7.0E-01	mg/kg-day	3.3E-03
				Lead	3.7E+03	mg/kg	3.9E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	2.0E-05	mg/kg-day	--	--	--	7.9E-05	mg/kg-day	2.4E-02	mg/kg-day	3.3E-03
				Zinc	2.5E+03	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	3.0E-01	mg/kg-day	3.4E-04
			Exposure Route Total								9.7E-07					1.9E-02
			Dermal	Arsenic	1.0E+02	mg/kg	7.8E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	3.1E-06	mg/kg-day	3.0E-04	mg/kg-day	1.0E-02
				Cadmium	3.6E+01	mg/kg	9.1E-09	mg/kg-day	--	--	--	3.5E-08	mg/kg-day	5.0E-04	mg/kg-day	7.1E-05
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.2E-06					1.0E-02
		Exposure Point Total									2.1E-06					2.9E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	2.1E-10	mg/m3	4.3E-03	(µg/m3)-1	9.1E-10	8.3E-10	mg/m3	1.5E-05	mg/m3	5.5E-05
				Cadmium	3.6E+01	mg/kg	7.4E-11	mg/m3	1.8E-03	(µg/m3)-1	1.3E-10	2.9E-10	mg/m3	2.0E-05	mg/m3	1.4E-05
				Copper	6.2E+02	mg/kg	1.3E-09	mg/m3	--	--	--	5.0E-09	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	1.2E-07	mg/m3	--	--	--	4.6E-07	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	7.6E-09	mg/m3	--	--	--	3.0E-08	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	4.0E-09	mg/m3	--	--	--	1.5E-08	mg/m3	5.0E-05	mg/m3	3.1E-04
				Zinc	2.5E+03	mg/kg	5.1E-09	mg/m3	--	--	--	2.0E-08	mg/m3	--	--	--
			Exposure Route Total								1.0E-09					3.8E-04
		Exposure Point Total									1.0E-09					3.8E-04
	Exposure Medium Total										2.2E-06					3.0E-02
Medium Total											2.2E-06					3.0E-02

TABLE C2-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C2-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	9.7E-07	--	1.2E-06	2.1E-06	Skin	8.4E-03	--	1.0E-02	1.9E-02
			Cadmium	--	--	--	--	Kidney	2.9E-03	--	7.1E-05	3.0E-03
			Copper	--	--	--	--	Gastrointestinal	6.4E-04	--	--	6.4E-04
			Iron	--	--	--	--	Gastrointestinal	3.3E-03	--	--	3.3E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	3.3E-03	--	--	3.3E-03
			Zinc	--	--	--	--	Blood	3.4E-04	--	--	3.4E-04
			Chemical Total	9.7E-07	--	1.2E-06	2.1E-06		1.9E-02	--	1.0E-02	2.9E-02
		Exposure Point Total					2.1E-06					2.9E-02
		Outdoor Air (Particulates)	Arsenic	--	9.1E-10	--	9.1E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.5E-05	--	5.5E-05
			Cadmium	--	1.3E-10	--	1.3E-10	Kidney, Respiratory	--	1.4E-05	--	1.4E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.1E-04	--	3.1E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.0E-09	--	1.0E-09		--	3.8E-04	--	3.8E-04
		Exposure Point Total					1.0E-09					3.8E-04
	Exposure Medium Total						2.2E-06					3.0E-02
Medium Total							2.2E-06					3.0E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	3.4E-04
Cardiovascular	5.5E-05
Central Nervous System	3.7E-03
Developmental	5.5E-05
Gastrointestinal	4.0E-03
Kidney	3.0E-03
Lung	5.5E-05
Respiratory	1.4E-05
Skin	1.9E-02
Maximum	1.9E-02

TABLE C2-2.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	4.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.3E-06	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	9.0E-02
				Cadmium	3.6E+01	mg/kg	2.4E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	3.1E-02
				Copper	6.2E+02	mg/kg	4.3E-05	mg/kg-day	--	--	--	2.7E-04	mg/kg-day	4.0E-02	mg/kg-day	6.8E-03
				Iron	5.7E+04	mg/kg	3.9E-03	mg/kg-day	--	--	--	2.5E-02	mg/kg-day	7.0E-01	mg/kg-day	3.6E-02
				Lead	3.7E+03	mg/kg	2.5E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	1.3E-04	mg/kg-day	--	--	--	8.4E-04	mg/kg-day	2.4E-02	mg/kg-day	3.5E-02
				Zinc	2.5E+03	mg/kg	1.7E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	3.0E-01	mg/kg-day	3.6E-03
			Exposure Route Total								6.3E-06					2.0E-01
			Dermal	Arsenic	1.0E+02	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.0E-06	7.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2.4E-02
				Cadmium	3.6E+01	mg/kg	1.6E-08	mg/kg-day	--	--	--	8.4E-08	mg/kg-day	5.0E-04	mg/kg-day	1.7E-04
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.0E-06					2.4E-02
		Exposure Point Total									8.3E-06					2.3E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	5.5E-10	mg/m3	4.3E-03	(µg/m3)-1	2.4E-09	1.7E-09	mg/m3	1.5E-05	mg/m3	1.1E-04
				Cadmium	3.6E+01	mg/kg	1.9E-10	mg/m3	1.8E-03	(µg/m3)-1	3.4E-10	5.7E-10	mg/m3	2.0E-05	mg/m3	2.9E-05
				Copper	6.2E+02	mg/kg	3.3E-09	mg/m3	--	--	--	1.0E-08	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	3.1E-07	mg/m3	--	--	--	9.2E-07	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	2.0E-08	mg/m3	--	--	--	5.9E-08	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	1.0E-08	mg/m3	--	--	--	3.1E-08	mg/m3	5.0E-05	mg/m3	6.2E-04
				Zinc	2.5E+03	mg/kg	1.3E-08	mg/m3	--	--	--	4.0E-08	mg/m3	--	--	--
			Exposure Route Total								2.7E-09					7.6E-04
		Exposure Point Total									2.7E-09					7.6E-04
	Exposure Medium Total										8.3E-06					2.3E-01
Medium Total											8.3E-06					2.3E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C2-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD\ ROCK HOUND - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	6.3E-06	--	2.0E-06	8.3E-06	Skin	9.0E-02	--	2.4E-02	1.1E-01
			Cadmium	--	--	--	--	Kidney	3.1E-02	--	1.7E-04	3.1E-02
			Copper	--	--	--	--	Gastrointestinal	6.8E-03	--	--	6.8E-03
			Iron	--	--	--	--	Gastrointestinal	3.6E-02	--	--	3.6E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	3.5E-02	--	--	3.5E-02
			Zinc	--	--	--	--	Blood	3.6E-03	--	--	3.6E-03
			Chemical Total	6.3E-06	--	2.0E-06	8.3E-06		2.0E-01	--	2.4E-02	2.3E-01
		Exposure Point Total					8.3E-06					2.3E-01
		Outdoor Air (Particulates)	Arsenic	--	2.4E-09	--	2.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-04	--	1.1E-04
			Cadmium	--	3.4E-10	--	3.4E-10	Kidney, Respiratory	--	2.9E-05	--	2.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	6.2E-04	--	6.2E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.7E-09	--	2.7E-09		--	7.6E-04	--	7.6E-04
		Exposure Point Total					2.7E-09					7.6E-04
	Exposure Medium Total						8.3E-06					2.3E-01
Medium Total							8.3E-06					2.3E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	3.6E-03
Cardiovascular	1.1E-04
Central Nervous System	3.6E-02
Developmental	1.1E-04
Gastrointestinal	4.3E-02
Kidney	3.1E-02
Lung	1.1E-04
Respiratory	2.9E-05
Skin	1.1E-01
Maximum	1.1E-01

TABLE C2-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	4.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.5E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.6E-03
				Cadmium	3.6E+01	mg/kg	2.5E-07	mg/kg-day	--	--	--	9.8E-07	mg/kg-day	5.0E-04	mg/kg-day	2.0E-03
				Copper	6.2E+02	mg/kg	4.4E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	4.0E-02	mg/kg-day	4.3E-04
				Iron	5.7E+04	mg/kg	4.0E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	7.0E-01	mg/kg-day	2.2E-03
				Lead	3.7E+03	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	1.3E-05	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	2.4E-02	mg/kg-day	2.2E-03
				Zinc	2.5E+03	mg/kg	1.7E-05	mg/kg-day	--	--	--	6.7E-05	mg/kg-day	3.0E-01	mg/kg-day	2.2E-04
			Exposure Route Total								6.5E-07					1.3E-02
			Dermal	Arsenic	1.0E+02	mg/kg	5.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.8E-07	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	6.8E-03
				Cadmium	3.6E+01	mg/kg	6.0E-09	mg/kg-day	--	--	--	2.4E-08	mg/kg-day	5.0E-04	mg/kg-day	4.7E-05
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								7.8E-07					6.8E-03
		Exposure Point Total									1.4E-06					1.9E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	1.4E-10	mg/m3	4.3E-03	(µg/m3)-1	6.1E-10	5.5E-10	mg/m3	1.5E-05	mg/m3	3.7E-05
				Cadmium	3.6E+01	mg/kg	4.9E-11	mg/m3	1.8E-03	(µg/m3)-1	8.8E-11	1.9E-10	mg/m3	2.0E-05	mg/m3	9.6E-06
				Copper	6.2E+02	mg/kg	8.6E-10	mg/m3	--	--	--	3.3E-09	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	7.9E-08	mg/m3	--	--	--	3.1E-07	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	5.1E-09	mg/m3	--	--	--	2.0E-08	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	2.6E-09	mg/m3	--	--	--	1.0E-08	mg/m3	5.0E-05	mg/m3	2.1E-04
				Zinc	2.5E+03	mg/kg	3.4E-09	mg/m3	--	--	--	1.3E-08	mg/m3	--	--	--
			Exposure Route Total								7.0E-10					2.5E-04
		Exposure Point Total									7.0E-10					2.5E-04
	Exposure Medium Total										1.4E-06					2.0E-02
Medium Total											1.4E-06					2.0E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C2-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	6.5E-07	--	7.8E-07	1.4E-06	Skin	5.6E-03	--	6.8E-03	1.2E-02
			Cadmium	--	--	--	--	Kidney	2.0E-03	--	4.7E-05	2.0E-03
			Copper	--	--	--	--	Gastrointestinal	4.3E-04	--	--	4.3E-04
			Iron	--	--	--	--	Gastrointestinal	2.2E-03	--	--	2.2E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	2.2E-03	--	--	2.2E-03
			Zinc	--	--	--	--	Blood	2.2E-04	--	--	2.2E-04
			Chemical Total	6.5E-07	--	7.8E-07	1.4E-06		1.3E-02	--	6.8E-03	1.9E-02
		Exposure Point Total					1.4E-06					1.9E-02
		Outdoor Air (Particulates)	Arsenic	--	6.1E-10	--	6.1E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.7E-05	--	3.7E-05
			Cadmium	--	8.8E-11	--	8.8E-11	Kidney, Respiratory	--	9.6E-06	--	9.6E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.1E-04	--	2.1E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.0E-10	--	7.0E-10		--	2.5E-04	--	2.5E-04
		Exposure Point Total					7.0E-10					2.5E-04
	Exposure Medium Total						1.4E-06					2.0E-02
Medium Total							1.4E-06					2.0E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	2.2E-04
Cardiovascular	3.7E-05
Central Nervous System	2.4E-03
Developmental	3.7E-05
Gastrointestinal	2.7E-03
Kidney	2.0E-03
Lung	3.7E-05
Respiratory	9.6E-06
Skin	1.2E-02
Maximum	1.2E-02

TABLE C2-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.7E-05	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1.2E-01
				Cadmium	3.6E+01	mg/kg	6.5E-06	mg/kg-day	--	--	--	2.0E-05	mg/kg-day	5.0E-04	mg/kg-day	4.0E-02
				Copper	6.2E+02	mg/kg	1.1E-04	mg/kg-day	--	--	--	3.5E-04	mg/kg-day	4.0E-02	mg/kg-day	8.8E-03
				Iron	5.7E+04	mg/kg	1.0E-02	mg/kg-day	--	--	--	3.2E-02	mg/kg-day	7.0E-01	mg/kg-day	4.6E-02
				Lead	3.7E+03	mg/kg	6.7E-04	mg/kg-day	--	--	--	2.1E-03	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	3.5E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	2.4E-02	mg/kg-day	4.5E-02
				Zinc	2.5E+03	mg/kg	4.5E-04	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	3.0E-01	mg/kg-day	4.6E-03
			Exposure Route Total								1.7E-05					2.6E-01
			Dermal	Arsenic	1.0E+02	mg/kg	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.5E-06	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02
				Cadmium	3.6E+01	mg/kg	1.9E-08	mg/kg-day	--	--	--	6.0E-08	mg/kg-day	5.0E-04	mg/kg-day	1.2E-04
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.5E-06					1.7E-02
		Exposure Point Total									1.9E-05					2.8E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+02	mg/kg	3.6E-09	mg/m3	4.3E-03	(µg/m3)-1	1.6E-08	1.1E-08	mg/m3	1.5E-05	mg/m3	7.6E-04
				Cadmium	3.6E+01	mg/kg	1.3E-09	mg/m3	1.8E-03	(µg/m3)-1	2.3E-09	3.9E-09	mg/m3	2.0E-05	mg/m3	2.0E-04
				Copper	6.2E+02	mg/kg	2.2E-08	mg/m3	--	--	--	6.9E-08	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	2.0E-06	mg/m3	--	--	--	6.3E-06	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	1.3E-07	mg/m3	--	--	--	4.1E-07	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	6.8E-08	mg/m3	--	--	--	2.1E-07	mg/m3	5.0E-05	mg/m3	4.3E-03
				Zinc	2.5E+03	mg/kg	8.7E-08	mg/m3	--	--	--	2.7E-07	mg/m3	--	--	--
			Exposure Route Total								1.8E-08					5.2E-03
		Exposure Point Total									1.8E-08					5.2E-03
	Exposure Medium Total										1.9E-05					2.8E-01
Medium Total											1.9E-05					2.8E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C2-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.7E-05	--	2.5E-06	1.9E-05	Skin	1.2E-01	--	1.7E-02	1.3E-01
			Cadmium	--	--	--	--	Kidney	4.0E-02	--	1.2E-04	4.0E-02
			Copper	--	--	--	--	Gastrointestinal	8.8E-03	--	--	8.8E-03
			Iron	--	--	--	--	Gastrointestinal	4.6E-02	--	--	4.6E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.5E-02	--	--	4.5E-02
			Zinc	--	--	--	--	Blood	4.6E-03	--	--	4.6E-03
			Chemical Total	1.7E-05	--	2.5E-06	1.9E-05		2.6E-01	--	1.7E-02	2.8E-01
		Exposure Point Total					1.9E-05					2.8E-01
		Outdoor Air (Particulates)	Arsenic	--	1.6E-08	--	1.6E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.6E-04	--	7.6E-04
			Cadmium	--	2.3E-09	--	2.3E-09	Kidney, Respiratory	--	2.0E-04	--	2.0E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	4.3E-03	--	4.3E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.8E-08	--	1.8E-08		--	5.2E-03	--	5.2E-03
		Exposure Point Total					1.8E-08					5.2E-03
	Exposure Medium Total						1.9E-05					2.8E-01
Medium Total							1.9E-05					2.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	4.6E-03
Cardiovascular	7.6E-04
Central Nervous System	5.0E-02
Developmental	7.6E-04
Gastrointestinal	5.5E-02
Kidney	4.1E-02
Lung	7.6E-04
Respiratory	2.0E-04
Skin	1.3E-01
Maximum	1.3E-01

TABLE C2-5.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.7E-05	--	2.5E-06	1.9E-05	--	--	--	--	--
			Chemical Total	1.7E-05	--	2.5E-06	1.9E-05		--	--	--	--
		Exposure Point Total					1.9E-05					--
		Outdoor Air (Particulates)	Arsenic	--	1.6E-08	--	1.6E-08	--	--	--	--	--
			Cadmium	--	2.3E-09	--	2.3E-09					
			Chemical Total	--	1.8E-08	--	1.8E-08		--	--	--	--
		Exposure Point Total					1.8E-08					--
	Exposure Medium Total						1.9E-05					--
Medium Total							1.9E-05					--

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-6.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.7E-06	8.6E-05	mg/kg-day	3.0E-04	mg/kg-day	2.9E-01
				Cadmium	3.6E+01	mg/kg	6.4E-07	mg/kg-day	--	--	--	5.0E-05	mg/kg-day	5.0E-04	mg/kg-day	1.0E-01
				Copper	6.2E+02	mg/kg	1.1E-05	mg/kg-day	--	--	--	8.7E-04	mg/kg-day	4.0E-02	mg/kg-day	2.2E-02
				Iron	5.7E+04	mg/kg	1.0E-03	mg/kg-day	--	--	--	8.0E-02	mg/kg-day	7.0E-01	mg/kg-day	1.1E-01
				Lead	3.7E+03	mg/kg	6.6E-05	mg/kg-day	--	--	--	5.1E-03	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	3.4E-05	mg/kg-day	--	--	--	2.7E-03	mg/kg-day	2.4E-02	mg/kg-day	1.1E-01
				Zinc	2.5E+03	mg/kg	4.4E-05	mg/kg-day	--	--	--	3.5E-03	mg/kg-day	3.0E-01	mg/kg-day	1.2E-02
			Exposure Route Total								1.7E-06					6.5E-01
			Dermal	Arsenic	1.0E+02	mg/kg	1.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.8E-07	9.3E-06	mg/kg-day	3.0E-04	mg/kg-day	3.1E-02
				Cadmium	3.6E+01	mg/kg	1.4E-09	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	5.0E-04	mg/kg-day	2.2E-04
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.8E-07					3.1E-02
		Exposure Point Total									1.8E-06					6.8E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	1.1E-10	mg/m3	4.3E-03	(μg/m3)-1	4.7E-10	8.6E-09	mg/m3	1.5E-05	mg/m3	5.7E-04
				Cadmium	3.6E+01	mg/kg	3.8E-11	mg/m3	1.8E-03	(μg/m3)-1	6.8E-11	3.0E-09	mg/m3	2.0E-05	mg/m3	1.5E-04
				Copper	6.2E+02	mg/kg	6.6E-10	mg/m3	--	--	--	5.2E-08	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	6.1E-08	mg/m3	--	--	--	4.8E-06	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	3.9E-09	mg/m3	--	--	--	3.1E-07	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	2.0E-09	mg/m3	--	--	--	1.6E-07	mg/m3	5.0E-05	mg/m3	3.2E-03
				Zinc	2.5E+03	mg/kg	2.6E-09	mg/m3	--	--	--	2.1E-07	mg/m3	--	--	--
			Exposure Route Total								5.4E-10					3.9E-03
		Exposure Point Total									5.4E-10					3.9E-03
	Exposure Medium Total										1.8E-06					6.8E-01
Medium Total											1.8E-06					6.8E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(μg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C2-6.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer: Ingestion	Noncancer: Inhalation	Noncancer: Dermal	Noncancer: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.7E-06	--	1.8E-07	1.8E-06	Skin	2.9E-01	--	3.1E-02	3.2E-01
			Cadmium	--	--	--	--	Kidney	1.0E-01	--	2.2E-04	1.0E-01
			Copper	--	--	--	--	Gastrointestinal	2.2E-02	--	--	2.2E-02
			Iron	--	--	--	--	Gastrointestinal	1.1E-01	--	--	1.1E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.1E-01	--	--	1.1E-01
			Zinc	--	--	--	--	Blood	1.2E-02	--	--	1.2E-02
			Chemical Total	1.7E-06	--	1.8E-07	1.8E-06		6.5E-01	--	3.1E-02	6.8E-01
		Exposure Point Total					1.8E-06					6.8E-01
		Outdoor Air (Particulates)	Arsenic	--	4.7E-10	--	4.7E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.7E-04	--	5.7E-04
			Cadmium	--	6.8E-11	--	6.8E-11	Kidney, Respiratory	--	1.5E-04	--	1.5E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.2E-03	--	3.2E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.4E-10	--	5.4E-10		--	3.9E-03	--	3.9E-03
		Exposure Point Total					5.4E-10					3.9E-03
	Exposure Medium Total						1.8E-06					6.8E-01
Medium Total							1.8E-06					6.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.2E-02
Cardiovascular	5.7E-04
Central Nervous System	1.2E-01
Developmental	5.7E-04
Gastrointestinal	1.4E-01
Kidney	1.0E-01
Lung	5.7E-04
Respiratory	1.5E-04
Skin	3.2E-01
Maximum	3.2E-01

TABLE C2-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C2-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.0E+02	mg/kg	5.2E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.8E-05	5.2E-04	mg/kg-day	3.0E-04	mg/kg-day	1.7E+00
				Cadmium	3.6E+01	mg/kg	3.0E-05	mg/kg-day	--	--	--	3.0E-04	mg/kg-day	5.0E-04	mg/kg-day	6.0E-01
				Copper	6.2E+02	mg/kg	5.3E-04	mg/kg-day	--	--	--	5.2E-03	mg/kg-day	4.0E-02	mg/kg-day	1.3E-01
				Iron	5.7E+04	mg/kg	4.8E-02	mg/kg-day	--	--	--	4.8E-01	mg/kg-day	7.0E-01	mg/kg-day	6.8E-01
				Lead	3.7E+03	mg/kg	3.1E-03	mg/kg-day	--	--	--	3.1E-02	mg/kg-day	--	--	--
				Manganese	1.9E+03	mg/kg	1.6E-03	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	2.4E-02	mg/kg-day	6.7E-01
				Zinc	2.5E+03	mg/kg	2.1E-03	mg/kg-day	--	--	--	2.1E-02	mg/kg-day	3.0E-01	mg/kg-day	6.9E-02
			Exposure Route Total								7.8E-05					3.9E+00
			Dermal	Arsenic	1.0E+02	mg/kg	8.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-05	7.0E-05	mg/kg-day	3.0E-04	mg/kg-day	2.3E-01
				Cadmium	3.6E+01	mg/kg	9.2E-08	mg/kg-day	--	--	--	8.1E-07	mg/kg-day	5.0E-04	mg/kg-day	1.6E-03
				Copper	6.2E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.7E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.9E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	2.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.2E-05					2.3E-01
		Exposure Point Total									9.0E-05					4.1E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.0E+02	mg/kg	1.6E-08	mg/m3	4.3E-03	(μg/m3)-1	6.8E-08	4.8E-08	mg/m3	1.5E-05	mg/m3	3.2E-03
				Cadmium	3.6E+01	mg/kg	5.5E-09	mg/m3	1.8E-03	(μg/m3)-1	9.9E-09	1.7E-08	mg/m3	2.0E-05	mg/m3	8.3E-04
				Copper	6.2E+02	mg/kg	9.6E-08	mg/m3	--	--	--	2.9E-07	mg/m3	--	--	--
				Iron	5.7E+04	mg/kg	8.8E-06	mg/m3	--	--	--	2.6E-05	mg/m3	--	--	--
				Lead	3.7E+03	mg/kg	5.7E-07	mg/m3	--	--	--	1.7E-06	mg/m3	--	--	--
				Manganese	1.9E+03	mg/kg	3.0E-07	mg/m3	--	--	--	8.9E-07	mg/m3	5.0E-05	mg/m3	1.8E-02
				Zinc	2.5E+03	mg/kg	3.8E-07	mg/m3	--	--	--	1.1E-06	mg/m3	--	--	--
			Exposure Route Total								7.8E-08					2.2E-02
		Exposure Point Total									7.8E-08					2.2E-02
	Exposure Medium Total										9.0E-05					4.1E+00
Medium Total											9.0E-05					4.1E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(μg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C2-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	7.8E-05	--	1.2E-05	9.0E-05	Skin	1.7E+00	--	2.3E-01	2.0E+00
			Cadmium	--	--	--	--	Kidney	6.0E-01	--	1.6E-03	6.0E-01
			Copper	--	--	--	--	Gastrointestinal	1.3E-01	--	--	1.3E-01
			Iron	--	--	--	--	Gastrointestinal	6.8E-01	--	--	6.8E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	6.7E-01	--	--	6.7E-01
			Zinc	--	--	--	--	Blood	6.9E-02	--	--	6.9E-02
			Chemical Total	7.8E-05	--	1.2E-05	9.0E-05		3.9E+00	--	2.3E-01	4.1E+00
		Exposure Point Total					9.0E-05					4.1E+00
		Outdoor Air (Particulates)	Arsenic	--	6.8E-08	--	6.8E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.2E-03	--	3.2E-03
			Cadmium	--	9.9E-09	--	9.9E-09	Kidney, Respiratory	--	8.3E-04	--	8.3E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.8E-02	--	1.8E-02
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.8E-08	--	7.8E-08		--	2.2E-02	--	2.2E-02
		Exposure Point Total					7.8E-08					2.2E-02
	Exposure Medium Total						9.0E-05					4.1E+00
Medium Total							9.0E-05					4.1E+00

Notes:

-- Not available or not applicable

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

RAGS Risk Assessment Guidance for Superfund

Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	6.9E-02
Cardiovascular	3.2E-03
Central Nervous System	6.9E-01
Developmental	3.2E-03
Gastrointestinal	8.2E-01
Kidney	6.0E-01
Lung	3.2E-03
Respiratory	8.3E-04
Skin	**2.0E+00**
Maximum	**2.0E+00**

TABLE C2-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	7.8E-05	--	1.2E-05	9.0E-05	Skin	1.7E+00	--	2.3E-01	2.0E+00
			Chemical Total	7.8E-05	--	1.2E-05	9.0E-05		1.7E+00	--	2.3E-01	2.0E+00
		Exposure Point Total					9.0E-05					2.0E+00
		Outdoor Air (Particulates)	Arsenic	--	6.8E-08	--	6.8E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.2E-03	--	3.2E-03
			Chemical Total	--	6.8E-08	--	6.8E-08		--	3.2E-03	--	3.2E-03
		Exposure Point Total					6.8E-08					3.2E-03
	Exposure Medium Total						9.0E-05					2.0E+00
Medium Total							9.0E-05					2.0E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-2: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	6E-07	5E-07	3E-06	0.03	0.005	0.2	0.2	0.2	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	1E-06	1E-09	2E-06	0.019	0.01	0.0004	0.03	0.02	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	6E-06	2E-06	3E-09	8E-06	0.2	0.02	0.0008	0.2	0.1	Lead	PbB	440/440	33.86 - 38,839	4.2E+03	--	--	10.2
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	6E-07	8E-07	7E-10	1E-06	0.013	0.007	0.0003	0.02	0.012	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	2E-06	2E-08	2E-05	0.3	0.02	0.005	0.3	0.1	Lead	PbB	440/440	33.86 - 38,839	4.2E+03	--	--	16.5
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	5E-10	2E-06	0.6	0.03	0.004	0.7	0.3	Lead	PbB	440/440	33.86 - 38,839	4.2E+03	--	--	16.5
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	8E-05	1E-05	8E-08	9E-05	4	0.2	0.02	4	2	Arsenic	C, NC	371/440	6.63 - 1,057	1.0E+02	9E-05	2	--
												Lead	PbB	440/440	33.86 - 38,839	4.2E+03	--	--	51.7

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C3-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (2 to 10 feet bgs)	Site Soil	Ingestion	Arsenic	3.9E+01	mg/kg	4.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.4E-07	3.3E-05	mg/kg-day	3.0E-04	mg/kg-day	1.1E-01
				Cadmium	1.2E+01	mg/kg	2.2E-07	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	3.4E-02
				Copper	3.9E+02	mg/kg	7.0E-06	mg/kg-day	--	--	--	5.5E-04	mg/kg-day	4.0E-02	mg/kg-day	1.4E-02
				Iron	4.2E+04	mg/kg	7.6E-04	mg/kg-day	--	--	--	6.0E-02	mg/kg-day	7.0E-01	mg/kg-day	8.5E-02
				Lead	1.6E+03	mg/kg	2.8E-05	mg/kg-day	--	--	--	2.2E-03	mg/kg-day	--	--	--
				Manganese	2.0E+03	mg/kg	3.7E-05	mg/kg-day	--	--	--	2.9E-03	mg/kg-day	2.4E-02	mg/kg-day	1.2E-01
				Zinc	1.4E+03	mg/kg	2.5E-05	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	3.0E-01	mg/kg-day	6.5E-03
			Exposure Route Total								6.4E-07					3.7E-01
			Dermal	Arsenic	3.9E+01	mg/kg	4.6E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.9E-08	3.6E-06	mg/kg-day	3.0E-04	mg/kg-day	1.2E-02
				Cadmium	1.2E+01	mg/kg	4.6E-10	mg/kg-day	--	--	--	3.6E-08	mg/kg-day	5.0E-04	mg/kg-day	7.3E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.2E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.6E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								6.9E-08					1.2E-02
		Exposure Point Total									7.1E-07					3.8E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.9E+01	mg/kg	4.2E-11	mg/m3	4.3E-03	(µg/m3)-1	1.8E-10	3.3E-09	mg/m3	1.5E-05	mg/m3	2.2E-04
				Cadmium	1.2E+01	mg/kg	1.3E-11	mg/m3	1.8E-03	(µg/m3)-1	2.3E-11	1.0E-09	mg/m3	2.0E-05	mg/m3	5.0E-05
				Copper	3.9E+02	mg/kg	4.2E-10	mg/m3	--	--	--	3.3E-08	mg/m3	--	--	--
				Iron	4.2E+04	mg/kg	4.5E-08	mg/m3	--	--	--	3.5E-06	mg/m3	--	--	--
				Lead	1.6E+03	mg/kg	1.7E-09	mg/m3	--	--	--	1.3E-07	mg/m3	--	--	--
				Manganese	2.0E+03	mg/kg	2.2E-09	mg/m3	--	--	--	1.7E-07	mg/m3	5.0E-05	mg/m3	3.4E-03
				Zinc	1.4E+03	mg/kg	1.5E-09	mg/m3	--	--	--	1.2E-07	mg/m3	--	--	--
			Exposure Route Total								2.0E-10					3.7E-03
		Exposure Point Total									2.0E-10					3.7E-03
	Exposure Medium Total										7.1E-07					3.8E-01
Medium Total											7.1E-07					3.8E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C3-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	Arsenic	6.4E-07	--	6.9E-08	7.1E-07	Skin	1.1E-01	--	1.2E-02	1.2E-01
			Cadmium	--	--	--	--	Kidney	3.4E-02	--	7.3E-05	3.4E-02
			Copper	--	--	--	--	Gastrointestinal	1.4E-02	--	--	1.4E-02
			Iron	--	--	--	--	Gastrointestinal	8.5E-02	--	--	8.5E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.2E-01	--	--	1.2E-01
			Zinc	--	--	--	--	Blood	6.5E-03	--	--	6.5E-03
			Chemical Total	6.4E-07	--	6.9E-08	7.1E-07		3.7E-01	--	1.2E-02	3.8E-01
		Exposure Point Total					7.1E-07					3.8E-01
		Outdoor Air (Particulates)	Arsenic	--	1.8E-10	--	1.8E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.2E-04	--	2.2E-04
			Cadmium	--	2.3E-11	--	2.3E-11	Kidney, Respiratory	--	5.0E-05	--	5.0E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.4E-03	--	3.4E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.0E-10	--	2.0E-10		--	3.7E-03	--	3.7E-03
		Exposure Point Total					2.0E-10					3.7E-03
	Exposure Medium Total						7.1E-07					3.8E-01
Medium Total							7.1E-07					3.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (2-10)
Blood	6.5E-03
Cardiovascular	2.2E-04
Central Nervous System	1.2E-01
Developmental	2.2E-04
Gastrointestinal	9.9E-02
Kidney	3.4E-02
Lung	2.2E-04
Respiratory	5.0E-05
Skin	1.2E-01
Maximum	1.2E-01

TABLE C3-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-3: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 2 - BLACKFOOT RIVER DISPERSED TAILINGS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA AND OVERBANK DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Soil / Mine Waste (2 to 10 feet bgs)	124	6E-07	7E-08	2E-10	7E-07	0.4	0.01	0.004	0.4	0.1	--	--	--	--	--	--	--	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C4-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	7.1E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-05	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9.3E-02
				Copper	3.8E+02	mg/kg	6.6E-06	mg/kg-day	--	--	--	2.6E-05	mg/kg-day	4.0E-02	mg/kg-day	6.4E-04
				Iron	1.2E+05	mg/kg	2.1E-03	mg/kg-day	--	--	--	8.1E-03	mg/kg-day	7.0E-01	mg/kg-day	1.2E-02
				Lead	1.2E+03	mg/kg	2.1E-05	mg/kg-day	--	--	--	8.0E-05	mg/kg-day	--	--	--
			Exposure Route Total								1.1E-05					1.0E-01
			Dermal	Arsenic	6.8E+02	mg/kg	2.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.9E-06	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	3.4E-02
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.9E-06					3.4E-02
		Exposure Point Total									1.5E-05					1.4E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	6.8E+02	mg/kg	7.4E-07	mg/m3	4.3E-03	(µg/m3)-1	3.2E-06	2.9E-06	mg/m3	1.5E-05	mg/m3	1.9E-01
				Copper	3.8E+02	mg/kg	4.1E-07	mg/m3	--	--	--	1.6E-06	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	1.3E-04	mg/m3	--	--	--	5.0E-04	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	1.3E-06	mg/m3	--	--	--	5.0E-06	mg/m3	--	--	--
			Exposure Route Total								3.2E-06					1.9E-01
		Exposure Point Total									3.2E-06					1.9E-01
	Exposure Medium Total										1.8E-05					3.3E-01
Medium Total											1.8E-05					3.3E-01

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C4-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 3 - CAPITAL

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-05	--	3.9E-06	1.5E-05	Skin	9.3E-02	--	3.4E-02	1.3E-01
			Copper	--	--	--	--	Gastrointestinal	6.4E-04	--	--	6.4E-04
			Iron	--	--	--	--	Gastrointestinal	1.2E-02	--	--	1.2E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.1E-05	--	3.9E-06	1.5E-05		1.0E-01	--	3.4E-02	1.4E-01
		Exposure Point Total					1.5E-05					1.4E-01
		Outdoor Air (Particulates)	Arsenic	--	3.2E-06	--	3.2E-06	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.9E-01	--	1.9E-01
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.2E-06	--	3.2E-06		--	1.9E-01	--	1.9E-01
		Exposure Point Total					3.2E-06					1.9E-01
	Exposure Medium Total						1.8E-05					3.3E-01
Medium Total							1.8E-05					3.3E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.9E-01
Central Nervous System	1.9E-01
Developmental	1.9E-01
Gastrointestinal	1.2E-02
Kidney	--
Lung	1.9E-01
Respiratory	--
Skin	3.2E-01
Maximum	3.2E-01

TABLE C4-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-05	--	3.9E-06	1.5E-05	Skin	9.3E-02	--	3.4E-02	1.3E-01
			Chemical Total	1.1E-05	--	3.9E-06	1.5E-05		9.3E-02	--	3.4E-02	1.3E-01
		Exposure Point Total					1.5E-05					1.3E-01
		Outdoor Air (Particulates)	Arsenic	--	3.2E-06	--	3.2E-06	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.9E-01	--	1.9E-01
			Chemical Total	--	3.2E-06	--	3.2E-06		--	1.9E-01	--	1.9E-01
		Exposure Point Total					3.2E-06					1.9E-01
	Exposure Medium Total						1.8E-05					3.2E-01
Medium Total							1.8E-05					3.2E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C4-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	2.8E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.2E-05	1.8E-04	mg/kg-day	3.0E-04	mg/kg-day	6.0E-01
				Copper	3.8E+02	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	4.0E-02	mg/kg-day	4.2E-03
				Iron	1.2E+05	mg/kg	8.2E-03	mg/kg-day	--	--	--	5.3E-02	mg/kg-day	7.0E-01	mg/kg-day	7.5E-02
				Lead	1.2E+03	mg/kg	8.1E-05	mg/kg-day	--	--	--	5.2E-04	mg/kg-day	--	--	--
			Exposure Route Total								4.2E-05					6.8E-01
			Dermal	Arsenic	6.8E+02	mg/kg	8.9E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-05	4.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1.6E-01
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.3E-05					1.6E-01
		Exposure Point Total									5.6E-05					8.4E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	6.8E+02	mg/kg	3.7E-09	mg/m3	4.3E-03	(µg/m3)-1	1.6E-08	1.1E-08	mg/m3	1.5E-05	mg/m3	7.3E-04
				Copper	3.8E+02	mg/kg	2.0E-09	mg/m3	--	--	--	6.1E-09	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	6.4E-07	mg/m3	--	--	--	1.9E-06	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	6.3E-09	mg/m3	--	--	--	1.9E-08	mg/m3	--	--	--
			Exposure Route Total								1.6E-08					7.3E-04
		Exposure Point Total									1.6E-08					7.3E-04
	Exposure Medium Total										5.6E-05					8.4E-01
Medium Total											5.6E-05					8.4E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C4-2.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.2E-05	--	1.3E-05	5.6E-05	Skin	6.0E-01	--	1.6E-01	7.6E-01
			Copper	--	--	--	--	Gastrointestinal	4.2E-03	--	--	4.2E-03
			Iron	--	--	--	--	Gastrointestinal	7.5E-02	--	--	7.5E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	4.2E-05	--	1.3E-05	5.6E-05		6.8E-01	--	1.6E-01	8.4E-01
		Exposure Point Total					5.6E-05					8.4E-01
		Outdoor Air (Particulates)	Arsenic	--	1.6E-08	--	1.6E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.3E-04	--	7.3E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.6E-08	--	1.6E-08		--	7.3E-04	--	7.3E-04
		Exposure Point Total					1.6E-08					7.3E-04
	Exposure Medium Total						5.6E-05					8.4E-01
Medium Total							5.6E-05					8.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	7.3E-04
Central Nervous System	7.3E-04
Developmental	7.3E-04
Gastrointestinal	7.9E-02
Kidney	--
Lung	7.3E-04
Respiratory	--
Skin	7.6E-01
Maximum	7.6E-01

TABLE C4-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.2E-05	--	1.3E-05	5.6E-05	Skin	6.0E-01	--	1.6E-01	7.6E-01
			Chemical Total	4.2E-05	--	1.3E-05	5.6E-05		6.0E-01	--	1.6E-01	7.6E-01
		Exposure Point Total					5.6E-05					7.6E-01
		Outdoor Air (Particulates)	Arsenic	--	1.6E-08	--	1.6E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.3E-04	--	7.3E-04
			Chemical Total	--	1.6E-08	--	1.6E-08		--	7.3E-04	--	7.3E-04
		Exposure Point Total					1.6E-08					7.3E-04
	Exposure Medium Total						5.6E-05					7.6E-01
Medium Total							5.6E-05					7.6E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C4-3.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	2.9E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.3E-06	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.7E-02
				Copper	3.8E+02	mg/kg	2.7E-06	mg/kg-day	--	--	--	1.0E-05	mg/kg-day	4.0E-02	mg/kg-day	2.6E-04
				Iron	1.2E+05	mg/kg	8.4E-04	mg/kg-day	--	--	--	3.3E-03	mg/kg-day	7.0E-01	mg/kg-day	4.7E-03
				Lead	1.2E+03	mg/kg	8.3E-06	mg/kg-day	--	--	--	3.2E-05	mg/kg-day	--	--	--
			Exposure Route Total								4.3E-06					4.2E-02
			Dermal	Arsenic	6.8E+02	mg/kg	3.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.2E-06	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.5E-02
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								5.2E-06					4.5E-02
		Exposure Point Total									9.5E-06					8.8E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	6.8E+02	mg/kg	9.4E-10	mg/m3	4.3E-03	(µg/m3)-1	4.0E-09	3.7E-09	mg/m3	1.5E-05	mg/m3	2.4E-04
				Copper	3.8E+02	mg/kg	5.2E-10	mg/m3	--	--	--	2.0E-09	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	1.7E-07	mg/m3	--	--	--	6.4E-07	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	1.6E-09	mg/m3	--	--	--	6.3E-09	mg/m3	--	--	--
			Exposure Route Total								4.0E-09					2.4E-04
		Exposure Point Total									4.0E-09					2.4E-04
	Exposure Medium Total										9.5E-06					8.8E-02
Medium Total											9.5E-06					8.8E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C4-3.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.3E-06	--	5.2E-06	9.5E-06	Skin	3.7E-02	--	4.5E-02	8.3E-02
			Copper	--	--	--	--	Gastrointestinal	2.6E-04	--	--	2.6E-04
			Iron	--	--	--	--	Gastrointestinal	4.7E-03	--	--	4.7E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	4.3E-06	--	5.2E-06	9.5E-06		4.2E-02	--	4.5E-02	8.8E-02
		Exposure Point Total					9.5E-06					8.8E-02
		Outdoor Air (Particulates)	Arsenic	--	4.0E-09	--	4.0E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.4E-04	--	2.4E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.0E-09	--	4.0E-09		--	2.4E-04	--	2.4E-04
		Exposure Point Total					4.0E-09					2.4E-04
	Exposure Medium Total						9.5E-06					8.8E-02
Medium Total							9.5E-06					8.8E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	2.4E-04
Central Nervous System	2.4E-04
Developmental	2.4E-04
Gastrointestinal	5.0E-03
Kidney	--
Lung	2.4E-04
Respiratory	--
Skin	8.3E-02
Maximum	8.3E-02

TABLE C4-3.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C4-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	7.4E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-04	2.3E-04	mg/kg-day	3.0E-04	mg/kg-day	7.7E-01
				Copper	3.8E+02	mg/kg	6.9E-05	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	4.0E-02	mg/kg-day	5.4E-03
				Iron	1.2E+05	mg/kg	2.2E-02	mg/kg-day	--	--	--	6.8E-02	mg/kg-day	7.0E-01	mg/kg-day	9.7E-02
				Lead	1.2E+03	mg/kg	2.1E-04	mg/kg-day	--	--	--	6.7E-04	mg/kg-day	--	--	--
			Exposure Route Total								1.1E-04					8.7E-01
			Dermal	Arsenic	6.8E+02	mg/kg	1.5E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-05	4.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1.6E-01
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.3E-05					1.6E-01
		Exposure Point Total									1.3E-04					1.0E+00
		Outdoor Air	Inhalation (Partculates)	Arsenic	6.8E+02	mg/kg	2.4E-08	mg/m3	4.3E-03	(µg/m3)-1	1.0E-07	7.6E-08	mg/m3	1.5E-05	mg/m3	5.0E-03
				Copper	3.8E+02	mg/kg	1.3E-08	mg/m3	--	--	--	4.2E-08	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	4.3E-06	mg/m3	--	--	--	1.3E-05	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	4.2E-08	mg/m3	--	--	--	1.3E-07	mg/m3	--	--	--
			Exposure Route Total								1.0E-07					5.0E-03
		Exposure Point Total									1.0E-07					5.0E-03
	Exposure Medium Total										1.3E-04					1.0E+00
Medium Total											1.3E-04					1.0E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C4-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-04	--	2.3E-05	1.3E-04	Skin	7.7E-01	--	1.6E-01	9.3E-01
			Copper	--	--	--	--	Gastrointestinal	5.4E-03	--	--	5.4E-03
			Iron	--	--	--	--	Gastrointestinal	9.7E-02	--	--	9.7E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.1E-04	--	2.3E-05	1.3E-04		8.7E-01	--	1.6E-01	1.0E+00
		Exposure Point Total					1.3E-04					1.0E+00
		Outdoor Air (Particulates)	Arsenic	--	1.0E-07	--	1.0E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.0E-03	--	5.0E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.0E-07	--	1.0E-07		--	5.0E-03	--	5.0E-03
		Exposure Point Total					1.0E-07					5.0E-03
	Exposure Medium Total						1.3E-04					1.0E+00
Medium Total							1.3E-04					1.0E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	5.0E-03
Central Nervous System	5.0E-03
Developmental	5.0E-03
Gastrointestinal	1.0E-01
Kidney	--
Lung	5.0E-03
Respiratory	--
Skin	9.4E-01
Maximum	9.4E-01

TABLE C4-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-04	--	2.3E-05	1.3E-04	Skin	7.7E-01	--	1.6E-01	9.3E-01
			Chemical Total	1.1E-04	--	2.3E-05	1.3E-04		7.7E-01	--	1.6E-01	9.3E-01
		Exposure Point Total					1.3E-04					9.3E-01
		Outdoor Air (Particulates)	Arsenic	--	1.0E-07	--	1.0E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.0E-03	--	5.0E-03
			Chemical Total	--	1.0E-07	--	1.0E-07		--	5.0E-03	--	5.0E-03
		Exposure Point Total					1.0E-07					5.0E-03
	Exposure Medium Total						1.3E-04					9.4E-01
Medium Total							1.3E-04					9.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C4-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	7.4E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-05	5.7E-04	mg/kg-day	3.0E-04	mg/kg-day	1.9E+00
				Copper	3.8E+02	mg/kg	6.8E-06	mg/kg-day	--	--	--	5.3E-04	mg/kg-day	4.0E-02	mg/kg-day	1.3E-02
				Iron	1.2E+05	mg/kg	2.2E-03	mg/kg-day	--	--	--	1.7E-01	mg/kg-day	7.0E-01	mg/kg-day	2.4E-01
				Lead	1.2E+03	mg/kg	2.1E-05	mg/kg-day	--	--	--	1.7E-03	mg/kg-day	--	--	--
			Exposure Route Total								1.1E-05					2.2E+00
			Dermal	Arsenic	6.8E+02	mg/kg	8.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	6.2E-05	mg/kg-day	3.0E-04	mg/kg-day	2.1E-01
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.2E-06					2.1E-01
		Exposure Point Total									1.2E-05					2.4E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	6.8E+02	mg/kg	7.3E-10	mg/m3	4.3E-03	(µg/m3)-1	3.1E-09	5.7E-08	mg/m3	1.5E-05	mg/m3	3.8E-03
				Copper	3.8E+02	mg/kg	4.0E-10	mg/m3	--	--	--	3.2E-08	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	1.3E-07	mg/m3	--	--	--	1.0E-05	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	1.3E-09	mg/m3	--	--	--	9.8E-08	mg/m3	--	--	--
			Exposure Route Total								3.1E-09					3.8E-03
		Exposure Point Total									3.1E-09					3.8E-03
	Exposure Medium Total										1.2E-05					2.4E+00
Medium Total											1.2E-05					2.4E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C4-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-05	--	1.2E-06	1.2E-05	Skin	1.9E+00	--	2.1E-01	2.1E+00
			Copper	--	--	--	--	Gastrointestinal	1.3E-02	--	--	1.3E-02
			Iron	--	--	--	--	Gastrointestinal	2.4E-01	--	--	2.4E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.1E-05	--	1.2E-06	1.2E-05		2.2E+00	--	2.1E-01	2.4E+00
		Exposure Point Total					1.2E-05					2.4E+00
		Outdoor Air (Particulates)	Arsenic	--	3.1E-09	--	3.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.8E-03	--	3.8E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.1E-09	--	3.1E-09		--	3.8E-03	--	3.8E-03
		Exposure Point Total					3.1E-09					3.8E-03
	Exposure Medium Total						1.2E-05					2.4E+00
Medium Total							1.2E-05					2.4E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	3.8E-03
Central Nervous System	3.8E-03
Developmental	3.8E-03
Gastrointestinal	2.5E-01
Kidney	--
Lung	3.8E-03
Respiratory	--
Skin	**2.1E+00**
Maximum	**2.1E+00**

TABLE C4-5.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-05	--	1.2E-06	1.2E-05	Skin	1.9E+00	--	2.1E-01	2.1E+00
			Chemical Total	1.1E-05	--	1.2E-06	1.2E-05		1.9E+00	--	2.1E-01	2.1E+00
		Exposure Point Total					1.2E-05					2.1E+00
		Outdoor Air (Particulates)	Arsenic	--	3.1E-09	--	3.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.8E-03	--	3.8E-03
			Chemical Total	--	3.1E-09	--	3.1E-09		--	3.8E-03	--	3.8E-03
		Exposure Point Total					3.1E-09					3.8E-03
	Exposure Medium Total						1.2E-05					2.1E+00
Medium Total							1.2E-05					2.1E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C4-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	6.8E+02	mg/kg	3.5E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.2E-04	3.4E-03	mg/kg-day	3.0E-04	mg/kg-day	1.1E+01
				Copper	3.8E+02	mg/kg	3.2E-04	mg/kg-day	--	--	--	3.2E-03	mg/kg-day	4.0E-02	mg/kg-day	8.0E-02
				Iron	1.2E+05	mg/kg	1.0E-01	mg/kg-day	--	--	--	1.0E+00	mg/kg-day	7.0E-01	mg/kg-day	1.4E+00
				Lead	1.2E+03	mg/kg	1.0E-03	mg/kg-day	--	--	--	9.9E-03	mg/kg-day	--	--	--
			Exposure Route Total								5.2E-04					1.3E+01
			Dermal	Arsenic	6.8E+02	mg/kg	5.3E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.0E-05	4.6E-04	mg/kg-day	3.0E-04	mg/kg-day	1.5E+00
				Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	1.2E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								8.0E-05					1.5E+00
		Exposure Point Total									6.0E-04					1.5E+01
		Outdoor Air	Inhalation (Particulates)	Arsenic	6.8E+02	mg/kg	1.1E-07	mg/m3	4.3E-03	(µg/m3)-1	4.5E-07	3.2E-07	mg/m3	1.5E-05	mg/m3	2.1E-02
				Copper	3.8E+02	mg/kg	5.9E-08	mg/m3	--	--	--	1.8E-07	mg/m3	--	--	--
				Iron	1.2E+05	mg/kg	1.9E-05	mg/m3	--	--	--	5.6E-05	mg/m3	--	--	--
				Lead	1.2E+03	mg/kg	1.8E-07	mg/m3	--	--	--	5.5E-07	mg/m3	--	--	--
			Exposure Route Total								4.5E-07					2.1E-02
		Exposure Point Total									4.5E-07					2.1E-02
	Exposure Medium Total										6.0E-04					1.5E+01
Medium Total											6.0E-04					1.5E+01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C4-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.2E-04	--	8.0E-05	6.0E-04	Skin	1.1E+01	--	1.5E+00	1.3E+01
			Copper	--	--	--	--	Gastrointestinal	8.0E-02	--	--	8.0E-02
			Iron	--	--	--	--	Gastrointestinal	1.4E+00	--	--	1.4E+00
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	5.2E-04	--	8.0E-05	6.0E-04		1.3E+01	--	1.5E+00	1.5E+01
		Exposure Point Total					6.0E-04					1.5E+01
		Outdoor Air (Particulates)	Arsenic	--	4.5E-07	--	4.5E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.1E-02	--	2.1E-02
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.5E-07	--	4.5E-07		--	2.1E-02	--	2.1E-02
		Exposure Point Total					4.5E-07					2.1E-02
	Exposure Medium Total						6.0E-04					1.5E+01
Medium Total							6.0E-04					1.5E+01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	**--**
Cardiovascular	2.1E-02
Central Nervous System	2.1E-02
Developmental	2.1E-02
Gastrointestinal	**1.5E+00**
Kidney	**--**
Lung	2.1E-02
Respiratory	**--**
Skin	**1.3E+01**
Maximum	**1.3E+01**

TABLE C4-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 3 - CAPITAL MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.2E-04	--	8.0E-05	6.0E-04	Skin	1.1E+01	--	1.5E+00	1.3E+01
			Chemical Total	5.2E-04	--	8.0E-05	6.0E-04		1.1E+01	--	1.5E+00	1.3E+01
		Exposure Point Total					6.0E-04					1.3E+01
		Outdoor Air (Particulates)	Arsenic	--	4.5E-07	--	4.5E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.1E-02	--	2.1E-02
			Chemical Total	--	4.5E-07	--	4.5E-07		--	2.1E-02	--	2.1E-02
		Exposure Point Total					4.5E-07					2.1E-02
	Exposure Medium Total						6.0E-04					1.3E+01
Medium Total							6.0E-04					1.3E+01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-4: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 3 - CAPITAL MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	1E-05	4E-06	3E-06	2E-05	0.1	0.03	0.2	0.3	0.3	Arsenic	C	15/17	14.17 - 1,570	0.0E+00	2E-05	0.3	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	4E-05	1E-05	2E-08	6E-05	0.7	0.2	0.0007	0.8	0.8	Arsenic	C	15/17	14.17 - 1,570	0.0E+00	6E-05	0.8	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	4E-06	5E-06	4E-09	1E-05	0.04	0.05	0.0002	0.09	0.08	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	1E-04	2E-05	1E-07	1E-04	0.9	0.2	0.005	1.0	0.9	Arsenic	C	15/17	14.17 - 1,570	0.0E+00	1E-04	0.9	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	1E-05	1E-06	3E-09	1E-05	2	0.2	0.004	2	2	Arsenic	C, NC	15/17	14.17 - 1,570	0.0E+00	1E-05	2	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	5E-04	8E-05	5E-07	6E-04	13	2	0.02	15	13	Arsenic	C, NC	15/17	14.17 - 1,570	0.0E+00	6E-04	13	--
												Lead	PbB	18/18	125.47 - 2,270	1.2E+03	--	--	21.9

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C5-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	1.9E-07	mg/kg-day	--	--	--	7.5E-07	mg/kg-day	5.0E-04	mg/kg-day	1.5E-03
				Copper	3.9E+02	mg/kg	6.8E-06	mg/kg-day	--	--	--	2.7E-05	mg/kg-day	4.0E-02	mg/kg-day	6.7E-04
				Iron	7.9E+04	mg/kg	1.4E-03	mg/kg-day	--	--	--	5.4E-03	mg/kg-day	7.0E-01	mg/kg-day	7.6E-03
				Lead	4.4E+02	mg/kg	7.7E-06	mg/kg-day	--	--	--	3.0E-05	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					9.8E-03
			Dermal	Cadmium	1.1E+01	mg/kg	1.4E-09	mg/kg-day	--	--	--	5.5E-09	mg/kg-day	5.0E-04	mg/kg-day	1.1E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					1.1E-05
		Exposure Point Total									0.0E+00					9.8E-03
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	1.2E-08	mg/m3	1.8E-03	(µg/m3)-1	2.2E-08	4.7E-08	mg/m3	2.0E-05	mg/m3	2.3E-03
				Copper	3.9E+02	mg/kg	4.2E-07	mg/m3	--	--	--	1.7E-06	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	8.5E-05	mg/m3	--	--	--	3.3E-04	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	4.7E-07	mg/m3	--	--	--	1.8E-06	mg/m3	--	--	--
			Exposure Route Total								2.2E-08					2.3E-03
		Exposure Point Total									2.2E-08					2.3E-03
	Exposure Medium Total										2.2E-08					1.2E-02
Medium Total											2.2E-08					1.2E-02

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C5-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 4 - CARBONATE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	1.5E-03	--	1.1E-05	1.5E-03
			Copper	--	--	--	--	Gastrointestinal	6.7E-04	--	--	6.7E-04
			Iron	--	--	--	--	Gastrointestinal	7.6E-03	--	--	7.6E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		9.8E-03	--	1.1E-05	9.8E-03
		Exposure Point Total					--					9.8E-03
		Outdoor Air (Particulates)	Cadmium	--	2.2E-08	--	2.2E-08	Kidney, Respiratory	--	2.3E-03	--	2.3E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.2E-08	--	2.2E-08		--	2.3E-03	--	2.3E-03
		Exposure Point Total					2.2E-08					2.3E-03
	Exposure Medium Total						2.2E-08					1.2E-02
Medium Total							2.2E-08					1.2E-02

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	8.3E-03
Kidney	3.8E-03
Lung	--
Respiratory	2.3E-03
Skin	--
Maximum	8.3E-03

TABLE C5-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	1.2E-07	mg/kg-day	--	--	--	4.6E-07	mg/kg-day	5.0E-04	mg/kg-day	9.1E-04
				Copper	3.9E+02	mg/kg	4.1E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	4.0E-02	mg/kg-day	4.0E-04
				Iron	7.9E+04	mg/kg	8.3E-04	mg/kg-day	--	--	--	3.2E-03	mg/kg-day	7.0E-01	mg/kg-day	4.6E-03
				Lead	4.4E+02	mg/kg	4.6E-06	mg/kg-day	--	--	--	1.8E-05	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					6.0E-03
			Dermal	Cadmium	1.1E+01	mg/kg	2.8E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	5.0E-04	mg/kg-day	2.2E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					2.2E-05
		Exposure Point Total									0.0E+00					6.0E-03
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	2.3E-11	mg/m3	1.8E-03	(µg/m3)-1	4.1E-11	8.9E-11	mg/m3	2.0E-05	mg/m3	4.5E-06
				Copper	3.9E+02	mg/kg	8.1E-10	mg/m3	--	--	--	3.2E-09	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	1.6E-07	mg/m3	--	--	--	6.4E-07	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	9.1E-10	mg/m3	--	--	--	3.5E-09	mg/m3	--	--	--
			Exposure Route Total								4.1E-11					4.5E-06
		Exposure Point Total									4.1E-11					4.5E-06
	Exposure Medium Total										4.1E-11					6.0E-03
Medium Total											4.1E-11					6.0E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C5-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	9.1E-04	--	2.2E-05	9.3E-04
			Copper	--	--	--	--	Gastrointestinal	4.0E-04	--	--	4.0E-04
			Iron	--	--	--	--	Gastrointestinal	4.6E-03	--	--	4.6E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		6.0E-03	--	2.2E-05	6.0E-03
		Exposure Point Total					--					6.0E-03
		Outdoor Air (Particulates)	Cadmium	--	4.1E-11	--	4.1E-11	Kidney, Respiratory	--	4.5E-06	--	4.5E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.1E-11	--	4.1E-11		--	4.5E-06	--	4.5E-06
		Exposure Point Total					4.1E-11					4.5E-06
	Exposure Medium Total						4.1E-11					6.0E-03
Medium Total							4.1E-11					6.0E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	5.0E-03
Kidney	9.4E-04
Lung	--
Respiratory	4.5E-06
Skin	--
Maximum	5.0E-03

TABLE C5-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-3.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	7.6E-07	mg/kg-day	--	--	--	4.9E-06	mg/kg-day	5.0E-04	mg/kg-day	9.7E-03
				Copper	3.9E+02	mg/kg	2.7E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	4.0E-02	mg/kg-day	4.3E-03
				Iron	7.9E+04	mg/kg	5.4E-03	mg/kg-day	--	--	--	3.5E-02	mg/kg-day	7.0E-01	mg/kg-day	4.9E-02
				Lead	4.4E+02	mg/kg	3.0E-05	mg/kg-day	--	--	--	1.9E-04	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					6.3E-02
			Dermal	Cadmium	1.1E+01	mg/kg	4.8E-09	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	5.0E-04	mg/kg-day	5.2E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					5.2E-05
		Exposure Point Total									0.0E+00					6.4E-02
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	6.0E-11	mg/m3	1.8E-03	(µg/m3)-1	1.1E-10	1.8E-10	mg/m3	2.0E-05	mg/m3	8.9E-06
				Copper	3.9E+02	mg/kg	2.1E-09	mg/m3	--	--	--	6.3E-09	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	4.2E-07	mg/m3	--	--	--	1.3E-06	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	2.4E-09	mg/m3	--	--	--	7.1E-09	mg/m3	--	--	--
			Exposure Route Total								1.1E-10					8.9E-06
		Exposure Point Total									1.1E-10					8.9E-06
	Exposure Medium Total										1.1E-10					6.4E-02
Medium Total											1.1E-10					6.4E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C5-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	9.7E-03	--	5.2E-05	9.8E-03
			Copper	--	--	--	--	Gastrointestinal	4.3E-03	--	--	4.3E-03
			Iron	--	--	--	--	Gastrointestinal	4.9E-02	--	--	4.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		6.3E-02	--	5.2E-05	6.4E-02
		Exposure Point Total					--					6.4E-02
		Outdoor Air (Particulates)	Cadmium	--	1.1E-10	--	1.1E-10	Kidney, Respiratory	--	8.9E-06	--	8.9E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.1E-10	--	1.1E-10		--	8.9E-06	--	8.9E-06
		Exposure Point Total					1.1E-10					8.9E-06
	Exposure Medium Total						1.1E-10					6.4E-02
Medium Total							1.1E-10					6.4E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	5.4E-02
Kidney	9.8E-03
Lung	--
Respiratory	8.9E-06
Skin	--
Maximum	5.4E-02

TABLE C5-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	7.8E-08	mg/kg-day	--	--	--	3.0E-07	mg/kg-day	5.0E-04	mg/kg-day	6.1E-04
				Copper	3.9E+02	mg/kg	2.8E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	2.7E-04
				Iron	7.9E+04	mg/kg	5.5E-04	mg/kg-day	--	--	--	2.2E-03	mg/kg-day	7.0E-01	mg/kg-day	3.1E-03
				Lead	4.4E+02	mg/kg	3.1E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					4.0E-03
			Dermal	Cadmium	1.1E+01	mg/kg	1.9E-09	mg/kg-day	--	--	--	7.3E-09	mg/kg-day	5.0E-04	mg/kg-day	1.5E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					1.5E-05
		Exposure Point Total									0.0E+00					4.0E-03
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	1.5E-11	mg/m3	1.8E-03	(µg/m3)-1	2.8E-11	6.0E-11	mg/m3	2.0E-05	mg/m3	3.0E-06
				Copper	3.9E+02	mg/kg	5.4E-10	mg/m3	--	--	--	2.1E-09	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	1.1E-07	mg/m3	--	--	--	4.2E-07	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	6.1E-10	mg/m3	--	--	--	2.4E-09	mg/m3	--	--	--
			Exposure Route Total								2.8E-11					3.0E-06
		Exposure Point Total									2.8E-11					3.0E-06
	Exposure Medium Total										2.8E-11					4.0E-03
Medium Total											2.8E-11					4.0E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C5-4.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	6.1E-04	--	1.5E-05	6.2E-04
			Copper	--	--	--	--	Gastrointestinal	2.7E-04	--	--	2.7E-04
			Iron	--	--	--	--	Gastrointestinal	3.1E-03	--	--	3.1E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		4.0E-03	--	1.5E-05	4.0E-03
		Exposure Point Total					--					4.0E-03
		Outdoor Air (Particulates)	Cadmium	--	2.8E-11	--	2.8E-11	Kidney, Respiratory	--	3.0E-06	--	3.0E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.8E-11	--	2.8E-11		--	3.0E-06	--	3.0E-06
		Exposure Point Total					2.8E-11					3.0E-06
	Exposure Medium Total						2.8E-11					4.0E-03
Medium Total							2.8E-11					4.0E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	3.4E-03
Kidney	6.3E-04
Lung	--
Respiratory	3.0E-06
Skin	--
Maximum	3.4E-03

TABLE C5-4.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	2.0E-06	mg/kg-day	--	--	--	6.3E-06	mg/kg-day	5.0E-04	mg/kg-day	1.3E-02
				Copper	3.9E+02	mg/kg	7.1E-05	mg/kg-day	--	--	--	2.2E-04	mg/kg-day	4.0E-02	mg/kg-day	5.6E-03
				Iron	7.9E+04	mg/kg	1.4E-02	mg/kg-day	--	--	--	4.5E-02	mg/kg-day	7.0E-01	mg/kg-day	6.4E-02
				Lead	4.4E+02	mg/kg	8.0E-05	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					8.2E-02
			Dermal	Cadmium	1.1E+01	mg/kg	8.4E-09	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	5.0E-04	mg/kg-day	5.2E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					5.2E-05
		Exposure Point Total									0.0E+00					8.2E-02
		Outdoor Air	Inhalation (Partculates)	Cadmium	1.1E+01	mg/kg	3.9E-10	mg/m3	1.8E-03	(µg/m3)-1	7.1E-10	1.2E-09	mg/m3	2.0E-05	mg/m3	6.1E-05
				Copper	3.9E+02	mg/kg	1.4E-08	mg/m3	--	--	--	4.4E-08	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	2.8E-06	mg/m3	--	--	--	8.7E-06	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	1.6E-08	mg/m3	--	--	--	4.9E-08	mg/m3	--	--	--
			Exposure Route Total								7.1E-10					6.1E-05
		Exposure Point Total									7.1E-10					6.1E-05
	Exposure Medium Total										7.1E-10					8.2E-02
Medium Total											7.1E-10					8.2E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C5-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	1.3E-02	--	5.2E-05	1.3E-02
			Copper	--	--	--	--	Gastrointestinal	5.6E-03	--	--	5.6E-03
			Iron	--	--	--	--	Gastrointestinal	6.4E-02	--	--	6.4E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		8.2E-02	--	5.2E-05	8.2E-02
		Exposure Point Total					--					8.2E-02
		Outdoor Air (Particulates)	Cadmium	--	7.1E-10	--	7.1E-10	Kidney, Respiratory	--	6.1E-05	--	6.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.1E-10	--	7.1E-10		--	6.1E-05	--	6.1E-05
		Exposure Point Total					7.1E-10					6.1E-05
	Exposure Medium Total						7.1E-10					8.2E-02
Medium Total							7.1E-10					8.2E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	6.9E-02
Kidney	1.3E-02
Lung	--
Respiratory	6.1E-05
Skin	--
Maximum	6.9E-02

TABLE C5-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-6.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	2.0E-07	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	3.1E-02
				Copper	3.9E+02	mg/kg	7.1E-06	mg/kg-day	--	--	--	5.5E-04	mg/kg-day	4.0E-02	mg/kg-day	1.4E-02
				Iron	7.9E+04	mg/kg	1.4E-03	mg/kg-day	--	--	--	1.1E-01	mg/kg-day	7.0E-01	mg/kg-day	1.6E-01
				Lead	4.4E+02	mg/kg	7.9E-06	mg/kg-day	--	--	--	6.2E-04	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					2.0E-01
			Dermal	Cadmium	1.1E+01	mg/kg	4.3E-10	mg/kg-day	--	--	--	3.4E-08	mg/kg-day	5.0E-04	mg/kg-day	6.7E-05
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					6.7E-05
		Exposure Point Total									0.0E+00					2.0E-01
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	1.2E-11	mg/m3	1.8E-03	(μg/m3)-1	2.1E-11	9.2E-10	mg/m3	2.0E-05	mg/m3	4.6E-05
				Copper	3.9E+02	mg/kg	4.2E-10	mg/m3	--	--	--	3.3E-08	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	8.4E-08	mg/m3	--	--	--	6.6E-06	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	4.7E-10	mg/m3	--	--	--	3.7E-08	mg/m3	--	--	--
			Exposure Route Total								2.1E-11					4.6E-05
		Exposure Point Total									2.1E-11					4.6E-05
	Exposure Medium Total										2.1E-11					2.0E-01
Medium Total											2.1E-11					2.0E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(μg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C5-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	3.1E-02	--	6.7E-05	3.1E-02
			Copper	--	--	--	--	Gastrointestinal	1.4E-02	--	--	1.4E-02
			Iron	--	--	--	--	Gastrointestinal	1.6E-01	--	--	1.6E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		2.0E-01	--	6.7E-05	2.0E-01
		Exposure Point Total					--					2.0E-01
		Outdoor Air (Particulates)	Cadmium	--	2.1E-11	--	2.1E-11	Kidney, Respiratory	--	4.6E-05	--	4.6E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.1E-11	--	2.1E-11		--	4.6E-05	--	4.6E-05
		Exposure Point Total					2.1E-11					4.6E-05
	Exposure Medium Total						2.1E-11					2.0E-01
Medium Total							2.1E-11					2.0E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	1.7E-01
Kidney	3.1E-02
Lung	--
Respiratory	4.6E-05
Skin	--
Maximum	1.7E-01

TABLE C5-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C5-7.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Cadmium	1.1E+01	mg/kg	9.4E-06	mg/kg-day	--	--	--	9.3E-05	mg/kg-day	5.0E-04	mg/kg-day	1.9E-01
				Copper	3.9E+02	mg/kg	3.3E-04	mg/kg-day	--	--	--	3.3E-03	mg/kg-day	4.0E-02	mg/kg-day	8.3E-02
				Iron	7.9E+04	mg/kg	6.7E-02	mg/kg-day	--	--	--	6.6E-01	mg/kg-day	7.0E-01	mg/kg-day	9.5E-01
				Lead	4.4E+02	mg/kg	3.7E-04	mg/kg-day	--	--	--	3.7E-03	mg/kg-day	--	--	--
			Exposure Route Total								0.0E+00					1.2E+00
			Dermal	Cadmium	1.1E+01	mg/kg	2.9E-08	mg/kg-day	--	--	--	2.5E-07	mg/kg-day	5.0E-04	mg/kg-day	5.0E-04
				Copper	3.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								0.0E+00					5.0E-04
		Exposure Point Total									0.0E+00					1.2E+00
		Outdoor Air	Inhalation (Particulates)	Cadmium	1.1E+01	mg/kg	1.7E-09	mg/m3	1.8E-03	(µg/m3)-1	3.1E-09	5.1E-09	mg/m3	2.0E-05	mg/m3	2.6E-04
				Copper	3.9E+02	mg/kg	6.1E-08	mg/m3	--	--	--	1.8E-07	mg/m3	--	--	--
				Iron	7.9E+04	mg/kg	1.2E-05	mg/m3	--	--	--	3.7E-05	mg/m3	--	--	--
				Lead	4.4E+02	mg/kg	6.8E-08	mg/m3	--	--	--	2.0E-07	mg/m3	--	--	--
			Exposure Route Total								3.1E-09					2.6E-04
		Exposure Point Total									3.1E-09					2.6E-04
	Exposure Medium Total										3.1E-09					1.2E+00
Medium Total											3.1E-09					1.2E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C5-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 4 - CARBONATE MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Cadmium	--	--	--	--	Kidney	1.9E-01	--	5.0E-04	1.9E-01
			Copper	--	--	--	--	Gastrointestinal	8.3E-02	--	--	8.3E-02
			Iron	--	--	--	--	Gastrointestinal	9.5E-01	--	--	9.5E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		1.2E+00	--	5.0E-04	1.2E+00
		Exposure Point Total					--					1.2E+00
		Outdoor Air (Particulates)	Cadmium	--	3.1E-09	--	3.1E-09	Kidney, Respiratory	--	2.6E-04	--	2.6E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.1E-09	--	3.1E-09		--	2.6E-04	--	2.6E-04
		Exposure Point Total					3.1E-09					2.6E-04
	Exposure Medium Total						3.1E-09					1.2E+00
Medium Total							3.1E-09					1.2E+00

Notes:

-- Not available or not applicable

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

RAGS Risk Assessment Guidance for Superfund

Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	**--**
Cardiovascular	**--**
Central Nervous System	**--**
Developmental	**--**
Gastrointestinal	**1.0E+00**
Kidney	1.9E-01
Lung	**--**
Respiratory	2.6E-04
Skin	**--**
Maximum	**1.0E+00**

TABLE C5-7.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	#N/A	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-5: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 4 - CARBONATE MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	0E+00	0E+00	2E-08	2E-08	0.01	0.00001	0.002	0.01	0.008	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	0E+00	0E+00	4E-11	4E-11	0.006	0.00002	0.000004	0.006	0.005	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	0E+00	0E+00	1E-10	1E-10	0.06	0.00005	0.000009	0.06	0.05	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	0E+00	0E+00	3E-11	3E-11	0.004	0.00001	0.000003	0.004	0.003	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	0E+00	0E+00	7E-10	7E-10	0.08	0.00005	0.00006	0.08	0.07	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	0E+00	0E+00	2E-11	2E-11	0.2	0.00007	0.00005	0.2	0.2	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	0E+00	0E+00	3E-09	3E-09	1	0.0005	0.0003	1	1	Lead	PbB	18/18	125.47 - 2,270	1.2E+03	--	--	10.4

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C6-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.1E-07	8.1E-07	mg/kg-day	3.0E-04	mg/kg-day	2.7E-03
				Copper	3.1E+02	mg/kg	5.5E-06	mg/kg-day	--	--	--	2.1E-05	mg/kg-day	4.0E-02	mg/kg-day	5.3E-04
				Iron	3.9E+04	mg/kg	6.8E-04	mg/kg-day	--	--	--	2.7E-03	mg/kg-day	7.0E-01	mg/kg-day	3.8E-03
				Lead	2.5E+02	mg/kg	4.3E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	--	--	--
			Exposure Route Total								3.1E-07					7.0E-03
			Dermal	Arsenic	2.0E+01	mg/kg	7.6E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-07	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	9.9E-04
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.1E-07					9.9E-04
		Exposure Point Total									4.2E-07					8.0E-03
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	2.1E-08	mg/m3	4.3E-03	(µg/m3)-1	9.2E-08	8.3E-08	mg/m3	1.5E-05	mg/m3	5.6E-03
				Copper	3.1E+02	mg/kg	3.4E-07	mg/m3	--	--	--	1.3E-06	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	4.2E-05	mg/m3	--	--	--	1.7E-04	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	2.7E-07	mg/m3	--	--	--	1.0E-06	mg/m3	--	--	--
			Exposure Route Total								9.2E-08					5.6E-03
		Exposure Point Total									9.2E-08					5.6E-03
	Exposure Medium Total										5.2E-07					1.4E-02
Medium Total											5.2E-07					1.4E-02

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C6-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 5 - EDITH MINE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.1E-07	--	1.1E-07	4.2E-07	Skin	2.7E-03	--	9.9E-04	3.7E-03
			Copper	--	--	--	--	Gastrointestinal	5.3E-04	--	--	5.3E-04
			Iron	--	--	--	--	Gastrointestinal	3.8E-03	--	--	3.8E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	3.1E-07	--	1.1E-07	4.2E-07		7.0E-03	--	9.9E-04	8.0E-03
		Exposure Point Total					4.2E-07					8.0E-03
		Outdoor Air (Particulates)	Arsenic	--	9.2E-08	--	9.2E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.6E-03	--	5.6E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	9.2E-08	--	9.2E-08		--	5.6E-03	--	5.6E-03
		Exposure Point Total					9.2E-08					5.6E-03
	Exposure Medium Total						5.2E-07					1.4E-02
Medium Total							5.2E-07					1.4E-02

Notes:

-- Not available or not applicable
ATV All terrain vehicle
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	5.6E-03
Central Nervous System	5.6E-03
Developmental	5.6E-03
Gastrointestinal	4.3E-03
Kidney	--
Lung	5.6E-03
Respiratory	--
Skin	9.2E-03
Maximum	9.2E-03

TABLE C6-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:
-- Not available or not applicable
ATV All terrain vehicle
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund

TABLE C6-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-07	4.9E-07	mg/kg-day	3.0E-04	mg/kg-day	1.6E-03
				Copper	3.1E+02	mg/kg	3.3E-06	mg/kg-day	--	--	--	1.3E-05	mg/kg-day	4.0E-02	mg/kg-day	3.2E-04
				Iron	3.9E+04	mg/kg	4.1E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	7.0E-01	mg/kg-day	2.3E-03
				Lead	2.5E+02	mg/kg	2.6E-06	mg/kg-day	--	--	--	1.0E-05	mg/kg-day	--	--	--
			Exposure Route Total								1.9E-07					4.3E-03
			Dermal	Arsenic	2.0E+01	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-07	5.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.0E-03
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.3E-07					2.0E-03
		Exposure Point Total									4.2E-07					6.2E-03
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	4.1E-11	mg/m3	4.3E-03	(µg/m3)-1	1.8E-10	1.6E-10	mg/m3	1.5E-05	mg/m3	1.1E-05
				Copper	3.1E+02	mg/kg	6.5E-10	mg/m3	--	--	--	2.5E-09	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	8.1E-08	mg/m3	--	--	--	3.2E-07	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	5.1E-10	mg/m3	--	--	--	2.0E-09	mg/m3	--	--	--
			Exposure Route Total								1.8E-10					1.1E-05
		Exposure Point Total									1.8E-10					1.1E-05
	Exposure Medium Total										4.2E-07					6.2E-03
Medium Total											4.2E-07					6.2E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C6-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-07	--	2.3E-07	4.2E-07	Skin	1.6E-03	--	2.0E-03	3.6E-03
			Copper	--	--	--	--	Gastrointestinal	3.2E-04	--	--	3.2E-04
			Iron	--	--	--	--	Gastrointestinal	2.3E-03	--	--	2.3E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.9E-07	--	2.3E-07	4.2E-07		4.3E-03	--	2.0E-03	6.2E-03
		Exposure Point Total					4.2E-07					6.2E-03
		Outdoor Air (Particulates)	Arsenic	--	1.8E-10	--	1.8E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-05	--	1.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.8E-10	--	1.8E-10		--	1.1E-05	--	1.1E-05
		Exposure Point Total					1.8E-10					1.1E-05
	Exposure Medium Total						4.2E-07					6.2E-03
Medium Total							4.2E-07					6.2E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.1E-05
Central Nervous System	1.1E-05
Developmental	1.1E-05
Gastrointestinal	2.6E-03
Kidney	--
Lung	1.1E-05
Respiratory	--
Skin	3.6E-03
Maximum	3.6E-03

TABLE C6-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C6-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	8.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02
				Copper	3.1E+02	mg/kg	2.2E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	4.0E-02	mg/kg-day	3.4E-03
				Iron	3.9E+04	mg/kg	2.7E-03	mg/kg-day	--	--	--	1.7E-02	mg/kg-day	7.0E-01	mg/kg-day	2.5E-02
				Lead	2.5E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.1E-04	mg/kg-day	--	--	--
			Exposure Route Total								1.2E-06					4.6E-02
			Dermal	Arsenic	2.0E+01	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.9E-07	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	4.7E-03
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.9E-07					4.7E-03
		Exposure Point Total									1.6E-06					5.0E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	1.1E-10	mg/m3	4.3E-03	(µg/m3)-1	4.6E-10	3.2E-10	mg/m3	1.5E-05	mg/m3	2.1E-05
				Copper	3.1E+02	mg/kg	1.7E-09	mg/m3	--	--	--	5.1E-09	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	2.1E-07	mg/m3	--	--	--	6.3E-07	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	1.3E-09	mg/m3	--	--	--	4.0E-09	mg/m3	--	--	--
			Exposure Route Total								4.6E-10					2.1E-05
		Exposure Point Total									4.6E-10					2.1E-05
	Exposure Medium Total										1.6E-06					5.0E-02
Medium Total											1.6E-06					5.0E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C6-3.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.2E-06	--	3.9E-07	1.6E-06	Skin	1.7E-02	--	4.7E-03	2.2E-02
			Copper	--	--	--	--	Gastrointestinal	3.4E-03	--	--	3.4E-03
			Iron	--	--	--	--	Gastrointestinal	2.5E-02	--	--	2.5E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.2E-06	--	3.9E-07	1.6E-06		4.6E-02	--	4.7E-03	5.0E-02
		Exposure Point Total					1.6E-06					5.0E-02
		Outdoor Air (Particulates)	Arsenic	--	4.6E-10	--	4.6E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.1E-05	--	2.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.6E-10	--	4.6E-10		--	2.1E-05	--	2.1E-05
		Exposure Point Total					4.6E-10					2.1E-05
	Exposure Medium Total						1.6E-06					5.0E-02
Medium Total							1.6E-06					5.0E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	2.1E-05
Central Nervous System	2.1E-05
Developmental	2.1E-05
Gastrointestinal	2.8E-02
Kidney	--
Lung	2.1E-05
Respiratory	--
Skin	2.2E-02
Maximum	2.8E-02

TABLE C6-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C6-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	8.4E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-07	3.3E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
				Copper	3.1E+02	mg/kg	2.2E-06	mg/kg-day	--	--	--	8.6E-06	mg/kg-day	4.0E-02	mg/kg-day	2.2E-04
				Iron	3.9E+04	mg/kg	2.8E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	7.0E-01	mg/kg-day	1.5E-03
				Lead	2.5E+02	mg/kg	1.7E-06	mg/kg-day	--	--	--	6.8E-06	mg/kg-day	--	--	--
			Exposure Route Total								1.3E-07					2.8E-03
			Dermal	Arsenic	2.0E+01	mg/kg	1.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.5E-07	3.9E-07	mg/kg-day	3.0E-04	mg/kg-day	1.3E-03
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.5E-07					1.3E-03
		Exposure Point Total									2.8E-07					4.2E-03
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	2.7E-11	mg/m3	4.3E-03	(µg/m3)-1	1.2E-10	1.1E-10	mg/m3	1.5E-05	mg/m3	7.1E-06
				Copper	3.1E+02	mg/kg	4.3E-10	mg/m3	--	--	--	1.7E-09	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	5.4E-08	mg/m3	--	--	--	2.1E-07	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	3.4E-10	mg/m3	--	--	--	1.3E-09	mg/m3	--	--	--
			Exposure Route Total								1.2E-10					7.1E-06
		Exposure Point Total									1.2E-10					7.1E-06
	Exposure Medium Total										2.8E-07					4.2E-03
Medium Total											2.8E-07					4.2E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C6-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-07	--	1.5E-07	2.8E-07	Skin	1.1E-03	--	1.3E-03	2.4E-03
			Copper	--	--	--	--	Gastrointestinal	2.2E-04	--	--	2.2E-04
			Iron	--	--	--	--	Gastrointestinal	1.5E-03	--	--	1.5E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.3E-07	--	1.5E-07	2.8E-07		2.8E-03	--	1.3E-03	4.2E-03
		Exposure Point Total					2.8E-07					4.2E-03
		Outdoor Air (Particulates)	Arsenic	--	1.2E-10	--	1.2E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.1E-06	--	7.1E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.2E-10	--	1.2E-10		--	7.1E-06	--	7.1E-06
		Exposure Point Total					1.2E-10					7.1E-06
	Exposure Medium Total						2.8E-07					4.2E-03
Medium Total							2.8E-07					4.2E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	7.1E-06
Central Nervous System	7.1E-06
Developmental	7.1E-06
Gastrointestinal	1.8E-03
Kidney	--
Lung	7.1E-06
Respiratory	--
Skin	2.4E-03
Maximum	2.4E-03

TABLE C6-4.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C6-5.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.2E-06	6.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2.2E-02
				Copper	3.1E+02	mg/kg	5.7E-05	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	4.0E-02	mg/kg-day	4.4E-03
				Iron	3.9E+04	mg/kg	7.1E-03	mg/kg-day	--	--	--	2.2E-02	mg/kg-day	7.0E-01	mg/kg-day	3.2E-02
				Lead	2.5E+02	mg/kg	4.5E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	--	--	--
			Exposure Route Total								3.2E-06					5.9E-02
			Dermal	Arsenic	2.0E+01	mg/kg	4.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.7E-07	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	4.7E-03
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								6.7E-07					4.7E-03
		Exposure Point Total									3.9E-06					6.3E-02
		Outdoor Air	Inhalation (Partculates)	Arsenic	2.0E+01	mg/kg	7.1E-10	mg/m3	4.3E-03	(µg/m3)-1	3.0E-09	2.2E-09	mg/m3	1.5E-05	mg/m3	1.5E-04
				Copper	3.1E+02	mg/kg	1.1E-08	mg/m3	--	--	--	3.5E-08	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	1.4E-06	mg/m3	--	--	--	4.4E-06	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	8.8E-09	mg/m3	--	--	--	2.7E-08	mg/m3	--	--	--
			Exposure Route Total								3.0E-09					1.5E-04
		Exposure Point Total									3.0E-09					1.5E-04
	Exposure Medium Total										3.9E-06					6.4E-02
Medium Total											3.9E-06					6.4E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C6-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.2E-06	--	6.7E-07	3.9E-06	Skin	2.2E-02	--	4.7E-03	2.7E-02
			Copper	--	--	--	--	Gastrointestinal	4.4E-03	--	--	4.4E-03
			Iron	--	--	--	--	Gastrointestinal	3.2E-02	--	--	3.2E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	3.2E-06	--	6.7E-07	3.9E-06		5.9E-02	--	4.7E-03	6.3E-02
		Exposure Point Total					3.9E-06					6.3E-02
		Outdoor Air (Particulates)	Arsenic	--	3.0E-09	--	3.0E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.5E-04	--	1.5E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.0E-09	--	3.0E-09		--	1.5E-04	--	1.5E-04
		Exposure Point Total					3.0E-09					1.5E-04
	Exposure Medium Total						3.9E-06					6.4E-02
Medium Total							3.9E-06					6.4E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.5E-04
Central Nervous System	1.5E-04
Developmental	1.5E-04
Gastrointestinal	3.6E-02
Kidney	--
Lung	1.5E-04
Respiratory	--
Skin	2.7E-02
Maximum	3.6E-02

TABLE C6-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C6-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.2E-07	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.6E-02
				Copper	3.1E+02	mg/kg	5.7E-06	mg/kg-day	--	--	--	4.4E-04	mg/kg-day	4.0E-02	mg/kg-day	1.1E-02
				Iron	3.9E+04	mg/kg	7.1E-04	mg/kg-day	--	--	--	5.5E-02	mg/kg-day	7.0E-01	mg/kg-day	7.9E-02
				Lead	2.5E+02	mg/kg	4.5E-06	mg/kg-day	--	--	--	3.5E-04	mg/kg-day	--	--	--
			Exposure Route Total								3.2E-07					1.5E-01
			Dermal	Arsenic	2.0E+01	mg/kg	2.3E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.5E-08	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	6.0E-03
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.5E-08					6.0E-03
		Exposure Point Total									3.6E-07					1.5E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	2.1E-11	mg/m3	4.3E-03	(µg/m3)-1	9.1E-11	1.7E-09	mg/m3	1.5E-05	mg/m3	1.1E-04
				Copper	3.1E+02	mg/kg	3.4E-10	mg/m3	--	--	--	2.6E-08	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	4.2E-08	mg/m3	--	--	--	3.3E-06	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	2.6E-10	mg/m3	--	--	--	2.1E-08	mg/m3	--	--	--
			Exposure Route Total								9.1E-11					1.1E-04
		Exposure Point Total									9.1E-11					1.1E-04
	Exposure Medium Total										3.6E-07					1.5E-01
Medium Total											3.6E-07					1.5E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C6-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.2E-07	--	3.5E-08	3.6E-07	Skin	5.6E-02	--	6.0E-03	6.2E-02
			Copper	--	--	--	--	Gastrointestinal	1.1E-02	--	--	1.1E-02
			Iron	--	--	--	--	Gastrointestinal	7.9E-02	--	--	7.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	3.2E-07	--	3.5E-08	3.6E-07		1.5E-01	--	6.0E-03	1.5E-01
		Exposure Point Total					3.6E-07					1.5E-01
		Outdoor Air (Particulates)	Arsenic	--	9.1E-11	--	9.1E-11	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-04	--	1.1E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	9.1E-11	--	9.1E-11		--	1.1E-04	--	1.1E-04
		Exposure Point Total					9.1E-11					1.1E-04
	Exposure Medium Total						3.6E-07					1.5E-01
Medium Total							3.6E-07					1.5E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.1E-04
Central Nervous System	1.1E-04
Developmental	1.1E-04
Gastrointestinal	9.0E-02
Kidney	--
Lung	1.1E-04
Respiratory	--
Skin	6.2E-02
Maximum	9.0E-02

TABLE C6-6.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C6-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.0E+01	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.5E-05	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3.3E-01
				Copper	3.1E+02	mg/kg	2.7E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	4.0E-02	mg/kg-day	6.6E-02
				Iron	3.9E+04	mg/kg	3.3E-02	mg/kg-day	--	--	--	3.3E-01	mg/kg-day	7.0E-01	mg/kg-day	4.7E-01
				Lead	2.5E+02	mg/kg	2.1E-04	mg/kg-day	--	--	--	2.1E-03	mg/kg-day	--	--	--
			Exposure Route Total								1.5E-05					8.7E-01
			Dermal	Arsenic	2.0E+01	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-06	1.3E-05	mg/kg-day	3.0E-04	mg/kg-day	4.5E-02
				Copper	3.1E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.9E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.5E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.3E-06					4.5E-02
		Exposure Point Total									1.7E-05					9.2E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.0E+01	mg/kg	3.1E-09	mg/m3	4.3E-03	(µg/m3)-1	1.3E-08	9.2E-09	mg/m3	1.5E-05	mg/m3	6.1E-04
				Copper	3.1E+02	mg/kg	4.9E-08	mg/m3	--	--	--	1.5E-07	mg/m3	--	--	--
				Iron	3.9E+04	mg/kg	6.1E-06	mg/m3	--	--	--	1.8E-05	mg/m3	--	--	--
				Lead	2.5E+02	mg/kg	3.8E-08	mg/m3	--	--	--	1.1E-07	mg/m3	--	--	--
			Exposure Route Total								1.3E-08					6.1E-04
		Exposure Point Total									1.3E-08					6.1E-04
	Exposure Medium Total										1.8E-05					9.2E-01
Medium Total											1.8E-05					9.2E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C6-7.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Primary Target Organ(s)	Noncancer Ingestion	Noncancer Inhalation	Noncancer Dermal	Noncancer Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.5E-05	--	2.3E-06	1.7E-05	Skin	3.3E-01	--	4.5E-02	3.8E-01
			Copper	--	--	--	--	Gastrointestinal	6.6E-02	--	--	6.6E-02
			Iron	--	--	--	--	Gastrointestinal	4.7E-01	--	--	4.7E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.5E-05	--	2.3E-06	1.7E-05		8.7E-01	--	4.5E-02	9.2E-01
		Exposure Point Total					1.7E-05					9.2E-01
		Outdoor Air (Particulates)	Arsenic	--	1.3E-08	--	1.3E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.1E-04	--	6.1E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.3E-08	--	1.3E-08		--	6.1E-04	--	6.1E-04
		Exposure Point Total					1.3E-08					6.1E-04
	Exposure Medium Total						1.8E-05					9.2E-01
Medium Total							1.8E-05					9.2E-01

Notes:

-- Not available or not applicable
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	6.1E-04
Central Nervous System	6.1E-04
Developmental	6.1E-04
Gastrointestinal	5.4E-01
Kidney	--
Lung	6.1E-04
Respiratory	--
Skin	3.8E-01
Maximum	5.4E-01

TABLE C6-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 5 - EDITH MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.5E-05	--	2.3E-06	1.7E-05	Skin	3.3E-01	--	4.5E-02	3.8E-01
			Chemical Total	1.5E-05	--	2.3E-06	1.7E-05		3.3E-01	--	4.5E-02	3.8E-01
		Exposure Point Total					1.7E-05					3.8E-01
		Outdoor Air (Particulates)	Arsenic	--	1.3E-08	--	1.3E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.1E-04	--	6.1E-04
			Chemical Total	--	1.3E-08	--	1.3E-08		--	6.1E-04	--	6.1E-04
		Exposure Point Total					1.3E-08					6.1E-04
	Exposure Medium Total						1.8E-05					3.8E-01
Medium Total							1.8E-05					3.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-6: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 5 - EDITH MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	3E-07	1E-07	9E-08	5E-07	0.007	0.0010	0.006	0.01	0.009	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-07	2E-07	2E-10	4E-07	0.004	0.002	0.00001	0.006	0.004	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	4E-07	5E-10	2E-06	0.05	0.005	0.00002	0.05	0.03	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-07	2E-07	1E-10	3E-07	0.003	0.001	0.000007	0.004	0.002	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	3E-06	7E-07	3E-09	4E-06	0.06	0.005	0.0001	0.06	0.04	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	3E-07	3E-08	9E-11	4E-07	0.1	0.006	0.0001	0.2	0.09	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-05	2E-06	1E-08	2E-05	0.9	0.04	0.0006	0.9	0.5	Arsenic	C	37/58	8.07 - 85	2.0E+01	2E-05	0.4	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C7-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	3.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.8E-06	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4.1E-02
				Copper	2.3E+02	mg/kg	4.0E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	4.0E-02	mg/kg-day	3.9E-04
				Iron	3.8E+04	mg/kg	6.7E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	7.0E-01	mg/kg-day	3.7E-03
				Lead	1.9E+03	mg/kg	3.4E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	--	--	--
			Exposure Route Total								4.8E-06					4.6E-02
			Dermal	Arsenic	3.1E+02	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.8E-06	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	1.5E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.8E-06					1.5E-02
		Exposure Point Total									6.5E-06					6.1E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	3.3E-07	mg/m3	4.3E-03	(µg/m3)-1	1.4E-06	1.3E-06	mg/m3	1.5E-05	mg/m3	8.6E-02
				Copper	2.3E+02	mg/kg	2.5E-07	mg/m3	--	--	--	9.7E-07	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	4.1E-05	mg/m3	--	--	--	1.6E-04	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	2.1E-06	mg/m3	--	--	--	8.2E-06	mg/m3	--	--	--
			Exposure Route Total								1.4E-06					8.6E-02
		Exposure Point Total									1.4E-06					8.6E-02
	Exposure Medium Total										8.0E-06					1.5E-01
Medium Total											8.0E-06					1.5E-01

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C7-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 6 -
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.8E-06	--	1.8E-06	6.5E-06	Skin	4.1E-02	--	1.5E-02	5.7E-02
			Copper	--	--	--	--	Gastrointestinal	3.9E-04	--	--	3.9E-04
			Iron	--	--	--	--	Gastrointestinal	3.7E-03	--	--	3.7E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	4.8E-06	--	1.8E-06	6.5E-06		4.6E-02	--	1.5E-02	6.1E-02
		Exposure Point Total					6.5E-06					6.1E-02
		Outdoor Air (Particulates)	Arsenic	--	1.4E-06	--	1.4E-06	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	8.6E-02	--	8.6E-02
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.4E-06	--	1.4E-06		--	8.6E-02	--	8.6E-02
		Exposure Point Total					1.4E-06					8.6E-02
	Exposure Medium Total						8.0E-06					1.5E-01
Medium Total							8.0E-06					1.5E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	8.6E-02
Central Nervous System	8.6E-02
Developmental	8.6E-02
Gastrointestinal	4.1E-03
Kidney	--
Lung	8.6E-02
Respiratory	--
Skin	1.4E-01
Maximum	1.4E-01

TABLE C7-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	1.9E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.9E-06	7.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2.5E-02
				Copper	2.3E+02	mg/kg	2.4E-06	mg/kg-day	--	--	--	9.5E-06	mg/kg-day	4.0E-02	mg/kg-day	2.4E-04
				Iron	3.8E+04	mg/kg	4.0E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	7.0E-01	mg/kg-day	2.3E-03
				Lead	1.9E+03	mg/kg	2.0E-05	mg/kg-day	--	--	--	8.0E-05	mg/kg-day	--	--	--
			Exposure Route Total								2.9E-06					2.8E-02
			Dermal	Arsenic	3.1E+02	mg/kg	2.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.5E-06	9.1E-06	mg/kg-day	3.0E-04	mg/kg-day	3.0E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.5E-06					3.0E-02
		Exposure Point Total									6.4E-06					5.8E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	6.3E-10	mg/m3	4.3E-03	(µg/m3)-1	2.7E-09	2.5E-09	mg/m3	1.5E-05	mg/m3	1.6E-04
				Copper	2.3E+02	mg/kg	4.8E-10	mg/m3	--	--	--	1.9E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	7.9E-08	mg/m3	--	--	--	3.1E-07	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	4.0E-09	mg/m3	--	--	--	1.6E-08	mg/m3	--	--	--
			Exposure Route Total								2.7E-09					1.6E-04
		Exposure Point Total									2.7E-09					1.6E-04
	Exposure Medium Total										6.4E-06					5.8E-02
Medium Total											6.4E-06					5.8E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C7-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.9E-06	--	3.5E-06	6.4E-06	Skin	2.5E-02	--	3.0E-02	5.5E-02
			Copper	--	--	--	--	Gastrointestinal	2.4E-04	--	--	2.4E-04
			Iron	--	--	--	--	Gastrointestinal	2.3E-03	--	--	2.3E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	2.9E-06	--	3.5E-06	6.4E-06		2.8E-02	--	3.0E-02	5.8E-02
		Exposure Point Total					6.4E-06					5.8E-02
		Outdoor Air (Particulates)	Arsenic	--	2.7E-09	--	2.7E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.6E-04	--	1.6E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.7E-09	--	2.7E-09		--	1.6E-04	--	1.6E-04
		Exposure Point Total					2.7E-09					1.6E-04
	Exposure Medium Total						6.4E-06					5.8E-02
Medium Total							6.4E-06					5.8E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.6E-04
Central Nervous System	1.6E-04
Developmental	1.6E-04
Gastrointestinal	2.5E-03
Kidney	--
Lung	1.6E-04
Respiratory	--
Skin	5.6E-02
Maximum	5.6E-02

TABLE C7-2.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-05	8.0E-05	mg/kg-day	3.0E-04	mg/kg-day	2.7E-01
				Copper	2.3E+02	mg/kg	1.6E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	4.0E-02	mg/kg-day	2.5E-03
				Iron	3.8E+04	mg/kg	2.6E-03	mg/kg-day	--	--	--	1.7E-02	mg/kg-day	7.0E-01	mg/kg-day	2.4E-02
				Lead	1.9E+03	mg/kg	1.3E-04	mg/kg-day	--	--	--	8.5E-04	mg/kg-day	--	--	--
			Exposure Route Total								1.9E-05					2.9E-01
			Dermal	Arsenic	3.1E+02	mg/kg	4.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.0E-06	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	7.2E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								6.0E-06					7.2E-02
		Exposure Point Total									2.5E-05					3.7E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	1.6E-09	mg/m3	4.3E-03	(µg/m3)-1	7.1E-09	4.9E-09	mg/m3	1.5E-05	mg/m3	3.3E-04
				Copper	2.3E+02	mg/kg	1.2E-09	mg/m3	--	--	--	3.7E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	2.1E-07	mg/m3	--	--	--	6.2E-07	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	1.0E-08	mg/m3	--	--	--	3.1E-08	mg/m3	--	--	--
			Exposure Route Total								7.1E-09					3.3E-04
		Exposure Point Total									7.1E-09					3.3E-04
	Exposure Medium Total										2.5E-05					3.7E-01
Medium Total											2.5E-05					3.7E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C7-3.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-05	--	6.0E-06	2.5E-05	Skin	2.7E-01	--	7.2E-02	3.4E-01
			Copper	--	--	--	--	Gastrointestinal	2.5E-03	--	--	2.5E-03
			Iron	--	--	--	--	Gastrointestinal	2.4E-02	--	--	2.4E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.9E-05	--	6.0E-06	2.5E-05		2.9E-01	--	7.2E-02	3.7E-01
		Exposure Point Total					2.5E-05					3.7E-01
		Outdoor Air (Particulates)	Arsenic	--	7.1E-09	--	7.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.3E-04	--	3.3E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.1E-09	--	7.1E-09		--	3.3E-04	--	3.3E-04
		Exposure Point Total					7.1E-09					3.3E-04
	Exposure Medium Total						2.5E-05					3.7E-01
Medium Total							2.5E-05					3.7E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	3.3E-04
Central Nervous System	3.3E-04
Developmental	3.3E-04
Gastrointestinal	2.7E-02
Kidney	--
Lung	3.3E-04
Respiratory	--
Skin	3.4E-01
Maximum	3.4E-01

TABLE C7-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-05	--	6.0E-06	2.5E-05	Skin	2.7E-01	--	7.2E-02	3.4E-01
			Chemical Total	1.9E-05	--	6.0E-06	2.5E-05		2.7E-01	--	7.2E-02	3.4E-01
		Exposure Point Total					2.5E-05					3.4E-01
		Outdoor Air (Particulates)	Arsenic	--	7.1E-09	--	7.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.3E-04	--	3.3E-04
			Chemical Total	--	7.1E-09	--	7.1E-09		--	3.3E-04	--	3.3E-04
		Exposure Point Total					7.1E-09					3.3E-04
	Exposure Medium Total						2.5E-05					3.4E-01
Medium Total							2.5E-05					3.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-06	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02
				Copper	2.3E+02	mg/kg	1.6E-06	mg/kg-day	--	--	--	6.3E-06	mg/kg-day	4.0E-02	mg/kg-day	1.6E-04
				Iron	3.8E+04	mg/kg	2.7E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	7.0E-01	mg/kg-day	1.5E-03
				Lead	1.9E+03	mg/kg	1.4E-05	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	--	--	--
			Exposure Route Total								1.9E-06					1.8E-02
			Dermal	Arsenic	3.1E+02	mg/kg	1.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-06	6.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2.0E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.3E-06					2.0E-02
		Exposure Point Total									4.3E-06					3.9E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	4.2E-10	mg/m3	4.3E-03	(µg/m3)-1	1.8E-09	1.6E-09	mg/m3	1.5E-05	mg/m3	1.1E-04
				Copper	2.3E+02	mg/kg	3.2E-10	mg/m3	--	--	--	1.2E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	5.3E-08	mg/m3	--	--	--	2.1E-07	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	2.7E-09	mg/m3	--	--	--	1.0E-08	mg/m3	--	--	--
			Exposure Route Total								1.8E-09					1.1E-04
		Exposure Point Total									1.8E-09					1.1E-04
	Exposure Medium Total										4.3E-06					3.9E-02
Medium Total											4.3E-06					3.9E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C7-4.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-06	--	2.3E-06	4.3E-06	Skin	1.7E-02	--	2.0E-02	3.7E-02
			Copper	--	--	--	--	Gastrointestinal	1.6E-04	--	--	1.6E-04
			Iron	--	--	--	--	Gastrointestinal	1.5E-03	--	--	1.5E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.9E-06	--	2.3E-06	4.3E-06		1.8E-02	--	2.0E-02	3.9E-02
		Exposure Point Total					4.3E-06					3.9E-02
		Outdoor Air (Particulates)	Arsenic	--	1.8E-09	--	1.8E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-04	--	1.1E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.8E-09	--	1.8E-09		--	1.1E-04	--	1.1E-04
		Exposure Point Total					1.8E-09					1.1E-04
	Exposure Medium Total						4.3E-06					3.9E-02
Medium Total							4.3E-06					3.9E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.1E-04
Central Nervous System	1.1E-04
Developmental	1.1E-04
Gastrointestinal	1.7E-03
Kidney	--
Lung	1.1E-04
Respiratory	--
Skin	3.7E-02
Maximum	3.7E-02

TABLE C7-4.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	3.3E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.0E-05	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3.5E-01
				Copper	2.3E+02	mg/kg	4.2E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	4.0E-02	mg/kg-day	3.3E-03
				Iron	3.8E+04	mg/kg	6.9E-03	mg/kg-day	--	--	--	2.2E-02	mg/kg-day	7.0E-01	mg/kg-day	3.1E-02
				Lead	1.9E+03	mg/kg	3.5E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	--	--	--
			Exposure Route Total								5.0E-05					3.8E-01
			Dermal	Arsenic	3.1E+02	mg/kg	6.9E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.0E-05	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	7.2E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.0E-05					7.2E-02
		Exposure Point Total									6.0E-05					4.5E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	3.1E+02	mg/kg	1.1E-08	mg/m3	4.3E-03	(µg/m3)-1	4.7E-08	3.4E-08	mg/m3	1.5E-05	mg/m3	2.3E-03
				Copper	2.3E+02	mg/kg	8.2E-09	mg/m3	--	--	--	2.6E-08	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	1.4E-06	mg/m3	--	--	--	4.2E-06	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	6.9E-08	mg/m3	--	--	--	2.2E-07	mg/m3	--	--	--
			Exposure Route Total								4.7E-08					2.3E-03
		Exposure Point Total									4.7E-08					2.3E-03
	Exposure Medium Total										6.0E-05					4.5E-01
Medium Total											6.0E-05					4.5E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C7-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.0E-05	--	1.0E-05	6.0E-05	Skin	3.5E-01	--	7.2E-02	4.2E-01
			Copper	--	--	--	--	Gastrointestinal	3.3E-03	--	--	3.3E-03
			Iron	--	--	--	--	Gastrointestinal	3.1E-02	--	--	3.1E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	5.0E-05	--	1.0E-05	6.0E-05		3.8E-01	--	7.2E-02	4.5E-01
		Exposure Point Total					6.0E-05					4.5E-01
		Outdoor Air (Particulates)	Arsenic	--	4.7E-08	--	4.7E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.3E-03	--	2.3E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	4.7E-08	--	4.7E-08		--	2.3E-03	--	2.3E-03
		Exposure Point Total					4.7E-08					2.3E-03
	Exposure Medium Total						6.0E-05					4.5E-01
Medium Total							6.0E-05					4.5E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	2.3E-03
Central Nervous System	2.3E-03
Developmental	2.3E-03
Gastrointestinal	3.4E-02
Kidney	--
Lung	2.3E-03
Respiratory	--
Skin	4.2E-01
Maximum	4.2E-01

TABLE C7-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	5.0E-05	--	1.0E-05	6.0E-05	Skin	3.5E-01	--	7.2E-02	4.2E-01
			Chemical Total	5.0E-05	--	1.0E-05	6.0E-05		3.5E-01	--	7.2E-02	4.2E-01
		Exposure Point Total					6.0E-05					4.2E-01
		Outdoor Air (Particulates)	Arsenic	--	4.7E-08	--	4.7E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.3E-03	--	2.3E-03
			Chemical Total	--	4.7E-08	--	4.7E-08		--	2.3E-03	--	2.3E-03
		Exposure Point Total					4.7E-08					2.3E-03
	Exposure Medium Total						6.0E-05					4.2E-01
Medium Total							6.0E-05					4.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-6.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	3.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.9E-06	2.6E-04	mg/kg-day	3.0E-04	mg/kg-day	8.6E-01
				Copper	2.3E+02	mg/kg	4.1E-06	mg/kg-day	--	--	--	3.2E-04	mg/kg-day	4.0E-02	mg/kg-day	8.1E-03
				Iron	3.8E+04	mg/kg	6.9E-04	mg/kg-day	--	--	--	5.4E-02	mg/kg-day	7.0E-01	mg/kg-day	7.7E-02
				Lead	1.9E+03	mg/kg	3.5E-05	mg/kg-day	--	--	--	2.7E-03	mg/kg-day	--	--	--
			Exposure Route Total								4.9E-06					9.4E-01
			Dermal	Arsenic	3.1E+02	mg/kg	3.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.3E-07	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9.3E-02
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								5.3E-07					9.3E-02
		Exposure Point Total									5.5E-06					1.0E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	3.3E-10	mg/m3	4.3E-03	(µg/m3)-1	1.4E-09	2.5E-08	mg/m3	1.5E-05	mg/m3	1.7E-03
				Copper	2.3E+02	mg/kg	2.5E-10	mg/m3	--	--	--	1.9E-08	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	4.1E-08	mg/m3	--	--	--	3.2E-06	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	2.1E-09	mg/m3	--	--	--	1.6E-07	mg/m3	--	--	--
			Exposure Route Total								1.4E-09					1.7E-03
		Exposure Point Total									1.4E-09					1.7E-03
	Exposure Medium Total										5.5E-06					1.0E+00
Medium Total											5.5E-06					1.0E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C7-6.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer: Ingestion	Noncancer: Inhalation	Noncancer: Dermal	Noncancer: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	4.9E-06	--	5.3E-07	5.5E-06	Skin	8.6E-01	--	9.3E-02	9.5E-01
			Copper	--	--	--	--	Gastrointestinal	8.1E-03	--	--	8.1E-03
			Iron	--	--	--	--	Gastrointestinal	7.7E-02	--	--	7.7E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	4.9E-06	--	5.3E-07	5.5E-06		9.4E-01	--	9.3E-02	1.0E+00
		Exposure Point Total					5.5E-06					1.0E+00
		Outdoor Air (Particulates)	Arsenic	--	1.4E-09	--	1.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.7E-03	--	1.7E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.4E-09	--	1.4E-09		--	1.7E-03	--	1.7E-03
		Exposure Point Total					1.4E-09					1.7E-03
	Exposure Medium Total						5.5E-06					1.0E+00
Medium Total							5.5E-06					1.0E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.7E-03
Central Nervous System	1.7E-03
Developmental	1.7E-03
Gastrointestinal	8.5E-02
Kidney	--
Lung	1.7E-03
Respiratory	--
Skin	9.5E-01
Maximum	9.5E-01

TABLE C7-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--	--	--	--	--	--
		Exposure Point Total										--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--	--	--	--	--	--
		Exposure Point Total					--				--	--
	Exposure Medium Total						--				--	--
Medium Total							--				--	--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C7-7.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	3.1E+02	mg/kg	1.6E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-04	1.5E-03	mg/kg-day	3.0E-04	mg/kg-day	5.1E+00
				Copper	2.3E+02	mg/kg	2.0E-04	mg/kg-day	--	--	--	1.9E-03	mg/kg-day	4.0E-02	mg/kg-day	4.8E-02
				Iron	3.8E+04	mg/kg	3.3E-02	mg/kg-day	--	--	--	3.2E-01	mg/kg-day	7.0E-01	mg/kg-day	4.6E-01
				Lead	1.9E+03	mg/kg	1.6E-03	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	--	--	--
			Exposure Route Total								2.3E-04					5.7E+00
			Dermal	Arsenic	3.1E+02	mg/kg	2.4E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.6E-05	2.1E-04	mg/kg-day	3.0E-04	mg/kg-day	6.9E-01
				Copper	2.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	1.9E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.6E-05					6.9E-01
		Exposure Point Total									2.7E-04					6.3E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	3.1E+02	mg/kg	4.7E-08	mg/m3	4.3E-03	(µg/m3)-1	2.0E-07	1.4E-07	mg/m3	1.5E-05	mg/m3	9.5E-03
				Copper	2.3E+02	mg/kg	3.6E-08	mg/m3	--	--	--	1.1E-07	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	5.9E-06	mg/m3	--	--	--	1.8E-05	mg/m3	--	--	--
				Lead	1.9E+03	mg/kg	3.0E-07	mg/m3	--	--	--	9.0E-07	mg/m3	--	--	--
			Exposure Route Total								2.0E-07					9.5E-03
		Exposure Point Total									2.0E-07					9.5E-03
	Exposure Medium Total										2.7E-04					6.4E+00
Medium Total											2.7E-04					6.4E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C7-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.3E-04	--	3.6E-05	2.7E-04	Skin	5.1E+00	--	6.9E-01	5.8E+00
			Copper	--	--	--	--	Gastrointestinal	4.8E-02	--	--	4.8E-02
			Iron	--	--	--	--	Gastrointestinal	4.6E-01	--	--	4.6E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	2.3E-04	--	3.6E-05	2.7E-04		5.7E+00	--	6.9E-01	6.3E+00
		Exposure Point Total					2.7E-04					6.3E+00
		Outdoor Air (Particulates)	Arsenic	--	2.0E-07	--	2.0E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	9.5E-03	--	9.5E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.0E-07	--	2.0E-07		--	9.5E-03	--	9.5E-03
		Exposure Point Total					2.0E-07					9.5E-03
	Exposure Medium Total						2.7E-04					6.4E+00
Medium Total							2.7E-04					6.4E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	9.5E-03
Central Nervous System	9.5E-03
Developmental	9.5E-03
Gastrointestinal	5.1E-01
Kidney	--
Lung	9.5E-03
Respiratory	--
Skin	**5.8E+00**
Maximum	**5.8E+00**

TABLE C7-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 6 - CONSOLATION MINE WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.3E-04	--	3.6E-05	2.7E-04	Skin	5.1E+00	--	6.9E-01	5.8E+00
			Chemical Total	2.3E-04	--	3.6E-05	2.7E-04		5.1E+00	--	6.9E-01	5.8E+00
		Exposure Point Total					2.7E-04					5.8E+00
		Outdoor Air (Particulates)	Arsenic	--	2.0E-07	--	2.0E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	9.5E-03	--	9.5E-03
			Chemical Total	--	2.0E-07	--	2.0E-07		--	9.5E-03	--	9.5E-03
		Exposure Point Total					2.0E-07					9.5E-03
	Exposure Medium Total						2.7E-04					5.8E+00
Medium Total							2.7E-04					5.8E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-7: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 6 - CONSOLATION MINE WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	5E-06	2E-06	1E-06	8E-06	0.05	0.02	0.09	0.1	0.1	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	3E-06	4E-06	3E-09	6E-06	0.03	0.03	0.0002	0.06	0.06	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-05	6E-06	7E-09	2E-05	0.3	0.07	0.0003	0.4	0.3	Arsenic	C	28/36	11.07 - 1,010	3.1E+02	2E-05	0.34	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	2E-06	2E-06	2E-09	4E-06	0.018	0.02	0.0001	0.04	0.04	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	5E-05	1E-05	5E-08	6E-05	0.4	0.1	0.002	0.5	0.4	Arsenic	C	28/36	11.07 - 1,010	3.1E+02	6E-05	0.4	--
												Lead	PbB	36/36	108.82 - 6,780	3.5E+03	--	--	14.4
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	5E-06	5E-07	1E-09	5E-06	0.9	0.1	0.002	1	1	Lead	PbB	36/36	108.82 - 6,780	3.5E+03	--	--	14.4
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-04	4E-05	2E-07	3E-04	6	0.7	0.009	6	6	Arsenic	C, NC	28/36	11.07 - 1,010	3.1E+02	3E-04	6	--
												Lead	PbB	36/36	108.82 - 6,780	3.5E+03	--	--	46.6

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C8-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.8E-06	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	1.6E-02
				Copper	5.8E+02	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.9E-05	mg/kg-day	4.0E-02	mg/kg-day	9.8E-04
				Iron	7.1E+04	mg/kg	1.2E-03	mg/kg-day	--	--	--	4.8E-03	mg/kg-day	7.0E-01	mg/kg-day	6.9E-03
				Lead	3.5E+03	mg/kg	6.1E-05	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	--	--	--
			Exposure Route Total								1.8E-06					2.4E-02
			Dermal	Arsenic	1.2E+02	mg/kg	4.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.6E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.7E-03
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								6.6E-07					5.7E-03
		Exposure Point Total									2.5E-06					2.9E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	1.2E-07	mg/m3	4.3E-03	(µg/m3)-1	5.3E-07	4.9E-07	mg/m3	1.5E-05	mg/m3	3.2E-02
				Copper	5.8E+02	mg/kg	6.2E-07	mg/m3	--	--	--	2.4E-06	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	7.7E-05	mg/m3	--	--	--	3.0E-04	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	3.7E-06	mg/m3	--	--	--	1.5E-05	mg/m3	--	--	--
			Exposure Route Total								5.3E-07					3.2E-02
		Exposure Point Total									5.3E-07					3.2E-02
	Exposure Medium Total										3.0E-06					6.2E-02
Medium Total											3.0E-06					6.2E-02

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C8-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 7 - MARY P.

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.8E-06	--	6.6E-07	2.5E-06	Skin	1.6E-02	--	5.7E-03	2.1E-02
			Copper	--	--	--	--	Gastrointestinal	9.8E-04	--	--	9.8E-04
			Iron	--	--	--	--	Gastrointestinal	6.9E-03	--	--	6.9E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.8E-06	--	6.6E-07	2.5E-06		2.4E-02	--	5.7E-03	2.9E-02
		Exposure Point Total					2.5E-06					2.9E-02
		Outdoor Air (Particulates)	Arsenic	--	5.3E-07	--	5.3E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.2E-02	--	3.2E-02
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.3E-07	--	5.3E-07		--	3.2E-02	--	3.2E-02
		Exposure Point Total					5.3E-07					3.2E-02
	Exposure Medium Total						3.0E-06					6.2E-02
Medium Total							3.0E-06					6.2E-02

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	3.2E-02
Central Nervous System	3.2E-02
Developmental	3.2E-02
Gastrointestinal	7.9E-03
Kidney	--
Lung	3.2E-02
Respiratory	--
Skin	5.4E-02
Maximum	5.4E-02

TABLE C8-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 7 - MARY P. MINE WASTE PILE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 7 - MARY P. MINE WASTE PILE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	7.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-06	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	9.5E-03
				Copper	5.8E+02	mg/kg	6.1E-06	mg/kg-day	--	--	--	2.4E-05	mg/kg-day	4.0E-02	mg/kg-day	6.0E-04
				Iron	7.1E+04	mg/kg	7.5E-04	mg/kg-day	--	--	--	2.9E-03	mg/kg-day	7.0E-01	mg/kg-day	4.2E-03
				Lead	3.5E+03	mg/kg	3.7E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	--	--	--
			Exposure Route Total								1.1E-06					1.4E-02
			Dermal	Arsenic	1.2E+02	mg/kg	8.8E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-06	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1.1E-02
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.3E-06					1.1E-02
		Exposure Point Total									2.4E-06					2.6E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	2.4E-10	mg/m3	4.3E-03	(µg/m3)-1	1.0E-09	9.3E-10	mg/m3	1.5E-05	mg/m3	6.2E-05
				Copper	5.8E+02	mg/kg	1.2E-09	mg/m3	--	--	--	4.7E-09	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	1.5E-07	mg/m3	--	--	--	5.7E-07	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	7.2E-09	mg/m3	--	--	--	2.8E-08	mg/m3	--	--	--
			Exposure Route Total								1.0E-09					6.2E-05
		Exposure Point Total									1.0E-09					6.2E-05
	Exposure Medium Total										2.4E-06					2.6E-02
Medium Total											2.4E-06					2.6E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C8-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.1E-06	--	1.3E-06	2.4E-06	Skin	9.5E-03	--	1.1E-02	2.1E-02
			Copper	--	--	--	--	Gastrointestinal	6.0E-04	--	--	6.0E-04
			Iron	--	--	--	--	Gastrointestinal	4.2E-03	--	--	4.2E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.1E-06	--	1.3E-06	2.4E-06		1.4E-02	--	1.1E-02	2.6E-02
		Exposure Point Total					2.4E-06					2.6E-02
		Outdoor Air (Particulates)	Arsenic	--	1.0E-09	--	1.0E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.2E-05	--	6.2E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.0E-09	--	1.0E-09		--	6.2E-05	--	6.2E-05
		Exposure Point Total					1.0E-09					6.2E-05
	Exposure Medium Total						2.4E-06					2.6E-02
Medium Total							2.4E-06					2.6E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	6.2E-05
Central Nervous System	6.2E-05
Developmental	6.2E-05
Gastrointestinal	4.8E-03
Kidney	--
Lung	6.2E-05
Respiratory	--
Skin	2.1E-02
Maximum	2.1E-02

TABLE C8-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 7 - MARY P. MINE WASTE PILE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	4.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.1E-06	3.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1.0E-01
				Copper	5.8E+02	mg/kg	4.0E-05	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	4.0E-02	mg/kg-day	6.4E-03
				Iron	7.1E+04	mg/kg	4.9E-03	mg/kg-day	--	--	--	3.1E-02	mg/kg-day	7.0E-01	mg/kg-day	4.5E-02
				Lead	3.5E+03	mg/kg	2.4E-04	mg/kg-day	--	--	--	1.5E-03	mg/kg-day	--	--	--
			Exposure Route Total								7.1E-06					1.5E-01
			Dermal	Arsenic	1.2E+02	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-06	8.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2.7E-02
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.3E-06					2.7E-02
		Exposure Point Total									9.4E-06					1.8E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	6.2E-10	mg/m3	4.3E-03	(µg/m3)-1	2.7E-09	1.9E-09	mg/m3	1.5E-05	mg/m3	1.2E-04
				Copper	5.8E+02	mg/kg	3.1E-09	mg/m3	--	--	--	9.3E-09	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	3.8E-07	mg/m3	--	--	--	1.1E-06	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	1.9E-08	mg/m3	--	--	--	5.6E-08	mg/m3	--	--	--
			Exposure Route Total								2.7E-09					1.2E-04
		Exposure Point Total									2.7E-09					1.2E-04
	Exposure Medium Total										9.4E-06					1.8E-01
Medium Total											9.4E-06					1.8E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C8-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	7.1E-06	--	2.3E-06	9.4E-06	Skin	1.0E-01	--	2.7E-02	1.3E-01
			Copper	--	--	--	--	Gastrointestinal	6.4E-03	--	--	6.4E-03
			Iron	--	--	--	--	Gastrointestinal	4.5E-02	--	--	4.5E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	7.1E-06	--	2.3E-06	9.4E-06		1.5E-01	--	2.7E-02	1.8E-01
		Exposure Point Total					9.4E-06					1.8E-01
		Outdoor Air (Particulates)	Arsenic	--	2.7E-09	--	2.7E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.2E-04	--	1.2E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.7E-09	--	2.7E-09		--	1.2E-04	--	1.2E-04
		Exposure Point Total					2.7E-09					1.2E-04
	Exposure Medium Total						9.4E-06					1.8E-01
Medium Total							9.4E-06					1.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.2E-04
Central Nervous System	1.2E-04
Developmental	1.2E-04
Gastrointestinal	5.1E-02
Kidney	--
Lung	1.2E-04
Respiratory	--
Skin	1.3E-01
Maximum	1.3E-01

TABLE C8-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 7 - MARY P. MINE WASTE PILE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	4.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.3E-07	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	6.3E-03
				Copper	5.8E+02	mg/kg	4.1E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	4.0E-02	mg/kg-day	4.0E-04
				Iron	7.1E+04	mg/kg	5.0E-04	mg/kg-day	--	--	--	1.9E-03	mg/kg-day	7.0E-01	mg/kg-day	2.8E-03
				Lead	3.5E+03	mg/kg	2.4E-05	mg/kg-day	--	--	--	9.5E-05	mg/kg-day	--	--	--
			Exposure Route Total								7.3E-07					9.5E-03
			Dermal	Arsenic	1.2E+02	mg/kg	5.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.8E-07	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	7.6E-03
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								8.8E-07					7.6E-03
		Exposure Point Total									1.6E-06					1.7E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	1.6E-10	mg/m3	4.3E-03	(µg/m3)-1	6.8E-10	6.2E-10	mg/m3	1.5E-05	mg/m3	4.1E-05
				Copper	5.8E+02	mg/kg	8.0E-10	mg/m3	--	--	--	3.1E-09	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	9.8E-08	mg/m3	--	--	--	3.8E-07	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	4.8E-09	mg/m3	--	--	--	1.9E-08	mg/m3	--	--	--
			Exposure Route Total								6.8E-10					4.1E-05
		Exposure Point Total									6.8E-10					4.1E-05
	Exposure Medium Total										1.6E-06					1.7E-02
Medium Total											1.6E-06					1.7E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C8-4.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 7 - MARY P. MINE WASTE PILE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	7.3E-07	--	8.8E-07	1.6E-06	Skin	6.3E-03	--	7.6E-03	1.4E-02
			Copper	--	--	--	--	Gastrointestinal	4.0E-04	--	--	4.0E-04
			Iron	--	--	--	--	Gastrointestinal	2.8E-03	--	--	2.8E-03
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	7.3E-07	--	8.8E-07	1.6E-06		9.5E-03	--	7.6E-03	1.7E-02
		Exposure Point Total					1.6E-06					1.7E-02
		Outdoor Air (Particulates)	Arsenic	--	6.8E-10	--	6.8E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.1E-05	--	4.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	6.8E-10	--	6.8E-10		--	4.1E-05	--	4.1E-05
		Exposure Point Total					6.8E-10					4.1E-05
	Exposure Medium Total						1.6E-06					1.7E-02
Medium Total							1.6E-06					1.7E-02

Notes:
-- Not available or not applicable
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	4.1E-05
Central Nervous System	4.1E-05
Developmental	4.1E-05
Gastrointestinal	3.2E-03
Kidney	--
Lung	4.1E-05
Respiratory	--
Skin	1.4E-02
Maximum	1.4E-02

TABLE C8-4.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-05	3.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1.3E-01
				Copper	5.8E+02	mg/kg	1.0E-04	mg/kg-day	--	--	--	3.3E-04	mg/kg-day	4.0E-02	mg/kg-day	8.2E-03
				Iron	7.1E+04	mg/kg	1.3E-02	mg/kg-day	--	--	--	4.0E-02	mg/kg-day	7.0E-01	mg/kg-day	5.7E-02
				Lead	3.5E+03	mg/kg	6.3E-04	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	--	--	--
			Exposure Route Total								1.9E-05					2.0E-01
			Dermal	Arsenic	1.2E+02	mg/kg	2.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.9E-06	8.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2.7E-02
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								3.9E-06					2.7E-02
		Exposure Point Total									2.3E-05					2.2E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+02	mg/kg	4.1E-09	mg/m3	4.3E-03	(µg/m3)-1	1.8E-08	1.3E-08	mg/m3	1.5E-05	mg/m3	8.5E-04
				Copper	5.8E+02	mg/kg	2.1E-08	mg/m3	--	--	--	6.4E-08	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	2.5E-06	mg/m3	--	--	--	7.9E-06	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	1.2E-07	mg/m3	--	--	--	3.9E-07	mg/m3	--	--	--
			Exposure Route Total								1.8E-08					8.5E-04
		Exposure Point Total									1.8E-08					8.5E-04
	Exposure Medium Total										2.3E-05					2.2E-01
Medium Total											2.3E-05					2.2E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C8-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-05	--	3.9E-06	2.3E-05	Skin	1.3E-01	--	2.7E-02	1.6E-01
			Copper	--	--	--	--	Gastrointestinal	8.2E-03	--	--	8.2E-03
			Iron	--	--	--	--	Gastrointestinal	5.7E-02	--	--	5.7E-02
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.9E-05	--	3.9E-06	2.3E-05		2.0E-01	--	2.7E-02	2.2E-01
		Exposure Point Total					2.3E-05					2.2E-01
		Outdoor Air (Particulates)	Arsenic	--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	8.5E-04	--	8.5E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.8E-08	--	1.8E-08		--	8.5E-04	--	8.5E-04
		Exposure Point Total					1.8E-08					8.5E-04
	Exposure Medium Total						2.3E-05					2.2E-01
Medium Total							2.3E-05					2.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	8.5E-04
Central Nervous System	8.5E-04
Developmental	8.5E-04
Gastrointestinal	6.6E-02
Kidney	--
Lung	8.5E-04
Respiratory	--
Skin	1.6E-01
Maximum	1.6E-01

TABLE C8-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-05	--	3.9E-06	2.3E-05	Skin	1.3E-01	--	2.7E-02	1.6E-01
			Chemical Total	1.9E-05	--	3.9E-06	2.3E-05		1.3E-01	--	2.7E-02	1.6E-01
		Exposure Point Total					2.3E-05					1.6E-01
		Outdoor Air (Particulates)	Arsenic	--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	8.5E-04	--	8.5E-04
			Chemical Total	--	1.8E-08	--	1.8E-08		--	8.5E-04	--	8.5E-04
		Exposure Point Total					1.8E-08					8.5E-04
	Exposure Medium Total						2.3E-05					1.6E-01
Medium Total							2.3E-05					1.6E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-06	9.7E-05	mg/kg-day	3.0E-04	mg/kg-day	3.2E-01
				Copper	5.8E+02	mg/kg	1.0E-05	mg/kg-day	--	--	--	8.1E-04	mg/kg-day	4.0E-02	mg/kg-day	2.0E-02
				Iron	7.1E+04	mg/kg	1.3E-03	mg/kg-day	--	--	--	1.0E-01	mg/kg-day	7.0E-01	mg/kg-day	1.4E-01
				Lead	3.5E+03	mg/kg	6.3E-05	mg/kg-day	--	--	--	4.9E-03	mg/kg-day	--	--	--
			Exposure Route Total								1.9E-06					4.9E-01
			Dermal	Arsenic	1.2E+02	mg/kg	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.0E-07	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.5E-02
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								2.0E-07					3.5E-02
		Exposure Point Total									2.1E-06					5.2E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	1.2E-10	mg/m3	4.3E-03	(µg/m3)-1	5.3E-10	9.6E-09	mg/m3	1.5E-05	mg/m3	6.4E-04
				Copper	5.8E+02	mg/kg	6.2E-10	mg/m3	--	--	--	4.8E-08	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	7.6E-08	mg/m3	--	--	--	5.9E-06	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	3.7E-09	mg/m3	--	--	--	2.9E-07	mg/m3	--	--	--
			Exposure Route Total								5.3E-10					6.4E-04
		Exposure Point Total									5.3E-10					6.4E-04
	Exposure Medium Total										2.1E-06					5.2E-01
Medium Total											2.1E-06					5.2E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C8-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.9E-06	--	2.0E-07	2.1E-06	Skin	3.2E-01	--	3.5E-02	3.6E-01
			Copper	--	--	--	--	Gastrointestinal	2.0E-02	--	--	2.0E-02
			Iron	--	--	--	--	Gastrointestinal	1.4E-01	--	--	1.4E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	1.9E-06	--	2.0E-07	2.1E-06		4.9E-01	--	3.5E-02	5.2E-01
		Exposure Point Total					2.1E-06					5.2E-01
		Outdoor Air (Particulates)	Arsenic	--	5.3E-10	--	5.3E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.4E-04	--	6.4E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.3E-10	--	5.3E-10		--	6.4E-04	--	6.4E-04
		Exposure Point Total					5.3E-10					6.4E-04
	Exposure Medium Total						2.1E-06					5.2E-01
Medium Total							2.1E-06					5.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	6.4E-04
Central Nervous System	6.4E-04
Developmental	6.4E-04
Gastrointestinal	1.6E-01
Kidney	--
Lung	6.4E-04
Respiratory	--
Skin	3.6E-01
Maximum	3.6E-01

TABLE C8-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C8-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.2E+02	mg/kg	5.9E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.8E-05	5.8E-04	mg/kg-day	3.0E-04	mg/kg-day	1.9E+00
				Copper	5.8E+02	mg/kg	4.9E-04	mg/kg-day	--	--	--	4.9E-03	mg/kg-day	4.0E-02	mg/kg-day	1.2E-01
				Iron	7.1E+04	mg/kg	6.0E-02	mg/kg-day	--	--	--	6.0E-01	mg/kg-day	7.0E-01	mg/kg-day	8.5E-01
				Lead	3.5E+03	mg/kg	3.0E-03	mg/kg-day	--	--	--	2.9E-02	mg/kg-day	--	--	--
			Exposure Route Total								8.8E-05					2.9E+00
			Dermal	Arsenic	1.2E+02	mg/kg	9.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-05	7.8E-05	mg/kg-day	3.0E-04	mg/kg-day	2.6E-01
				Copper	5.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	7.1E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
			Exposure Route Total								1.3E-05					2.6E-01
		Exposure Point Total									1.0E-04					3.2E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.2E+02	mg/kg	1.8E-08	mg/m3	4.3E-03	(µg/m3)-1	7.7E-08	5.4E-08	mg/m3	1.5E-05	mg/m3	3.6E-03
				Copper	5.8E+02	mg/kg	8.9E-08	mg/m3	--	--	--	2.7E-07	mg/m3	--	--	--
				Iron	7.1E+04	mg/kg	1.1E-05	mg/m3	--	--	--	3.3E-05	mg/m3	--	--	--
				Lead	3.5E+03	mg/kg	5.4E-07	mg/m3	--	--	--	1.6E-06	mg/m3	--	--	--
			Exposure Route Total								7.7E-08					3.6E-03
		Exposure Point Total									7.7E-08					3.6E-03
	Exposure Medium Total										1.0E-04					3.2E+00
Medium Total											1.0E-04					3.2E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C8-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	8.8E-05	--	1.3E-05	1.0E-04	Skin	1.9E+00	--	2.6E-01	2.2E+00
			Copper	--	--	--	--	Gastrointestinal	1.2E-01	--	--	1.2E-01
			Iron	--	--	--	--	Gastrointestinal	8.5E-01	--	--	8.5E-01
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	8.8E-05	--	1.3E-05	1.0E-04		2.9E+00	--	2.6E-01	3.2E+00
		Exposure Point Total					1.0E-04					3.2E+00
		Outdoor Air (Particulates)	Arsenic	--	7.7E-08	--	7.7E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.6E-03	--	3.6E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Chemical Total	--	7.7E-08	--	7.7E-08		--	3.6E-03	--	3.6E-03
		Exposure Point Total					7.7E-08					3.6E-03
	Exposure Medium Total						1.0E-04					3.2E+00
Medium Total							1.0E-04					3.2E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	3.6E-03
Central Nervous System	3.6E-03
Developmental	3.6E-03
Gastrointestinal	9.8E-01
Kidney	--
Lung	3.6E-03
Respiratory	--
Skin	**2.2E+00**
Maximum	**2.2E+00**

TABLE C8-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	8.8E-05	--	1.3E-05	1.0E-04	Skin	1.9E+00	--	2.6E-01	2.2E+00
			Chemical Total	8.8E-05	--	1.3E-05	1.0E-04		1.9E+00	--	2.6E-01	2.2E+00
		Exposure Point Total					1.0E-04					2.2E+00
		Outdoor Air (Particulates)	Arsenic	--	7.7E-08	--	7.7E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.6E-03	--	3.6E-03
			Chemical Total	--	7.7E-08	--	7.7E-08		--	3.6E-03	--	3.6E-03
		Exposure Point Total					7.7E-08					3.6E-03
	Exposure Medium Total						1.0E-04					2.2E+00
Medium Total							1.0E-04					2.2E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-8: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 7 - MARY P. MINE WASTE PILE

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	7E-07	5E-07	3E-06	0.02	0.006	0.03	0.06	0.05	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	1E-06	1E-09	2E-06	0.014	0.01	0.00006	0.03	0.02	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	7E-06	2E-06	3E-09	9E-06	0.2	0.03	0.0001	0.2	0.1	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	7E-07	9E-07	7E-10	2E-06	0.010	0.008	0.00004	0.02	0.01	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	4E-06	2E-08	2E-05	0.2	0.03	0.0009	0.2	0.2	Arsenic	C	5/8	26.53 - 116	1.2E+02	2E-05	0.2	--
												Lead	PbB	8/8	123.42 - 3,480	2.4E+03	--	--	10.7
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	5E-10	2E-06	0.5	0.04	0.0006	0.5	0.4	Lead	PbB	8/8	123.42 - 3,480	2.4E+03	--	--	10.7
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	9E-05	1E-05	8E-08	1E-04	3	0.3	0.004	3	2	Arsenic	C, NC	5/8	26.53 - 116	1.2E+02	1E-04	2	--
												Lead	PbB	8/8	123.42 - 3,480	2.4E+03	--	--	36.6

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C9-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	2.4E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.7E-06	9.5E-06	mg/kg-day	3.0E-04	mg/kg-day	3.2E-02
				Cadmium	1.1E+01	mg/kg	1.8E-07	mg/kg-day	--	--	--	7.2E-07	mg/kg-day	5.0E-04	mg/kg-day	1.4E-03
				Copper	1.0E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	6.8E-05	mg/kg-day	4.0E-02	mg/kg-day	1.7E-03
				Iron	3.4E+04	mg/kg	5.9E-04	mg/kg-day	--	--	--	2.3E-03	mg/kg-day	7.0E-01	mg/kg-day	3.3E-03
				Lead	5.2E+03	mg/kg	9.0E-05	mg/kg-day	--	--	--	3.5E-04	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	4.3E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	2.4E-02	mg/kg-day	7.0E-03
				Zinc	1.4E+03	mg/kg	2.4E-05	mg/kg-day	--	--	--	9.4E-05	mg/kg-day	3.0E-01	mg/kg-day	3.1E-04
			Exposure Route Total								3.7E-06					4.6E-02
			Dermal	Arsenic	2.3E+02	mg/kg	8.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-06	3.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1.2E-02
				Cadmium	1.1E+01	mg/kg	1.3E-09	mg/kg-day	--	--	--	5.3E-09	mg/kg-day	5.0E-04	mg/kg-day	1.1E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.3E-06					1.2E-02
		Exposure Point Total									5.0E-06					5.7E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	2.5E-07	mg/m3	4.3E-03	(µg/m3)-1	1.1E-06	9.8E-07	mg/m3	1.5E-05	mg/m3	6.5E-02
				Cadmium	1.1E+01	mg/kg	1.1E-08	mg/m3	1.8E-03	(µg/m3)-1	2.1E-08	4.4E-08	mg/m3	2.0E-05	mg/m3	2.2E-03
				Copper	1.0E+03	mg/kg	1.1E-06	mg/m3	--	--	--	4.2E-06	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	3.7E-05	mg/m3	--	--	--	1.4E-04	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	5.6E-06	mg/m3	--	--	--	2.2E-05	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	2.7E-06	mg/m3	--	--	--	1.0E-05	mg/m3	5.0E-05	mg/m3	2.1E-01
				Zinc	1.4E+03	mg/kg	1.5E-06	mg/m3	--	--	--	5.8E-06	mg/m3	--	--	--
			Exposure Route Total								1.1E-06					2.8E-01
		Exposure Point Total									1.1E-06					2.8E-01
	Exposure Medium Total										6.1E-06					3.3E-01
Medium Total											6.1E-06					3.3E-01

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C9-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 8 - MIKE HORSE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.7E-06	--	1.3E-06	5.0E-06	Skin	3.2E-02	--	1.2E-02	4.3E-02
			Cadmium	--	--	--	--	Kidney	1.4E-03	--	1.1E-05	1.4E-03
			Copper	--	--	--	--	Gastrointestinal	1.7E-03	--	--	1.7E-03
			Iron	--	--	--	--	Gastrointestinal	3.3E-03	--	--	3.3E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	7.0E-03	--	--	7.0E-03
			Zinc	--	--	--	--	Blood	3.1E-04	--	--	3.1E-04
			Chemical Total	3.7E-06	--	1.3E-06	5.0E-06		4.6E-02	--	1.2E-02	5.7E-02
		Exposure Point Total					5.0E-06					5.7E-02
		Outdoor Air (Particulates)	Arsenic	--	1.1E-06	--	1.1E-06	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.5E-02	--	6.5E-02
			Cadmium	--	2.1E-08	--	2.1E-08	Kidney, Respiratory	--	2.2E-03	--	2.2E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.1E-01	--	2.1E-01
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.1E-06	--	1.1E-06		--	2.8E-01	--	2.8E-01
		Exposure Point Total					1.1E-06					2.8E-01
	Exposure Medium Total						6.1E-06					3.3E-01
Medium Total							6.1E-06					3.3E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	3.1E-04
Cardiovascular	6.5E-02
Central Nervous System	2.8E-01
Developmental	6.5E-02
Gastrointestinal	5.0E-03
Kidney	3.7E-03
Lung	6.5E-02
Respiratory	2.2E-03
Skin	1.1E-01
Maximum	2.8E-01

TABLE C9-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.2E-06	5.8E-06	mg/kg-day	3.0E-04	mg/kg-day	1.9E-02
				Cadmium	1.1E+01	mg/kg	1.1E-07	mg/kg-day	--	--	--	4.4E-07	mg/kg-day	5.0E-04	mg/kg-day	8.7E-04
				Copper	1.0E+03	mg/kg	1.1E-05	mg/kg-day	--	--	--	4.2E-05	mg/kg-day	4.0E-02	mg/kg-day	1.0E-03
				Iron	3.4E+04	mg/kg	3.6E-04	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	7.0E-01	mg/kg-day	2.0E-03
				Lead	5.2E+03	mg/kg	5.5E-05	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	2.4E-02	mg/kg-day	4.3E-03
				Zinc	1.4E+03	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.7E-05	mg/kg-day	3.0E-01	mg/kg-day	1.9E-04
			Exposure Route Total								2.2E-06					2.8E-02
			Dermal	Arsenic	2.3E+02	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.7E-06	7.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Cadmium	1.1E+01	mg/kg	2.7E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	5.0E-04	mg/kg-day	2.1E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.7E-06					2.3E-02
		Exposure Point Total									4.9E-06					5.1E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	4.8E-10	mg/m3	4.3E-03	(µg/m3)-1	2.1E-09	1.9E-09	mg/m3	1.5E-05	mg/m3	1.3E-04
				Cadmium	1.1E+01	mg/kg	2.2E-11	mg/m3	1.8E-03	(µg/m3)-1	3.9E-11	8.5E-11	mg/m3	2.0E-05	mg/m3	4.3E-06
				Copper	1.0E+03	mg/kg	2.1E-09	mg/m3	--	--	--	8.1E-09	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	7.0E-08	mg/m3	--	--	--	2.7E-07	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	1.1E-08	mg/m3	--	--	--	4.2E-08	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	5.2E-09	mg/m3	--	--	--	2.0E-08	mg/m3	5.0E-05	mg/m3	4.0E-04
				Zinc	1.4E+03	mg/kg	2.9E-09	mg/m3	--	--	--	1.1E-08	mg/m3	--	--	--
			Exposure Route Total								2.1E-09					5.3E-04
		Exposure Point Total									2.1E-09					5.3E-04
	Exposure Medium Total										4.9E-06					5.1E-02
Medium Total											4.9E-06					5.1E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C9-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.2E-06	--	2.7E-06	4.9E-06	Skin	1.9E-02	--	2.3E-02	4.2E-02
			Cadmium	--	--	--	--	Kidney	8.7E-04	--	2.1E-05	8.9E-04
			Copper	--	--	--	--	Gastrointestinal	1.0E-03	--	--	1.0E-03
			Iron	--	--	--	--	Gastrointestinal	2.0E-03	--	--	2.0E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.3E-03	--	--	4.3E-03
			Zinc	--	--	--	--	Blood	1.9E-04	--	--	1.9E-04
			Chemical Total	2.2E-06	--	2.7E-06	4.9E-06		2.8E-02	--	2.3E-02	5.1E-02
		Exposure Point Total					4.9E-06					5.1E-02
		Outdoor Air (Particulates)	Arsenic	--	2.1E-09	--	2.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.3E-04	--	1.3E-04
			Cadmium	--	3.9E-11	--	3.9E-11	Kidney, Respiratory	--	4.3E-06	--	4.3E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	4.0E-04	--	4.0E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.1E-09	--	2.1E-09		--	5.3E-04	--	5.3E-04
		Exposure Point Total					2.1E-09					5.3E-04
	Exposure Medium Total						4.9E-06					5.1E-02
Medium Total							4.9E-06					5.1E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.9E-04
Cardiovascular	1.3E-04
Central Nervous System	4.8E-03
Developmental	1.3E-04
Gastrointestinal	3.0E-03
Kidney	9.0E-04
Lung	1.3E-04
Respiratory	4.3E-06
Skin	4.3E-02
Maximum	4.3E-02

TABLE C9-2.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-3.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	9.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.4E-05	6.2E-05	mg/kg-day	3.0E-04	mg/kg-day	2.1E-01
				Cadmium	1.1E+01	mg/kg	7.3E-07	mg/kg-day	--	--	--	4.6E-06	mg/kg-day	5.0E-04	mg/kg-day	9.3E-03
				Copper	1.0E+03	mg/kg	6.9E-05	mg/kg-day	--	--	--	4.4E-04	mg/kg-day	4.0E-02	mg/kg-day	1.1E-02
				Iron	3.4E+04	mg/kg	2.3E-03	mg/kg-day	--	--	--	1.5E-02	mg/kg-day	7.0E-01	mg/kg-day	2.1E-02
				Lead	5.2E+03	mg/kg	3.5E-04	mg/kg-day	--	--	--	2.3E-03	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	1.7E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	2.4E-02	mg/kg-day	4.6E-02
				Zinc	1.4E+03	mg/kg	9.5E-05	mg/kg-day	--	--	--	6.1E-04	mg/kg-day	3.0E-01	mg/kg-day	2.0E-03
			Exposure Route Total								1.4E-05					2.9E-01
			Dermal	Arsenic	2.3E+02	mg/kg	3.1E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.6E-06	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.5E-02
				Cadmium	1.1E+01	mg/kg	4.6E-09	mg/kg-day	--	--	--	2.5E-08	mg/kg-day	5.0E-04	mg/kg-day	5.0E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								4.6E-06					5.5E-02
		Exposure Point Total									1.9E-05					3.5E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	1.3E-09	mg/m3	4.3E-03	(µg/m3)-1	5.4E-09	3.8E-09	mg/m3	1.5E-05	mg/m3	2.5E-04
				Cadmium	1.1E+01	mg/kg	5.7E-11	mg/m3	1.8E-03	(µg/m3)-1	1.0E-10	1.7E-10	mg/m3	2.0E-05	mg/m3	8.5E-06
				Copper	1.0E+03	mg/kg	5.4E-09	mg/m3	--	--	--	1.6E-08	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	1.8E-07	mg/m3	--	--	--	5.5E-07	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	2.8E-08	mg/m3	--	--	--	8.3E-08	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	1.3E-08	mg/m3	--	--	--	4.0E-08	mg/m3	5.0E-05	mg/m3	8.0E-04
				Zinc	1.4E+03	mg/kg	7.5E-09	mg/m3	--	--	--	2.2E-08	mg/m3	--	--	--
			Exposure Route Total								5.5E-09					1.1E-03
		Exposure Point Total									5.5E-09					1.1E-03
	Exposure Medium Total										1.9E-05					3.5E-01
Medium Total											1.9E-05					3.5E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C9-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.4E-05	--	4.6E-06	1.9E-05	Skin	2.1E-01	--	5.5E-02	2.6E-01
			Cadmium	--	--	--	--	Kidney	9.3E-03	--	5.0E-05	9.3E-03
			Copper	--	--	--	--	Gastrointestinal	1.1E-02	--	--	1.1E-02
			Iron	--	--	--	--	Gastrointestinal	2.1E-02	--	--	2.1E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.6E-02	--	--	4.6E-02
			Zinc	--	--	--	--	Blood	2.0E-03	--	--	2.0E-03
			Chemical Total	1.4E-05	--	4.6E-06	1.9E-05		2.9E-01	--	5.5E-02	3.5E-01
		Exposure Point Total					1.9E-05					3.5E-01
		Outdoor Air (Particulates)	Arsenic	--	5.4E-09	--	5.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.5E-04	--	2.5E-04
			Cadmium	--	1.0E-10	--	1.0E-10	Kidney, Respiratory	--	8.5E-06	--	8.5E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	8.0E-04	--	8.0E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.5E-09	--	5.5E-09		--	1.1E-03	--	1.1E-03
		Exposure Point Total					5.5E-09					1.1E-03
	Exposure Medium Total						1.9E-05					3.5E-01
Medium Total							1.9E-05					3.5E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	2.0E-03
Cardiovascular	2.5E-04
Central Nervous System	4.7E-02
Developmental	2.5E-04
Gastrointestinal	3.2E-02
Kidney	9.4E-03
Lung	2.5E-04
Respiratory	8.5E-06
Skin	2.6E-01
Maximum	2.6E-01

TABLE C9-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.4E-05	--	4.6E-06	1.9E-05	Skin	2.1E-01	--	5.5E-02	2.6E-01
			Chemical Total	1.4E-05	--	4.6E-06	1.9E-05		2.1E-01	--	5.5E-02	2.6E-01
		Exposure Point Total					1.9E-05					2.6E-01
		Outdoor Air (Particulates)	Arsenic	--	5.4E-09	--	5.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.5E-04	--	2.5E-04
			Chemical Total	--	5.4E-09	--	5.4E-09		--	2.5E-04	--	2.5E-04
		Exposure Point Total					5.4E-09					2.5E-04
	Exposure Medium Total						1.9E-05					2.6E-01
Medium Total							1.9E-05					2.6E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	9.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.5E-06	3.8E-06	mg/kg-day	3.0E-04	mg/kg-day	1.3E-02
				Cadmium	1.1E+01	mg/kg	7.4E-08	mg/kg-day	--	--	--	2.9E-07	mg/kg-day	5.0E-04	mg/kg-day	5.8E-04
				Copper	1.0E+03	mg/kg	7.1E-06	mg/kg-day	--	--	--	2.8E-05	mg/kg-day	4.0E-02	mg/kg-day	6.9E-04
				Iron	3.4E+04	mg/kg	2.4E-04	mg/kg-day	--	--	--	9.3E-04	mg/kg-day	7.0E-01	mg/kg-day	1.3E-03
				Lead	5.2E+03	mg/kg	3.6E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	6.8E-05	mg/kg-day	2.4E-02	mg/kg-day	2.8E-03
				Zinc	1.4E+03	mg/kg	9.8E-06	mg/kg-day	--	--	--	3.8E-05	mg/kg-day	3.0E-01	mg/kg-day	1.3E-04
			Exposure Route Total								1.5E-06					1.8E-02
			Dermal	Arsenic	2.3E+02	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.8E-06	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	1.5E-02
				Cadmium	1.1E+01	mg/kg	1.8E-09	mg/kg-day	--	--	--	7.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.8E-06					1.5E-02
		Exposure Point Total									3.3E-06					3.4E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	3.2E-10	mg/m3	4.3E-03	(µg/m3)-1	1.4E-09	1.3E-09	mg/m3	1.5E-05	mg/m3	8.4E-05
				Cadmium	1.1E+01	mg/kg	1.5E-11	mg/m3	1.8E-03	(µg/m3)-1	2.6E-11	5.7E-11	mg/m3	2.0E-05	mg/m3	2.8E-06
				Copper	1.0E+03	mg/kg	1.4E-09	mg/m3	--	--	--	5.4E-09	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	4.7E-08	mg/m3	--	--	--	1.8E-07	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	7.1E-09	mg/m3	--	--	--	2.8E-08	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	3.4E-09	mg/m3	--	--	--	1.3E-08	mg/m3	5.0E-05	mg/m3	2.7E-04
				Zinc	1.4E+03	mg/kg	1.9E-09	mg/m3	--	--	--	7.5E-09	mg/m3	--	--	--
			Exposure Route Total								1.4E-09					3.5E-04
		Exposure Point Total									1.4E-09					3.5E-04
	Exposure Medium Total										3.3E-06					3.4E-02
Medium Total											3.3E-06					3.4E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C9-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.5E-06	--	1.8E-06	3.3E-06	Skin	1.3E-02	--	1.5E-02	2.8E-02
			Cadmium	--	--	--	--	Kidney	5.8E-04	--	1.4E-05	5.9E-04
			Copper	--	--	--	--	Gastrointestinal	6.9E-04	--	--	6.9E-04
			Iron	--	--	--	--	Gastrointestinal	1.3E-03	--	--	1.3E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	2.8E-03	--	--	2.8E-03
			Zinc	--	--	--	--	Blood	1.3E-04	--	--	1.3E-04
			Chemical Total	1.5E-06	--	1.8E-06	3.3E-06		1.8E-02	--	1.5E-02	3.4E-02
		Exposure Point Total					3.3E-06					3.4E-02
		Outdoor Air (Particulates)	Arsenic	--	1.4E-09	--	1.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	8.4E-05	--	8.4E-05
			Cadmium	--	2.6E-11	--	2.6E-11	Kidney, Respiratory	--	2.8E-06	--	2.8E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.7E-04	--	2.7E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.4E-09	--	1.4E-09		--	3.5E-04	--	3.5E-04
		Exposure Point Total					1.4E-09					3.5E-04
	Exposure Medium Total						3.3E-06					3.4E-02
Medium Total							3.3E-06					3.4E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.3E-04
Cardiovascular	8.4E-05
Central Nervous System	3.2E-03
Developmental	8.4E-05
Gastrointestinal	2.0E-03
Kidney	6.0E-04
Lung	8.4E-05
Respiratory	2.8E-06
Skin	2.8E-02
Maximum	2.8E-02

TABLE C9-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	2.5E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.8E-05	7.9E-05	mg/kg-day	3.0E-04	mg/kg-day	2.6E-01
				Cadmium	1.1E+01	mg/kg	1.9E-06	mg/kg-day	--	--	--	6.0E-06	mg/kg-day	5.0E-04	mg/kg-day	1.2E-02
				Copper	1.0E+03	mg/kg	1.8E-04	mg/kg-day	--	--	--	5.7E-04	mg/kg-day	4.0E-02	mg/kg-day	1.4E-02
				Iron	3.4E+04	mg/kg	6.2E-03	mg/kg-day	--	--	--	1.9E-02	mg/kg-day	7.0E-01	mg/kg-day	2.7E-02
				Lead	5.2E+03	mg/kg	9.4E-04	mg/kg-day	--	--	--	2.9E-03	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	4.5E-04	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	2.4E-02	mg/kg-day	5.9E-02
				Zinc	1.4E+03	mg/kg	2.5E-04	mg/kg-day	--	--	--	7.9E-04	mg/kg-day	3.0E-01	mg/kg-day	2.6E-03
			Exposure Route Total								3.8E-05					3.8E-01
			Dermal	Arsenic	2.3E+02	mg/kg	5.3E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.9E-06	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.5E-02
				Cadmium	1.1E+01	mg/kg	8.0E-09	mg/kg-day	--	--	--	2.5E-08	mg/kg-day	5.0E-04	mg/kg-day	5.0E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								7.9E-06					5.5E-02
		Exposure Point Total									4.6E-05					4.3E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	2.3E+02	mg/kg	8.3E-09	mg/m3	4.3E-03	(µg/m3)-1	3.6E-08	2.6E-08	mg/m3	1.5E-05	mg/m3	1.7E-03
				Cadmium	1.1E+01	mg/kg	3.8E-10	mg/m3	1.8E-03	(µg/m3)-1	6.8E-10	1.2E-09	mg/m3	2.0E-05	mg/m3	5.9E-05
				Copper	1.0E+03	mg/kg	3.6E-08	mg/m3	--	--	--	1.1E-07	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	1.2E-06	mg/m3	--	--	--	3.8E-06	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	1.8E-07	mg/m3	--	--	--	5.7E-07	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	8.9E-08	mg/m3	--	--	--	2.8E-07	mg/m3	5.0E-05	mg/m3	5.5E-03
				Zinc	1.4E+03	mg/kg	4.9E-08	mg/m3	--	--	--	1.5E-07	mg/m3	--	--	--
			Exposure Route Total								3.6E-08					7.3E-03
		Exposure Point Total									3.6E-08					7.3E-03
	Exposure Medium Total										4.6E-05					4.4E-01
Medium Total											4.6E-05					4.4E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C9-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 8 - MIKE HORSE MINE WASTE PILES
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.8E-05	--	7.9E-06	4.6E-05	Skin	2.6E-01	--	5.5E-02	3.2E-01
			Cadmium	--	--	--	--	Kidney	1.2E-02	--	5.0E-05	1.2E-02
			Copper	--	--	--	--	Gastrointestinal	1.4E-02	--	--	1.4E-02
			Iron	--	--	--	--	Gastrointestinal	2.7E-02	--	--	2.7E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	5.9E-02	--	--	5.9E-02
			Zinc	--	--	--	--	Blood	2.6E-03	--	--	2.6E-03
			Chemical Total	3.8E-05	--	7.9E-06	4.6E-05		3.8E-01	--	5.5E-02	4.3E-01
		Exposure Point Total					4.6E-05					4.3E-01
		Outdoor Air (Particulates)	Arsenic	--	3.6E-08	--	3.6E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.7E-03	--	1.7E-03
			Cadmium	--	6.8E-10	--	6.8E-10	Kidney, Respiratory	--	5.9E-05	--	5.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	5.5E-03	--	5.5E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.6E-08	--	3.6E-08		--	7.3E-03	--	7.3E-03
		Exposure Point Total					3.6E-08					7.3E-03
	Exposure Medium Total						4.6E-05					4.4E-01
Medium Total							4.6E-05					4.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	2.6E-03
Cardiovascular	1.7E-03
Central Nervous System	6.6E-02
Developmental	1.7E-03
Gastrointestinal	4.2E-02
Kidney	1.2E-02
Lung	1.7E-03
Respiratory	5.9E-05
Skin	3.2E-01
Maximum	3.2E-01

TABLE C9-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.8E-05	--	7.9E-06	4.6E-05	Skin	2.6E-01	--	5.5E-02	3.2E-01
			Chemical Total	3.8E-05	--	7.9E-06	4.6E-05		2.6E-01	--	5.5E-02	3.2E-01
		Exposure Point Total					4.6E-05					3.2E-01
		Outdoor Air (Particulates)	Arsenic	--	3.6E-08	--	3.6E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.7E-03	--	1.7E-03
			Chemical Total	--	3.6E-08	--	3.6E-08		--	1.7E-03	--	1.7E-03
		Exposure Point Total					3.6E-08					1.7E-03
	Exposure Medium Total						4.6E-05					3.2E-01
Medium Total							4.6E-05					3.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	2.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.8E-06	2.0E-04	mg/kg-day	3.0E-04	mg/kg-day	6.6E-01
				Cadmium	1.1E+01	mg/kg	1.9E-07	mg/kg-day	--	--	--	1.5E-05	mg/kg-day	5.0E-04	mg/kg-day	3.0E-02
				Copper	1.0E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	4.0E-02	mg/kg-day	3.5E-02
				Iron	3.4E+04	mg/kg	6.1E-04	mg/kg-day	--	--	--	4.8E-02	mg/kg-day	7.0E-01	mg/kg-day	6.8E-02
				Lead	5.2E+03	mg/kg	9.3E-05	mg/kg-day	--	--	--	7.3E-03	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	4.5E-05	mg/kg-day	--	--	--	3.5E-03	mg/kg-day	2.4E-02	mg/kg-day	1.5E-01
				Zinc	1.4E+03	mg/kg	2.5E-05	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	3.0E-01	mg/kg-day	6.5E-03
			Exposure Route Total								3.8E-06					9.4E-01
			Dermal	Arsenic	2.3E+02	mg/kg	2.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.1E-07	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	7.1E-02
				Cadmium	1.1E+01	mg/kg	4.1E-10	mg/kg-day	--	--	--	3.2E-08	mg/kg-day	5.0E-04	mg/kg-day	6.4E-05
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								4.1E-07					7.1E-02
		Exposure Point Total									4.2E-06					1.0E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	2.5E-10	mg/m3	4.3E-03	(µg/m3)-1	1.1E-09	1.9E-08	mg/m3	1.5E-05	mg/m3	1.3E-03
				Cadmium	1.1E+01	mg/kg	1.1E-11	mg/m3	1.8E-03	(µg/m3)-1	2.0E-11	8.8E-10	mg/m3	2.0E-05	mg/m3	4.4E-05
				Copper	1.0E+03	mg/kg	1.1E-09	mg/m3	--	--	--	8.4E-08	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	3.6E-08	mg/m3	--	--	--	2.8E-06	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	5.5E-09	mg/m3	--	--	--	4.3E-07	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	2.7E-09	mg/m3	--	--	--	2.1E-07	mg/m3	5.0E-05	mg/m3	4.2E-03
				Zinc	1.4E+03	mg/kg	1.5E-09	mg/m3	--	--	--	1.2E-07	mg/m3	--	--	--
			Exposure Route Total								1.1E-09					5.5E-03
		Exposure Point Total									1.1E-09					5.5E-03
	Exposure Medium Total										4.2E-06					1.0E+00
Medium Total											4.2E-06					1.0E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C9-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.8E-06	--	4.1E-07	4.2E-06	Skin	6.6E-01	--	7.1E-02	7.3E-01
			Cadmium	--	--	--	--	Kidney	3.0E-02	--	6.4E-05	3.0E-02
			Copper	--	--	--	--	Gastrointestinal	3.5E-02	--	--	3.5E-02
			Iron	--	--	--	--	Gastrointestinal	6.8E-02	--	--	6.8E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.5E-01	--	--	1.5E-01
			Zinc	--	--	--	--	Blood	6.5E-03	--	--	6.5E-03
			Chemical Total	3.8E-06	--	4.1E-07	4.2E-06		9.4E-01	--	7.1E-02	1.0E+00
		Exposure Point Total					4.2E-06					1.0E+00
		Outdoor Air (Particulates)	Arsenic	--	1.1E-09	--	1.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.3E-03	--	1.3E-03
			Cadmium	--	2.0E-11	--	2.0E-11	Kidney, Respiratory	--	4.4E-05	--	4.4E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	4.2E-03	--	4.2E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.1E-09	--	1.1E-09		--	5.5E-03	--	5.5E-03
		Exposure Point Total					1.1E-09					5.5E-03
	Exposure Medium Total						4.2E-06					1.0E+00
Medium Total							4.2E-06					1.0E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	6.5E-03
Cardiovascular	1.3E-03
Central Nervous System	1.5E-01
Developmental	1.3E-03
Gastrointestinal	1.0E-01
Kidney	3.0E-02
Lung	1.3E-03
Respiratory	4.4E-05
Skin	7.3E-01
Maximum	7.3E-01

TABLE C9-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C9-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.3E+02	mg/kg	1.2E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.8E-04	1.2E-03	mg/kg-day	3.0E-04	mg/kg-day	3.9E+00
				Cadmium	1.1E+01	mg/kg	9.0E-06	mg/kg-day	--	--	--	8.9E-05	mg/kg-day	5.0E-04	mg/kg-day	1.8E-01
				Copper	1.0E+03	mg/kg	8.6E-04	mg/kg-day	--	--	--	8.5E-03	mg/kg-day	4.0E-02	mg/kg-day	2.1E-01
				Iron	3.4E+04	mg/kg	2.9E-02	mg/kg-day	--	--	--	2.9E-01	mg/kg-day	7.0E-01	mg/kg-day	4.1E-01
				Lead	5.2E+03	mg/kg	4.4E-03	mg/kg-day	--	--	--	4.3E-02	mg/kg-day	--	--	--
				Manganese	2.5E+03	mg/kg	2.1E-03	mg/kg-day	--	--	--	2.1E-02	mg/kg-day	2.4E-02	mg/kg-day	8.7E-01
				Zinc	1.4E+03	mg/kg	1.2E-03	mg/kg-day	--	--	--	1.2E-02	mg/kg-day	3.0E-01	mg/kg-day	3.9E-02
			Exposure Route Total								1.8E-04					5.6E+00
			Dermal	Arsenic	2.3E+02	mg/kg	1.8E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.7E-05	1.6E-04	mg/kg-day	3.0E-04	mg/kg-day	5.3E-01
				Cadmium	1.1E+01	mg/kg	2.7E-08	mg/kg-day	--	--	--	2.4E-07	mg/kg-day	5.0E-04	mg/kg-day	4.8E-04
				Copper	1.0E+03	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	5.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.5E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.4E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.7E-05					5.3E-01
		Exposure Point Total									2.1E-04					6.2E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.3E+02	mg/kg	3.6E-08	mg/m3	4.3E-03	(µg/m3)-1	1.6E-07	1.1E-07	mg/m3	1.5E-05	mg/m3	7.2E-03
				Cadmium	1.1E+01	mg/kg	1.6E-09	mg/m3	1.8E-03	(µg/m3)-1	2.9E-09	4.9E-09	mg/m3	2.0E-05	mg/m3	2.5E-04
				Copper	1.0E+03	mg/kg	1.6E-07	mg/m3	--	--	--	4.7E-07	mg/m3	--	--	--
				Iron	3.4E+04	mg/kg	5.2E-06	mg/m3	--	--	--	1.6E-05	mg/m3	--	--	--
				Lead	5.2E+03	mg/kg	8.0E-07	mg/m3	--	--	--	2.4E-06	mg/m3	--	--	--
				Manganese	2.5E+03	mg/kg	3.9E-07	mg/m3	--	--	--	1.2E-06	mg/m3	5.0E-05	mg/m3	2.3E-02
				Zinc	1.4E+03	mg/kg	2.2E-07	mg/m3	--	--	--	6.5E-07	mg/m3	--	--	--
			Exposure Route Total								1.6E-07					3.1E-02
		Exposure Point Total									1.6E-07					3.1E-02
	Exposure Medium Total										2.1E-04					6.2E+00
Medium Total											2.1E-04					6.2E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C9-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.8E-04	--	2.7E-05	2.1E-04	Skin	3.9E+00	--	5.3E-01	4.5E+00
			Cadmium	--	--	--	--	Kidney	1.8E-01	--	4.8E-04	1.8E-01
			Copper	--	--	--	--	Gastrointestinal	2.1E-01	--	--	2.1E-01
			Iron	--	--	--	--	Gastrointestinal	4.1E-01	--	--	4.1E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	8.7E-01	--	--	8.7E-01
			Zinc	--	--	--	--	Blood	3.9E-02	--	--	3.9E-02
			Chemical Total	1.8E-04	--	2.7E-05	2.1E-04		5.6E+00	--	5.3E-01	6.2E+00
		Exposure Point Total					2.1E-04					6.2E+00
		Outdoor Air (Particulates)	Arsenic	--	1.6E-07	--	1.6E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.2E-03	--	7.2E-03
			Cadmium	--	2.9E-09	--	2.9E-09	Kidney, Respiratory	--	2.5E-04	--	2.5E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.3E-02	--	2.3E-02
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.6E-07	--	1.6E-07		--	3.1E-02	--	3.1E-02
		Exposure Point Total					1.6E-07					3.1E-02
	Exposure Medium Total						2.1E-04					6.2E+00
Medium Total							2.1E-04					6.2E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	3.9E-02
Cardiovascular	7.2E-03
Central Nervous System	9.0E-01
Developmental	7.2E-03
Gastrointestinal	6.2E-01
Kidney	1.8E-01
Lung	7.2E-03
Respiratory	2.5E-04
Skin	**4.5E+00**
Maximum	**4.5E+00**

TABLE C9-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.8E-04	--	2.7E-05	2.1E-04	Skin	3.9E+00	--	5.3E-01	4.5E+00
			Chemical Total	1.8E-04	--	2.7E-05	2.1E-04		3.9E+00	--	5.3E-01	4.5E+00
		Exposure Point Total					2.1E-04					4.5E+00
		Outdoor Air (Particulates)	Arsenic	--	1.6E-07	--	1.6E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.2E-03	--	7.2E-03
			Chemical Total	--	1.6E-07	--	1.6E-07		--	7.2E-03	--	7.2E-03
		Exposure Point Total					1.6E-07					7.2E-03
	Exposure Medium Total						2.1E-04					4.5E+00
Medium Total							2.1E-04					4.5E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-9: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 8 - MIKE HORSE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	4E-06	1E-06	1E-06	6E-06	0.05	0.01	0.3	0.3	0.3	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-06	3E-06	2E-09	5E-06	0.03	0.02	0.0005	0.05	0.04	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-05	5E-06	6E-09	2E-05	0.3	0.06	0.001	0.4	0.3	Arsenic	C	84/106	13.65 - 667	2.3E+02	2E-05	0.3	--
												Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	10.8
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-06	2E-06	1E-09	3E-06	0.018	0.02	0.0004	0.03	0.03	Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	10.8
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	4E-05	8E-06	4E-08	5E-05	0.4	0.06	0.007	0.4	0.3	Arsenic	C	84/106	13.65 - 667	2.3E+02	5E-05	0.3	--
												Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	32.2
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	4E-06	4E-07	1E-09	4E-06	0.9	0.1	0.005	1	0.7	Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	32.2
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-04	3E-05	2E-07	2E-04	6	0.5	0.03	6	4	Arsenic	C, NC	84/106	13.65 - 667	2.3E+02	2E-04	4	--
												Lead	PbB	105/105	43.05 - 30,700	5.2E+03	--	--	58.9

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C10-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	6.7E-06	mg/kg-day	--	--	--	2.6E-05	mg/kg-day	4.0E-02	mg/kg-day	6.5E-04
				Iron	5.8E+04	mg/kg	1.0E-03	mg/kg-day	--	--	--	3.9E-03	mg/kg-day	7.0E-01	mg/kg-day	5.6E-03
			Exposure Route Total								--					6.3E-03
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					6.3E-03
		Outdoor Air	Inhalation (Particulates)	Copper	3.8E+02	mg/kg	4.1E-07	mg/m3	--	--	--	1.6E-06	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	6.2E-05	mg/m3	--	--	--	2.4E-04	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					6.3E-03
Medium Total											--					6.3E-03

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C10-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 9 - PAYMASTER

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Noncancer: Ingestion	Noncancer: Inhalation	Noncancer: Dermal	Noncancer: Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	6.5E-04	--	--	6.5E-04
			Iron	--	--	--	--	Gastrointestinal	5.6E-03	--	--	5.6E-03
			Chemical Total	--	--	--	--		6.3E-03	--	--	6.3E-03
		Exposure Point Total					--					6.3E-03
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					6.3E-03
Medium Total							--					6.3E-03

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	6.3E-03
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	6.3E-03

TABLE C10-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C10-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	4.0E-02	mg/kg-day	4.2E-03
				Iron	5.8E+04	mg/kg	4.0E-03	mg/kg-day	--	--	--	2.5E-02	mg/kg-day	7.0E-01	mg/kg-day	3.6E-02
			Exposure Route Total								--					4.1E-02
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					4.1E-02
		Outdoor Air	Inhalation (Particulates)	Copper	3.8E+02	mg/kg	2.1E-09	mg/m3	--	--	--	6.2E-09	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	3.1E-07	mg/m3	--	--	--	9.3E-07	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					4.1E-02
Medium Total											--					4.1E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C10-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	4.2E-03	--	--	4.2E-03
			Iron	--	--	--	--	Gastrointestinal	3.6E-02	--	--	3.6E-02
			Chemical Total	--	--	--	--		4.1E-02	--	--	4.1E-02
		Exposure Point Total					--					4.1E-02
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					4.1E-02
Medium Total							--					4.1E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	4.1E-02
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	4.1E-02

TABLE C10-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C10-3.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	2.7E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	2.6E-04
				Iron	5.8E+04	mg/kg	4.1E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	7.0E-01	mg/kg-day	2.3E-03
			Exposure Route Total								--					2.5E-03
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					2.5E-03
		Outdoor Air	Inhalation (Particulates)	Copper	3.8E+02	mg/kg	5.3E-10	mg/m3	--	--	--	2.1E-09	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	8.0E-08	mg/m3	--	--	--	3.1E-07	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					2.5E-03
Medium Total											--					2.5E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C10-3.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	2.6E-04	--	--	2.6E-04
			Iron	--	--	--	--	Gastrointestinal	2.3E-03	--	--	2.3E-03
			Chemical Total	--	--	--	--		2.5E-03	--	--	2.5E-03
		Exposure Point Total					--					2.5E-03
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					2.5E-03
Medium Total							--					2.5E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	2.5E-03
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	2.5E-03

TABLE C10-3.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C10-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	7.0E-05	mg/kg-day	--	--	--	2.2E-04	mg/kg-day	4.0E-02	mg/kg-day	5.4E-03
				Iron	5.8E+04	mg/kg	1.1E-02	mg/kg-day	--	--	--	3.3E-02	mg/kg-day	7.0E-01	mg/kg-day	4.7E-02
			Exposure Route Total								--					5.2E-02
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					5.2E-02
		Outdoor Air	Inhalation (Partculates)	Copper	3.8E+02	mg/kg	1.4E-08	mg/m3	--	--	--	4.3E-08	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	2.1E-06	mg/m3	--	--	--	6.4E-06	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					5.2E-02
Medium Total											--					5.2E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C10-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	5.4E-03	--	--	5.4E-03
			Iron	--	--	--	--	Gastrointestinal	4.7E-02	--	--	4.7E-02
			Chemical Total	--	--	--	--		5.2E-02	--	--	5.2E-02
		Exposure Point Total					--					5.2E-02
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					5.2E-02
Medium Total							--					5.2E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	5.2E-02
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	5.2E-02

TABLE C10-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C10-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	6.9E-06	mg/kg-day	--	--	--	5.4E-04	mg/kg-day	4.0E-02	mg/kg-day	1.3E-02
				Iron	5.8E+04	mg/kg	1.0E-03	mg/kg-day	--	--	--	8.1E-02	mg/kg-day	7.0E-01	mg/kg-day	1.2E-01
			Exposure Route Total								--					1.3E-01
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					1.3E-01
		Outdoor Air	Inhalation (Particulates)	Copper	3.8E+02	mg/kg	4.1E-10	mg/m3	--	--	--	3.2E-08	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	6.2E-08	mg/m3	--	--	--	4.8E-06	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					1.3E-01
Medium Total											--					1.3E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C10-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	1.3E-02	--	--	1.3E-02
			Iron	--	--	--	--	Gastrointestinal	1.2E-01	--	--	1.2E-01
			Chemical Total	--	--	--	--		1.3E-01	--	--	1.3E-01
		Exposure Point Total					--					1.3E-01
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					1.3E-01
Medium Total							--					1.3E-01

Notes:

-- Not available or not applicable
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	1.3E-01
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	1.3E-01

TABLE C10-5.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C10-6.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Copper	3.8E+02	mg/kg	3.3E-04	mg/kg-day	--	--	--	3.2E-03	mg/kg-day	4.0E-02	mg/kg-day	8.1E-02
				Iron	5.8E+04	mg/kg	4.9E-02	mg/kg-day	--	--	--	4.9E-01	mg/kg-day	7.0E-01	mg/kg-day	7.0E-01
			Exposure Route Total								--					7.8E-01
			Dermal	Copper	3.8E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	5.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								--					--
		Exposure Point Total									--					7.8E-01
		Outdoor Air	Inhalation (Particulates)	Copper	3.8E+02	mg/kg	5.9E-08	mg/m3	--	--	--	1.8E-07	mg/m3	--	--	--
				Iron	5.8E+04	mg/kg	9.0E-06	mg/m3	--	--	--	2.7E-05	mg/m3	--	--	--
			Exposure Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					7.8E-01
Medium Total											--					7.8E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C10-6.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Copper	--	--	--	--	Gastrointestinal	8.1E-02	--	--	8.1E-02
			Iron	--	--	--	--	Gastrointestinal	7.0E-01	--	--	7.0E-01
			Chemical Total	--	--	--	--		7.8E-01	--	--	7.8E-01
		Exposure Point Total					--					7.8E-01
		Outdoor Air (Particulates)	Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					7.8E-01
Medium Total							--					7.8E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	7.8E-01
Kidney	--
Lung	--
Respiratory	--
Skin	--
Maximum	7.8E-01

TABLE C10-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-10: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	--	--	--	--	0.006	--	--	0.006	0.006	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	--	--	--	--	0.04	--	--	0.04	0.04	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	--	--	--	--	0.003	--	--	0.003	0.003	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	--	--	--	--	0.05	--	--	0.05	0.05	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	--	--	--	--	0.1	--	--	0.1	0.1	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	--	--	--	--	0.8	--	--	0.8	0.8	--	--	--	--	--	--	--	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C11-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SUBSURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (2 to 10 feet bgs)	Site Soil	Ingestion	Arsenic	7.5E+02	mg/kg	8.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-05	6.3E-04	mg/kg-day	3.0E-04	mg/kg-day	2.1E+00
				Iron	1.6E+05	mg/kg	2.8E-03	mg/kg-day	--	--	--	2.2E-01	mg/kg-day	7.0E-01	mg/kg-day	3.1E-01
			Exposure Route Total								1.2E-05					2.4E+00
			Dermal	Arsenic	7.5E+02	mg/kg	8.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-06	6.8E-05	mg/kg-day	3.0E-04	mg/kg-day	2.3E-01
				Iron	1.6E+05	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
			Exposure Route Total								1.3E-06					2.3E-01
		Exposure Point Total									1.3E-05					2.6E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	7.5E+02	mg/kg	8.0E-10	mg/m3	4.3E-03	(µg/m3)-1	3.4E-09	6.2E-08	mg/m3	1.5E-05	mg/m3	4.1E-03
				Iron	1.6E+05	mg/kg	1.7E-07	mg/m3	--	--	--	1.3E-05	mg/m3	--	--	--
			Exposure Route Total								3.4E-09					4.1E-03
		Exposure Point Total									3.4E-09					4.1E-03
	Exposure Medium Total										1.3E-05					2.6E+00
Medium Total											1.3E-05					2.6E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C11-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SUBSURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	Arsenic	1.2E-05	--	1.3E-06	1.3E-05	Skin	2.1E+00	--	2.3E-01	2.3E+00
			Iron	--	--	--	--	Gastrointestinal	3.1E-01	--	--	3.1E-01
			Chemical Total	1.2E-05	--	1.3E-06	1.3E-05		2.4E+00	--	2.3E-01	2.6E+00
		Exposure Point Total					1.3E-05					2.6E+00
		Outdoor Air (Particulates)	Arsenic	--	3.4E-09	--	3.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.1E-03	--	4.1E-03
			Iron	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.4E-09	--	3.4E-09		--	4.1E-03	--	4.1E-03
		Exposure Point Total					3.4E-09					4.1E-03
	Exposure Medium Total						1.3E-05					2.6E+00
Medium Total							1.3E-05					2.6E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (2-10)
Blood	--
Cardiovascular	4.1E-03
Central Nervous System	4.1E-03
Developmental	4.1E-03
Gastrointestinal	3.1E-01
Kidney	--
Lung	4.1E-03
Respiratory	--
Skin	**2.3E+00**
Maximum	**2.3E+00**

TABLE C11-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SUBSURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	Arsenic	1.2E-05	--	1.3E-06	1.3E-05	Skin	2.1E+00	--	2.3E-01	2.3E+00
			Chemical Total	1.2E-05	--	1.3E-06	1.3E-05		2.1E+00	--	2.3E-01	2.3E+00
		Exposure Point Total					1.3E-05					2.3E+00
		Outdoor Air (Particulates)	Arsenic	--	3.4E-09	--	3.4E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.1E-03	--	4.1E-03
			Chemical Total	--	3.4E-09	--	3.4E-09		--	4.1E-03	--	4.1E-03
		Exposure Point Total					3.4E-09					4.1E-03
	Exposure Medium Total						1.3E-05					2.3E+00
Medium Total							1.3E-05					2.3E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-11: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SOIL, EU 9 - PAYMASTER MINE WASTE AREAS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	1E-05	1E-06	3E-09	1E-05	2	0.2	0.004	3	2	Arsenic	C, NC	13/13	18.60 - 1,370	7.5E+02	1E-05	2	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C12-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	2.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.2E-07	8.4E-07	mg/kg-day	3.0E-04	mg/kg-day	2.8E-03
				Copper	4.5E+02	mg/kg	7.9E-06	mg/kg-day	--	--	--	3.1E-05	mg/kg-day	4.0E-02	mg/kg-day	7.7E-04
				Iron	3.8E+04	mg/kg	6.7E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	7.0E-01	mg/kg-day	3.7E-03
				Manganese	1.0E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	6.8E-05	mg/kg-day	2.4E-02	mg/kg-day	2.9E-03
			Exposure Route Total								3.2E-07					1.0E-02
			Dermal	Arsenic	2.1E+01	mg/kg	7.9E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-07	3.1E-07	mg/kg-day	3.0E-04	mg/kg-day	1.0E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								1.2E-07					1.0E-03
		Exposure Point Total									4.4E-07					1.1E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	2.2E-08	mg/m3	4.3E-03	(µg/m3)-1	9.5E-08	8.7E-08	mg/m3	1.5E-05	mg/m3	5.8E-03
				Copper	4.5E+02	mg/kg	4.9E-07	mg/m3	--	--	--	1.9E-06	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	4.1E-05	mg/m3	--	--	--	1.6E-04	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	1.1E-06	mg/m3	--	--	--	4.2E-06	mg/m3	5.0E-05	mg/m3	8.5E-02
			Exposure Route Total								9.5E-08					9.0E-02
		Exposure Point Total									9.5E-08					9.0E-02
	Exposure Medium Total										5.4E-07					1.0E-01
Medium Total											5.4E-07					1.0E-01

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C12-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 10 - NUMBER 3

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.2E-07	--	1.2E-07	4.4E-07	Skin	2.8E-03	--	1.0E-03	3.8E-03
			Copper	--	--	--	--	Gastrointestinal	7.7E-04	--	--	7.7E-04
			Iron	--	--	--	--	Gastrointestinal	3.7E-03	--	--	3.7E-03
			Manganese	--	--	--	--	Central Nervous System	2.9E-03	--	--	2.9E-03
			Chemical Total	3.2E-07	--	1.2E-07	4.4E-07		1.0E-02	--	1.0E-03	1.1E-02
		Exposure Point Total					4.4E-07					1.1E-02
		Outdoor Air (Particulates)	Arsenic	--	9.5E-08	--	9.5E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.8E-03	--	5.8E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	8.5E-02	--	8.5E-02
			Chemical Total	--	9.5E-08	--	9.5E-08		--	9.0E-02	--	9.0E-02
		Exposure Point Total					9.5E-08					9.0E-02
	Exposure Medium Total						5.4E-07					1.0E-01
Medium Total							5.4E-07					1.0E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	5.8E-03
Central Nervous System	9.3E-02
Developmental	5.8E-03
Gastrointestinal	4.5E-03
Kidney	--
Lung	5.8E-03
Respiratory	--
Skin	9.6E-03
Maximum	9.3E-02

TABLE C12-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ATV/MOTORCYCLE RIDER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.0E-07	5.1E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Copper	4.5E+02	mg/kg	4.8E-06	mg/kg-day	--	--	--	1.9E-05	mg/kg-day	4.0E-02	mg/kg-day	4.7E-04
				Iron	3.8E+04	mg/kg	4.0E-04	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	7.0E-01	mg/kg-day	2.2E-03
				Manganese	1.0E+03	mg/kg	1.1E-05	mg/kg-day	--	--	--	4.1E-05	mg/kg-day	2.4E-02	mg/kg-day	1.7E-03
			Exposure Route Total								2.0E-07					6.1E-03
			Dermal	Arsenic	2.1E+01	mg/kg	1.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.4E-07	6.1E-07	mg/kg-day	3.0E-04	mg/kg-day	2.0E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								2.4E-07					2.0E-03
		Exposure Point Total									4.3E-07					8.2E-03
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	4.3E-11	mg/m3	4.3E-03	(µg/m3)-1	1.8E-10	1.7E-10	mg/m3	1.5E-05	mg/m3	1.1E-05
				Copper	4.5E+02	mg/kg	9.4E-10	mg/m3	--	--	--	3.7E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	7.9E-08	mg/m3	--	--	--	3.1E-07	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	2.1E-09	mg/m3	--	--	--	8.1E-09	mg/m3	5.0E-05	mg/m3	1.6E-04
			Exposure Route Total								1.8E-10					1.7E-04
		Exposure Point Total									1.8E-10					1.7E-04
	Exposure Medium Total										4.3E-07					8.4E-03
Medium Total											4.3E-07					8.4E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C12-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.0E-07	--	2.4E-07	4.3E-07	Skin	1.7E-03	--	2.0E-03	3.7E-03
			Copper	--	--	--	--	Gastrointestinal	4.7E-04	--	--	4.7E-04
			Iron	--	--	--	--	Gastrointestinal	2.2E-03	--	--	2.2E-03
			Manganese	--	--	--	--	Central Nervous System	1.7E-03	--	--	1.7E-03
			Chemical Total	2.0E-07	--	2.4E-07	4.3E-07		6.1E-03	--	2.0E-03	8.2E-03
		Exposure Point Total					4.3E-07					8.2E-03
		Outdoor Air (Particulates)	Arsenic	--	1.8E-10	--	1.8E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-05	--	1.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.6E-04	--	1.6E-04
			Chemical Total	--	1.8E-10	--	1.8E-10		--	1.7E-04	--	1.7E-04
		Exposure Point Total					1.8E-10					1.7E-04
	Exposure Medium Total						4.3E-07					8.4E-03
Medium Total							4.3E-07					8.4E-03

Notes:

-- Not available or not applicable

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

RAGS Risk Assessment Guidance for Superfund

Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.1E-05
Central Nervous System	1.9E-03
Developmental	1.1E-05
Gastrointestinal	2.7E-03
Kidney	--
Lung	1.1E-05
Respiratory	--
Skin	3.7E-03
Maximum	3.7E-03

TABLE C12-2.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, FISHERMAN - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	8.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-06	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1.8E-02
				Copper	4.5E+02	mg/kg	3.1E-05	mg/kg-day	--	--	--	2.0E-04	mg/kg-day	4.0E-02	mg/kg-day	5.0E-03
				Iron	3.8E+04	mg/kg	2.6E-03	mg/kg-day	--	--	--	1.7E-02	mg/kg-day	7.0E-01	mg/kg-day	2.4E-02
				Manganese	1.0E+03	mg/kg	6.9E-05	mg/kg-day	--	--	--	4.4E-04	mg/kg-day	2.4E-02	mg/kg-day	1.8E-02
			Exposure Route Total								1.3E-06					6.5E-02
			Dermal	Arsenic	2.1E+01	mg/kg	2.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.0E-07	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	4.9E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								4.0E-07					4.9E-03
		Exposure Point Total									1.7E-06					7.0E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	1.1E-10	mg/m3	4.3E-03	(µg/m3)-1	4.8E-10	3.3E-10	mg/m3	1.5E-05	mg/m3	2.2E-05
				Copper	4.5E+02	mg/kg	2.4E-09	mg/m3	--	--	--	7.3E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	2.1E-07	mg/m3	--	--	--	6.2E-07	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	5.4E-09	mg/m3	--	--	--	1.6E-08	mg/m3	5.0E-05	mg/m3	3.3E-04
			Exposure Route Total								4.8E-10					3.5E-04
		Exposure Point Total									4.8E-10					3.5E-04
	Exposure Medium Total										1.7E-06					7.1E-02
Medium Total											1.7E-06					7.1E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C12-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-06	--	4.0E-07	1.7E-06	Skin	1.8E-02	--	4.9E-03	2.3E-02
			Copper	--	--	--	--	Gastrointestinal	5.0E-03	--	--	5.0E-03
			Iron	--	--	--	--	Gastrointestinal	2.4E-02	--	--	2.4E-02
			Manganese	--	--	--	--	Central Nervous System	1.8E-02	--	--	1.8E-02
			Chemical Total	1.3E-06	--	4.0E-07	1.7E-06		6.5E-02	--	4.9E-03	7.0E-02
		Exposure Point Total					1.7E-06					7.0E-02
		Outdoor Air (Particulates)	Arsenic	--	4.8E-10	--	4.8E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.2E-05	--	2.2E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.3E-04	--	3.3E-04
			Chemical Total	--	4.8E-10	--	4.8E-10		--	3.5E-04	--	3.5E-04
		Exposure Point Total					4.8E-10					3.5E-04
	Exposure Medium Total						1.7E-06					7.1E-02
Medium Total							1.7E-06					7.1E-02

Notes:

-- Not available or not applicable

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

RAGS Risk Assessment Guidance for Superfund

Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	2.2E-05
Central Nervous System	1.9E-02
Developmental	2.2E-05
Gastrointestinal	2.9E-02
Kidney	--
Lung	2.2E-05
Respiratory	--
Skin	2.3E-02
Maximum	2.9E-02

TABLE C12-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	8.7E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-07	3.4E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
				Copper	4.5E+02	mg/kg	3.2E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	4.0E-02	mg/kg-day	3.1E-04
				Iron	3.8E+04	mg/kg	2.7E-04	mg/kg-day	--	--	--	1.0E-03	mg/kg-day	7.0E-01	mg/kg-day	1.5E-03
				Manganese	1.0E+03	mg/kg	7.1E-06	mg/kg-day	--	--	--	2.8E-05	mg/kg-day	2.4E-02	mg/kg-day	1.2E-03
			Exposure Route Total								1.3E-07					4.1E-03
			Dermal	Arsenic	2.1E+01	mg/kg	1.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.6E-07	4.1E-07	mg/kg-day	3.0E-04	mg/kg-day	1.4E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								1.6E-07					1.4E-03
		Exposure Point Total									2.9E-07					5.5E-03
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	2.8E-11	mg/m3	4.3E-03	(µg/m3)-1	1.2E-10	1.1E-10	mg/m3	1.5E-05	mg/m3	7.4E-06
				Copper	4.5E+02	mg/kg	6.2E-10	mg/m3	--	--	--	2.4E-09	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	5.3E-08	mg/m3	--	--	--	2.1E-07	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	1.4E-09	mg/m3	--	--	--	5.4E-09	mg/m3	5.0E-05	mg/m3	1.1E-04
			Exposure Route Total								1.2E-10					1.2E-04
		Exposure Point Total									1.2E-10					1.2E-04
	Exposure Medium Total										2.9E-07					5.6E-03
Medium Total											2.9E-07					5.6E-03

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C12-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-07	--	1.6E-07	2.9E-07	Skin	1.1E-03	--	1.4E-03	2.5E-03
			Copper	--	--	--	--	Gastrointestinal	3.1E-04	--	--	3.1E-04
			Iron	--	--	--	--	Gastrointestinal	1.5E-03	--	--	1.5E-03
			Manganese	--	--	--	--	Central Nervous System	1.2E-03	--	--	1.2E-03
			Chemical Total	1.3E-07	--	1.6E-07	2.9E-07		4.1E-03	--	1.4E-03	5.5E-03
		Exposure Point Total					2.9E-07					5.5E-03
		Outdoor Air (Particulates)	Arsenic	--	1.2E-10	--	1.2E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.4E-06	--	7.4E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.1E-04	--	1.1E-04
			Chemical Total	--	1.2E-10	--	1.2E-10		--	1.2E-04	--	1.2E-04
		Exposure Point Total					1.2E-10					1.2E-04
	Exposure Medium Total						2.9E-07					5.6E-03
Medium Total							2.9E-07					5.6E-03

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	7.4E-06
Central Nervous System	1.3E-03
Developmental	7.4E-06
Gastrointestinal	1.8E-03
Kidney	--
Lung	7.4E-06
Respiratory	--
Skin	2.5E-03
Maximum	2.5E-03

TABLE C12-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, HUNTER - EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.4E-06	7.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Copper	4.5E+02	mg/kg	8.2E-05	mg/kg-day	--	--	--	2.6E-04	mg/kg-day	4.0E-02	mg/kg-day	6.4E-03
				Iron	3.8E+04	mg/kg	6.9E-03	mg/kg-day	--	--	--	2.2E-02	mg/kg-day	7.0E-01	mg/kg-day	3.1E-02
				Manganese	1.0E+03	mg/kg	1.8E-04	mg/kg-day	--	--	--	5.7E-04	mg/kg-day	2.4E-02	mg/kg-day	2.4E-02
			Exposure Route Total								3.4E-06					8.4E-02
			Dermal	Arsenic	2.1E+01	mg/kg	4.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.0E-07	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	4.8E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								7.0E-07					4.8E-03
		Exposure Point Total									4.1E-06					8.9E-02
		Outdoor Air	Inhalation (Partculates)	Arsenic	2.1E+01	mg/kg	7.3E-10	mg/m3	4.3E-03	(µg/m3)-1	3.1E-09	2.3E-09	mg/m3	1.5E-05	mg/m3	1.5E-04
				Copper	4.5E+02	mg/kg	1.6E-08	mg/m3	--	--	--	5.0E-08	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	1.4E-06	mg/m3	--	--	--	4.2E-06	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	3.6E-08	mg/m3	--	--	--	1.1E-07	mg/m3	5.0E-05	mg/m3	2.2E-03
			Exposure Route Total								3.1E-09					2.4E-03
		Exposure Point Total									3.1E-09					2.4E-03
	Exposure Medium Total										4.1E-06					9.2E-02
Medium Total											4.1E-06					9.2E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C12-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.4E-06	--	7.0E-07	4.1E-06	Skin	2.3E-02	--	4.8E-03	2.8E-02
			Copper	--	--	--	--	Gastrointestinal	6.4E-03	--	--	6.4E-03
			Iron	--	--	--	--	Gastrointestinal	3.1E-02	--	--	3.1E-02
			Manganese	--	--	--	--	Central Nervous System	2.4E-02	--	--	2.4E-02
			Chemical Total	3.4E-06	--	7.0E-07	4.1E-06		8.4E-02	--	4.8E-03	8.9E-02
		Exposure Point Total					4.1E-06					8.9E-02
		Outdoor Air (Particulates)	Arsenic	--	3.1E-09	--	3.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.5E-04	--	1.5E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.2E-03	--	2.2E-03
			Chemical Total	--	3.1E-09	--	3.1E-09		--	2.4E-03	--	2.4E-03
		Exposure Point Total					3.1E-09					2.4E-03
	Exposure Medium Total						4.1E-06					9.2E-02
Medium Total							4.1E-06					9.2E-02

Notes:

-- Not available or not applicable
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.5E-04
Central Nervous System	2.6E-02
Developmental	1.5E-04
Gastrointestinal	3.7E-02
Kidney	--
Lung	1.5E-04
Respiratory	--
Skin	2.8E-02
Maximum	3.7E-02

TABLE C12-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, INDUSTRIAL WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	2.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.3E-07	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.8E-02
				Copper	4.5E+02	mg/kg	8.1E-06	mg/kg-day	--	--	--	6.4E-04	mg/kg-day	4.0E-02	mg/kg-day	1.6E-02
				Iron	3.8E+04	mg/kg	6.9E-04	mg/kg-day	--	--	--	5.4E-02	mg/kg-day	7.0E-01	mg/kg-day	7.7E-02
				Manganese	1.0E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	2.4E-02	mg/kg-day	5.9E-02
			Exposure Route Total								3.3E-07					2.1E-01
			Dermal	Arsenic	2.1E+01	mg/kg	2.4E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.6E-08	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	6.2E-03
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								3.6E-08					6.2E-03
		Exposure Point Total									3.7E-07					2.2E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	2.2E-11	mg/m3	4.3E-03	(µg/m3)-1	9.5E-11	1.7E-09	mg/m3	1.5E-05	mg/m3	1.1E-04
				Copper	4.5E+02	mg/kg	4.8E-10	mg/m3	--	--	--	3.8E-08	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	4.1E-08	mg/m3	--	--	--	3.2E-06	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	1.1E-09	mg/m3	--	--	--	8.4E-08	mg/m3	5.0E-05	mg/m3	1.7E-03
			Exposure Route Total								9.5E-11					1.8E-03
		Exposure Point Total									9.5E-11					1.8E-03
	Exposure Medium Total										3.7E-07					2.2E-01
Medium Total											3.7E-07					2.2E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C12-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	3.3E-07	--	3.6E-08	3.7E-07	Skin	5.8E-02	--	6.2E-03	6.4E-02
			Copper	--	--	--	--	Gastrointestinal	1.6E-02	--	--	1.6E-02
			Iron	--	--	--	--	Gastrointestinal	7.7E-02	--	--	7.7E-02
			Manganese	--	--	--	--	Central Nervous System	5.9E-02	--	--	5.9E-02
			Chemical Total	3.3E-07	--	3.6E-08	3.7E-07		2.1E-01	--	6.2E-03	2.2E-01
		Exposure Point Total					3.7E-07					2.2E-01
		Outdoor Air (Particulates)	Arsenic	--	9.5E-11	--	9.5E-11	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-04	--	1.1E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.7E-03	--	1.7E-03
			Chemical Total	--	9.5E-11	--	9.5E-11		--	1.8E-03	--	1.8E-03
		Exposure Point Total					9.5E-11					1.8E-03
	Exposure Medium Total						3.7E-07					2.2E-01
Medium Total							3.7E-07					2.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	1.1E-04
Central Nervous System	6.1E-02
Developmental	1.1E-04
Gastrointestinal	9.3E-02
Kidney	--
Lung	1.1E-04
Respiratory	--
Skin	6.4E-02
Maximum	9.3E-02

TABLE C12-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, CONSTRUCTION WORKER - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C12-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	2.1E+01	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.6E-05	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3.5E-01
				Copper	4.5E+02	mg/kg	3.8E-04	mg/kg-day	--	--	--	3.8E-03	mg/kg-day	4.0E-02	mg/kg-day	9.5E-02
				Iron	3.8E+04	mg/kg	3.3E-02	mg/kg-day	--	--	--	3.2E-01	mg/kg-day	7.0E-01	mg/kg-day	4.6E-01
				Manganese	1.0E+03	mg/kg	8.6E-04	mg/kg-day	--	--	--	8.5E-03	mg/kg-day	2.4E-02	mg/kg-day	3.5E-01
			Exposure Route Total								1.6E-05					1.3E+00
			Dermal	Arsenic	2.1E+01	mg/kg	1.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.4E-06	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.7E-02
				Copper	4.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.8E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Manganese	1.0E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
			Exposure Route Total								2.4E-06					4.7E-02
		Exposure Point Total									1.8E-05					1.3E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	2.1E+01	mg/kg	3.2E-09	mg/m3	4.3E-03	(μg/m3)-1	1.4E-08	9.5E-09	mg/m3	1.5E-05	mg/m3	6.4E-04
				Copper	4.5E+02	mg/kg	7.0E-08	mg/m3	--	--	--	2.1E-07	mg/m3	--	--	--
				Iron	3.8E+04	mg/kg	5.9E-06	mg/m3	--	--	--	1.8E-05	mg/m3	--	--	--
				Manganese	1.0E+03	mg/kg	1.6E-07	mg/m3	--	--	--	4.7E-07	mg/m3	5.0E-05	mg/m3	9.4E-03
			Exposure Route Total								1.4E-08					1.0E-02
		Exposure Point Total									1.4E-08					1.0E-02
	Exposure Medium Total										1.8E-05					1.3E+00
Medium Total											1.8E-05					1.3E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(μg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C12-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.6E-05	--	2.4E-06	1.8E-05	Skin	3.5E-01	--	4.7E-02	3.9E-01
			Copper	--	--	--	--	Gastrointestinal	9.5E-02	--	--	9.5E-02
			Iron	--	--	--	--	Gastrointestinal	4.6E-01	--	--	4.6E-01
			Manganese	--	--	--	--	Central Nervous System	3.5E-01	--	--	3.5E-01
			Chemical Total	1.6E-05	--	2.4E-06	1.8E-05		1.3E+00	--	4.7E-02	1.3E+00
		Exposure Point Total					1.8E-05					1.3E+00
		Outdoor Air (Particulates)	Arsenic	--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.4E-04	--	6.4E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	9.4E-03	--	9.4E-03
			Chemical Total	--	1.4E-08	--	1.4E-08		--	1.0E-02	--	1.0E-02
		Exposure Point Total					1.4E-08					1.0E-02
	Exposure Medium Total						1.8E-05					1.3E+00
Medium Total							1.8E-05					1.3E+00

Notes:

-- Not available or not applicable
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
RAGS Risk Assessment Guidance for Superfund
Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	--
Cardiovascular	6.4E-04
Central Nervous System	3.6E-01
Developmental	6.4E-04
Gastrointestinal	5.6E-01
Kidney	--
Lung	6.4E-04
Respiratory	--
Skin	3.9E-01
Maximum	5.6E-01

TABLE C12-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/MINE WASTE EXPOSURE, ADULT AND CHILD RESIDENT - EU 10 - NUMBER 3 TUNNEL WASTE AREA

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.6E-05	--	2.4E-06	1.8E-05	Skin	3.5E-01	--	4.7E-02	3.9E-01
			Chemical Total	1.6E-05	--	2.4E-06	1.8E-05		3.5E-01	--	4.7E-02	3.9E-01
		Exposure Point Total					1.8E-05					3.9E-01
		Outdoor Air (Particulates)	Arsenic	--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	6.4E-04	--	6.4E-04
			Chemical Total	--	1.4E-08	--	1.4E-08		--	6.4E-04	--	6.4E-04
		Exposure Point Total					1.4E-08					6.4E-04
	Exposure Medium Total						1.8E-05					3.9E-01
Medium Total							1.8E-05					3.9E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-12: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 10 - NUMBER 3 TUNNEL WASTE AREA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	3E-07	1E-07	1E-07	5E-07	0.01	0.001	0.09	0.1	0.09	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	2E-07	2E-07	2E-10	4E-07	0.006	0.002	0.0002	0.008	0.004	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	4E-07	5E-10	2E-06	0.07	0.005	0.0003	0.07	0.03	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	1E-07	2E-07	1E-10	3E-07	0.004	0.001	0.0001	0.006	0.002	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	3E-06	7E-07	3E-09	4E-06	0.08	0.005	0.002	0.09	0.04	--	--	--	--	--	--	--	--
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	3E-07	4E-08	9E-11	4E-07	0.2	0.006	0.002	0.2	0.09	--	--	--	--	--	--	--	--
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	2E-05	2E-06	1E-08	2E-05	1	0.05	0.01	1	0.6	Arsenic	C	15/30	11.00 - 53	2.1E+01	2E-05	0.4	--

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C13-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.1E-06	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1.8E-02
				Cadmium	2.1E+01	mg/kg	3.7E-07	mg/kg-day	--	--	--	1.5E-06	mg/kg-day	5.0E-04	mg/kg-day	2.9E-03
				Copper	3.3E+02	mg/kg	5.8E-06	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	4.0E-02	mg/kg-day	5.6E-04
				Iron	6.3E+04	mg/kg	1.1E-03	mg/kg-day	--	--	--	4.3E-03	mg/kg-day	7.0E-01	mg/kg-day	6.1E-03
				Lead	2.0E+03	mg/kg	3.6E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	4.0E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	2.4E-02	mg/kg-day	6.4E-03
				Zinc	1.7E+03	mg/kg	2.9E-05	mg/kg-day	--	--	--	1.1E-04	mg/kg-day	3.0E-01	mg/kg-day	3.8E-04
			Exposure Route Total								2.1E-06					3.5E-02
			Dermal	Arsenic	1.4E+02	mg/kg	5.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.8E-07	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	6.7E-03
				Cadmium	2.1E+01	mg/kg	2.7E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	5.0E-04	mg/kg-day	2.1E-05
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								7.8E-07					6.8E-03
		Exposure Point Total									2.9E-06					4.2E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	1.5E-07	mg/m3	4.3E-03	(µg/m3)-1	6.3E-07	5.7E-07	mg/m3	1.5E-05	mg/m3	3.8E-02
				Cadmium	2.1E+01	mg/kg	2.3E-08	mg/m3	1.8E-03	(µg/m3)-1	4.1E-08	9.0E-08	mg/m3	2.0E-05	mg/m3	4.5E-03
				Copper	3.3E+02	mg/kg	3.6E-07	mg/m3	--	--	--	1.4E-06	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	6.8E-05	mg/m3	--	--	--	2.6E-04	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	2.2E-06	mg/m3	--	--	--	8.6E-06	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	2.4E-06	mg/m3	--	--	--	9.5E-06	mg/m3	5.0E-05	mg/m3	1.9E-01
				Zinc	1.7E+03	mg/kg	1.8E-06	mg/m3	--	--	--	7.1E-06	mg/m3	--	--	--
			Exposure Route Total								6.7E-07					2.3E-01
		Exposure Point Total									6.7E-07					2.3E-01
	Exposure Medium Total										3.6E-06					2.8E-01
Medium Total											3.6E-06					2.8E-01

Notes:

--	Not available or not applicable	EU	Exposure unit	Reference dose
ATV	All terrain vehicle	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	

TABLE C13-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 11 - BEARTRAP

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.1E-06	--	7.8E-07	2.9E-06	Skin	1.8E-02	--	6.7E-03	2.5E-02
			Cadmium	--	--	--	--	Kidney	2.9E-03	--	2.1E-05	2.9E-03
			Copper	--	--	--	--	Gastrointestinal	5.6E-04	--	--	5.6E-04
			Iron	--	--	--	--	Gastrointestinal	6.1E-03	--	--	6.1E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	6.4E-03	--	--	6.4E-03
			Zinc	--	--	--	--	Blood	3.8E-04	--	--	3.8E-04
			Chemical Total	2.1E-06	--	7.8E-07	2.9E-06		3.5E-02	--	6.8E-03	4.2E-02
		Exposure Point Total					2.9E-06					4.2E-02
		Outdoor Air (Particulates)	Arsenic	--	6.3E-07	--	6.3E-07	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.8E-02	--	3.8E-02
			Cadmium	--	4.1E-08	--	4.1E-08	Kidney, Respiratory	--	4.5E-03	--	4.5E-03
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.9E-01	--	1.9E-01
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	6.7E-07	--	6.7E-07		--	2.3E-01	--	2.3E-01
		Exposure Point Total					6.7E-07					2.3E-01
	Exposure Medium Total						3.6E-06					2.8E-01
Medium Total							3.6E-06					2.8E-01

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	3.8E-04
Cardiovascular	3.8E-02
Central Nervous System	2.4E-01
Developmental	3.8E-02
Gastrointestinal	6.7E-03
Kidney	7.4E-03
Lung	3.8E-02
Respiratory	4.5E-03
Skin	6.3E-02
Maximum	2.4E-01

TABLE C13-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ATV/MOTORCYCLE RIDER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational ATV/Motorcycle Rider
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
ATV	All terrain vehicle
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	8.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.3E-06	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1.1E-02
				Cadmium	2.1E+01	mg/kg	2.3E-07	mg/kg-day	--	--	--	8.8E-07	mg/kg-day	5.0E-04	mg/kg-day	1.8E-03
				Copper	3.3E+02	mg/kg	3.5E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	4.0E-02	mg/kg-day	3.4E-04
				Iron	6.3E+04	mg/kg	6.6E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	7.0E-01	mg/kg-day	3.7E-03
				Lead	2.0E+03	mg/kg	2.2E-05	mg/kg-day	--	--	--	8.4E-05	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	2.4E-05	mg/kg-day	--	--	--	9.3E-05	mg/kg-day	2.4E-02	mg/kg-day	3.9E-03
				Zinc	1.7E+03	mg/kg	1.8E-05	mg/kg-day	--	--	--	7.0E-05	mg/kg-day	3.0E-01	mg/kg-day	2.3E-04
			Exposure Route Total								1.3E-06					2.1E-02
			Dermal	Arsenic	1.4E+02	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.6E-06	4.0E-06	mg/kg-day	3.0E-04	mg/kg-day	1.3E-02
				Cadmium	2.1E+01	mg/kg	5.4E-09	mg/kg-day	--	--	--	2.1E-08	mg/kg-day	5.0E-04	mg/kg-day	4.2E-05
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.6E-06					1.4E-02
		Exposure Point Total									2.8E-06					3.5E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	2.8E-10	mg/m3	4.3E-03	(µg/m3)-1	1.2E-09	1.1E-09	mg/m3	1.5E-05	mg/m3	7.3E-05
				Cadmium	2.1E+01	mg/kg	4.4E-11	mg/m3	1.8E-03	(µg/m3)-1	8.0E-11	1.7E-10	mg/m3	2.0E-05	mg/m3	8.6E-06
				Copper	3.3E+02	mg/kg	6.9E-10	mg/m3	--	--	--	2.7E-09	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	1.3E-07	mg/m3	--	--	--	5.1E-07	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	4.2E-09	mg/m3	--	--	--	1.6E-08	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	4.7E-09	mg/m3	--	--	--	1.8E-08	mg/m3	5.0E-05	mg/m3	3.7E-04
				Zinc	1.7E+03	mg/kg	3.5E-09	mg/m3	--	--	--	1.4E-08	mg/m3	--	--	--
			Exposure Route Total								1.3E-09					4.5E-04
		Exposure Point Total									1.3E-09					4.5E-04
	Exposure Medium Total										2.8E-06					3.5E-02
Medium Total											2.8E-06					3.5E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C13-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.3E-06	--	1.6E-06	2.8E-06	Skin	1.1E-02	--	1.3E-02	2.5E-02
			Cadmium	--	--	--	--	Kidney	1.8E-03	--	4.2E-05	1.8E-03
			Copper	--	--	--	--	Gastrointestinal	3.4E-04	--	--	3.4E-04
			Iron	--	--	--	--	Gastrointestinal	3.7E-03	--	--	3.7E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	3.9E-03	--	--	3.9E-03
			Zinc	--	--	--	--	Blood	2.3E-04	--	--	2.3E-04
			Chemical Total	1.3E-06	--	1.6E-06	2.8E-06		2.1E-02	--	1.4E-02	3.5E-02
		Exposure Point Total					2.8E-06					3.5E-02
		Outdoor Air (Particulates)	Arsenic	--	1.2E-09	--	1.2E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.3E-05	--	7.3E-05
			Cadmium	--	8.0E-11	--	8.0E-11	Kidney, Respiratory	--	8.6E-06	--	8.6E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.7E-04	--	3.7E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.3E-09	--	1.3E-09		--	4.5E-04	--	4.5E-04
		Exposure Point Total					1.3E-09					4.5E-04
	Exposure Medium Total						2.8E-06					3.5E-02
Medium Total							2.8E-06					3.5E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	2.3E-04
Cardiovascular	7.3E-05
Central Nervous System	4.3E-03
Developmental	7.3E-05
Gastrointestinal	4.0E-03
Kidney	1.8E-03
Lung	7.3E-05
Respiratory	8.6E-06
Skin	2.5E-02
Maximum	2.5E-02

TABLE C13-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, FISHERMAN - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	5.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.4E-06	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1.2E-01
				Cadmium	2.1E+01	mg/kg	1.5E-06	mg/kg-day	--	--	--	9.4E-06	mg/kg-day	5.0E-04	mg/kg-day	1.9E-02
				Copper	3.3E+02	mg/kg	2.3E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	4.0E-02	mg/kg-day	3.7E-03
				Iron	6.3E+04	mg/kg	4.3E-03	mg/kg-day	--	--	--	2.8E-02	mg/kg-day	7.0E-01	mg/kg-day	3.9E-02
				Lead	2.0E+03	mg/kg	1.4E-04	mg/kg-day	--	--	--	9.0E-04	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	1.6E-04	mg/kg-day	--	--	--	1.0E-03	mg/kg-day	2.4E-02	mg/kg-day	4.2E-02
				Zinc	1.7E+03	mg/kg	1.2E-04	mg/kg-day	--	--	--	7.4E-04	mg/kg-day	3.0E-01	mg/kg-day	2.5E-03
			Exposure Route Total								8.4E-06					2.3E-01
			Dermal	Arsenic	1.4E+02	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.7E-06	9.6E-06	mg/kg-day	3.0E-04	mg/kg-day	3.2E-02
				Cadmium	2.1E+01	mg/kg	9.3E-09	mg/kg-day	--	--	--	5.1E-08	mg/kg-day	5.0E-04	mg/kg-day	1.0E-04
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.7E-06					3.2E-02
		Exposure Point Total									1.1E-05					2.6E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	7.3E-10	mg/m3	4.3E-03	(µg/m3)-1	3.1E-09	2.2E-09	mg/m3	1.5E-05	mg/m3	1.5E-04
				Cadmium	2.1E+01	mg/kg	1.2E-10	mg/m3	1.8E-03	(µg/m3)-1	2.1E-10	3.5E-10	mg/m3	2.0E-05	mg/m3	1.7E-05
				Copper	3.3E+02	mg/kg	1.8E-09	mg/m3	--	--	--	5.4E-09	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	3.4E-07	mg/m3	--	--	--	1.0E-06	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	1.1E-08	mg/m3	--	--	--	3.3E-08	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	1.2E-08	mg/m3	--	--	--	3.7E-08	mg/m3	5.0E-05	mg/m3	7.3E-04
				Zinc	1.7E+03	mg/kg	9.1E-09	mg/m3	--	--	--	2.7E-08	mg/m3	--	--	--
			Exposure Route Total								3.3E-09					9.0E-04
		Exposure Point Total									3.3E-09					9.0E-04
	Exposure Medium Total										1.1E-05					2.6E-01
Medium Total											1.1E-05					2.6E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C13-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	8.4E-06	--	2.7E-06	1.1E-05	Skin	1.2E-01	--	3.2E-02	1.5E-01
			Cadmium	--	--	--	--	Kidney	1.9E-02	--	1.0E-04	1.9E-02
			Copper	--	--	--	--	Gastrointestinal	3.7E-03	--	--	3.7E-03
			Iron	--	--	--	--	Gastrointestinal	3.9E-02	--	--	3.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.2E-02	--	--	4.2E-02
			Zinc	--	--	--	--	Blood	2.5E-03	--	--	2.5E-03
			Chemical Total	8.4E-06	--	2.7E-06	1.1E-05		2.3E-01	--	3.2E-02	2.6E-01
		Exposure Point Total					1.1E-05					2.6E-01
		Outdoor Air (Particulates)	Arsenic	--	3.1E-09	--	3.1E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.5E-04	--	1.5E-04
			Cadmium	--	2.1E-10	--	2.1E-10	Kidney, Respiratory	--	1.7E-05	--	1.7E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	7.3E-04	--	7.3E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.3E-09	--	3.3E-09		--	9.0E-04	--	9.0E-04
		Exposure Point Total					3.3E-09					9.0E-04
	Exposure Medium Total						1.1E-05					2.6E-01
Medium Total							1.1E-05					2.6E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	2.5E-03
Cardiovascular	1.5E-04
Central Nervous System	4.2E-02
Developmental	1.5E-04
Gastrointestinal	4.3E-02
Kidney	1.9E-02
Lung	1.5E-04
Respiratory	1.7E-05
Skin	1.5E-01
Maximum	1.5E-01

TABLE C13-3.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	5.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.6E-07	2.2E-06	mg/kg-day	3.0E-04	mg/kg-day	7.5E-03
				Cadmium	2.1E+01	mg/kg	1.5E-07	mg/kg-day	--	--	--	5.9E-07	mg/kg-day	5.0E-04	mg/kg-day	1.2E-03
				Copper	3.3E+02	mg/kg	2.3E-06	mg/kg-day	--	--	--	9.1E-06	mg/kg-day	4.0E-02	mg/kg-day	2.3E-04
				Iron	6.3E+04	mg/kg	4.4E-04	mg/kg-day	--	--	--	1.7E-03	mg/kg-day	7.0E-01	mg/kg-day	2.5E-03
				Lead	2.0E+03	mg/kg	1.4E-05	mg/kg-day	--	--	--	5.6E-05	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	1.6E-05	mg/kg-day	--	--	--	6.2E-05	mg/kg-day	2.4E-02	mg/kg-day	2.6E-03
				Zinc	1.7E+03	mg/kg	1.2E-05	mg/kg-day	--	--	--	4.6E-05	mg/kg-day	3.0E-01	mg/kg-day	1.5E-04
			Exposure Route Total								8.6E-07					1.4E-02
			Dermal	Arsenic	1.4E+02	mg/kg	6.9E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.0E-06	2.7E-06	mg/kg-day	3.0E-04	mg/kg-day	9.0E-03
				Cadmium	2.1E+01	mg/kg	3.6E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	5.0E-04	mg/kg-day	2.8E-05
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.0E-06					9.0E-03
		Exposure Point Total									1.9E-06					2.3E-02
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	1.9E-10	mg/m3	4.3E-03	(µg/m3)-1	8.1E-10	7.3E-10	mg/m3	1.5E-05	mg/m3	4.9E-05
				Cadmium	2.1E+01	mg/kg	3.0E-11	mg/m3	1.8E-03	(µg/m3)-1	5.3E-11	1.2E-10	mg/m3	2.0E-05	mg/m3	5.8E-06
				Copper	3.3E+02	mg/kg	4.6E-10	mg/m3	--	--	--	1.8E-09	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	8.7E-08	mg/m3	--	--	--	3.4E-07	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	2.8E-09	mg/m3	--	--	--	1.1E-08	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	3.1E-09	mg/m3	--	--	--	1.2E-08	mg/m3	5.0E-05	mg/m3	2.4E-04
				Zinc	1.7E+03	mg/kg	2.3E-09	mg/m3	--	--	--	9.1E-09	mg/m3	--	--	--
			Exposure Route Total								8.6E-10					3.0E-04
		Exposure Point Total									8.6E-10					3.0E-04
	Exposure Medium Total										1.9E-06					2.3E-02
Medium Total											1.9E-06					2.3E-02

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter	
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund	
EU	Exposure unit	RfD	Reference dose	

TABLE C13-4.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	8.6E-07	--	1.0E-06	1.9E-06	Skin	7.5E-03	--	9.0E-03	1.6E-02
			Cadmium	--	--	--	--	Kidney	1.2E-03	--	2.8E-05	1.2E-03
			Copper	--	--	--	--	Gastrointestinal	2.3E-04	--	--	2.3E-04
			Iron	--	--	--	--	Gastrointestinal	2.5E-03	--	--	2.5E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	2.6E-03	--	--	2.6E-03
			Zinc	--	--	--	--	Blood	1.5E-04	--	--	1.5E-04
			Chemical Total	8.6E-07	--	1.0E-06	1.9E-06		1.4E-02	--	9.0E-03	2.3E-02
		Exposure Point Total					1.9E-06					2.3E-02
		Outdoor Air (Particulates)	Arsenic	--	8.1E-10	--	8.1E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.9E-05	--	4.9E-05
			Cadmium	--	5.3E-11	--	5.3E-11	Kidney, Respiratory	--	5.8E-06	--	5.8E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.4E-04	--	2.4E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	8.6E-10	--	8.6E-10		--	3.0E-04	--	3.0E-04
		Exposure Point Total					8.6E-10					3.0E-04
	Exposure Medium Total						1.9E-06					2.3E-02
Medium Total							1.9E-06					2.3E-02

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Soil (0-2)
Blood	1.5E-04
Cardiovascular	4.9E-05
Central Nervous System	2.9E-03
Developmental	4.9E-05
Gastrointestinal	2.7E-03
Kidney	1.2E-03
Lung	4.9E-05
Respiratory	5.8E-06
Skin	1.6E-02
Maximum	1.6E-02

TABLE C13-4.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, HUNTER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Hunter
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	1.5E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.2E-05	4.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1.5E-01
				Cadmium	2.1E+01	mg/kg	3.9E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	5.0E-04	mg/kg-day	2.4E-02
				Copper	3.3E+02	mg/kg	6.0E-05	mg/kg-day	--	--	--	1.9E-04	mg/kg-day	4.0E-02	mg/kg-day	4.7E-03
				Iron	6.3E+04	mg/kg	1.1E-02	mg/kg-day	--	--	--	3.6E-02	mg/kg-day	7.0E-01	mg/kg-day	5.1E-02
				Lead	2.0E+03	mg/kg	3.7E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	4.1E-04	mg/kg-day	--	--	--	1.3E-03	mg/kg-day	2.4E-02	mg/kg-day	5.4E-02
				Zinc	1.7E+03	mg/kg	3.1E-04	mg/kg-day	--	--	--	9.6E-04	mg/kg-day	3.0E-01	mg/kg-day	3.2E-03
			Exposure Route Total								2.2E-05					2.9E-01
			Dermal	Arsenic	1.4E+02	mg/kg	3.1E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.6E-06	9.6E-06	mg/kg-day	3.0E-04	mg/kg-day	3.2E-02
				Cadmium	2.1E+01	mg/kg	1.6E-08	mg/kg-day	--	--	--	5.0E-08	mg/kg-day	5.0E-04	mg/kg-day	1.0E-04
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								4.6E-06					3.2E-02
		Exposure Point Total									2.7E-05					3.2E-01
		Outdoor Air	Inhalation (Partculates)	Arsenic	1.4E+02	mg/kg	4.8E-09	mg/m3	4.3E-03	(µg/m3)-1	2.1E-08	1.5E-08	mg/m3	1.5E-05	mg/m3	1.0E-03
				Cadmium	2.1E+01	mg/kg	7.6E-10	mg/m3	1.8E-03	(µg/m3)-1	1.4E-09	2.4E-09	mg/m3	2.0E-05	mg/m3	1.2E-04
				Copper	3.3E+02	mg/kg	1.2E-08	mg/m3	--	--	--	3.7E-08	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	2.2E-06	mg/m3	--	--	--	7.0E-06	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	7.3E-08	mg/m3	--	--	--	2.3E-07	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	8.1E-08	mg/m3	--	--	--	2.5E-07	mg/m3	5.0E-05	mg/m3	5.0E-03
				Zinc	1.7E+03	mg/kg	6.0E-08	mg/m3	--	--	--	1.9E-07	mg/m3	--	--	--
			Exposure Route Total								2.2E-08					6.2E-03
		Exposure Point Total									2.2E-08					6.2E-03
	Exposure Medium Total										2.7E-05					3.3E-01
Medium Total											2.7E-05					3.3E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C13-5.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.2E-05	--	4.6E-06	2.7E-05	Skin	1.5E-01	--	3.2E-02	1.9E-01
			Cadmium	--	--	--	--	Kidney	2.4E-02	--	1.0E-04	2.4E-02
			Copper	--	--	--	--	Gastrointestinal	4.7E-03	--	--	4.7E-03
			Iron	--	--	--	--	Gastrointestinal	5.1E-02	--	--	5.1E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	5.4E-02	--	--	5.4E-02
			Zinc	--	--	--	--	Blood	3.2E-03	--	--	3.2E-03
			Chemical Total	2.2E-05	--	4.6E-06	2.7E-05		2.9E-01	--	3.2E-02	3.2E-01
		Exposure Point Total					2.7E-05					3.2E-01
		Outdoor Air (Particulates)	Arsenic	--	2.1E-08	--	2.1E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.0E-03	--	1.0E-03
			Cadmium	--	1.4E-09	--	1.4E-09	Kidney, Respiratory	--	1.2E-04	--	1.2E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	5.0E-03	--	5.0E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	2.2E-08	--	2.2E-08		--	6.2E-03	--	6.2E-03
		Exposure Point Total					2.2E-08					6.2E-03
	Exposure Medium Total						2.7E-05					3.3E-01
Medium Total							2.7E-05					3.3E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	3.2E-03
Cardiovascular	1.0E-03
Central Nervous System	6.0E-02
Developmental	1.0E-03
Gastrointestinal	5.5E-02
Kidney	2.4E-02
Lung	1.0E-03
Respiratory	1.2E-04
Skin	1.9E-01
Maximum	1.9E-01

TABLE C13-5.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, INDUSTRIAL WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.2E-05	--	4.6E-06	2.7E-05	Skin	1.5E-01	--	3.2E-02	1.9E-01
			Chemical Total	2.2E-05	--	4.6E-06	2.7E-05		1.5E-01	--	3.2E-02	1.9E-01
		Exposure Point Total					2.7E-05					1.9E-01
		Outdoor Air (Particulates)	Arsenic	--	2.1E-08	--	2.1E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.0E-03	--	1.0E-03
			Chemical Total	--	2.1E-08	--	2.1E-08		--	1.0E-03	--	1.0E-03
		Exposure Point Total					2.1E-08					1.0E-03
	Exposure Medium Total						2.7E-05					1.9E-01
Medium Total							2.7E-05					1.9E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-6.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.2E-06	1.1E-04	mg/kg-day	3.0E-04	mg/kg-day	3.8E-01
				Cadmium	2.1E+01	mg/kg	3.8E-07	mg/kg-day	--	--	--	3.0E-05	mg/kg-day	5.0E-04	mg/kg-day	6.0E-02
				Copper	3.3E+02	mg/kg	6.0E-06	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	4.0E-02	mg/kg-day	1.2E-02
				Iron	6.3E+04	mg/kg	1.1E-03	mg/kg-day	--	--	--	8.8E-02	mg/kg-day	7.0E-01	mg/kg-day	1.3E-01
				Lead	2.0E+03	mg/kg	3.7E-05	mg/kg-day	--	--	--	2.9E-03	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	4.1E-05	mg/kg-day	--	--	--	3.2E-03	mg/kg-day	2.4E-02	mg/kg-day	1.3E-01
				Zinc	1.7E+03	mg/kg	3.0E-05	mg/kg-day	--	--	--	2.4E-03	mg/kg-day	3.0E-01	mg/kg-day	7.9E-03
			Exposure Route Total								2.2E-06					7.2E-01
			Dermal	Arsenic	1.4E+02	mg/kg	1.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.4E-07	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4.1E-02
				Cadmium	2.1E+01	mg/kg	8.3E-10	mg/kg-day	--	--	--	6.5E-08	mg/kg-day	5.0E-04	mg/kg-day	1.3E-04
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.4E-07					4.1E-02
		Exposure Point Total									2.4E-06					7.6E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	1.5E-10	mg/m3	4.3E-03	(µg/m3)-1	6.2E-10	1.1E-08	mg/m3	1.5E-05	mg/m3	7.5E-04
				Cadmium	2.1E+01	mg/kg	2.3E-11	mg/m3	1.8E-03	(µg/m3)-1	4.1E-11	1.8E-09	mg/m3	2.0E-05	mg/m3	8.9E-05
				Copper	3.3E+02	mg/kg	3.6E-10	mg/m3	--	--	--	2.8E-08	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	6.7E-08	mg/m3	--	--	--	5.2E-06	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	2.2E-09	mg/m3	--	--	--	1.7E-07	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	2.4E-09	mg/m3	--	--	--	1.9E-07	mg/m3	5.0E-05	mg/m3	3.8E-03
				Zinc	1.7E+03	mg/kg	1.8E-09	mg/m3	--	--	--	1.4E-07	mg/m3	--	--	--
			Exposure Route Total								6.7E-10					4.6E-03
		Exposure Point Total									6.7E-10					4.6E-03
	Exposure Medium Total										2.4E-06					7.7E-01
Medium Total											2.4E-06					7.7E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C13-6.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	2.2E-06	--	2.4E-07	2.4E-06	Skin	3.8E-01	--	4.1E-02	4.2E-01
			Cadmium	--	--	--	--	Kidney	6.0E-02	--	1.3E-04	6.0E-02
			Copper	--	--	--	--	Gastrointestinal	1.2E-02	--	--	1.2E-02
			Iron	--	--	--	--	Gastrointestinal	1.3E-01	--	--	1.3E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.3E-01	--	--	1.3E-01
			Zinc	--	--	--	--	Blood	7.9E-03	--	--	7.9E-03
			Chemical Total	2.2E-06	--	2.4E-07	2.4E-06		7.2E-01	--	4.1E-02	7.6E-01
		Exposure Point Total					2.4E-06					7.6E-01
		Outdoor Air (Particulates)	Arsenic	--	6.2E-10	--	6.2E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.5E-04	--	7.5E-04
			Cadmium	--	4.1E-11	--	4.1E-11	Kidney, Respiratory	--	8.9E-05	--	8.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.8E-03	--	3.8E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	6.7E-10	--	6.7E-10		--	4.6E-03	--	4.6E-03
		Exposure Point Total					6.7E-10					4.6E-03
	Exposure Medium Total						2.4E-06					7.7E-01
Medium Total							2.4E-06					7.7E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	7.9E-03
Cardiovascular	7.5E-04
Central Nervous System	1.4E-01
Developmental	7.5E-04
Gastrointestinal	1.4E-01
Kidney	6.0E-02
Lung	7.5E-04
Respiratory	8.9E-05
Skin	4.2E-01
Maximum	4.2E-01

TABLE C13-6.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C13-7.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (0 to 2 feet bgs)	Site Soil	Ingestion	Arsenic	1.4E+02	mg/kg	6.9E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.0E-04	6.9E-04	mg/kg-day	3.0E-04	mg/kg-day	2.3E+00
				Cadmium	2.1E+01	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	5.0E-04	mg/kg-day	3.6E-01
				Copper	3.3E+02	mg/kg	2.8E-04	mg/kg-day	--	--	--	2.8E-03	mg/kg-day	4.0E-02	mg/kg-day	7.0E-02
				Iron	6.3E+04	mg/kg	5.3E-02	mg/kg-day	--	--	--	5.3E-01	mg/kg-day	7.0E-01	mg/kg-day	7.6E-01
				Lead	2.0E+03	mg/kg	1.7E-03	mg/kg-day	--	--	--	1.7E-02	mg/kg-day	--	--	--
				Manganese	2.3E+03	mg/kg	1.9E-03	mg/kg-day	--	--	--	1.9E-02	mg/kg-day	2.4E-02	mg/kg-day	8.0E-01
				Zinc	1.7E+03	mg/kg	1.4E-03	mg/kg-day	--	--	--	1.4E-02	mg/kg-day	3.0E-01	mg/kg-day	4.7E-02
			Exposure Route Total								1.0E-04					4.3E+00
			Dermal	Arsenic	1.4E+02	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.6E-05	9.2E-05	mg/kg-day	3.0E-04	mg/kg-day	3.1E-01
				Cadmium	2.1E+01	mg/kg	5.6E-08	mg/kg-day	--	--	--	4.8E-07	mg/kg-day	5.0E-04	mg/kg-day	9.7E-04
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	6.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.0E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.3E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.7E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.6E-05					3.1E-01
		Exposure Point Total									1.2E-04					4.6E+00
		Outdoor Air	Inhalation (Particulates)	Arsenic	1.4E+02	mg/kg	2.1E-08	mg/m3	4.3E-03	(µg/m3)-1	9.0E-08	6.3E-08	mg/m3	1.5E-05	mg/m3	4.2E-03
				Cadmium	2.1E+01	mg/kg	3.3E-09	mg/m3	1.8E-03	(µg/m3)-1	6.0E-09	9.9E-09	mg/m3	2.0E-05	mg/m3	5.0E-04
				Copper	3.3E+02	mg/kg	5.1E-08	mg/m3	--	--	--	1.5E-07	mg/m3	--	--	--
				Iron	6.3E+04	mg/kg	9.7E-06	mg/m3	--	--	--	2.9E-05	mg/m3	--	--	--
				Lead	2.0E+03	mg/kg	3.2E-07	mg/m3	--	--	--	9.5E-07	mg/m3	--	--	--
				Manganese	2.3E+03	mg/kg	3.5E-07	mg/m3	--	--	--	1.1E-06	mg/m3	5.0E-05	mg/m3	2.1E-02
				Zinc	1.7E+03	mg/kg	2.6E-07	mg/m3	--	--	--	7.8E-07	mg/m3	--	--	--
			Exposure Route Total								9.6E-08					2.6E-02
		Exposure Point Total									9.6E-08					2.6E-02
	Exposure Medium Total										1.2E-04					4.6E+00
Medium Total											1.2E-04					4.6E+00

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C13-7.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.0E-04	--	1.6E-05	1.2E-04	Skin	2.3E+00	--	3.1E-01	2.6E+00
			Cadmium	--	--	--	--	Kidney	3.6E-01	--	9.7E-04	3.6E-01
			Copper	--	--	--	--	Gastrointestinal	7.0E-02	--	--	7.0E-02
			Iron	--	--	--	--	Gastrointestinal	7.6E-01	--	--	7.6E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	8.0E-01	--	--	8.0E-01
			Zinc	--	--	--	--	Blood	4.7E-02	--	--	4.7E-02
			Chemical Total	1.0E-04	--	1.6E-05	1.2E-04		4.3E+00	--	3.1E-01	4.6E+00
		Exposure Point Total					1.2E-04					4.6E+00
		Outdoor Air (Particulates)	Arsenic	--	9.0E-08	--	9.0E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.2E-03	--	4.2E-03
			Cadmium	--	6.0E-09	--	6.0E-09	Kidney, Respiratory	--	5.0E-04	--	5.0E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.1E-02	--	2.1E-02
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	9.6E-08	--	9.6E-08		--	2.6E-02	--	2.6E-02
		Exposure Point Total					9.6E-08					2.6E-02
	Exposure Medium Total						1.2E-04					4.6E+00
Medium Total							1.2E-04					4.6E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (0-2)
Blood	4.7E-02
Cardiovascular	4.2E-03
Central Nervous System	8.2E-01
Developmental	4.2E-03
Gastrointestinal	8.3E-01
Kidney	3.6E-01
Lung	4.2E-03
Respiratory	5.0E-04
Skin	**2.6E+00**
Maximum	**2.6E+00**

TABLE C13-7.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SOIL/TAILINGS EXPOSURE, ADULT AND CHILD RESIDENT - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (0 to 2 feet bgs)	Site Soil	Arsenic	1.0E-04	--	1.6E-05	1.2E-04	Skin	2.3E+00	--	3.1E-01	2.6E+00
			Chemical Total	1.0E-04	--	1.6E-05	1.2E-04		2.3E+00	--	3.1E-01	2.6E+00
		Exposure Point Total					1.2E-04					2.6E+00
		Outdoor Air (Particulates)	Arsenic	--	9.0E-08	--	9.0E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.2E-03	--	4.2E-03
			Chemical Total	--	9.0E-08	--	9.0E-08		--	4.2E-03	--	4.2E-03
		Exposure Point Total					9.0E-08					4.2E-03
	Exposure Medium Total						1.2E-04					2.6E+00
Medium Total							1.2E-04					2.6E+00

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-13: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SOIL, EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (a)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
ATV/Motorcycle Rider	Soil / Mine Waste (0 to 2 feet bgs)	12	2E-06	8E-07	7E-07	4E-06	0.03	0.007	0.2	0.3	0.2	--	--	--	--	--	--	--	--
Fisherman	Soil / Mine Waste (0 to 2 feet bgs)	24	1E-06	2E-06	1E-09	3E-06	0.02	0.01	0.0004	0.04	0.02	--	--	--	--	--	--	--	--
Rock Hound	Soil / Mine Waste (0 to 2 feet bgs)	24	8E-06	3E-06	3E-09	1E-05	0.23	0.03	0.0009	0.3	0.2	--	--	--	--	--	--	--	--
Hunter	Soil / Mine Waste (0 to 2 feet bgs)	16	9E-07	1E-06	9E-10	2E-06	0.014	0.009	0.0003	0.02	0.02	--	--	--	--	--	--	--	--
Industrial Worker	Soil / Mine Waste (0 to 2 feet bgs)	165	2E-05	5E-06	2E-08	3E-05	0.3	0.03	0.006	0.3	0.2	Arsenic	C	182/200	9.25 - 616	1.4E+02	3E-05	0.2	--
												Lead	PbB	200/200	26.36 - 21,699	2.4E+03	--	--	10.4
Construction Worker	Soil / Mine Waste (0 to 2 feet bgs)	124	2E-06	2E-07	7E-10	2E-06	0.7	0.04	0.005	0.8	0.4	Lead	PbB	200/200	26.36 - 21,699	2.4E+03	--	--	10.4
Resident	Soil / Mine Waste (0 to 2 feet bgs)	230	1E-04	2E-05	1E-07	1E-04	4	0.3	0.03	5	3	Arsenic	C, NC	182/200	9.25 - 616	1.4E+02	1E-04	3	--
												Lead	PbB	200/200	26.36 - 21,699	2.4E+03	--	--	36

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C14-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Soil (2 to 10 feet bgs)	Site Soil	Ingestion	Arsenic	8.8E+01	mg/kg	9.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.4E-06	7.4E-05	mg/kg-day	3.0E-04	mg/kg-day	2.5E-01
				Cadmium	7.4E+01	mg/kg	1.3E-06	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	5.0E-04	mg/kg-day	2.1E-01
				Copper	7.9E+02	mg/kg	1.4E-05	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	4.0E-02	mg/kg-day	2.8E-02
				Iron	4.7E+04	mg/kg	8.4E-04	mg/kg-day	--	--	--	6.5E-02	mg/kg-day	7.0E-01	mg/kg-day	9.4E-02
				Lead	4.5E+03	mg/kg	8.2E-05	mg/kg-day	--	--	--	6.4E-03	mg/kg-day	--	--	--
				Manganese	3.6E+03	mg/kg	6.6E-05	mg/kg-day	--	--	--	5.1E-03	mg/kg-day	2.4E-02	mg/kg-day	2.1E-01
				Zinc	3.2E+03	mg/kg	5.8E-05	mg/kg-day	--	--	--	4.5E-03	mg/kg-day	3.0E-01	mg/kg-day	1.5E-02
			Exposure Route Total								1.4E-06					8.1E-01
			Dermal	Arsenic	8.8E+01	mg/kg	1.0E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.5E-07	8.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2.7E-02
				Cadmium	7.4E+01	mg/kg	2.9E-09	mg/kg-day	--	--	--	2.3E-07	mg/kg-day	5.0E-04	mg/kg-day	4.5E-04
				Copper	7.9E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.7E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	4.5E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	3.6E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	3.2E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.5E-07					2.7E-02
		Exposure Point Total									1.6E-06					8.3E-01
		Outdoor Air	Inhalation (Particulates)	Arsenic	8.8E+01	mg/kg	9.4E-11	mg/m3	4.3E-03	(µg/m3)-1	4.1E-10	7.4E-09	mg/m3	1.5E-05	mg/m3	4.9E-04
				Cadmium	7.4E+01	mg/kg	7.9E-11	mg/m3	1.8E-03	(µg/m3)-1	1.4E-10	6.2E-09	mg/m3	2.0E-05	mg/m3	3.1E-04
				Copper	7.9E+02	mg/kg	8.4E-10	mg/m3	--	--	--	6.6E-08	mg/m3	--	--	--
				Iron	4.7E+04	mg/kg	5.0E-08	mg/m3	--	--	--	3.9E-06	mg/m3	--	--	--
				Lead	4.5E+03	mg/kg	4.8E-09	mg/m3	--	--	--	3.8E-07	mg/m3	--	--	--
				Manganese	3.6E+03	mg/kg	3.9E-09	mg/m3	--	--	--	3.0E-07	mg/m3	5.0E-05	mg/m3	6.1E-03
				Zinc	3.2E+03	mg/kg	3.4E-09	mg/m3	--	--	--	2.7E-07	mg/m3	--	--	--
			Exposure Route Total								5.5E-10					6.9E-03
		Exposure Point Total									5.5E-10					6.9E-03
	Exposure Medium Total										1.6E-06					8.4E-01
Medium Total											1.6E-06					8.4E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C14-1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS ASSOCIATED WITH EE/CA REMOVAL ACTION AREA, OVERBANK TAILINGS DEPOSITS, AND FLOSSIE LOUISE MINE WASTE PILES

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	Arsenic	1.4E-06	--	1.5E-07	1.6E-06	Skin	2.5E-01	--	2.7E-02	2.7E-01
			Cadmium	--	--	--	--	Kidney	2.1E-01	--	4.5E-04	2.1E-01
			Copper	--	--	--	--	Gastrointestinal	2.8E-02	--	--	2.8E-02
			Iron	--	--	--	--	Gastrointestinal	9.4E-02	--	--	9.4E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	2.1E-01	--	--	2.1E-01
			Zinc	--	--	--	--	Blood	1.5E-02	--	--	1.5E-02
			Chemical Total	1.4E-06	--	1.5E-07	1.6E-06		8.1E-01	--	2.7E-02	8.3E-01
		Exposure Point Total					1.6E-06					8.3E-01
		Outdoor Air (Particulates)	Arsenic	--	4.1E-10	--	4.1E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.9E-04	--	4.9E-04
			Cadmium	--	1.4E-10	--	1.4E-10	Kidney, Respiratory	--	3.1E-04	--	3.1E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	6.1E-03	--	6.1E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.5E-10	--	5.5E-10		--	6.9E-03	--	6.9E-03
		Exposure Point Total					5.5E-10					6.9E-03
	Exposure Medium Total						1.6E-06					8.4E-01
Medium Total							1.6E-06					8.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Soil (2-10)
Blood	1.5E-02
Cardiovascular	4.9E-04
Central Nervous System	2.2E-01
Developmental	4.9E-04
Gastrointestinal	1.2E-01
Kidney	2.1E-01
Lung	4.9E-04
Respiratory	3.1E-04
Skin	2.8E-01
Maximum	2.8E-01

TABLE C14-1.3

EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SUBSURFACE SOIL/TAILINGS EXPOSURE, CONSTRUCTION WORKER - EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil (2 to 10 feet bgs)	Site Soil	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-14: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SOIL, EU 11 - BEARTRAP CREEK DISPERSED TAILINGS DEPOSITS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Subsurface Soil / Mine Waste (2 to 10 feet bgs)	124	1E-06	2E-07	5E-10	2E-06	0.8	0.03	0.007	0.8	0.3	Lead	PbB	113/114	29.00 - 24,892	4.5E+03	--	--	17.8

Notes:

--	Not applicable
µg/dL	Microgram per deciliter
ATV	All-terrain vehicle
bgs	Below ground surface
C	Cancer
EPC	Exposure point concentration
EU	Exposure unit
HI	Hazard index
mg/kg	Milligram per kilogram
NC	Noncancer
PbB	Blood lead modeling
UBMC	Upper Blackfoot Mining Complex

TABLE C15-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, FISHERMAN - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.1E+04	mg/kg	1.2E-04	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	1.0E+00	mg/kg-day	4.7E-04
				Arsenic	6.9E+01	mg/kg	4.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	6.6E-07	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	5.7E-03
				Cadmium	1.1E+01	mg/kg	1.2E-07	mg/kg-day	--	--	--	4.6E-07	mg/kg-day	5.0E-04	mg/kg-day	9.1E-04
				Copper	6.7E+02	mg/kg	7.0E-06	mg/kg-day	--	--	--	2.7E-05	mg/kg-day	4.0E-02	mg/kg-day	6.9E-04
				Iron	4.6E+04	mg/kg	4.8E-04	mg/kg-day	--	--	--	1.9E-03	mg/kg-day	7.0E-01	mg/kg-day	2.7E-03
				Lead	2.2E+03	mg/kg	2.3E-05	mg/kg-day	--	--	--	9.1E-05	mg/kg-day	--	--	--
				Manganese	5.8E+03	mg/kg	6.2E-05	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	2.4E-02	mg/kg-day	1.0E-02
				Zinc	4.5E+03	mg/kg	4.8E-05	mg/kg-day	--	--	--	1.9E-04	mg/kg-day	3.0E-01	mg/kg-day	6.2E-04
			Exposure Route Total								6.6E-07					2.1E-02
			Dermal	Aluminum	1.1E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	6.9E+01	mg/kg	5.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	7.9E-07	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	6.9E-03
				Cadmium	1.1E+01	mg/kg	2.8E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	5.0E-04	mg/kg-day	2.2E-05
				Copper	6.7E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.6E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	5.8E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	4.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								7.9E-07					6.9E-03
		Exposure Point Total									1.5E-06					2.8E-02
	Exposure Medium Total										1.5E-06					2.8E-02
Medium Total											1.5E-06					2.8E-02

Notes:

--	Not available or not applicable	mg/kg-day	Milligram per kilogram per day
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure

TABLE C15-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, FISHERMAN - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	4.7E-04	--	--	4.7E-04
			Arsenic	6.6E-07	--	7.9E-07	1.5E-06	Skin	5.7E-03	--	6.9E-03	1.3E-02
			Cadmium	--	--	--	--	Kidney	9.1E-04	--	2.2E-05	9.3E-04
			Copper	--	--	--	--	Gastrointestinal	6.9E-04	--	--	6.9E-04
			Iron	--	--	--	--	Gastrointestinal	2.7E-03	--	--	2.7E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.0E-02	--	--	1.0E-02
			Zinc	--	--	--	--	Blood	6.2E-04	--	--	6.2E-04
			Chemical Total	6.6E-07	--	7.9E-07	1.5E-06		2.1E-02	--	6.9E-03	2.8E-02
		Exposure Point Total					1.5E-06					2.8E-02
	Exposure Medium Total						1.5E-06					2.8E-02
Medium Total							1.5E-06					2.8E-02

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	6.2E-04
Cardiovascular	--
Central Nervous System	1.0E-02
Developmental	--
Gastrointestinal	3.4E-03
Kidney	9.3E-04
Lung	--
Respiratory	--
Skin	1.3E-02
Maximum	1.3E-02

TABLE C15-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, FISHERMAN - EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk								Noncancer Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--
		Exposure Point Total					--				--					--			--	--
	Exposure Medium Total						--				--					--				--
Medium Total							--				--					--				--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population. .

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C15-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 12 - MARSH

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.1E+04	mg/kg	7.8E-04	mg/kg-day	--	--	--	5.0E-03	mg/kg-day	1.0E+00	mg/kg-day	5.0E-03
				Arsenic	6.9E+01	mg/kg	2.9E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.3E-06	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	6.1E-02
				Cadmium	1.1E+01	mg/kg	7.6E-07	mg/kg-day	--	--	--	4.9E-06	mg/kg-day	5.0E-04	mg/kg-day	9.7E-03
				Copper	6.7E+02	mg/kg	4.6E-05	mg/kg-day	--	--	--	2.9E-04	mg/kg-day	4.0E-02	mg/kg-day	7.3E-03
				Iron	4.6E+04	mg/kg	3.1E-03	mg/kg-day	--	--	--	2.0E-02	mg/kg-day	7.0E-01	mg/kg-day	2.9E-02
				Lead	2.2E+03	mg/kg	1.5E-04	mg/kg-day	--	--	--	9.7E-04	mg/kg-day	--	--	--
				Manganese	5.8E+03	mg/kg	4.0E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	2.4E-02	mg/kg-day	1.1E-01
				Zinc	4.5E+03	mg/kg	3.1E-04	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	3.0E-01	mg/kg-day	6.6E-03
			Exposure Route Total								4.3E-06					2.3E-01
			Dermal	Aluminum	1.1E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	6.9E+01	mg/kg	9.4E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.4E-05	1.2E-04	mg/kg-day	3.0E-04	mg/kg-day	3.9E-01
				Cadmium	1.1E+01	mg/kg	5.0E-08	mg/kg-day	--	--	--	6.2E-07	mg/kg-day	5.0E-04	mg/kg-day	1.2E-03
				Copper	6.7E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.6E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	5.8E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	4.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.4E-05					3.9E-01
		Exposure Point Total									1.8E-05					6.1E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.1E+04	mg/kg	6.1E-08	mg/m3	--	--	--	1.8E-07	mg/m3	5.0E-03	mg/m3	3.7E-05
				Arsenic	6.9E+01	mg/kg	3.7E-10	mg/m3	4.3E-03	(µg/m3)-1	1.6E-09	1.1E-09	mg/m3	1.5E-05	mg/m3	7.5E-05
				Cadmium	1.1E+01	mg/kg	6.0E-11	mg/m3	1.8E-03	(µg/m3)-1	1.1E-10	1.8E-10	mg/m3	2.0E-05	mg/m3	8.9E-06
				Copper	6.7E+02	mg/kg	3.6E-09	mg/m3	--	--	--	1.1E-08	mg/m3	--	--	--
				Iron	4.6E+04	mg/kg	2.5E-07	mg/m3	--	--	--	7.4E-07	mg/m3	--	--	--
				Lead	2.2E+03	mg/kg	1.2E-08	mg/m3	--	--	--	3.6E-08	mg/m3	--	--	--
				Manganese	5.8E+03	mg/kg	3.1E-08	mg/m3	--	--	--	9.4E-08	mg/m3	5.0E-05	mg/m3	1.9E-03
				Zinc	4.5E+03	mg/kg	2.4E-08	mg/m3	--	--	--	7.3E-08	mg/m3	--	--	--
			Exposure Route Total								1.7E-09					2.0E-03
		Exposure Point Total									1.7E-09					2.0E-03
	Exposure Medium Total										1.8E-05					6.1E-01
Medium Total											1.8E-05					6.1E-01

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
CSF	Cancer slope factor	mg/m3	Milligram per cubic meter
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day	(µg/m3)-1	1/(Microgram per cubic meter)

TABLE C15-2.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	5.0E-03	--	--	5.0E-03
			Arsenic	4.3E-06	--	1.4E-05	1.8E-05	Skin	6.1E-02	--	3.9E-01	4.5E-01
			Cadmium	--	--	--	--	Kidney	9.7E-03	--	1.2E-03	1.1E-02
			Copper	--	--	--	--	Gastrointestinal	7.3E-03	--	--	7.3E-03
			Iron	--	--	--	--	Gastrointestinal	2.9E-02	--	--	2.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.1E-01	--	--	1.1E-01
			Zinc	--	--	--	--	Blood	6.6E-03	--	--	6.6E-03
			Chemical Total	4.3E-06	--	1.4E-05	1.8E-05		2.3E-01	--	3.9E-01	6.1E-01
		Exposure Point Total					1.8E-05					6.1E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	3.7E-05	--	3.7E-05
			Arsenic	--	1.6E-09	--	1.6E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	7.5E-05	--	7.5E-05
			Cadmium	--	1.1E-10	--	1.1E-10	Kidney, Respiratory	--	8.9E-06	--	8.9E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.9E-03	--	1.9E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.7E-09	--	1.7E-09		--	2.0E-03	--	2.0E-03
		Exposure Point Total					1.7E-09					2.0E-03
	Exposure Medium Total						1.8E-05					6.1E-01
Medium Total							1.8E-05					6.1E-01

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	6.6E-03
Cardiovascular	7.5E-05
Central Nervous System	1.1E-01
Developmental	7.5E-05
Gastrointestinal	3.6E-02
Kidney	1.1E-02
Lung	7.5E-05
Respiratory	8.9E-06
Skin	4.5E-01
Maximum	4.5E-01

TABLE C15-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	4.3E-06	--	1.4E-05	1.8E-05	--	--	--	--	--
			Chemical Total	4.3E-06	--	1.4E-05	1.8E-05		--	--	--	--
		Exposure Point Total					1.8E-05					--
		Outdoor Air (Particulates)	Arsenic	--	1.6E-09	--	1.6E-09	--	--	7.5E-05	--	7.5E-05
			Cadmium	--	1.1E-10	--	1.1E-10					
			Chemical Total	--	1.7E-09	--	1.7E-09		--	7.5E-05	--	7.5E-05
		Exposure Point Total					1.7E-09					7.5E-05
	Exposure Medium Total						1.8E-05					7.5E-05
Medium Total							1.8E-05					7.5E-05

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C15-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Ingestion	Aluminum	1.1E+04	mg/kg	2.1E-03	mg/kg-day	--	--	--	6.4E-03	mg/kg-day	1.0E+00	mg/kg-day	6.4E-03
				Arsenic	6.9E+01	mg/kg	7.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-05	2.4E-05	mg/kg-day	3.0E-04	mg/kg-day	7.9E-02
				Cadmium	1.1E+01	mg/kg	2.0E-06	mg/kg-day	--	--	--	6.3E-06	mg/kg-day	5.0E-04	mg/kg-day	1.3E-02
				Copper	6.7E+02	mg/kg	1.2E-04	mg/kg-day	--	--	--	3.8E-04	mg/kg-day	4.0E-02	mg/kg-day	9.4E-03
				Iron	4.6E+04	mg/kg	8.3E-03	mg/kg-day	--	--	--	2.6E-02	mg/kg-day	7.0E-01	mg/kg-day	3.7E-02
				Lead	2.2E+03	mg/kg	4.0E-04	mg/kg-day	--	--	--	1.3E-03	mg/kg-day	--	--	--
				Manganese	5.8E+03	mg/kg	1.1E-03	mg/kg-day	--	--	--	3.3E-03	mg/kg-day	2.4E-02	mg/kg-day	1.4E-01
				Zinc	4.5E+03	mg/kg	8.2E-04	mg/kg-day	--	--	--	2.6E-03	mg/kg-day	3.0E-01	mg/kg-day	8.5E-03
			Exposure Route Total								1.1E-05					2.9E-01
			Dermal	Aluminum	1.1E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	6.9E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.3E-06	6.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Cadmium	1.1E+01	mg/kg	1.2E-08	mg/kg-day	--	--	--	3.7E-08	mg/kg-day	5.0E-04	mg/kg-day	7.4E-05
				Copper	6.7E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.6E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	5.8E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	4.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								3.3E-06					2.3E-02
		Exposure Point Total									1.5E-05					3.1E-01
		Outdoor Air	Inhalation (Partculates)	Aluminum	1.1E+04	mg/kg	4.0E-07	mg/m3	--	--	--	1.3E-06	mg/m3	5.0E-03	mg/m3	2.5E-04
				Arsenic	6.9E+01	mg/kg	2.5E-09	mg/m3	4.3E-03	(µg/m3)-1	1.1E-08	7.7E-09	mg/m3	1.5E-05	mg/m3	5.1E-04
				Cadmium	1.1E+01	mg/kg	3.9E-10	mg/m3	1.8E-03	(µg/m3)-1	7.1E-10	1.2E-09	mg/m3	2.0E-05	mg/m3	6.1E-05
				Copper	6.7E+02	mg/kg	2.4E-08	mg/m3	--	--	--	7.4E-08	mg/m3	--	--	--
				Iron	4.6E+04	mg/kg	1.6E-06	mg/m3	--	--	--	5.1E-06	mg/m3	--	--	--
				Lead	2.2E+03	mg/kg	7.9E-08	mg/m3	--	--	--	2.5E-07	mg/m3	--	--	--
				Manganese	5.8E+03	mg/kg	2.1E-07	mg/m3	--	--	--	6.5E-07	mg/m3	5.0E-05	mg/m3	1.3E-02
				Zinc	4.5E+03	mg/kg	1.6E-07	mg/m3	--	--	--	5.0E-07	mg/m3	--	--	--
			Exposure Route Total								1.1E-08					1.4E-02
		Exposure Point Total									1.1E-08					1.4E-02
	Exposure Medium Total										1.5E-05					3.3E-01
Medium Total											1.5E-05					3.3E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C15-3.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	6.4E-03	--	--	6.4E-03
			Arsenic	1.1E-05	--	3.3E-06	1.5E-05	Skin	7.9E-02	--	2.3E-02	1.0E-01
			Cadmium	--	--	--	--	Kidney	1.3E-02	--	7.4E-05	1.3E-02
			Copper	--	--	--	--	Gastrointestinal	9.4E-03	--	--	9.4E-03
			Iron	--	--	--	--	Gastrointestinal	3.7E-02	--	--	3.7E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.4E-01	--	--	1.4E-01
			Zinc	--	--	--	--	Blood	8.5E-03	--	--	8.5E-03
			Chemical Total	1.1E-05	--	3.3E-06	1.5E-05		2.9E-01	--	2.3E-02	3.1E-01
		Exposure Point Total					1.5E-05					3.1E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	2.5E-04	--	2.5E-04
			Arsenic	--	1.1E-08	--	1.1E-08	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	5.1E-04	--	5.1E-04
			Cadmium	--	7.1E-10	--	7.1E-10	Kidney, Respiratory	--	6.1E-05	--	6.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.3E-02	--	1.3E-02
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.1E-08	--	1.1E-08		--	1.4E-02	--	1.4E-02
		Exposure Point Total					1.1E-08					1.4E-02
	Exposure Medium Total						1.5E-05					3.3E-01
Medium Total							1E-05					3.3E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	--
Cardiovascular	5.1E-04
Central Nervous System	1.6E-01
Developmental	5.1E-04
Gastrointestinal	4.7E-02
Kidney	1.3E-02
Lung	5.1E-04
Respiratory	6.1E-05
Skin	1.0E-01
Maximum	1.6E-01

TABLE C15-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C15-4.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Ingestion	Aluminum	1.1E+04	mg/kg	2.0E-04	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	1.0E+00	mg/kg-day	1.6E-02
				Arsenic	6.9E+01	mg/kg	7.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.1E-06	5.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1.9E-01
				Cadmium	1.1E+01	mg/kg	2.0E-07	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	3.1E-02
				Copper	6.7E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	9.4E-04	mg/kg-day	4.0E-02	mg/kg-day	2.3E-02
				Iron	4.6E+04	mg/kg	8.3E-04	mg/kg-day	--	--	--	6.4E-02	mg/kg-day	7.0E-01	mg/kg-day	9.2E-02
				Lead	2.2E+03	mg/kg	4.0E-05	mg/kg-day	--	--	--	3.1E-03	mg/kg-day	--	--	--
				Manganese	5.8E+03	mg/kg	1.0E-04	mg/kg-day	--	--	--	8.2E-03	mg/kg-day	2.4E-02	mg/kg-day	3.4E-01
				Zinc	4.5E+03	mg/kg	8.1E-05	mg/kg-day	--	--	--	6.3E-03	mg/kg-day	3.0E-01	mg/kg-day	2.1E-02
			Exposure Route Total								1.1E-06					7.2E-01
			Dermal	Aluminum	1.1E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	6.9E+01	mg/kg	8.1E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-07	6.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2.1E-02
				Cadmium	1.1E+01	mg/kg	4.3E-10	mg/kg-day	--	--	--	3.4E-08	mg/kg-day	5.0E-04	mg/kg-day	6.7E-05
				Copper	6.7E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.6E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	5.8E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	4.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								1.2E-07					2.1E-02
		Exposure Point Total									1.2E-06					7.4E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.1E+04	mg/kg	1.2E-08	mg/m3	--	--	--	9.5E-07	mg/m3	5.0E-03	mg/m3	1.9E-04
				Arsenic	6.9E+01	mg/kg	7.4E-11	mg/m3	4.3E-03	(µg/m3)-1	3.2E-10	5.8E-09	mg/m3	1.5E-05	mg/m3	3.9E-04
				Cadmium	1.1E+01	mg/kg	1.2E-11	mg/m3	1.8E-03	(µg/m3)-1	2.1E-11	9.2E-10	mg/m3	2.0E-05	mg/m3	4.6E-05
				Copper	6.7E+02	mg/kg	7.1E-10	mg/m3	--	--	--	5.6E-08	mg/m3	--	--	--
				Iron	4.6E+04	mg/kg	4.9E-08	mg/m3	--	--	--	3.8E-06	mg/m3	--	--	--
				Lead	2.2E+03	mg/kg	2.4E-09	mg/m3	--	--	--	1.8E-07	mg/m3	--	--	--
				Manganese	5.8E+03	mg/kg	6.2E-09	mg/m3	--	--	--	4.9E-07	mg/m3	5.0E-05	mg/m3	9.7E-03
				Zinc	4.5E+03	mg/kg	4.8E-09	mg/m3	--	--	--	3.8E-07	mg/m3	--	--	--
			Exposure Route Total								3.4E-10					1.0E-02
		Exposure Point Total									3.4E-10					1.0E-02
	Exposure Medium Total										1.2E-06					7.5E-01
Medium Total											1.2E-06					7.5E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C15-4.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	1.6E-02	--	--	1.6E-02
			Arsenic	1.1E-06	--	1.2E-07	1.2E-06	Skin	1.9E-01	--	2.1E-02	2.2E-01
			Cadmium	--	--	--	--	Kidney	3.1E-02	--	6.7E-05	3.1E-02
			Copper	--	--	--	--	Gastrointestinal	2.3E-02	--	--	2.3E-02
			Iron	--	--	--	--	Gastrointestinal	9.2E-02	--	--	9.2E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	3.4E-01	--	--	3.4E-01
			Chemical Total	1.1E-06	--	1.2E-07	1.2E-06		7.0E-01	--	2.1E-02	7.2E-01
		Exposure Point Total					1.2E-06					7.2E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	1.9E-04	--	1.9E-04
			Arsenic	--	3.2E-10	--	3.2E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	3.9E-04	--	3.9E-04
			Cadmium	--	2.1E-11	--	2.1E-11	Kidney, Respiratory	--	4.6E-05	--	4.6E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	9.7E-03	--	9.7E-03
			Chemical Total	--	3.4E-10	--	3.4E-10		--	1.0E-02	--	1.0E-02
		Exposure Point Total					3.4E-10					1.0E-02
	Exposure Medium Total						1.2E-06					7.3E-01
Medium Total							1.2E-06					7.3E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	--
Cardiovascular	3.9E-04
Central Nervous System	3.7E-01
Developmental	3.9E-04
Gastrointestinal	1.2E-01
Kidney	3.1E-02
Lung	3.9E-04
Respiratory	4.6E-05
Skin	2.2E-01
Maximum	3.7E-01

TABLE C15-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C15-5.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.1E+04	mg/kg	2.1E-03	mg/kg-day	--	--	--	2.1E-02	mg/kg-day	1.0E+00	mg/kg-day	2.1E-02
				Arsenic	6.9E+01	mg/kg	7.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-05	7.6E-05	mg/kg-day	3.0E-04	mg/kg-day	2.5E-01
				Cadmium	1.1E+01	mg/kg	2.0E-06	mg/kg-day	--	--	--	2.0E-05	mg/kg-day	5.0E-04	mg/kg-day	4.1E-02
				Copper	6.7E+02	mg/kg	1.2E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	4.0E-02	mg/kg-day	3.1E-02
				Iron	4.6E+04	mg/kg	8.5E-03	mg/kg-day	--	--	--	8.4E-02	mg/kg-day	7.0E-01	mg/kg-day	1.2E-01
				Lead	2.2E+03	mg/kg	4.1E-04	mg/kg-day	--	--	--	4.1E-03	mg/kg-day	--	--	--
				Manganese	5.8E+03	mg/kg	1.1E-03	mg/kg-day	--	--	--	1.1E-02	mg/kg-day	2.4E-02	mg/kg-day	4.4E-01
				Zinc	4.5E+03	mg/kg	8.3E-04	mg/kg-day	--	--	--	8.3E-03	mg/kg-day	3.0E-01	mg/kg-day	2.8E-02
			Exposure Route Total								1.2E-05					9.4E-01
			Dermal	Aluminum	1.1E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	6.9E+01	mg/kg	1.9E-05	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.9E-05	2.4E-04	mg/kg-day	3.0E-04	mg/kg-day	8.0E-01
				Cadmium	1.1E+01	mg/kg	1.0E-07	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	5.0E-04	mg/kg-day	2.6E-03
				Copper	6.7E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	4.6E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	2.2E+03	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	5.8E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	4.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.9E-05					8.0E-01
		Exposure Point Total									4.1E-05					1.7E+00
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.1E+04	mg/kg	1.3E-07	mg/m3	--	--	--	3.8E-07	mg/m3	5.0E-03	mg/m3	7.6E-05
				Arsenic	6.9E+01	mg/kg	7.8E-10	mg/m3	4.3E-03	(µg/m3)-1	3.3E-09	2.3E-09	mg/m3	1.5E-05	mg/m3	1.6E-04
				Cadmium	1.1E+01	mg/kg	1.2E-10	mg/m3	1.8E-03	(µg/m3)-1	2.2E-10	3.7E-10	mg/m3	2.0E-05	mg/m3	1.9E-05
				Copper	6.7E+02	mg/kg	7.5E-09	mg/m3	--	--	--	2.2E-08	mg/m3	--	--	--
				Iron	4.6E+04	mg/kg	5.1E-07	mg/m3	--	--	--	1.5E-06	mg/m3	--	--	--
				Lead	2.2E+03	mg/kg	2.5E-08	mg/m3	--	--	--	7.5E-08	mg/m3	--	--	--
				Manganese	5.8E+03	mg/kg	6.5E-08	mg/m3	--	--	--	2.0E-07	mg/m3	5.0E-05	mg/m3	3.9E-03
				Zinc	4.5E+03	mg/kg	5.1E-08	mg/m3	--	--	--	1.5E-07	mg/m3	--	--	--
			Exposure Route Total								3.6E-09					4.2E-03
		Exposure Point Total									3.6E-09					4.2E-03
	Exposure Medium Total										4.1E-05					1.7E+00
Medium Total											4.1E-05					1.7E+00

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
CSF	Cancer slope factor	mg/m3	Milligram per cubic meter
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day	(µg/m3)-1	1/(Microgram per cubic meter)

TABLE C15-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	2.1E-02	--	--	2.1E-02
			Arsenic	1.2E-05	--	2.9E-05	4.1E-05	Skin	2.5E-01	--	8.0E-01	1.1E+00
			Cadmium	--	--	--	--	Kidney	4.1E-02	--	2.6E-03	4.3E-02
			Copper	--	--	--	--	Gastrointestinal	3.1E-02	--	--	3.1E-02
			Iron	--	--	--	--	Gastrointestinal	1.2E-01	--	--	1.2E-01
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.4E-01	--	--	4.4E-01
			Zinc	--	--	--	--	Blood	2.8E-02	--	--	2.8E-02
			Chemical Total	1.2E-05	--	2.9E-05	4.1E-05		9.4E-01	--	8.0E-01	1.7E+00
		Exposure Point Total					4.1E-05					1.7E+00
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	7.6E-05	--	7.6E-05
			Arsenic	--	3.3E-09	--	3.3E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.6E-04	--	1.6E-04
			Cadmium	--	2.2E-10	--	2.2E-10	Kidney, Respiratory	--	1.9E-05	--	1.9E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	3.9E-03	--	3.9E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.6E-09	--	3.6E-09		--	4.2E-03	--	4.2E-03
		Exposure Point Total					3.6E-09					4.2E-03
	Exposure Medium Total						4.1E-05					1.7E+00
Medium Total							4.1E-05					1.7E+00

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	2.8E-02
Cardiovascular	1.6E-04
Central Nervous System	4.7E-01
Developmental	1.6E-04
Gastrointestinal	1.5E-01
Kidney	4.3E-02
Lung	1.6E-04
Respiratory	1.9E-05
Skin	**1.1E+00**
Maximum	**1E+00**

TABLE C15-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	1.2E-05	--	2.9E-05	4.1E-05		--	--	--	--
			Chemical Total	--	--	--	4.1E-05		--	--	--	--
		Exposure Point Total					4.1E-05					--
		Outdoor Air (Particulates)	Arsenic	--	3.3E-09	--	3.3E-09		--	--	--	--
			Chemical Total	--	--	--	4.1E-05		--	--	--	--
							4.1E-05					--
		Exposure Point Total					4.1E-05					--
	Exposure Medium Total						4.1E-05					--
Medium Total												

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-15: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SEDIMENT, EU 12 - UPPER MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Fisherman	Stream Sediment (0 to 2 feet bgs)	24	7E-07	8E-07	-- (a)	1E-06	0.02	0.007	-- (a)	0.03	0.013	--	--	--	--	--	--	--	--
Rock Hound	Stream Sediment (0 to 2 feet bgs)	24	4E-06	1E-05	2E-09	2E-05	0.2	0.39	0.002	0.6	0.4	--	--	--	--	--	--	--	--
Industrial Worker	Stream Sediment (0 to 2 feet bgs)	165	1E-05	3E-06	1E-08	1E-05	0.3	0.02	0.01	0.3	0.16	--	--	--	--	--	--	--	--
Construction Worker	Stream Sediment (0 to 2 feet bgs)	124	1E-06	1E-07	3E-10	1E-06	0.7	0.02	0.01	0.8	0.4	--	--	--	--	--	--	--	--
Resident	Stream Sediment (0 to 2 feet bgs)	50	1E-05	3E-05	4E-09	4E-05	1	0.8	0.00	2	1	Arsenic	C, NC	292/293	0.954 0.00 - 507 0	6.9E+01	4.1E-05	1.1	--
												Lead	PbB	61/61	1.86 J - 30867.30352 0	2.5E+03	--	--	14.1
												Manganese	NC	61/61	12.3 0.00 - 75108.09577 0	5.8E+03	--	0.4	--

Notes:

(a) Inhalation exposure for sediment was not evaluated for the fisherman receptor (see Section 4.5).
-- Not applicable
µg/dL Microgram per deciliter
bgs Below ground surface
C Cancer
EPC Exposure point concentration
EU Exposure unit
HI Hazard index
J Estimated value
mg/kg Milligram per kilogram
NC Noncancer
PbB Blood lead modeling
UBMC Upper Blackfoot Mining Complex

TABLE C16-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SUBSURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment (2 to 10 feet bgs)	Site Sediment	Ingestion	Aluminum	3.4E+04	mg/kg	6.0E-04	mg/kg-day	--	--	--	4.7E-02	mg/kg-day	1.0E+00	mg/kg-day	4.7E-02
				Arsenic	3.1E+01	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.0E-07	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	8.7E-02
				Copper	3.3E+02	mg/kg	5.9E-06	mg/kg-day	--	--	--	4.6E-04	mg/kg-day	4.0E-02	mg/kg-day	1.2E-02
				Iron	3.3E+04	mg/kg	5.9E-04	mg/kg-day	--	--	--	4.6E-02	mg/kg-day	7.0E-01	mg/kg-day	6.6E-02
				Lead	6.6E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	9.2E-04	mg/kg-day	--	--	--
				Manganese	1.2E+03	mg/kg	2.2E-05	mg/kg-day	--	--	--	1.7E-03	mg/kg-day	2.4E-02	mg/kg-day	7.1E-02
				Zinc	1.2E+03	mg/kg	2.1E-05	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	3.0E-01	mg/kg-day	5.5E-03
			Exposure Route Total								5.0E-07					2.9E-01
			Dermal	Aluminum	3.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	3.1E+01	mg/kg	3.6E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	5.4E-08	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	9.4E-03
				Copper	3.3E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	3.3E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	6.6E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	1.2E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.2E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								5.4E-08					9.4E-03
		Exposure Point Total									5.5E-07					3.0E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	3.4E+04	mg/kg	3.6E-08	mg/m3	--	--	--	2.8E-06	mg/m3	5.0E-03	mg/m3	5.6E-04
				Arsenic	3.1E+01	mg/kg	3.3E-11	mg/m3	4.3E-03	(µg/m3)-1	1.4E-10	2.6E-09	mg/m3	1.5E-05	mg/m3	1.7E-04
				Copper	3.3E+02	mg/kg	3.5E-10	mg/m3	--	--	--	2.8E-08	mg/m3	--	--	--
				Iron	3.3E+04	mg/kg	3.5E-08	mg/m3	--	--	--	2.7E-06	mg/m3	--	--	--
				Lead	6.6E+02	mg/kg	7.0E-10	mg/m3	--	--	--	5.5E-08	mg/m3	--	--	--
				Manganese	1.2E+03	mg/kg	1.3E-09	mg/m3	--	--	--	1.0E-07	mg/m3	5.0E-05	mg/m3	2.0E-03
				Zinc	1.2E+03	mg/kg	1.2E-09	mg/m3	--	--	--	9.7E-08	mg/m3	--	--	--
			Exposure Route Total								1.4E-10					2.8E-03
		Exposure Point Total									1.4E-10					2.8E-03
	Exposure Medium Total										5.6E-07					3.0E-01
Medium Total											5.6E-07					3.0E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C16-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SUBSURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (2 to 10 feet bgs)	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	4.7E-02	--	--	4.7E-02
			Arsenic	5.0E-07	--	5.4E-08	5.5E-07	Skin	8.7E-02	--	9.4E-03	9.6E-02
			Copper	--	--	--	--	Gastrointestinal	1.2E-02	--	--	1.2E-02
			Iron	--	--	--	--	Gastrointestinal	6.6E-02	--	--	6.6E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	7.1E-02	--	--	7.1E-02
			Zinc	--	--	--	--	Blood	5.5E-03	--	--	5.5E-03
			Chemical Total	5.0E-07	--	5.4E-08	5.5E-07		2.9E-01	--	9.4E-03	3.0E-01
		Exposure Point Total					5.5E-07					3.0E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	5.6E-04	--	5.6E-04
			Arsenic	--	1.4E-10	--	1.4E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.7E-04	--	1.7E-04
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	2.0E-03	--	2.0E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.4E-10	--	1.4E-10		--	2.8E-03	--	2.8E-03
		Exposure Point Total					1.4E-10					2.8E-03
	Exposure Medium Total						5.6E-07					3.0E-01
Medium Total							5.6E-07					3.0E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices

Target Organ	Sediment (2-10)
Blood	5.5E-03
Cardiovascular	1.7E-04
Central Nervous System	1.2E-01
Developmental	1.7E-04
Gastrointestinal	7.7E-02
Kidney	--
Lung	1.7E-04
Respiratory	--
Skin	9.6E-02
Maximum	1.2E-01

TABLE C16-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SUBSURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 12 - MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (2 to 10 feet bgs)	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-16: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SUBSURFACE SEDIMENT, EU 12 - UPPER MARSH
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (b)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Construction Worker	Stream Sediment (2 to 10 feet bgs)	124	5E-07	5E-08	1E-10	6E-07	0.3	0.01	0.003	0.3	0.1	--	--	--	--	--	--	--	--

Notes:

(a) Inhalation exposure for sediment was not evaluated for the fisherman receptor (see Section 4.5).
-- Not applicable
µg/dL Microgram per deciliter
bgs Below ground surface
C Cancer
EPC Exposure point concentration
EU Exposure unit
HI Hazard index
J Estimated value
mg/kg Milligram per kilogram
NC Noncancer
PbB Blood lead modeling
UBMC Upper Blackfoot Mining Complex

TABLE C17-1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SEDIMENT EXPOSURE, FISHERMAN - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.4E+04	mg/kg	1.4E-04	mg/kg-day	--	--	--	5.6E-04	mg/kg-day	1.0E+00	mg/kg-day	5.6E-04
				Arsenic	2.0E+01	mg/kg	1.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.9E-07	4.9E-07	mg/kg-day	3.0E-04	mg/kg-day	1.6E-03
				Cadmium	6.7E+00	mg/kg	7.1E-08	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	5.0E-04	mg/kg-day	5.5E-04
				Copper	6.5E+02	mg/kg	6.8E-06	mg/kg-day	--	--	--	2.7E-05	mg/kg-day	4.0E-02	mg/kg-day	6.6E-04
				Iron	2.4E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	9.8E-04	mg/kg-day	7.0E-01	mg/kg-day	1.4E-03
				Lead	3.4E+02	mg/kg	3.6E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	--	--	--
				Manganese	2.4E+03	mg/kg	2.6E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	2.4E-02	mg/kg-day	4.2E-03
				Zinc	1.5E+03	mg/kg	1.6E-05	mg/kg-day	--	--	--	6.2E-05	mg/kg-day	3.0E-01	mg/kg-day	2.1E-04
			Exposure Route Total								1.9E-07					9.2E-03
			Dermal	Aluminum	1.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	2.0E+01	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2.3E-07	5.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.0E-03
				Cadmium	6.7E+00	mg/kg	1.7E-09	mg/kg-day	--	--	--	6.7E-09	mg/kg-day	5.0E-04	mg/kg-day	1.3E-05
				Copper	6.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	2.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.4E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								2.3E-07					2.0E-03
		Exposure Point Total									4.1E-07					1.1E-02
	Exposure Medium Total										4.1E-07					1.1E-02
Medium Total											4.1E-07					1.1E-02

Notes:

--	Not available or not applicable	mg/kg-day	Milligram per kilogram per day
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure

TABLE C17-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, FISHERMAN - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	5.6E-04	--	--	5.6E-04
			Arsenic	1.9E-07	--	2.3E-07	4.1E-07	Skin	1.6E-03	--	2.0E-03	3.6E-03
			Cadmium	--	--	--	--	Kidney	5.5E-04	--	1.3E-05	5.7E-04
			Copper	--	--	--	--	Gastrointestinal	6.6E-04	--	--	6.6E-04
			Iron	--	--	--	--	Gastrointestinal	1.4E-03	--	--	1.4E-03
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.2E-03	--	--	4.2E-03
			Zinc	--	--	--	--	Blood	2.1E-04	--	--	2.1E-04
			Chemical Total	1.9E-07	--	2.3E-07	4.1E-07		9.2E-03	--	2.0E-03	1.1E-02
		Exposure Point Total					4.1E-07					1.1E-02
	Exposure Medium Total						4.1E-07					1.1E-02
Medium Total							4.1E-07					1.1E-02

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices

Target Organ	Sediment (0-2)
Blood	2.1E-04
Cardiovascular	--
Central Nervous System	4.7E-03
Developmental	--
Gastrointestinal	2.1E-03
Kidney	5.7E-04
Lung	--
Respiratory	--
Skin	3.6E-03
Maximum	4.7E-03

TABLE C17-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, FISHERMAN - EU 13 - STREAM SEDIMENTS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk								Noncancer Hazard Quotient								
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total		Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--
		Exposure Point Total					--				--					--			--	--
	Exposure Medium Total						--				--					--				--
Medium Total							--				--					--				--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population. .

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C17-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.4E+04	mg/kg	9.3E-04	mg/kg-day	--	--	--	6.0E-03	mg/kg-day	1.0E+00	mg/kg-day	6.0E-03
				Arsenic	2.0E+01	mg/kg	8.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	1.2E-06	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1.7E-02
				Cadmium	6.7E+00	mg/kg	4.6E-07	mg/kg-day	--	--	--	2.9E-06	mg/kg-day	5.0E-04	mg/kg-day	5.9E-03
				Copper	6.5E+02	mg/kg	4.4E-05	mg/kg-day	--	--	--	2.8E-04	mg/kg-day	4.0E-02	mg/kg-day	7.1E-03
				Iron	2.4E+04	mg/kg	1.6E-03	mg/kg-day	--	--	--	1.0E-02	mg/kg-day	7.0E-01	mg/kg-day	1.5E-02
				Lead	3.4E+02	mg/kg	2.3E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	--	--	--
				Manganese	2.4E+03	mg/kg	1.7E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	2.4E-02	mg/kg-day	4.4E-02
				Zinc	1.5E+03	mg/kg	1.0E-04	mg/kg-day	--	--	--	6.6E-04	mg/kg-day	3.0E-01	mg/kg-day	2.2E-03
			Exposure Route Total								1.2E-06					9.8E-02
			Dermal	Aluminum	1.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	2.0E+01	mg/kg	2.7E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4.0E-06	3.3E-05	mg/kg-day	3.0E-04	mg/kg-day	1.1E-01
				Cadmium	6.7E+00	mg/kg	3.0E-08	mg/kg-day	--	--	--	3.7E-07	mg/kg-day	5.0E-04	mg/kg-day	7.5E-04
				Copper	6.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	2.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.4E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								4.0E-06					1.1E-01
		Exposure Point Total									5.2E-06					2.1E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.4E+04	mg/kg	7.3E-08	mg/m3	--	--	--	2.2E-07	mg/m3	5.0E-03	mg/m3	4.4E-05
				Arsenic	2.0E+01	mg/kg	1.1E-10	mg/m3	4.3E-03	(µg/m3)-1	4.6E-10	3.2E-10	mg/m3	1.5E-05	mg/m3	2.1E-05
				Cadmium	6.7E+00	mg/kg	3.6E-11	mg/m3	1.8E-03	(µg/m3)-1	6.5E-11	1.1E-10	mg/m3	2.0E-05	mg/m3	5.4E-06
				Copper	6.5E+02	mg/kg	3.5E-09	mg/m3	--	--	--	1.0E-08	mg/m3	--	--	--
				Iron	2.4E+04	mg/kg	1.3E-07	mg/m3	--	--	--	3.8E-07	mg/m3	--	--	--
				Lead	3.4E+02	mg/kg	1.8E-09	mg/m3	--	--	--	5.4E-09	mg/m3	--	--	--
				Manganese	2.4E+03	mg/kg	1.3E-08	mg/m3	--	--	--	3.9E-08	mg/m3	5.0E-05	mg/m3	7.8E-04
				Zinc	1.5E+03	mg/kg	8.1E-09	mg/m3	--	--	--	2.4E-08	mg/m3	--	--	--
			Exposure Route Total								5.2E-10					8.5E-04
		Exposure Point Total									5.2E-10					8.5E-04
	Exposure Medium Total										5.2E-06					2.1E-01
Medium Total											5.2E-06					2.1E-01

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
CSF	Cancer slope factor	mg/m3	Milligram per cubic meter
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day	(µg/m3)-1	1/(Microgram per cubic meter)

TABLE C17-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	6.0E-03	--	--	6.0E-03
			Arsenic	1.2E-06	--	4.0E-06	5.2E-06	Skin	1.7E-02	--	1.1E-01	1.3E-01
			Cadmium	--	--	--	--	Kidney	5.9E-03	--	7.5E-04	6.6E-03
			Copper	--	--	--	--	Gastrointestinal	7.1E-03	--	--	7.1E-03
			Iron	--	--	--	--	Gastrointestinal	1.5E-02	--	--	1.5E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	4.4E-02	--	--	4.4E-02
			Zinc	--	--	--	--	Blood	2.2E-03	--	--	2.2E-03
			Chemical Total	1.2E-06	--	4.0E-06	5.2E-06		9.8E-02	--	1.1E-01	2.1E-01
		Exposure Point Total					5.2E-06					2.1E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	4.4E-05	--	4.4E-05
			Arsenic	--	4.6E-10	--	4.6E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	2.1E-05	--	2.1E-05
			Cadmium	--	6.5E-11	--	6.5E-11	Kidney, Respiratory	--	5.4E-06	--	5.4E-06
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	7.8E-04	--	7.8E-04
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	5.2E-10	--	5.2E-10		--	8.5E-04	--	8.5E-04
		Exposure Point Total					5.2E-10					8.5E-04
	Exposure Medium Total						5.2E-06					2.1E-01
Medium Total							5.2E-06					2.1E-01

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	2.2E-03
Cardiovascular	2.1E-05
Central Nervous System	5.1E-02
Developmental	2.1E-05
Gastrointestinal	2.2E-02
Kidney	6.6E-03
Lung	2.1E-05
Respiratory	5.4E-06
Skin	1.3E-01
Maximum	1.3E-01

TABLE C17-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD ROCK HOUND - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Rock Hound
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C17-3.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Ingestion	Aluminum	1.4E+04	mg/kg	2.5E-03	mg/kg-day	--	--	--	7.7E-03	mg/kg-day	1.0E+00	mg/kg-day	7.7E-03
				Arsenic	2.0E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.2E-06	6.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2.2E-02
				Cadmium	6.7E+00	mg/kg	1.2E-06	mg/kg-day	--	--	--	3.8E-06	mg/kg-day	5.0E-04	mg/kg-day	7.6E-03
				Copper	6.5E+02	mg/kg	1.2E-04	mg/kg-day	--	--	--	3.6E-04	mg/kg-day	4.0E-02	mg/kg-day	9.1E-03
				Iron	2.4E+04	mg/kg	4.3E-03	mg/kg-day	--	--	--	1.3E-02	mg/kg-day	7.0E-01	mg/kg-day	1.9E-02
				Lead	3.4E+02	mg/kg	6.1E-05	mg/kg-day	--	--	--	1.9E-04	mg/kg-day	--	--	--
				Manganese	2.4E+03	mg/kg	4.4E-04	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	2.4E-02	mg/kg-day	5.7E-02
				Zinc	1.5E+03	mg/kg	2.7E-04	mg/kg-day	--	--	--	8.5E-04	mg/kg-day	3.0E-01	mg/kg-day	2.8E-03
			Exposure Route Total								3.2E-06					1.3E-01
			Dermal	Aluminum	1.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	2.0E+01	mg/kg	6.3E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	9.5E-07	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	6.6E-03
				Cadmium	6.7E+00	mg/kg	7.2E-09	mg/kg-day	--	--	--	2.2E-08	mg/kg-day	5.0E-04	mg/kg-day	4.5E-05
				Copper	6.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	2.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.4E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								9.5E-07					6.6E-03
		Exposure Point Total									4.2E-06					1.3E-01
		Outdoor Air	Inhalation (Partculates)	Aluminum	1.4E+04	mg/kg	4.8E-07	mg/m3	--	--	--	1.5E-06	mg/m3	5.0E-03	mg/m3	3.0E-04
				Arsenic	2.0E+01	mg/kg	7.0E-10	mg/m3	4.3E-03	(µg/m3)-1	3.0E-09	2.2E-09	mg/m3	1.5E-05	mg/m3	1.5E-04
				Cadmium	6.7E+00	mg/kg	2.4E-10	mg/m3	1.8E-03	(µg/m3)-1	4.3E-10	7.5E-10	mg/m3	2.0E-05	mg/m3	3.7E-05
				Copper	6.5E+02	mg/kg	2.3E-08	mg/m3	--	--	--	7.1E-08	mg/m3	--	--	--
				Iron	2.4E+04	mg/kg	8.5E-07	mg/m3	--	--	--	2.6E-06	mg/m3	--	--	--
				Lead	3.4E+02	mg/kg	1.2E-08	mg/m3	--	--	--	3.7E-08	mg/m3	--	--	--
				Manganese	2.4E+03	mg/kg	8.6E-08	mg/m3	--	--	--	2.7E-07	mg/m3	5.0E-05	mg/m3	5.4E-03
				Zinc	1.5E+03	mg/kg	5.4E-08	mg/m3	--	--	--	1.7E-07	mg/m3	--	--	--
			Exposure Route Total								3.5E-09					5.9E-03
		Exposure Point Total									3.5E-09					5.9E-03
	Exposure Medium Total										4.2E-06					1.4E-01
Medium Total											4.2E-06					1.4E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C17-3.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	7.7E-03	--	--	7.7E-03
			Arsenic	3.2E-06	--	9.5E-07	4.2E-06	Skin	2.2E-02	--	6.6E-03	2.9E-02
			Cadmium	--	--	--	--	Kidney	7.6E-03	--	4.5E-05	7.6E-03
			Copper	--	--	--	--	Gastrointestinal	9.1E-03	--	--	9.1E-03
			Iron	--	--	--	--	Gastrointestinal	1.9E-02	--	--	1.9E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	5.7E-02	--	--	5.7E-02
			Zinc	--	--	--	--	Blood	2.8E-03	--	--	2.8E-03
			Chemical Total	3.2E-06	--	9.5E-07	4.2E-06		1.3E-01	--	6.6E-03	1.3E-01
		Exposure Point Total					4.2E-06					1.3E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	3.0E-04	--	3.0E-04
			Arsenic	--	3.0E-09	--	3.0E-09	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.5E-04	--	1.5E-04
			Cadmium	--	4.3E-10	--	4.3E-10	Kidney, Respiratory	--	3.7E-05	--	3.7E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	5.4E-03	--	5.4E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	3.5E-09	--	3.5E-09		--	5.9E-03	--	5.9E-03
		Exposure Point Total					3.5E-09					5.9E-03
	Exposure Medium Total						4.2E-06					1.4E-01
Medium Total							4.2E-06					1.4E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	--
Cardiovascular	1.5E-04
Central Nervous System	7.1E-02
Developmental	1.5E-04
Gastrointestinal	2.8E-02
Kidney	7.7E-03
Lung	1.5E-04
Respiratory	3.7E-05
Skin	2.9E-02
Maximum	7.1E-02

TABLE C17-3.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, INDUSTRIAL WORKER - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Industrial Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C17-4.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 13 - STREAM SEDIMENTS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Ingestion	Aluminum	1.4E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	1.9E-02	mg/kg-day	1.0E+00	mg/kg-day	1.9E-02
				Arsenic	2.0E+01	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.2E-07	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.6E-02
				Cadmium	6.7E+00	mg/kg	1.2E-07	mg/kg-day	--	--	--	9.4E-06	mg/kg-day	5.0E-04	mg/kg-day	1.9E-02
				Copper	6.5E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	9.0E-04	mg/kg-day	4.0E-02	mg/kg-day	2.3E-02
				Iron	2.4E+04	mg/kg	4.3E-04	mg/kg-day	--	--	--	3.3E-02	mg/kg-day	7.0E-01	mg/kg-day	4.8E-02
				Lead	3.4E+02	mg/kg	6.1E-06	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	--	--	--
				Manganese	2.4E+03	mg/kg	4.4E-05	mg/kg-day	--	--	--	3.4E-03	mg/kg-day	2.4E-02	mg/kg-day	1.4E-01
				Zinc	1.5E+03	mg/kg	2.7E-05	mg/kg-day	--	--	--	2.1E-03	mg/kg-day	3.0E-01	mg/kg-day	7.0E-03
			Exposure Route Total								3.2E-07					3.1E-01
			Dermal	Aluminum	1.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	2.0E+01	mg/kg	2.3E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.5E-08	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	6.0E-03
				Cadmium	6.7E+00	mg/kg	2.6E-10	mg/kg-day	--	--	--	2.0E-08	mg/kg-day	5.0E-04	mg/kg-day	4.1E-05
				Copper	6.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	2.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.4E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								3.5E-08					6.1E-03
		Exposure Point Total									3.6E-07					3.2E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.4E+04	mg/kg	1.5E-08	mg/m3	--	--	--	1.1E-06	mg/m3	5.0E-03	mg/m3	2.3E-04
				Arsenic	2.0E+01	mg/kg	2.1E-11	mg/m3	4.3E-03	(µg/m3)-1	9.1E-11	1.6E-09	mg/m3	1.5E-05	mg/m3	1.1E-04
				Cadmium	6.7E+00	mg/kg	7.2E-12	mg/m3	1.8E-03	(µg/m3)-1	1.3E-11	5.6E-10	mg/m3	2.0E-05	mg/m3	2.8E-05
				Copper	6.5E+02	mg/kg	6.9E-10	mg/m3	--	--	--	5.4E-08	mg/m3	--	--	--
				Iron	2.4E+04	mg/kg	2.5E-08	mg/m3	--	--	--	2.0E-06	mg/m3	--	--	--
				Lead	3.4E+02	mg/kg	3.6E-10	mg/m3	--	--	--	2.8E-08	mg/m3	--	--	--
				Manganese	2.4E+03	mg/kg	2.6E-09	mg/m3	--	--	--	2.0E-07	mg/m3	5.0E-05	mg/m3	4.0E-03
				Zinc	1.5E+03	mg/kg	1.6E-09	mg/m3	--	--	--	1.3E-07	mg/m3	--	--	--
			Exposure Route Total								1.0E-10					4.4E-03
		Exposure Point Total									1.0E-10					4.4E-03
	Exposure Medium Total										3.6E-07					3.2E-01
Medium Total											3.6E-07					3.2E-01

Notes:

--	Not available or not applicable	mg/kg	Milligram per kilogram	RfC	Reference concentration
bgs	Below ground surface	mg/kg-day	Milligram per kilogram per day	RME	Reasonable maximum exposure
CSF	Cancer slope factor	(mg/kg-day)-1	1/(Milligram per kilogram per day)	(µg/m3)-1	1/(Microgram per cubic meter)
EPA	U.S. Environmental Protection Agency	mg/m3	Milligram per cubic meter		
EPC	Exposure point concentration	RAGS	Risk Assessment Guidance for Superfund		
EU	Exposure unit	RfD	Reference dose		

TABLE C17-4.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	1.9E-02	--	--	1.9E-02
			Arsenic	3.2E-07	--	3.5E-08	3.6E-07	Skin	5.6E-02	--	6.0E-03	6.2E-02
			Cadmium	--	--	--	--	Kidney	1.9E-02	--	4.1E-05	1.9E-02
			Copper	--	--	--	--	Gastrointestinal	2.3E-02	--	--	2.3E-02
			Iron	--	--	--	--	Gastrointestinal	4.8E-02	--	--	4.8E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.4E-01	--	--	1.4E-01
			Chemical Total	3.2E-07	--	3.5E-08	3.6E-07		3.1E-01	--	6.1E-03	3.1E-01
		Exposure Point Total					3.6E-07					3.1E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	2.3E-04	--	2.3E-04
			Arsenic	--	9.1E-11	--	9.1E-11	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	1.1E-04	--	1.1E-04
			Cadmium	--	1.3E-11	--	1.3E-11	Kidney, Respiratory	--	2.8E-05	--	2.8E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	4.0E-03	--	4.0E-03
			Chemical Total	--	1.0E-10	--	1.0E-10		--	4.4E-03	--	4.4E-03
		Exposure Point Total					1.0E-10					4.4E-03
	Exposure Medium Total						3.6E-07					3.2E-01
Medium Total							3.6E-07					3.2E-01

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund
	Entries in the target organ hazard indices table are bolded if the exposure frequency exceeds 1.

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	--
Cardiovascular	1.1E-04
Central Nervous System	1.7E-01
Developmental	1.1E-04
Gastrointestinal	7.0E-02
Kidney	1.9E-02
Lung	1.1E-04
Respiratory	2.8E-05
Skin	6.2E-02
Maximum	1.7E-01

TABLE C17-4.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, CONSTRUCTION WORKER - EU 13 - STREAM SEDIMENTS
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment (0 to 2 feet bgs)	Site Sediment	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C17-5.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Site Sediment	Ingestion	Aluminum	1.4E+04	mg/kg	2.5E-03	mg/kg-day	--	--	--	2.5E-02	mg/kg-day	1.0E+00	mg/kg-day	2.5E-02
				Arsenic	2.0E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	3.3E-06	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	7.2E-02
				Cadmium	6.7E+00	mg/kg	1.2E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	5.0E-04	mg/kg-day	2.5E-02
				Copper	6.5E+02	mg/kg	1.2E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	4.0E-02	mg/kg-day	2.9E-02
				Iron	2.4E+04	mg/kg	4.4E-03	mg/kg-day	--	--	--	4.3E-02	mg/kg-day	7.0E-01	mg/kg-day	6.2E-02
				Lead	3.4E+02	mg/kg	6.2E-05	mg/kg-day	--	--	--	6.2E-04	mg/kg-day	--	--	--
				Manganese	2.4E+03	mg/kg	4.5E-04	mg/kg-day	--	--	--	4.4E-03	mg/kg-day	2.4E-02	mg/kg-day	1.8E-01
				Zinc	1.5E+03	mg/kg	2.8E-04	mg/kg-day	--	--	--	2.8E-03	mg/kg-day	3.0E-01	mg/kg-day	9.2E-03
			Exposure Route Total								3.3E-06					4.1E-01
			Dermal	Aluminum	1.4E+04	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Arsenic	2.0E+01	mg/kg	5.5E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	8.3E-06	6.9E-05	mg/kg-day	3.0E-04	mg/kg-day	2.3E-01
				Cadmium	6.7E+00	mg/kg	6.3E-08	mg/kg-day	--	--	--	7.8E-07	mg/kg-day	5.0E-04	mg/kg-day	1.6E-03
				Copper	6.5E+02	mg/kg	--	--	--	--	--	--	--	4.0E-02	mg/kg-day	--
				Iron	2.4E+04	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	3.4E+02	mg/kg	--	--	--	--	--	--	--	--	--	--
				Manganese	2.4E+03	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	1.5E+03	mg/kg	--	--	--	--	--	--	--	3.0E-01	mg/kg-day	--
			Exposure Route Total								8.3E-06					2.3E-01
		Exposure Point Total									1.2E-05					6.4E-01
		Outdoor Air	Inhalation (Particulates)	Aluminum	1.4E+04	mg/kg	1.5E-07	mg/m3	--	--	--	4.6E-07	mg/m3	5.0E-03	mg/m3	9.2E-05
				Arsenic	2.0E+01	mg/kg	2.2E-10	mg/m3	4.3E-03	(µg/m3)-1	9.5E-10	6.7E-10	mg/m3	1.5E-05	mg/m3	4.4E-05
				Cadmium	6.7E+00	mg/kg	7.5E-11	mg/m3	1.8E-03	(µg/m3)-1	1.4E-10	2.3E-10	mg/m3	2.0E-05	mg/m3	1.1E-05
				Copper	6.5E+02	mg/kg	7.2E-09	mg/m3	--	--	--	2.2E-08	mg/m3	--	--	--
				Iron	2.4E+04	mg/kg	2.7E-07	mg/m3	--	--	--	8.0E-07	mg/m3	--	--	--
				Lead	3.4E+02	mg/kg	3.8E-09	mg/m3	--	--	--	1.1E-08	mg/m3	--	--	--
				Manganese	2.4E+03	mg/kg	2.7E-08	mg/m3	--	--	--	8.2E-08	mg/m3	5.0E-05	mg/m3	1.6E-03
				Zinc	1.5E+03	mg/kg	1.7E-08	mg/m3	--	--	--	5.1E-08	mg/m3	--	--	--
			Exposure Route Total								1.1E-09					1.8E-03
		Exposure Point Total									1.1E-09					1.8E-03
	Exposure Medium Total										1.2E-05					6.4E-01
Medium Total											1.2E-05					6.4E-01

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
CSF	Cancer slope factor	mg/m3	Milligram per cubic meter
EPA	U.S. Environmental Protection Agency	RAGS	Risk Assessment Guidance for Superfund
EPC	Exposure point concentration	RfD	Reference dose
EU	Exposure unit	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day	(µg/m3)-1	1/(Microgram per cubic meter)

TABLE C17-5.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Aluminum	--	--	--	--	Central Nervous System	2.5E-02	--	--	2.5E-02
			Arsenic	3.3E-06	--	8.3E-06	1.2E-05	Skin	7.2E-02	--	2.3E-01	3.0E-01
			Cadmium	--	--	--	--	Kidney	2.5E-02	--	1.6E-03	2.6E-02
			Copper	--	--	--	--	Gastrointestinal	2.9E-02	--	--	2.9E-02
			Iron	--	--	--	--	Gastrointestinal	6.2E-02	--	--	6.2E-02
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	1.8E-01	--	--	1.8E-01
			Zinc	--	--	--	--	Blood	9.2E-03	--	--	9.2E-03
			Chemical Total	3.3E-06	--	8.3E-06	1.2E-05		4.1E-01	--	2.3E-01	6.4E-01
		Exposure Point Total					1.2E-05					6.4E-01
		Outdoor Air (Particulates)	Aluminum	--	--	--	--	Central Nervous System	--	9.2E-05	--	9.2E-05
			Arsenic	--	9.5E-10	--	9.5E-10	Developmental, Cardiovascular, Central Nervous System, Skin, Lung	--	4.4E-05	--	4.4E-05
			Cadmium	--	1.4E-10	--	1.4E-10	Kidney, Respiratory	--	1.1E-05	--	1.1E-05
			Copper	--	--	--	--	--	--	--	--	--
			Iron	--	--	--	--	--	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	1.6E-03	--	1.6E-03
			Zinc	--	--	--	--	--	--	--	--	--
			Chemical Total	--	1.1E-09	--	1.1E-09		--	1.8E-03	--	1.8E-03
		Exposure Point Total					1.1E-09					1.8E-03
	Exposure Medium Total						1.2E-05					6.4E-01
Medium Total							1.2E-05					6.4E-01

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Sediment (0-2)
Blood	9.2E-03
Cardiovascular	4.4E-05
Central Nervous System	2.1E-01
Developmental	4.4E-05
Gastrointestinal	9.2E-02
Kidney	2.6E-02
Lung	4.4E-05
Respiratory	1.1E-05
Skin	3.0E-01
Maximum	3.0E-01

TABLE C17-5.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE SEDIMENT EXPOSURE, ADULT AND CHILD RESIDENT - EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Modified Resident
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment		--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
		Outdoor Air (Particulates)		--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
							--					--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total												

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-17: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SEDIMENT, EU 13 - STREAM SEDIMENTS

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk				Noncancer Hazard Index					Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI	95th Percentile Blood Lead Level (µg/dL) (b)
			Ingestion	Dermal Contact	Inhalation	Total	Ingestion	Dermal Contact	Inhalation	Total	Highest Segregated								
Fisherman	Stream Sediment (0 to 2 feet bgs)	24	2E-07	2E-07	-- (a)	4E-07	0.009	0.002	-- (a)	0.011	0.005	--	--	--	--	--	--	--	--
Rock Hound	Stream Sediment (0 to 2 feet bgs)	24	1E-06	4E-06	5E-10	5E-06	0.1	0.111	0.0009	0.2	0.13	--	--	--	--	--	--	--	--
Industrial Worker	Stream Sediment (0 to 2 feet bgs)	165	3E-06	1E-06	3E-09	4E-06	0.13	0.007	0.006	0.14	0.07	--	--	--	--	--	--	--	--
Construction Worker	Stream Sediment (0 to 2 feet bgs)	124	3E-07	3E-08	1E-10	4E-07	0.3	0.006	0.004	0.3	0.2	--	--	--	--	--	--	--	--
Resident	Stream Sediment (0 to 2 feet bgs)	50	3E-06	8E-06	1E-09	1E-05	0	0.23	0.00	1	0	Arsenic	C, NC	292/293	0.954 0.00 - 507 0	6.9E+01	1E-05	0.3	--

Notes:

(a) Inhalation exposure for sediment was not evaluated for the fisherman receptor (see Section 4.5).
(b) Lead was evaluated for two scenarios for the resident receptor: one assuming that UBMC groundwater is used as a drinking water source, and one assuming that UBMC groundwater is not used as a drinking water source (non-drinking water result shown in parentheses).
-- Not applicable
µg/dL Microgram per deciliter
bgs Below ground surface
C Cancer
EPC Exposure point concentration
EU Exposure unit
HI Hazard index
J Estimated value
mg/kg Milligram per kilogram
NC Noncancer
PbB Blood lead modeling
UBMC Upper Blackfoot Mining Complex

TABLE C18-1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE WATER EXPOSURE, CHILD FISHERMAN - FISH INGESTION

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC					Cancer Risk Calculations					Noncancer Hazard Quotient				
										Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Bioconcentration factor	Surface Water EPC	Units	Fish EPC	Units	Value	Units	Value	Units	Value	Value	Units	Value	Units	Value
Surface Water	Surface Water	Fish	Ingestion	Aluminum	--	8.0E-02	mg/L	--	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Cadmium	64	8.0E-03	mg/L	5.1E-01	mg/kg	2.0E-05	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	5.0E-04	mg/kg-day	5.1E-01
				Copper	36	2.1E-01	mg/L	7.7E+00	mg/kg	3.0E-04	mg/kg-day	--	--	--	3.8E-03	mg/kg-day	4.0E-02	mg/kg-day	9.5E-02
				Iron	--	1.1E+00	mg/L	--	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	49	1.6E-02	mg/L	8.0E-01	mg/kg	3.2E-05	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	--	--	--
				Manganese	--	7.0E-01	mg/L	--	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	47	1.5E+00	mg/L	7.2E+01	mg/kg	2.9E-03	mg/kg-day	--	--	--	3.6E-02	mg/kg-day	3.0E-01	mg/kg-day	1.2E-01
			Exposure Route Total											0.0E+00					7.2E-01
		Exposure Point Total												--					7.2E-01
	Exposure Medium Total													--					7.2E-01
Medium Total														--					7.2E-01

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
BCF	Bioconcentration Factor (DEQ, 2012)	mg/L	milligrams per liter
CSF	Cancer slope factor	RAGS	Risk Assessment Guidance for Superfund
EPA	U.S. Environmental Protection Agency	RfD	Reference dose
EPC	Exposure point concentration	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day		

References:

DEQ. 2012. Circular DEQ-7. Montana Numeric Water Quality Standards. August. Available on-line at: http://deq.mt.gov/wqinfo/Standards

TABLE C18-1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE WATER EXPOSURE, CHILD FISHERMAN - FISH INGESTION
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Fish	Aluminum	--	--	--	--	Central Nervous System	--	--	--	--
			Cadmium	--	--	--	--	Kidney	5.1E-01	--	--	5.1E-01
			Copper	--	--	--	--	Gastrointestinal	9.5E-02	--	--	9.5E-02
			Iron	--	--	--	--	Gastrointestinal	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	--	--	--
			Zinc	--	--	--	--	Blood	1.2E-01	--	--	1.2E-01
			Chemical Total	--	--	--	--		7.2E-01	--	--	7.2E-01
		Exposure Point Total					--					7.2E-01
	Exposure Medium Total						--					7.2E-01
Medium Total							--					7.2E-01

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Surface Water
Blood	1.2E-01
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	9.5E-02
Kidney	5.1E-01
Lung	--
Respiratory	--
Skin	--
Maximum	5.1E-01

TABLE C18-1.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE WATER EXPOSURE, CHILD FISHERMAN - FISH INGESTION
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern					Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Fish	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE C18-2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS FOR SURFACE WATER EXPOSURE, ADULT FISHERMAN - FISH INGESTION

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC					Cancer Risk Calculations					Noncancer Hazard Quotient				
										Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Noncancer Hazard Quotient
					Bioconcentration factor	Surface Water EPC	Units	Fish EPC	Units	Value	Units	Value	Units	Value	Value	Units	Value	Units	Value
Surface Water	Surface Water	Fish	Ingestion	Aluminum	--	8.0E-02	mg/L	--	mg/kg	--	--	--	--	--	--	--	1.0E+00	mg/kg-day	--
				Cadmium	64	8.0E-03	mg/L	5.1E-01	mg/kg	1.3E-05	mg/kg-day	--	--	--	4.8E-05	mg/kg-day	5.0E-04	mg/kg-day	9.5E-02
				Copper	36	2.1E-01	mg/L	7.7E+00	mg/kg	1.9E-04	mg/kg-day	--	--	--	7.1E-04	mg/kg-day	4.0E-02	mg/kg-day	1.8E-02
				Iron	--	1.1E+00	mg/L	--	mg/kg	--	--	--	--	--	--	--	7.0E-01	mg/kg-day	--
				Lead	49	1.6E-02	mg/L	8.0E-01	mg/kg	2.0E-05	mg/kg-day	--	--	--	7.5E-05	mg/kg-day	--	--	--
				Manganese	--	7.0E-01	mg/L	--	mg/kg	--	--	--	--	--	--	--	2.4E-02	mg/kg-day	--
				Zinc	47	1.5E+00	mg/L	7.2E+01	mg/kg	1.8E-03	mg/kg-day	--	--	--	6.7E-03	mg/kg-day	3.0E-01	mg/kg-day	2.2E-02
			Exposure Route Total											0.0E+00					1.4E-01
		Exposure Point Total												--					1.4E-01
	Exposure Medium Total													--					1.4E-01
Medium Total														--					1.4E-01

Notes:

--	Not available or not applicable	(mg/kg-day)-1	1/(Milligram per kilogram per day)
BCF	Bioconcentration Factor (DEQ, 2012)	mg/L	milligrams per liter
CSF	Cancer slope factor	RAGS	Risk Assessment Guidance for Superfund
EPA	U.S. Environmental Protection Agency	RfD	Reference dose
EPC	Exposure point concentration	RfC	Reference concentration
mg/kg	Milligram per kilogram	RME	Reasonable maximum exposure
mg/kg-day	Milligram per kilogram per day		

References:

DEQ. 2012. Circular DEQ-7. Montana Numeric Water Quality Standards. August. Available on-line at: http://deq.mt.gov/wqinfo/Standards

TABLE C18-2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR SURFACE WATER EXPOSURE, ADULT FISHERMAN - FISH INGESTION

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Low Exposure Frequency (7 days/year) Ingestion	Inhalation	Dermal	Exposure Routes Total	Noncancer Hazard Quotient: Primary Target Organ(s)	Low Exposure Frequency (7 days/year) Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Fish	Aluminum	--	--	--	--	Central Nervous System	--	--	--	--
			Cadmium	--	--	--	--	Kidney	9.5E-02	--	--	9.5E-02
			Copper	--	--	--	--	Gastrointestinal	1.8E-02	--	--	1.8E-02
			Iron	--	--	--	--	Gastrointestinal	--	--	--	--
			Lead	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	Central Nervous System	--	--	--	--
			Zinc	--	--	--	--	Blood	2.2E-02	--	--	2.2E-02
			Chemical Total	--	--	--	--		1.4E-01	--	--	1.4E-01
		Exposure Point Total					--					1.4E-01
	Exposure Medium Total						--					1.4E-01
Medium Total							--					1.4E-01

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

Target Organ Hazard Indices	
Target Organ	Low Exposure Frequency
Blood	2.2E-02
Cardiovascular	--
Central Nervous System	--
Developmental	--
Gastrointestinal	1.8E-02
Kidney	9.5E-02
Lung	--
Respiratory	--
Skin	--
Maximum	9.5E-02

TABLE C18-2.3
EPA RAGS PART D TABLE 10, RISK SUMMARY FOR SURFACE WATER EXPOSURE, ADULT FISHERMAN - FISH INGESTION
Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor Population:	Recreational Fisherman
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern					Noncancer Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Fish	--	--	--	--	--	--	--	--	--	--
			Chemical Total	--	--	--	--		--	--	--	--
		Exposure Point Total					--					--
	Exposure Medium Total						--					--
Medium Total							--					--

This table is intentionally blank - cancer risks do not exceed 1E-05 and noncancer hazards do not exceed 1 for any chemicals of potential concern for this receptor population.

Notes:

--	Not available or not applicable
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
RAGS	Risk Assessment Guidance for Superfund

TABLE 9-18: SUMMARY OF CANCER RISKS, NONCANCER HAZARD INDICES, AND CHEMICALS OF CONCERN FOR SURFACE WATER, FISH INGESTION

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

Receptor	Exposure Medium	Exposure Frequency (days/year)	Cancer Risk	Noncancer Hazard Index		Chemical of Concern	Basis	Detection Frequency	Range of Detected Concentrations (mg/kg)	EPC (mg/kg)	Chemical-Specific Cancer Risk	Chemical-Specific Noncancer HI
			Total (a)	Total (a)	Highest Segregated							
Adult Fisherman	Surface Water (Fish Ingestion)	24	--	0.1	0.1	--	--	--	--	--	--	--
Child Fisherman	Surface Water (Fish Ingestion)	24	--	0.7	0.5	--	--	--	--	--	--	--

Notes:

(a) Total cancer risk and noncancer hazard index are evaluated for fish ingestion only; dermal and inhalation pathways are not complete for the surface water scenario.

-- Not applicable

EPC Exposure point concentration

HI Hazard index

mg/kg Milligram per kilogram

APPENDIX D
TOXICITY PROFILES

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ACRONYMS AND ABBREVIATIONS

µg/dL	Micrograms per deciliter
µg/kg-day	Micrograms per kilogram per day
CAS	Chemical Abstracts Service
COPC	Chemicals of potential concern
DHHS	Department of Health and Human Services
EPA	U.S. Environmental Protection Agency
HHRA	Human health risk assessment
mg	Milligrams
mg/day	Milligrams per day
mg/kg-day	Milligrams per kilogram per day
mg/m^3	Milligrams per cubic meter
MMT	Methylcyclopentadienyl manganese tricarbonyl
ppb	Parts per billion
PPRTV	Provisional peer reviewed toxicity value
RDA	Recommended daily allowance
WHO	World Health Organization

D1.0 INTRODUCTION

This appendix contains condensed toxicity profiles for the chemicals of potential concern (COPC) evaluated in the human health risk assessment (HHRA) for the Upper Blackfoot Mining Complex. The toxicity profiles summarize the sources and uses of the COPCs and provide information on the health effects associated with exposure to the COPC. Unless otherwise indicated, information for the toxicity profiles was taken from Oak Ridge National Laboratory and The University of Tennessee (2009).

D2.0 ALUMINUM

Aluminum (Chemical Abstracts Service [CAS] Number 7429905) is a silver-white flexible metal with a vast number of uses. It makes up about 8 percent of the earth's crust. The aluminum content of seawater ranges from 3 to 2400 parts per billion (ppb). Aluminum metal is used as a structural material in the construction, automotive, and aircraft industries, in the production of metal alloys, and in the electrical industry in power lines, insulated cables, and wiring. Other uses of aluminum metal include cooking utensils, decorations, fencing, highway signs, cans, food packaging, foil, and dental crowns and dentures. Aluminum powder is used in paints and fireworks, and natural aluminum minerals are used in water purification, sugar refining, and in the brewing and paper industries. Aluminum borate is used in the production of glass and ceramics, and aluminum chloride is used to make rubber, lubricants, wood preservatives, and cosmetics. Aluminum chlorohydrate is the active ingredient in antiperspirants and deodorants, while aluminum hydroxide is used as a pharmaceutical to lower plasma phosphorus levels of patients with kidney failure. Until recently, aluminum has been found predominantly in forms that were not available to humans and most other species. However, acid rain has increased the availability of aluminum to biological systems and has resulted in destructive effects on fish and plant species. It is unknown whether humans are susceptible to this increased bioavailability. It is poorly absorbed and efficiently eliminated; however, when absorption does occur, aluminum is distributed mainly in bone, liver, testes, kidneys, and brain. Aluminum may be involved in Alzheimer's disease (dialysis dementia) and in Amyotrophic Lateral Sclerosis and Parkinsonism-Dementia Syndromes of Guam. Aluminum content of brain, muscle, and bone increases in Alzheimer's patients. Neurofibrillary tangles are found in patients suffering from aluminum encephalopathy and Alzheimer's disease. Symptoms of "dialysis dementia" include speech disorders, dementia, convulsions, and myoclonus. Neurological effects have also been observed in rats orally exposed to aluminum compounds.

The respiratory system appears to be the primary target after inhalation exposure to aluminum. Alveolar proteinosis has been observed in guinea pigs, rats, and hamsters exposed to aluminum powders. Rats and guinea pigs exposed to aluminum chlorohydrate exhibited an increase in alveolar macrophages, increased relative lung weight, and multifocal granulomatous pneumonia. Male rats exposed to aluminum (as aluminum chloride) via gavage for 6 months exhibited decreased spermatozoa counts and sperm motility, and testicular histological and histochemical changes. Male rats exposed to drinking water that contained aluminum (as aluminum potassium sulfate) for a lifetime exhibited increases in unspecified malignant and nonmalignant tumors and similarly exposed female mice exhibited an increased incidence of leukemia. Rats and guinea pigs exposed via inhalation to aluminum chlorohydrate developed lung granulomas, while granulomatous foci developed in similarly exposed male hamsters.

Aluminum has been placed in the U.S. Environmental Protection Agency (EPA) weight-of-evidence classification D, not classifiable as to human carcinogenicity.

The toxicity criteria used in the HHRA to quantify risks for exposure to aluminum are summarized in Tables C-5.1 and C-5.2 of Appendix C. These tables include information on the primary target organ and the uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects.

D3.0 ARSENIC

Arsenic (CAS Number 7440382) is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants. Arsenic cannot be destroyed in the environment: It can only change its form. Arsenic in air will settle to the ground or is washed out of the air by rain. Many arsenic compounds can dissolve in water. Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful. The toxicity of inorganic arsenic depends on its valence state and also on the physical and chemical properties of the compound in which it occurs.

Water-soluble inorganic arsenic compounds are absorbed through the gastrointestinal tract and lungs; distributed primarily to the liver, kidney, lung, spleen, aorta, and skin; and excreted mainly in the urine at rates as high as 80 percent. Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. Dermatitis (exfoliative erythroderma), muscle cramps, cardiac abnormalities, hepatotoxicity, bone marrow suppression and hematologic abnormalities (anemia), vascular lesions, and peripheral neuropathy (motor dysfunction, paresthesia) have also been reported. Oral doses as low as 20 to 60 micrograms per kilogram per day (µg/kg-day) have been reported to cause toxic effects in some individuals. Severe exposures can result in acute encephalopathy, congestive heart failure, stupor, convulsions, paralysis, coma, and death. The acute lethal dose to humans has been estimated to be about 0.6 milligrams per kilogram per day (mg/kg-day).

General symptoms of chronic arsenic poisoning in humans are weakness, general debility and lassitude, loss of appetite and energy, loss of hair, hoarseness of voice, loss of weight, and mental disorders. Primary target organs are the skin (hyperpigmentation and hyperkeratosis), nervous system (peripheral neuropathy), and vascular system. Anemia, leukopenia, hepatomegaly, and portal hypertension have also been reported. In addition, possible reproductive effects include a high male to female birth ratio.

Epidemiological studies have revealed an association between arsenic concentrations in drinking water and increased incidences of skin cancers, as well as cancers of the liver, bladder, and respiratory and gastrointestinal tracts. Occupational exposure studies have shown a clear correlation between exposure to arsenic and lung cancer mortality. Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the

Department of Health and Human Services (DHHS), and EPA have concluded that inorganic arsenic is a human carcinogen and is classified A, human carcinogen.

The toxicity criteria used in the HHRA to quantify risks for exposure to arsenic are summarized in Tables C-5.1, C-5.2, C-6.1, and C-6.2 of Appendix C. These tables include information on the primary target organ, uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects, and the weight of evidence for toxicity criteria used to estimate cancer risks.

D4.0 CADMIUM

Cadmium (CAS Number 7440439) is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide). The degree of solubility of these cadmium compounds varies, ranging from very soluble to nearly insoluble. The solubility affects their absorption and toxicity. All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals such as zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics. The solubility affects their absorption and toxicity. Environmental exposure can occur via the diet and drinking water.

Breathing high levels of cadmium severely damages the lungs and can cause death. The 1-minute lethal concentration has been estimated to be about 2,500 milligram per cubic meter (mg/m^3) and the 10-minute lethal concentration of cadmium has been estimated at 250 mg/m^3. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea. Acute oral exposure to 20 to 30 grams has caused fatalities in humans. Cadmium is absorbed more efficiently by the lungs (30 to 60 percent) than by the gastrointestinal tract. Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones. Animals given cadmium in food or water had high blood pressure, iron-poor blood, liver disease, and nerve or brain damage.

There is limited evidence from epidemiologic studies for cadmium-related respiratory tract cancer. Based on limited evidence from multiple occupational exposure studies and adequate animal data, cadmium is placed in weight-of-evidence group B1, probable human carcinogen.

The toxicity criteria used in the HHRA to quantify risks for exposure to cadmium are summarized in Tables C-5.1, C-5.2 and C-6.2 of Appendix C. These tables include information on the primary target organ, uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects, and the weight of evidence for toxicity criteria used to estimate cancer risks.

D5.0 COPPER

Copper (CAS Number 7440508) is a reddish metal that occurs naturally in the environment in plants and animals. Copper is an essential element for all living things, including humans. Copper is extensively mined in the United States and is used to make wire, sheet metal, pipes, and pennies. It is also used in farming to treat some plant diseases; in water treatment; and to preserve wood, leather, and fabrics. In addition, metallic copper is widely used in the manufacture of electrical equipment because of its high electrical and thermal conductivity and other properties such as malleability.

Copper is an essential trace element that is widely distributed in animal and plant tissues. Copper is necessary for good health and can be absorbed by the oral, inhalation, and dermal routes of exposure. Very large doses, however, can be harmful. In humans, ingestion of gram quantities of copper salts may cause gastrointestinal, hepatic, and renal effects, with symptoms such as severe abdominal pain, vomiting, diarrhea, hemolysis, hepatic necrosis, hematuria, proteinuria, hypotension, tachycardia, convulsions, coma, and death. Acute inhalation exposure to copper dust or fumes at concentrations of 0.075-0.12 mg/m^3 may cause metal fume fever with symptoms such as cough, chills, and muscle ache. Skin contact with copper can result in an allergic reaction, usually skin irritation or a skin rash.

No suitable bioassays or epidemiological studies are available to assess the carcinogenicity of copper. EPA, therefore, has placed copper in weight-of-evidence group D, not classifiable as to human carcinogenicity.

The toxicity criterion used in the HHRA to quantify risks for exposure to copper is summarized in Table C-5.1 of Appendix C. This table includes information on the primary target organ and the uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects.

D6.0 IRON

Iron is naturally occurring and the most abundant metal present in the Earth's crust and core. Iron can be found in all parts of the environment, including numerous common mineral ores. Iron is mined in the United States and is used to make steel, wrought iron, and other metal alloy products. The production and use of iron compounds for use as catalysts, pigments, and drugs, and for use in agriculture, nutrition, metallurgy, and leather tanning, can result in releases to the environment from human activities.

Iron is an essential element that is widely distributed in animal and plant tissues. Iron is necessary for good health and can be absorbed by the oral, inhalation, and dermal routes of exposure. Iron deficiency is one of the most common known forms of nutritional deficiency. Very large doses, however, can be harmful. In humans, ingestion of milligram to gram quantities may cause gastrointestinal effects with symptoms such as nausea, diarrhea, vomiting, constipation, heartburn, bloating, abdominal pain, and epigastric pain. Acute doses in the range of 200 to 400 milligrams per kilogram (mg/kg) may be fatal (EPA 2006).

No suitable bioassays or epidemiological studies are available to assess the carcinogenicity of iron. EPA, therefore, has not assigned iron a weight-of-evidence cancer guideline description for human carcinogenicity.

The toxicity criteria used in the HHRA to quantify risks for exposure to iron are summarized in Table C-5.1 of Appendix C. This table includes information on the primary target organ and the uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects.

D7.0 LEAD

Lead (CAS Number 7439921) is a naturally occurring bluish-gray metal found in small amounts in the earth's crust and as a sulfide in galena. Lead can be found in all parts of the environment; much of it comes from human activities, including burning fossil fuels, mining, and manufacturing. Lead is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. New environmentally safe uses for lead include radiation protection in computer, television, diagnostic magnetic imaging, and other nuclear medical technology; circuit boards in computers and other electronic equipment; piezoelectric ceramics; superconductor technology; and high-purity lead oxides used in optical technology.

Human exposure to lead occurs primarily through diet, air, drinking water, dust, and paint chips. The efficiency of lead absorption depends on the route of exposure, age, and nutritional status. Adult humans absorb about 10 to 15 percent of ingested lead, whereas children may absorb up to 50 percent, depending on whether lead is in the diet, dirt, or paint chips. The systemic toxic effects of lead in humans have been well documented; the evidence shows that lead is a multi-targeted toxicant, causing effects in the gastrointestinal tract, hematopoietic system, cardiovascular system, central and peripheral nervous systems, kidneys, immune system, and reproductive system. Lead can affect almost every organ and system in the human body. The most sensitive system is the central nervous system, particularly in children. Irreversible brain damage occurs at blood lead levels greater than or equal to 100 micrograms per deciliter (µg/dL) in adults and at 80 to 100 µg/dL in children; death can occur at the same blood levels in children. Children who survive these high levels of exposure suffer permanent severe mental retardation. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed. At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may also cause anemia, a disorder of the blood.

Young children (generally 7 years of age and younger) are generally considered the population at greatest risk from exposure to lead for three primary reasons: (1) young children display behavior characteristics such as hand-to-mouth activity and pica behavior that contribute to higher intakes of lead than is the case among older children and adults; (2) young children generally absorb lead through the gastrointestinal tract with greater efficiency than do other age groups; and (3) young children display a greater susceptibility to the toxic effects of lead, particularly with regard to impacts on their developing nervous systems.

EPA has evaluated inorganic lead and lead compounds for carcinogenicity. The data from human studies are inadequate for evaluating the potential carcinogenicity of lead. Data from animal studies, however, are sufficient based on numerous studies showing that lead induces renal tumors in experimental animals. A few studies have shown evidence for induction of tumors at other sites (cerebral gliomas; testicular, adrenal, prostate, pituitary, and thyroid tumors). EPA has assigned lead classification B2, probable human carcinogen.

The toxicity criteria used in the HHRA to quantify risks for exposure to lead are discussed in Appendix E.

D8.0 MANGANESE

Manganese (CAS Number 7439965) is a silver-colored, naturally occurring metal that is found in many types of rocks and makes up about 0.10 percent of the earth's crust. Manganese is not found alone, but combines with other substances such as oxygen, sulfur, or chlorine. Manganese can also be combined with carbon to make organic manganese compounds, including pesticides (such as maneb or mancozeb) and methylcyclopentadienyl manganese tricarbonyl (MMT), a fuel additive in some gasolines. Manganese is an essential trace element and is necessary for good health. Normal nutritional requirements of manganese are satisfied through the diet, which is the normal source of the element, with minor contributions from water and air. The National Research Council recommends a dietary allowance of 2-5 milligrams per day (mg/day) for a safe and adequate intake of manganese for an adult human. Manganese can be found in several food items, including grains, cereals, and tea.

Manganese can elicit a variety of serious toxic responses on prolonged exposure to elevated concentrations, either orally or by inhalation. The central nervous system is the primary target. Initial symptoms are headache, insomnia, disorientation, anxiety, lethargy, and memory loss. These symptoms progress with continued exposure and eventually include motor disturbances, tremors, and difficulty in walking, symptoms similar to those seen with Parkinsonism. These motor difficulties are often irreversible. Some individuals exposed to very high levels of manganese for long periods of time at work developed mental and emotional disturbances and slow and clumsy body movements. This combination of symptoms is a disease called "manganism."

No human cancer data are available for manganese. Some conflicting data exist on possible carcinogenesis after injections of manganese chloride and manganese sulfate in mice. However, the EPA weight-of-evidence classification is D, not classifiable as to human carcinogenicity, based on no evidence in humans and inadequate evidence in animals.

The toxicity criteria used in the HHRA to quantify risks for exposure to manganese are summarized in Tables C-5.1 and C-5.2 of Appendix C. These tables include information on the primary target organ, and the uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects.

D9.0 ZINC

Pure zinc (CAS Number 7440666) is a bluish-white shiny metal. Zinc is one of the most common elements in the earth's crust and is found in air, soil, and water, and is present in all foods. Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys such as brass and bronze. A zinc and copper alloy is used to make pennies in the United States. Zinc combines with other elements to form zinc compounds; common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, zinc phosphide, zinc cyanide, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dye, wood preservatives, and ointments.

Zinc is an essential element, with recommended daily allowances (RDA) ranging from 5 milligrams (mg) for infants to 15 mg for adult males. Too little zinc can cause health problems, but too much zinc is also harmful.

The digestive tract absorbs 20 percent to 80 percent of ingested zinc based on the chemical compound ingested. Harmful health effects generally begin at levels in the 100 to 250 mg/day range. Eating large amounts of zinc, even for a short time, can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia, pancreas damage, and lower levels of high-density lipoprotein cholesterol (the good form of cholesterol). Breathing large amounts of zinc (as dust or fumes) can cause a specific short-term disease called metal fume fever. This fever is believed to be an immune response affecting the lungs and body temperature. The long-term effects of breathing high levels of zinc or the effects on human reproduction are not known. Rats that were fed large amounts of zinc became infertile or had smaller babies. Irritation was also observed on the skin of rabbits, guinea pigs, and mice when exposed to some zinc compounds. Skin irritation will probably occur in humans.

No case studies or epidemiologic evidence has been presented to suggest that zinc is carcinogenic in humans by the oral or inhalation route. In animal studies, zinc sulfate in drinking water or zinc oleate in the diet of mice for a period of 1 year did not result in a statistically significant increase in tumors; however, in a 3-year, 5-generation study on tumor-resistant and tumor-susceptible strains of mice, exposure to zinc in drinking water resulted in increased frequencies of tumors. Zinc is placed in weight-of-evidence Group D, not classifiable as to human carcinogenicity due to inadequate evidence in humans and animals.

The toxicity criteria used in the HHRA to quantify risks for exposure to zinc are summarized in Table C-5.1 of Appendix C. This table includes information on the primary target organ and the uncertainty and modifying factors associated with toxicity criteria used to evaluate systemic (noncancer) effects.

D10.0 REFERENCES

Oak Ridge National Laboratory and the University of Tennessee. 2009. Risk Assessment Information System Toxicity Profiles. Accessed December 1, 2009. Available on-line at: <http://rais.ornl.gov/tools/tox_profiles.html>

U.S. Environmental Protection Agency (EPA). 2006. Provisional Peer Reviewed Toxicity Values for Iron and Compounds. September 11.

APPENDIX E
RISK EVALUATION FOR LEAD

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ATTACHMENT

ACRONYMS AND ABBREVIATIONS

µg/dL	Microgram per deciliter
$\mu g/m^3$	Micrograms per cubic meter
ALM	Adult lead methodology
ATV	All-terrain vehicle
bgs	Below ground surface
BTV	Background threshold value
CDC	Centers for Disease Control and Prevention
COC	Chemical of concern
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
EU	Exposure unit
HHRA	Human health risk assessment
IEUBK	Integrated exposure uptake biokinetic
mg/kg	Milligram per kilogram
OSWER	Office of Solid Waste and Emergency Response
SSCL	Site-specific Cleanup Level
TWA	Time-weighted average
UBMC	Upper Blackfoot Mining Complex
UCL	upper percent confidence limit

E1.0 INTRODUCTION

This appendix summarizes the methods used to characterize risk and calculate site-specific cleanup levels (SSCL) for lead in soil. This evaluation was completed to support the human health risk assessment (HHRA) for the Upper Blackfoot Mining Company (UBMC) site. Risks for exposure to lead were characterized for all 13 exposure units (EU) at the UBMC. A detailed description of the EUs is provided in Section 2.0 of the HHRA. As indicated in Section 7.4 of the HHRA, health effects from exposure to lead, particularly in children, may occur at such low blood lead levels that use of threshold-based toxicity criteria to evaluate potential risks from exposure to lead is not preferred. Rather, exposure to lead is evaluated by using blood lead level as a biomarker. Blood lead modeling, which accounts for multiple sources of exposure to lead (site-related and background), is used to predict blood lead levels. Using the blood lead level modeling approach, the U.S. Environmental Protection Agency (EPA) (1994a, 2009a) has generated blood lead modeling-based screening levels for lead based on a blood lead level of 10 micrograms per deciliter (µg/dL).

In January 2012, the Centers for Disease Control and Prevention (CDC) Advisory Committee on Childhood Lead Poisoning Prevention recommended that 5 µg/dL be used to identify children with elevated blood lead levels. This recommendation is based on the weight of evidence that includes studies with a large number and diverse group of children with low blood lead levels and associated intelligence deficits. Effects at blood lead levels less than 10 µg/dL are also reported for other behavioral domains, particularly attention-related behaviors and academic achievement. New findings suggest that the adverse health effects of blood lead levels less than 10 µg/dL in children extend beyond cognitive function to include cardiovascular, immunological, and endocrine effects. Additionally, these effects do not appear to be confined to lower socioeconomic status populations, and these effects, in the absence of other interventions, appear to be irreversible (CDC 2012). Therefore, DEQ evaluated exposures based upon both blood lead levels. DEQ developed risk reduction goals to limit the probability that a child's blood lead concentration will exceed either 10 µg/dL or 5 µg/dL to 5 percent or less after cleanup (EPA 2012).

EPA has developed guidance documents and directives regarding evaluation of risks associated with exposure to lead. In particular, EPA's Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.4-12, "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities" (EPA 1994b), recommends a residential soil screening level for lead of 400 milligrams per kilogram (mg/kg). EPA further recommends use of the "Integrated Exposure Uptake Biokinetic Model for Lead in Children" (IEUBK model) for further evaluation of a site or facility if the screening level is exceeded in a residential land use scenario (EPA 1994a, 1994b, 1994c). The IEUBK model is used to evaluate lead exposure in child populations for residential and other land use scenarios with child receptors. EPA recommends use of the "Adult Lead Methodology Spreadsheet" (ALM) for evaluation of older populations (that is, populations for which children are not receptors) (EPA 2003a, 2009b).

Section E2.0 describes the exposure scenarios and assumptions for the receptors evaluated for exposure to lead. Section E3.0 describes the methods for modeling blood lead levels for each receptor. Section E4.0 discusses the methods used for calculating SSCLs for lead. References are listed in Section E5.0, and tables are provided immediately after the references.

E2.0 EXPOSURE SCENARIOS AND ASSUMPTIONS

As discussed in Section 4.4 of the HHRA, the potential human receptors that may be exposed to lead in soil at the UBMC under current land use conditions are recreational users (all-terrain vehicle [ATV]/motorcycle riders, fishermen, rock hounds, and hunters), construction workers, and residents. For sediment in EUs 12 and 13, DEQ evaluated a modified child residential exposure based upon less exposure to sediments than soils. These residential receptors would are expected to live on-site but only in areas that are suitable for residential use and may be exposed to contaminated sediments fairly regularly. Under the anticipated future land uses of UBMC, all of these current receptors are also potential future receptors. In addition, industrial workers are current (only at the water treatment plant within EU 1) and potential future receptors.

This section discusses receptor-specific assumptions and exposure parameter values that were used to estimate blood lead levels for the UBMC receptor populations and to calculate SSCLs for lead. As discussed in EPA guidance, receptors are expected to be exposed to lead in soil primarily through ingestion (EPA 1994a, 1994b, 2003a). Dermal exposure is not considered a significant exposure pathway because lead in soil is not well absorbed through the skin. Therefore, dermal exposure to lead in soil was not considered in the HHRA. Similarly, inhalation of fugitive dust released from site sources was not considered in the HHRA because this route of exposure is insignificant compared with lead exposure through soil ingestion and ambient (non-site-specific) dust inhalation. For example, the inhalation intake/exposure concentration for lead at EU 1 for the ATV/motorcycle rider is 0.10 micrograms per cubic meter ($\mu g/m^3$), which is the same as the default outdoor air lead concentration assumed by the IEUBK model. Since EU 1 has the highest concentration of lead at the UBMC, the default outdoor air lead concentration of 0.1 $\mu g/m^3$ is conservative for all other EUs.

Sections E2.1, E2.2, and E2.3 discuss the assumptions used to evaluate recreational, worker, and residential exposure to lead. Section 4.5 of the HHRA provides rationale for the exposure media (for example, surface soil) evaluated for each of these receptors. The off-site background concentration for lead in soil for all exposure scenarios was assumed to be 29.8 mg/kg; this concentration is based on a measured background concentration for lead (DEQ 2013b).

The geometric standard deviation of blood lead concentration for receptors evaluated using the ALM was set to 1.8, and the baseline blood lead concentration was set to 1.0. These values are representative of a default from all races/ethnic groups in the U.S. (EPA 2009c).

E2.1 RECREATIONAL EXPOSURE SCENARIOS

Based on DEQ guidance (DEQ 1996), ATV/motorcycle riders, fishermen, rock hounds, and hunters were selected as receptors representative of current and future recreational use. DEQ guidance recommends that these receptors be evaluated as adult receptors, with the exception of the rock hound, which it recommends be evaluated for both adult and child scenarios (DEQ 1996). The child scenario is considered protective of the adult scenarios because lead toxicity is higher for children than adults. Therefore, only the child scenario was evaluated for the rock hound receptor. The ATV/motorcycle rider, fisherman, and hunter receptors were evaluated for the adult scenario only.

The IEUBK model was used with the default exposure settings for the child rock hound receptor, with the following exception. Following EPA guidance (EPA 2003a), the appropriate (95 percent or higher) upper percent confidence limit (UCL) on the mean soil concentration for each EU was set to a time-weighted average (TWA) concentration based on the UCL concentration calculated for lead for the EU (see Appendix A). A TWA concentration was used because recreational exposures at the UBMC are intermittent, rather than continuous. To calculate the TWA concentration, the child rock hound was assumed to be awake for 16 hours each day (where waking hours represent the number of hours each day when exposure may occur) over 24 consecutive weeks (a 168-day exposure period, which is the expected length of the season for rock hounding) (DEQ 2013a). On-site rock hound activities are assumed to occur for 24 of the 168 days, for 8 of the 16 waking hours (DEQ 1996). Off-site residential exposure to background concentrations is assumed for the days and hours not occupied by recreational activities. Over the course of a 168-day exposure season, these assumptions result in 2496 hours of off-site (background) residential exposure time and 192 hours of recreational (on-site) exposure time for rock hunting. The TWA concentration is calculated using the equation (EPA 2003b):

$$Weighted\ PbC_{medium} = \sum_{t=1}^{n} C_t \cdot F_t$$

where:

Weighted PbC_{medium}	=	Weighted lead concentration across all exposure scenarios mg/kg)
C_t	=	Lead concentration for the medium at each location (mg/kg)
F_t	=	Fraction of time spent at each location (hours/total waking hours)

This equation was adapted as follows to calculate the TWA lead concentration for the rock hound:

$$C_{TOT} = C_{OS} \cdot F_{OS} + C_{RES} \cdot F_{RES}$$

where:

C_{TOT}	=	TWA concentration for exposed child (based on time-weighted on-site recreational and off-site residential background exposure)
C_{OS}	=	On-site exposure concentration for lead in soil
C_{RES}	=	Off-site background exposure concentration for lead in soil
F_{OS}	=	Fraction of time spent on-site (on-site hours/total waking hours)
F_{RES}	=	Fraction of time spent away from the site (off-site hours/total waking hours)

For adult recreational receptors, the ALM model was used with default exposure settings, with a few exceptions. The exposure concentration for lead was set to the UCL lead concentration for each EU and exposure medium. The soil ingestion rate and high-end exposure frequency values for adult recreational receptors provided in Appendix C, Table 4.1, were used. The averaging time was set to the length of the exposure period for each receptor based on DEQ guidance (DEQ 1996). An averaging time of 168 days was used for the ATV/motorcycle rider and fisherman based on the assumption that exposure occurs during 24 weeks during the late spring, summer, and early autumn. An averaging time of 90 days was used for the hunter based on the minimum time applicable for the model that would exceed the length of the big game and archery hunting season (EPA 2003a).

Recreational receptors were evaluated for exposure to lead in surface soil (0 to 2 feet below ground surface [bgs]) and sediment. Additionally, the fisherman and rock hound receptors were evaluated for exposure to lead in sediment.

E2.2 INDUSTRIAL WORKER AND CONSTRUCTION WORKER SCENARIOS

The ALM model was used with the default settings for ingestion rate, exposure frequency, and averaging time for the adult construction worker and industrial worker receptors. The exposure concentration for lead was set to the UCL lead concentration for each EU and exposure medium. The industrial worker was evaluated for exposure to surface soil (0 to 2 feet bgs) and surface sediment. The construction worker was evaluated for exposure to surface soil and sediment and subsurface soil and sediment (2 to 10 feet bgs).

E2.3 RESIDENTIAL SCENARIO

The IEUBK model was used with the default exposure settings for the residential (child) scenario. Residential receptors were evaluated for exposure to surface soil (0 to 2 feet bgs) and surface sediment.

The scenario evaluated assumes that groundwater at the UBMC is not used as a source of drinking water. The exposure concentration for lead in groundwater was assumed to be 4 micrograms per liter, equal to the default groundwater lead concentration provided in the IEUBK model (EPA 2009a).

For residential exposure to sediments in EUs 12 and 13, DEQ evaluated a modified child residential exposure based upon less exposure to sediments than soils. These residential receptors would are expected to live on-site but only in areas that are suitable for residential use and may be exposed to contaminated sediments fairly regularly. A similar TWA approach to the child rock hound was used for this receptor. To calculate the TWA concentration, the child resident was assumed to spend 8 of the 16 waking hours represent of each day when exposure may occur over 24 consecutive weeks (a 168-day exposure period, which is the expected length of the season for sediment exposure) (DEQ 2013a). On-site sediment exposure is assumed to occur for 50 of the 168 days (roughly twice a week). Off-site residential exposure to background concentrations is assumed for the days and hours not occupied by sediment exposure.

E3.0 BLOOD LEAD LEVEL MODELING RESULTS

The IEUBK and ALM models were used to estimate blood lead levels for each receptor. The geometric mean blood lead level, 95th percentile blood lead level, and the probability that the blood lead level exceeds either 5 or 10 µg/dL were estimated for each receptor. Lead is identified as a chemical of concern (COC) if the predicted blood lead level exceeds either 5 or 10 µg/dL for more than 5 percent of the receptor population evaluated. Results of the blood lead modeling are summarized below.

E3.1 RECREATIONAL EXPOSURE SCENARIOS

The IEUBK model was used to model blood lead levels for the child rock hound receptor. The ALM was used to model blood lead levels for adult recreational receptors.

Table E-1 summarizes the results of the blood lead modeling for the adult ATV/motorcycle rider. Lead is a COC at the 10 µg/dL level for surface soil at EU 1 for the ATV/motorcycle rider. At the 5 µg/dL level, it is also a COC for surface soil in EUs 2, 6, 7, 8, and 11 for the ATV/motorcycle rider.

Table E-2 summarizes the results of the blood lead modeling for the adult fisherman. Lead is a COC at the 10 µg/dL level for surface soil at EU 1. Lead is not a COC for sediment for the fisherman. At the 5 µg/dL level, it is also a COC for surface soil in EUs 2, 7, and 8 for the fisherman.

Table E-3 summarizes the results of the blood lead modeling for the child rock hound. Lead is a COC at the 10 µg/dL level for surface soil at EU 1 for the child rock hound. Lead is not a COC at the 10 µg/dL level for sediment for the rock hound. At the 5 µg/dL level, it is also a COC for surface soil in EUs 2, 6, 7, 8, and 11 and for sediment in EU 12 for the child rock hound.

Table E-4 summarizes the results of the blood lead modeling for the adult hunter. Lead is a COC at the 10 µg/dL level for surface soil at EU 1 for the hunter. At the 5 µg/dL level, it is also a COC for surface soil in EUs 2, 7, and 8 for the hunter.

E3.2 INDUSTRIAL WORKER AND CONSTRUCTION WORKER SCENARIOS

The ALM was used to model blood lead levels for the adult construction worker and industrial worker receptors.

Table E-5 summarizes the results of the blood lead modeling for the industrial worker. Lead is a COC at the 10 µg/dL level for the industrial worker for surface soil at EUs 1, 2, 6, 7, 8, and 11. Lead is also a COC at the 10 µg/dL level for surface sediment at EU 12 for the industrial worker. At the 5 µg/dL level, it is also a COC for surface soil in EU 3 for the industrial worker.

Table E-6 summarizes the results of the blood lead modeling for the construction worker. Lead is a COC at the 10 µg/dL level for the construction worker for surface soil at EUs 1, 2, 6, 7, 8, and 11. Lead is a COC at the 10 µg/dL level for the construction worker for subsurface soil at EUs 2 and 11. Lead is also a COC at the 10 µg/dL level for surface sediment at EU 12 for the construction worker. At the 5 µg/dL level, it is also a COC for surface soil in EUs 3 and 4 and for subsurface sediment in EU 12 for the construction worker.

E3.3 RESIDENTIAL SCENARIO

The IEUBK model was used to model blood lead levels for the child residential receptor and the modified child resident sediment exposure.

Table E-7 summarizes the results of the blood lead modeling for the resident. If groundwater is not used as a source of drinking water, lead is a COC at the 10 µg/dL level for surface soil at EUs 1, 2, 3, 4, 6, 7, 8, and 11. At the 5 µg/dL level, it is also a COC for surface soil in EU 5 and surface sediment in EU 12 for the child resident.

E4.0 CALCULATION OF HUMAN HEALTH SITE-SPECIFIC CLEANUP LEVELS FOR LEAD

This section describes the methodology used to calculate SSCLs for lead in soil using the IEUBK and ALM models. The SSCLs for lead correspond to concentrations of lead in soil that are not expected to exceed of a target blood lead level of 5 or 10 µg/dL for more than 5 percent of the population. The following table provides the input parameters used in the models for the receptors:

Variable (units)	ATV/ Motorcycle Rider	Fisherman	Rock Hound	Hunter	Industrial Worker	Construction Worker	Child Resident	Modified Child Resident
Adult/Child	Adult	Adult	Child	Adult	Adult	Adult	Child	Child
Soil Ingestion rate (grams/day)	0.165	0.05	IEUBK defaults	0.05	0.05	0.1	IEUBK defaults	IEUBK defaults
Exposure Frequency (days/year)	12	24	24	16	165	124	IEUBK defaults	50
Averaging Time (days/year)	168	168	168	90	230	230	IEUBK defaults	168

The model output pages are provided as Attachment E-1.

The following table summarizes the soil SSCLs for lead calculated for each receptor:

Receptor	Lead SSCL at 10 µg/dL (mg/kg)	Lead SSCL at 5 µg/dL (mg/kg)
Adult Recreational ATV/Motorcycle Rider	5,701	1,967
Adult Recreational Fisherman	9,406	3,245
Child Recreational Rock Hound	5,318	1,790
Adult Recreational Adult Hunter	7,559	2,608
Adult Industrial Worker	1,873	646
Adult Construction Worker	1,246	430
Child Resident (not drinking site groundwater)	400	153
Modified Child Resident Exposed to Sediment	2,498	851

The basis for the receptor-specific SSCLs are discussed in Sections E4.1 through E4.3.

E4.1 RECREATIONAL EXPOSURE SCENARIOS

The soil SSCLs for lead for adult recreational receptors are based on back-calculations using the ALM model. The exposure assumptions discussed in Sections E2.1 and E3.1 were used in each calculation. The calculated SSCL at 10 µg/dL for the ATV/motorcycle rider is 5,701 mg/kg. The calculated SSCLs at 10 µg/dL are 9,406 mg/kg for the fisherman and 7,559 mg/kg for the hunter. The calculated SSCL at 5 µg/dL for the ATV/motorcycle rider is 1,967 mg/kg. The calculated SSCLs at 5 µg/dL are 3,245 mg/kg for the fisherman and 2,608 mg/kg for the hunter.

The soil SSCL for lead for the child recreational receptor (rock hound) was calculated by rearranging the TWA equation provided in Section E2.1 to solve for $C_{OS,}$ assuming C_{TOT} cannot exceed the SSCL for the child resident (see Section E4.3 below). The child resident SSCL is used to represent the maximum concentration of lead in soil for the child hound, based on combined on-site recreational exposure and off-site background residential exposure. The residential SSCL is assumed to be protective of a child residing off site but participating in recreation on site. This equation used to calculate the soil SSCL for the child rock hound is:

$$SSCL_{OS} = \frac{SSCL_{RES} - C_{RES} \cdot F_{RES}}{F_{OS}}$$

where:

$SSCL_{OS}$	=	SSCL for lead in soil protective of a child receptor involved with on-site activities
$SSCL_{RES}$	=	SSCL for lead in soil protective of on-site child residential receptors (derived in Section E4.3)
C_{RES}	=	Off-site background exposure concentration for lead in soil
F_{OS}	=	Fraction of time spent on-site (on-site hours/total waking hours)
F_{RES}	=	Fraction of time spent away from the site (off-site hours/total waking hours)

The calculated SSCL at 10 µg/dL for the child rock hound is 5,318 mg/kg. The calculated SSCL at 5 µg/dL for the child rock hound is 1,790 mg/kg.

E4.2 INDUSTRIAL WORKER AND CONSTRUCTION WORKER SCENARIOS

DEQ used the Adult Lead Model to estimate SSCLs for an industrial setting. The SSCLs are intended to protect a fetus that may be carried by a pregnant female worker. The model equations were developed to calculate cleanup goals such that the fetus of a pregnant female worker would not likely have an unsafe concentration of lead in blood. It is assumed that a cleanup goal that is protective of a fetus will also afford protection for male or female adult workers (EPA 2013). The calculated SSCL at 10 µg/dL for the industrial worker is 1,873 mg/kg. The calculated SSCL at 5 µg/dL for the industrial worker is 646 mg/kg. The calculated SSCL at 10 µg/dL for the construction worker is 2,492 mg/kg. The calculated SSCL at 5 µg/dL for the construction worker is 430 mg/kg. The calculated SSCL at 5 µg/dL for both workers are less than the BTV for lead in soil of 1,109 mg/kg (see Appendix B).

E4.3 RESIDENTIAL SCENARIO

The EPA Office of Solid Waste and Emergency Response has also released a detailed directive on risk assessment and cleanup of residential soil lead (EPA 1994b). The directive indicates that soil lead levels less than 400 mg/kg are generally safe for residential use based upon the IEUBK model and a blood lead level of 10 µg/dL. Thus, the SSCL at 10 µg/dL for the child resident is 400 mg/kg. Based upon the current IEUBK model and a blood lead level of 5 µg/dL the SSCL for the child resident is 153 mg/kg. However, these calculated SSCL are less than the BTV for lead in soil of 1,109 mg/kg (see Appendix B).

The soil SSCL for lead for the modified child resident exposure to sediment was calculated in the same manner as the SSCL for the child rock hound by rearranging the TWA equation provided in Section E2.1 to solve for C_{OS}, assuming C_{TOT} cannot exceed the SSCL for the child resident (see Section E4.3 below). The child resident SSCL is used to represent the maximum concentration of lead in sediment for the child, based on combined sediment exposure and background residential exposure. The SSCL for sediments at 10 µg/dL is 2,498 mg/kg and at 5 µg/dL is 851 mg/kg.

E5.0 REFERENCES

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TABLES

TABLE E-1: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE ADULT RECREATIONAL ATV/MOTORCYCLE RIDER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Geometric Mean Blood Lead Level (µg/dL)	95th Percentile Blood Lead Level Among Fetuses of Adult Recreational ATV/Motorcycle Riders (µg/dL) [c]	Probability that Fetal Blood Lead Level is > 10 µg/dL	Probability that Fetal Blood Lead Level is > 5 µg/dL
1	Surface Soil	11,540	7.5	**17.8**	**25%**	**70%**
2	Surface Soil	3,674	3.1	**7.3**	1%	**16%**
3	Surface Soil	1,182	1.7	3.9	0.06%	2%
4	Surface Soil	441	1.2	3.0	0.01%	0.6%
5	Surface Soil	248	1.1	2.7	0.005%	0.4%
6	Surface Soil	1,942	2.1	**5.0**	0.2%	**5%**
7	Surface Soil	3,480	3.0	**7.0**	1%	**14%**
8	Surface Soil	5,175	3.9	**9.3**	4%	**28%**
9	Surface Soil	NE [d]				
10	Surface Soil	NE [d]				
11	Surface Soil	2,044	2.2	**5.1**	0.3%	**5%**

Notes:

a Surface soil is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational ATV/motorcycle riders modeled using the EPA (2009) Adult Lead Model exceeds either 10 µg/dL or 5 µg/dL.

d Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

ATV All-terrain vehicle
µg/dL Microgram per deciliter
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
mg/kg Milligram per kilogram

Sources:

EPA. 2009. Adult Lead Methodology Spreadsheet. June 21. Available on-line at:

TABLE E-2: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE ADULT RECREATIONAL FISHERMAN

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Geometric Mean Blood Lead Level (µg/dL)	95th Percentile Blood Lead Level Among Fetuses of Adult Recreational Fishermen (µg/dL) [c]	Probability that Fetal Blood Lead Level is > 10 µg/dL	Probability that Fetal Blood Lead Level is > 5 µg/dL
1	Surface Soil	11,540	5.0	**11.7**	**8%**	**42%**
2	Surface Soil	3,674	2.3	**5.3**	0.3%	**6%**
3	Surface Soil	NE [d]				
4	Surface Soil	441	1.2	2.7	0.006%	0.4%
5	Surface Soil	248	1.1	2.6	0.004%	0.3%
6	Surface Soil	1,942	1.7	3.9	0.1%	2%
7	Surface Soil	3,480	2.2	**5.2**	0.3%	**6%**
8	Surface Soil	5,175	2.8	**6.6**	0.9%	**12%**
9	Surface Soil	NE [d,e]				
10	Surface Soil	NE [e]				
11	Surface Soil	2,044	1.7	4.0	0.1%	2%
12	Surface Sediment	656	1.2	2.9	0.009%	0.5%
13	Surface Sediment	337	1.1	2.6	0.005%	0.3%

Notes:

a Surface soil is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational fisherman modeled using the EPA (2009) Adult Lead Model exceeds either 10 µg/dL or 5 µg/dL.

d The recreational fisherman receptor was not evaluated in this EU because no fish are present in Paymaster Gulch.

e Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

µg/dL Microgram per deciliter
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
mg/kg Milligram per kilogram
NE Not evaluated

Sources:

EPA. 2009. Adult Lead Methodology Spreadsheet. June 21. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

TABLE E-3: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE CHILD RECREATIONAL ROCK HOUND

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	EU Time-Weighted Average Lead Exposure Point Concentration [c]	Geometric Mean Blood Lead Level (µg/dL) [d]	95th Percentile Blood Lead Level Among Child Recreational Rock Hounds (µg/dL) [d,e]	Probability that Blood Lead Level is > 10 µg/dL	Probability that Blood Lead Level is > 5 µg/dL
1	Surface Soil	11,540	836	7.8	**16.9**	**30%**	**83%**
2	Surface Soil	3,674	285	3.5	**7.6**	1%	**22%**
3	Surface Soil	1182	110	1.9	4.1	0.02%	2%
4	Surface Soil	441	59	1.4	3.1	0.002%	0.4%
5	Surface Soil	248	45	1.3	2.8	0.001%	0.2%
6	Surface Soil	1,942	164	2.4	**5.2**	0.1%	**6%**
7	Surface Soil	3,480	271	3.4	**7.4**	1%	**20%**
8	Surface Soil	5,175	390	4.4	**9.5**	4%	**39%**
9	Surface Soil	NE [f]					
10	Surface Soil	NE [f]					
11	Surface Soil	2,044	171	2.5	**5.3**	0.1%	**7%**
12	Surface Sediment	2,221	183	2.6	**5.6**	0.2%	**8%**
13	Surface Sediment	337	51	1.3	2.8	0.001%	0.2%

Notes:

a Surface soil and surface sediment is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Time-weighted soil lead exposure point concentrations were calculated following EPA (2003) guidance for assessing intermittent or variable exposures at lead sites.

d Calculated blood lead levels assume that rock hounds do not consume groundwater at the site.

e Results are shown in bold if the 95th percentile of the blood lead level among child recreational rock hounds modeled using the EPA (2009) Integrated Exposure Uptake Biokinetic Model exceeds either 10 µg/dL or 5 µg/dL.

f Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

µg/dL Microgram per deciliter
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
mg/kg Milligram per kilogram
NE Not evaluated

Sources:

EPA. 2003. Assessing Intermittent or Variable Exposures at Lead Sites. EPA-540-R-0-008. November. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products/twa-final-nov2003.pdf

EPA. 2009. Integrated Exposure Uptake Biokinetic Model. Version 1.1, Build 9. June. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

TABLE E-4: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE ADULT RECREATIONAL HUNTER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Geometric Mean Blood Lead Level (μg/dL)	95th Percentile Blood Lead Level Among Fetuses of Adult Recreational Hunters (μg/dL) [c]	Probability that Fetal Blood Lead Level is > 10 μg/dL	Probability that Blood Lead Level is > 5 μg/dL
1	Surface Soil	11,540	5.9	**14.0**	**14%**	**54%**
2	Surface Soil	3,674	2.6	**6.1**	0.6%	**9%**
3	Surface Soil	1,182	1.5	3.6	0.03%	1%
4	Surface Soil	441	1.2	2.8	0.007%	0.4%
5	Surface Soil	248	1.1	2.6	0.004%	0.3%
6	Surface Soil	1,942	1.8	4.3	0.1%	3%
7	Surface Soil	3,480	2.5	**5.9**	0.5%	**9%**
8	Surface Soil	5,175	3.2	**7.6**	2%	**18%**
9	Surface Soil	NE [d]				
10	Surface Soil	NE [d]				
11	Surface Soil	2,044	1.9	4.4	0.1%	3%

Notes:

a Surface soil is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational fisherman modeled using the EPA (2009) Adult Lead Model exceeds either 10 μg/dL or 5 μg/dL.

d Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

-- Not applicable
μg/dL Microgram per deciliter
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
mg/kg Milligram per kilogram
NE Not evaluated

Sources:

EPA. 2009. Adult Lead Methodology Spreadsheet. June 21. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

TABLE E-5: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE ADULT INDUSTRIAL WORKER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Geometric Mean Blood Lead Level (µg/dL)	95th Percentile Blood Lead Level Among Fetuses of Adult Industrial Workers (µg/dL) [c]	Probability that Blood Lead Level is > 10 µg/dL	Probability that Blood Lead Level is > 5 µg/dL
1	Surface Soil	11,540	20.9	**49.4**	**86%**	**99%**
2	Surface Soil	3,674	7.3	**17.3**	**24%**	**68%**
3	Surface Soil	1,182	3.0	**7.2**	1%	**15%**
4	Surface Soil	441	1.8	4.2	0.09%	3%
5	Surface Soil	248	1.4	3.4	0.02%	1%
6	Surface Soil	1,942	4.3	**10.3**	**6%**	**34%**
7	Surface Soil	3,480	7.0	**16.5**	**22%**	**65%**
8	Surface Soil	5,175	9.9	**23.5**	**42%**	**84%**
9	Surface Soil	NE [d]				
10	Surface Soil	NE [d]				
11	Surface Soil	2,044	4.5	**10.7**	**6%**	**36%**
12	Surface Sediment	2,221	4.8	**11.4**	**8%**	**41%**
13	Surface Sediment	337	1.6	3.7	0.05%	2%

Notes:

a Surface soil is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational fisherman modeled using the EPA (2009) Adult Lead Model exceeds either 10 µg/dL or 5 µg/dL.

d Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

µg/dL Microgram per deciliter

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

mg/kg Milligram per kilogram

NE Not evaluated

Sources:

EPA. 2009. Adult Lead Methodology Spreadsheet. June 21. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

TABLE E-6: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE ADULT CONSTRUCTION WORKER

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Geometric Mean Blood Lead Level (μg/dL)	95th Percentile Blood Lead Level Among Fetuses of Adult Construction Workers (μg/dL) [c]	Probability that Blood Lead Level is > 10 μg/dL	Probability that Blood Lead Level is > 5 μg/dL
1	Surface Soil	11,540	30.9	**73.0**	**96%**	**100%**
2	Surface Soil	3,674	10.5	**24.9**	**46%**	**86%**
	Subsurface Soil	1,583	5.1	**12.1**	**9%**	**44%**
3	Surface Soil	1,182	4.1	**9.6**	4%	**30%**
4	Surface Soil	441	2.1	**5.1**	0.3%	**5%**
5	Surface Soil	248	1.6	3.9	0.06%	2%
6	Surface Soil	1,942	6.0	**14.3**	**15%**	**55%**
7	Surface Soil	3,480	10.0	**23.7**	**43%**	**84%**
8	Surface Soil	5,175	14.4	**34.1**	**67%**	**95%**
9	Surface Soil	NE [d]				
	Subsurface Soil	NE [d]				
10	Surface Soil	NE [d]				
11	Surface Soil	2,044	6.3	**14.9**	**17%**	**58%**
	Subsurface Soil	4,540	12.7	**30.2**	**59%**	**92%**
12	Surface Sediment	2,221	6.7	**16.0**	**20%**	**63%**
	Subsurface Sediment	656	2.7	**6.4**	0.8%	**11%**
13	Surface Sediment	337	1.9	4.4	0.1%	3%

Notes:

a Surface soil is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational fisherman modeled using the EPA (2009) Adult Lead Model exceeds either 10 μg/dL or 5 μg/dL.

d Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

μg/dL Microgram per deciliter
bgs Below ground surface
EPA U.S. Environmental Protection Agency
EU Exposure unit
mg/kg Milligram per kilogram
NE Not evaluated

Sources:

EPA. 2009. Adult Lead Methodology Spreadsheet. June 21. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

TABLE E-7: SUMMARY OF RISK EVALUATION FOR LEAD FOR THE CHILD RESIDENT

Baseline Human Health Risk Assessment
Upper Blackfoot Mining Complex, Lewis and Clark County, Montana

EU	Exposure Medium [a]	Lead Exposure Point Concentration (mg/kg) [b]	Groundwater at the UBMC Not Used as a Drinking Water Source			
			Geometric Mean Blood Lead Level (µg/dL)	**95th Percentile Blood Lead Level Among Child Residents (µg/dL) [c]**	**Probability that Blood Lead Level is > 10 µg/dL**	**Probability that Blood Lead Level is > 5 µg/dL**
1	Surface Soil	11,540	**43**	**93.2**	**100%**	**100%**
2	Surface Soil	3,674	**22**	**47.7**	**95%**	**100%**
3	Surface Soil	1,182	**10**	**21.9**	**51%**	**93%**
4	Surface Soil	441	4.8	**10.4**	**6%**	**47%**
5	Surface Soil	248	3.2	**6.8**	0.7%	**16%**
6	Surface Soil	1,942	**14**	**31.3**	**78%**	**99%**
7	Surface Soil	3,480	**21**	**46.2**	**95%**	**100%**
8	Surface Soil	5,175	**27**	**58.9**	**98%**	**100%**
9	Surface Soil	NE [d]				
10	Surface Soil	NE [d]				
11	Surface Soil	2,044	**15**	**32.5**	**81%**	**99%**
12	Surface Sediment[e]	358	4.1	**8.9**	3%	**34%**
13	Surface Sediment[e]	76	1.6	3.4	0.004%	0.7%

Notes:

a Surface soil and surface sediment is 0 to 2 feet bgs.

b Exposure point concentration is the appropriate upper confidence limit of the mean.

c Results are shown in bold if the 95th percentile of the blood lead level among fetuses of adult recreational fisherman modeled using the EPA (2009) Adult Lead Model exceeds either 10 µg/dL or 5 µg/dL.

d Lead was not evaluated at this EU; the EPC did not exceed the lead BTV for soil.

e EU Time-Weighted Average Lead Exposure Point Concentration based upon modified residential exposure to sediment

µg/dL Microgram per deciliter

bgs Below ground surface

EPA U.S. Environmental Protection Agency

EU Exposure unit

mg/kg Milligram per kilogram

NE Not evaluated

UBMC Upper Blackfoot Mining Complex

Sources:

EPA. 2009. Integrated Exposure Uptake Biokinetic Model. Version 1.1, Build 9. June. Available on-line at:
http://www.epa.gov/superfund/health/contaminants/lead/products.htm

ATTACHMENT E-1
ALM AND IEUBK MODEL OUTPUTS

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	17.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**25%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	17.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**70%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**16%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.06%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.01%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,\,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\,D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S,\,D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal,\,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.005%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

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PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.4%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

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Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**14%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	9.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**4%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	9.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**28%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for ATV/Motorcycle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	11.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**8%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	11.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**42%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.006%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.4%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.004%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.9%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**12%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	**Description of Variable**	**Units**	**GSDi and PbBo from Analysis of NHANES 1999-2004**
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	656
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.009%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	656
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.005%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

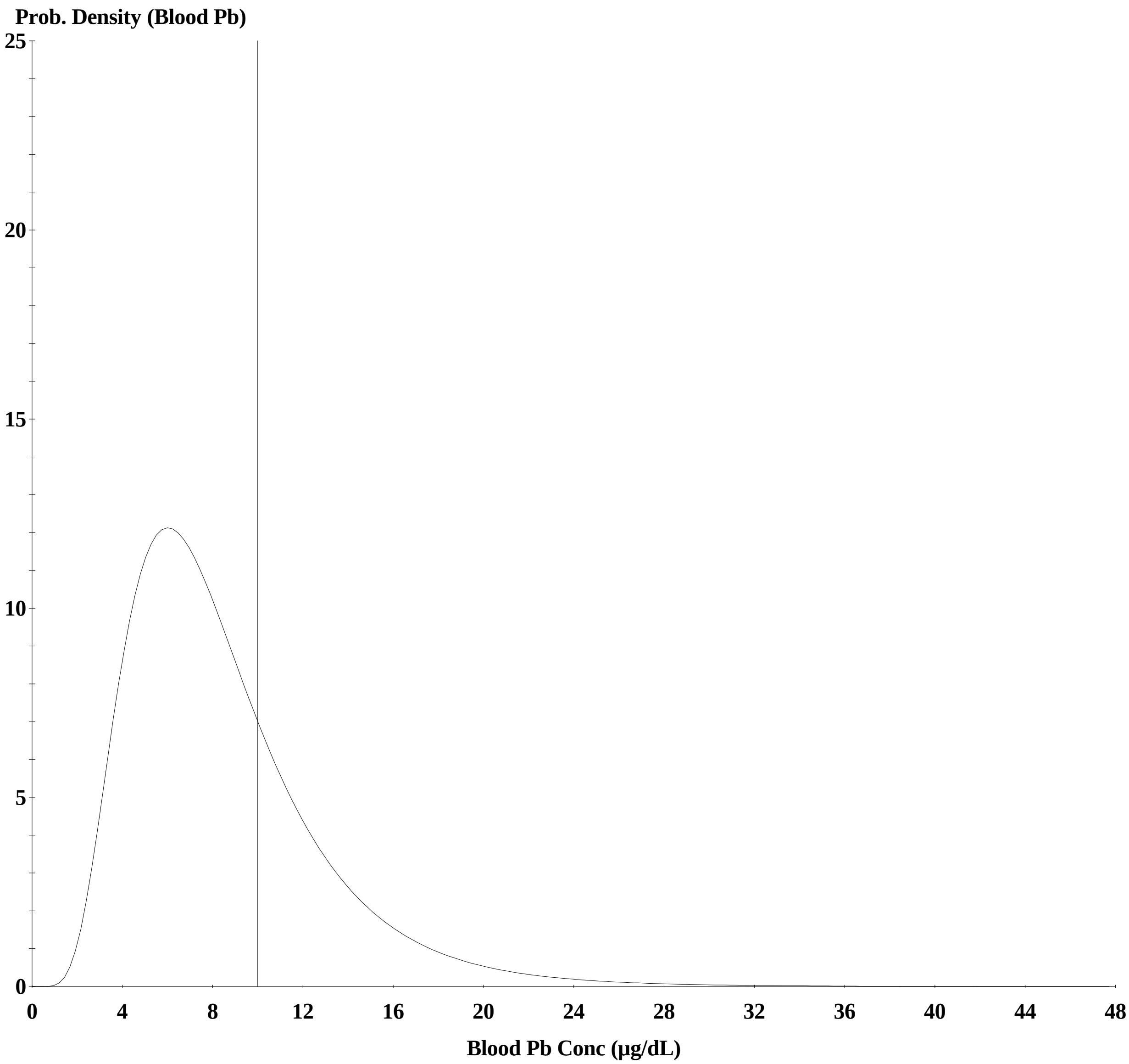
Calculations of Blood Lead Concentrations (PbBs) for Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

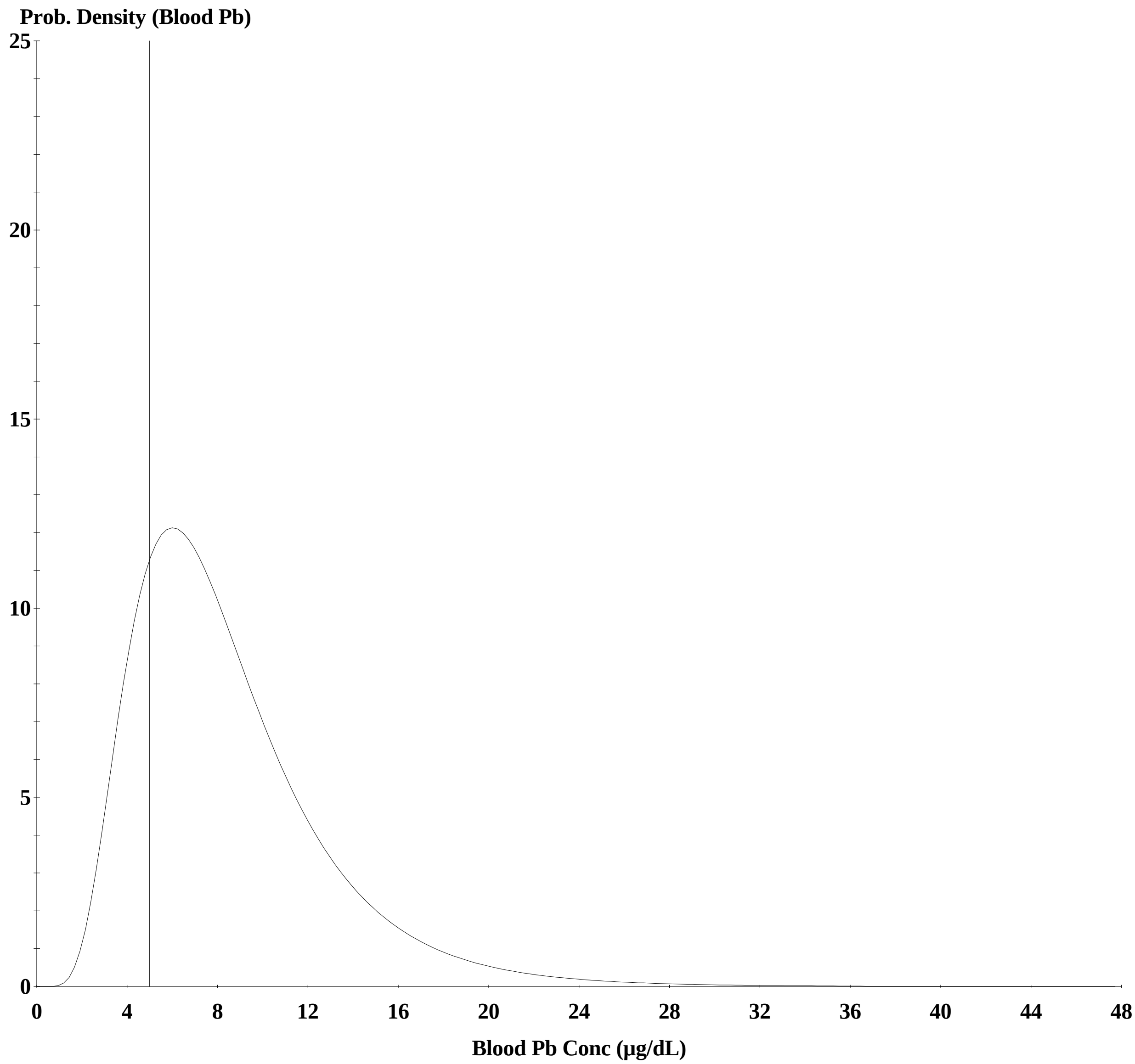
Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil



Cutoff = 10.000 µg/dl
Geo Mean = 7.806
GSD = 1.600
% Above = 29.911
% Below = 70.089

Age Range = 0 to 84 months

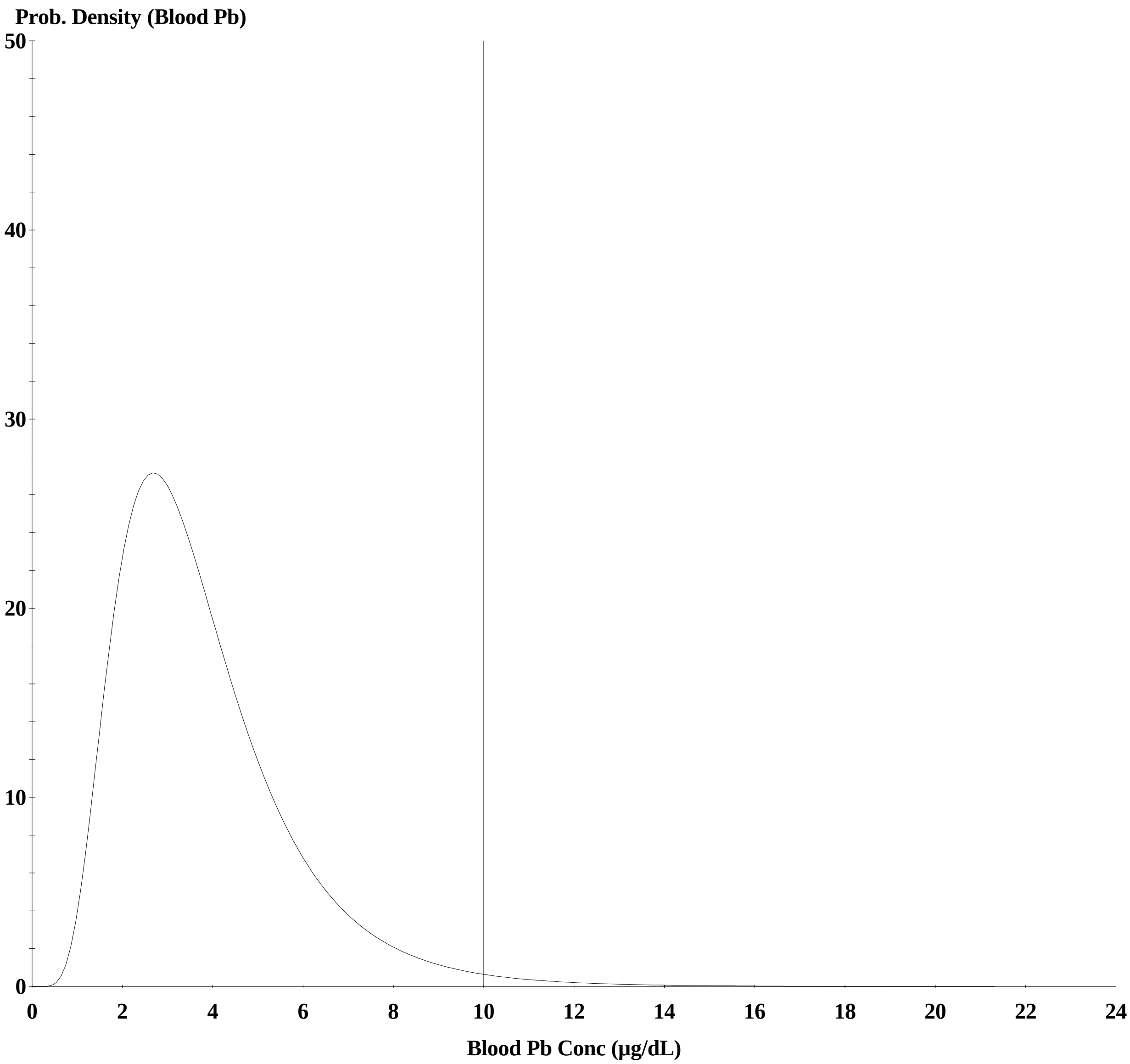
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 7.806
GSD = 1.600
% Above = 82.839
% Below = 17.161

Age Range = 0 to 84 months

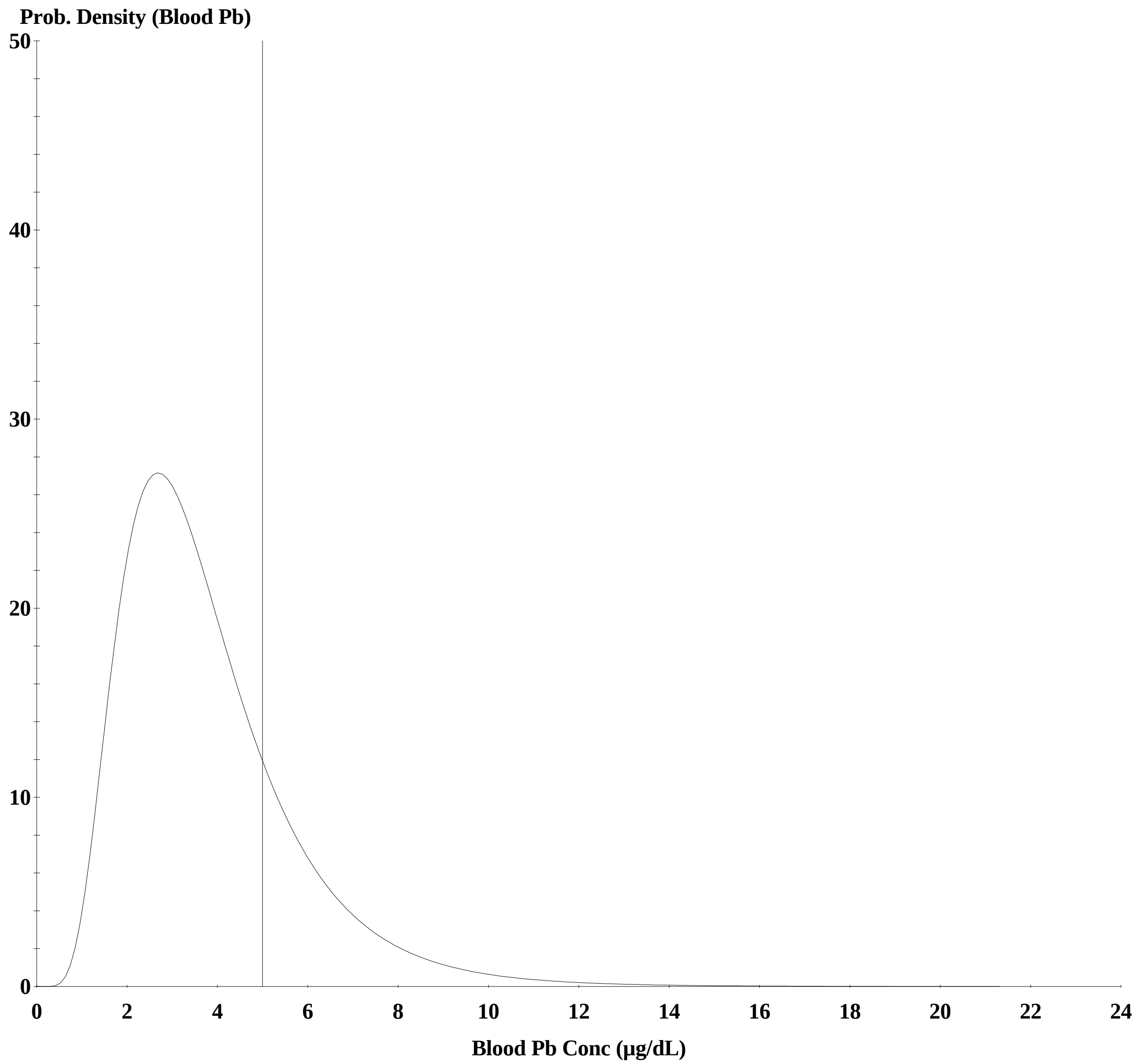
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 3.486
GSD = 1.600
% Above = 1.247
% Below = 98.753

Age Range = 0 to 84 months

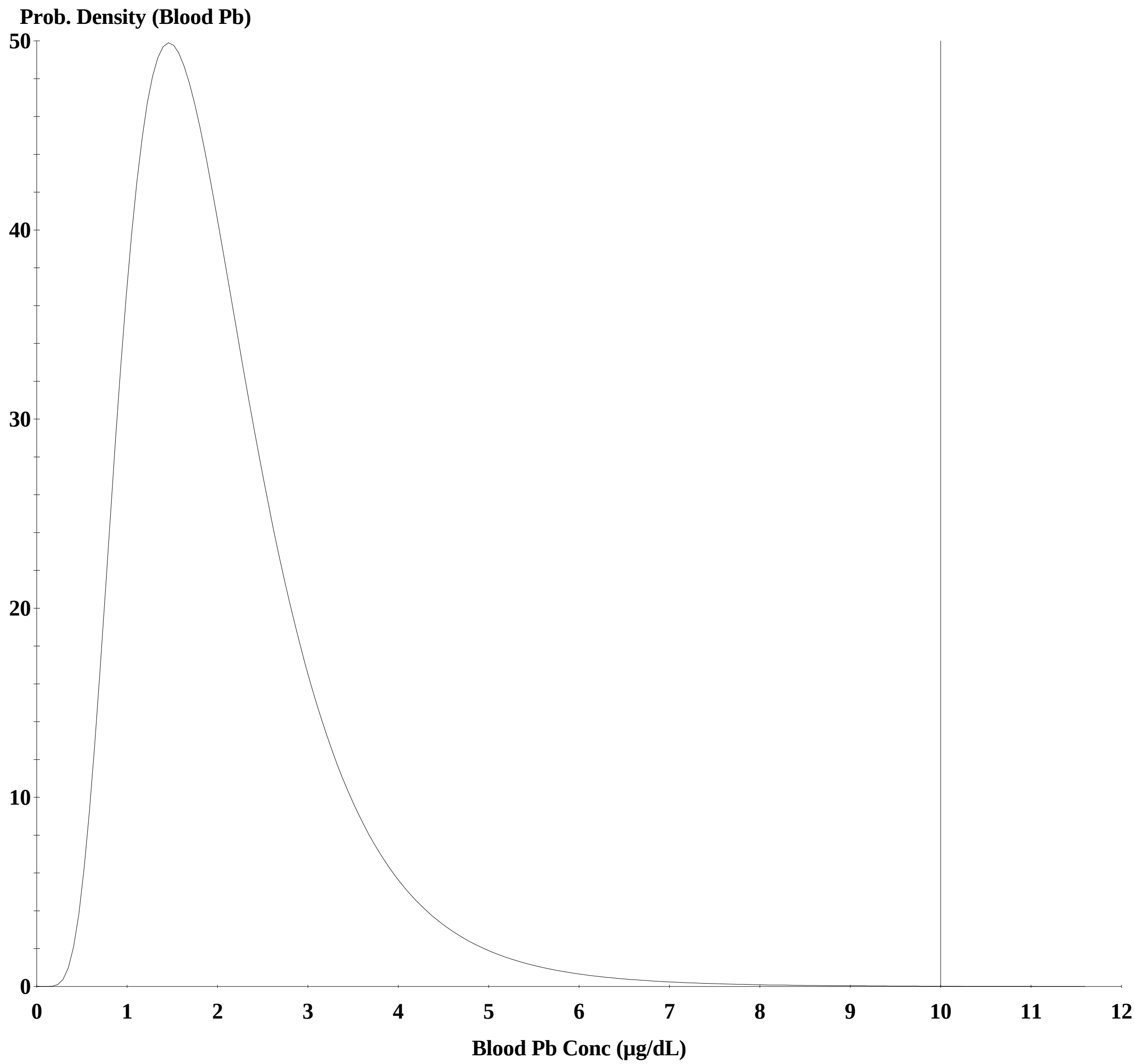
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 3.486
GSD = 1.600
% Above = 22.134
% Below = 77.866

Age Range = 0 to 84 months

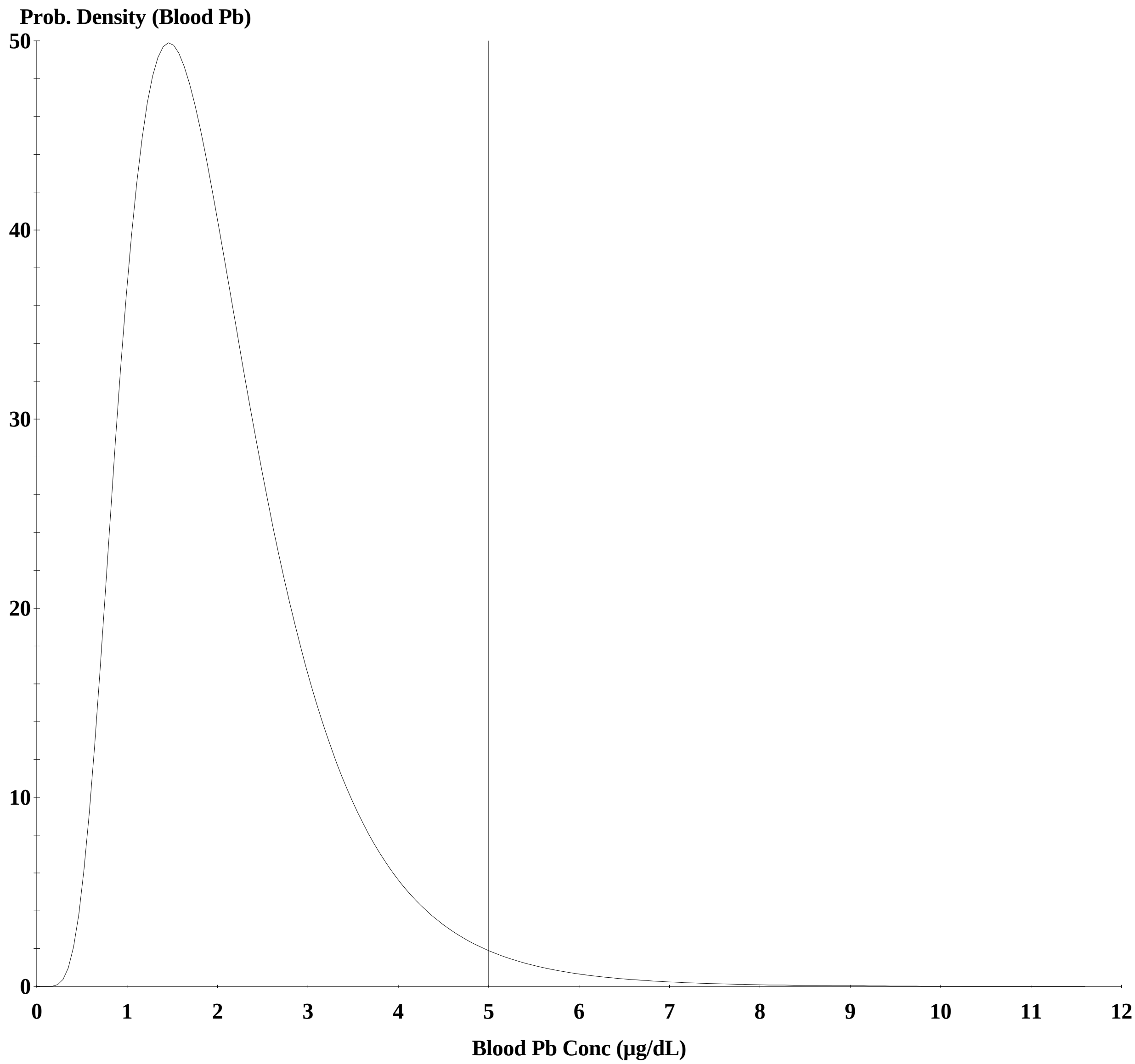
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 1.897
GSD = 1.600
% Above = 0.020
% Below = 99.980

Age Range = 0 to 84 months

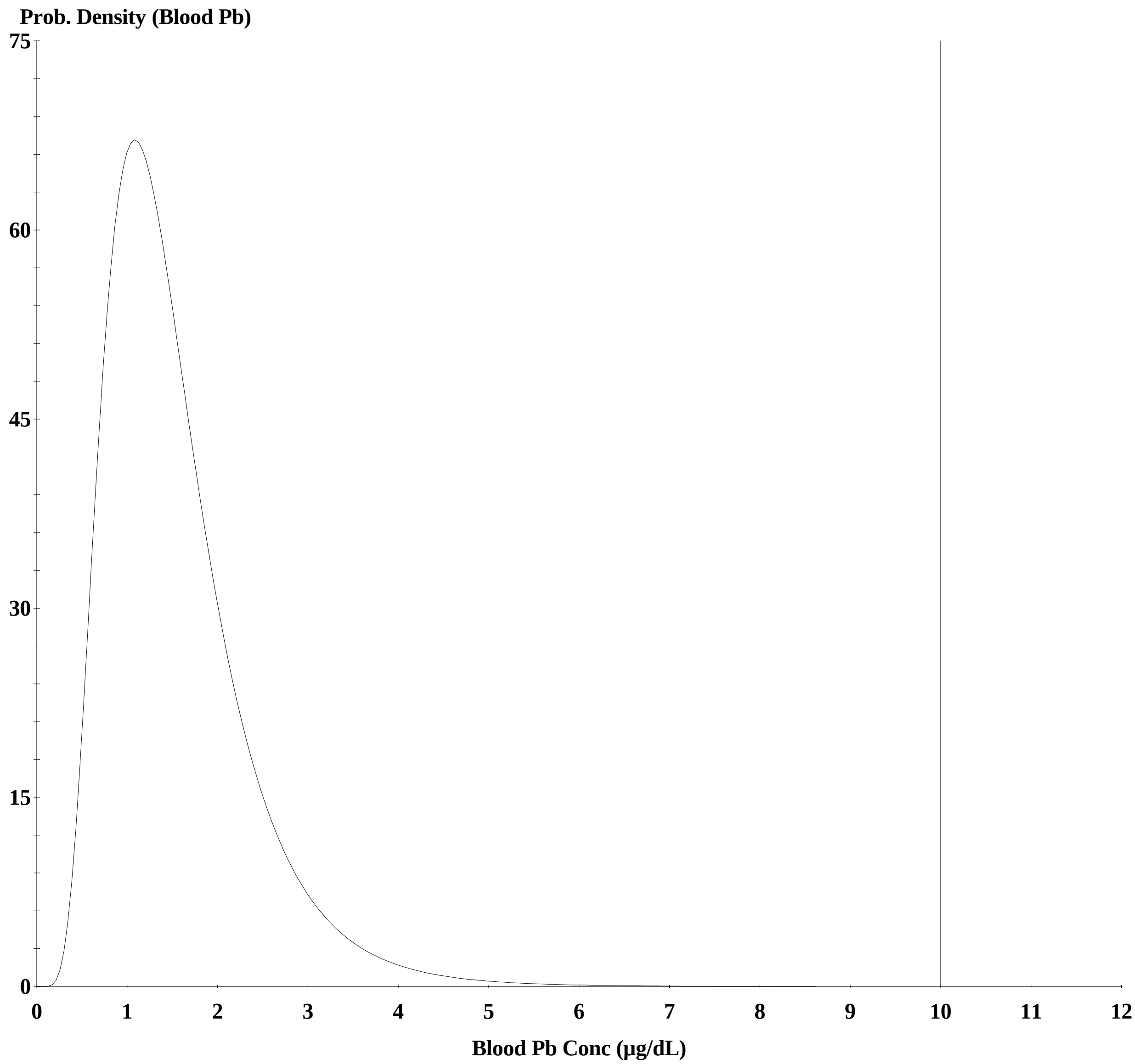
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 1.897
GSD = 1.600
% Above = 1.960
% Below = 98.040

Age Range = 0 to 84 months

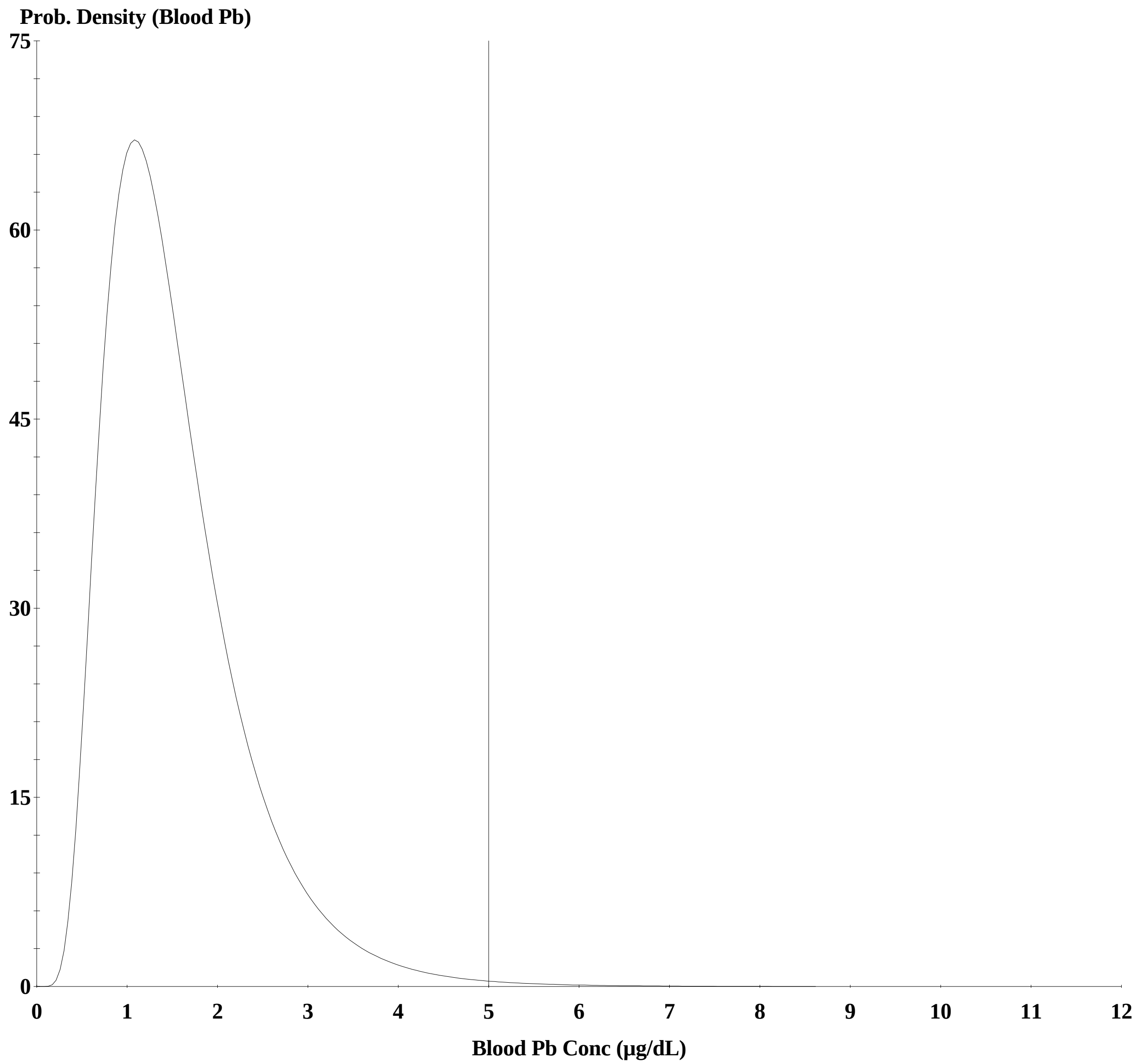
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 1.410
GSD = 1.600
% Above = 0.002
% Below = 99.998

Age Range = 0 to 84 months

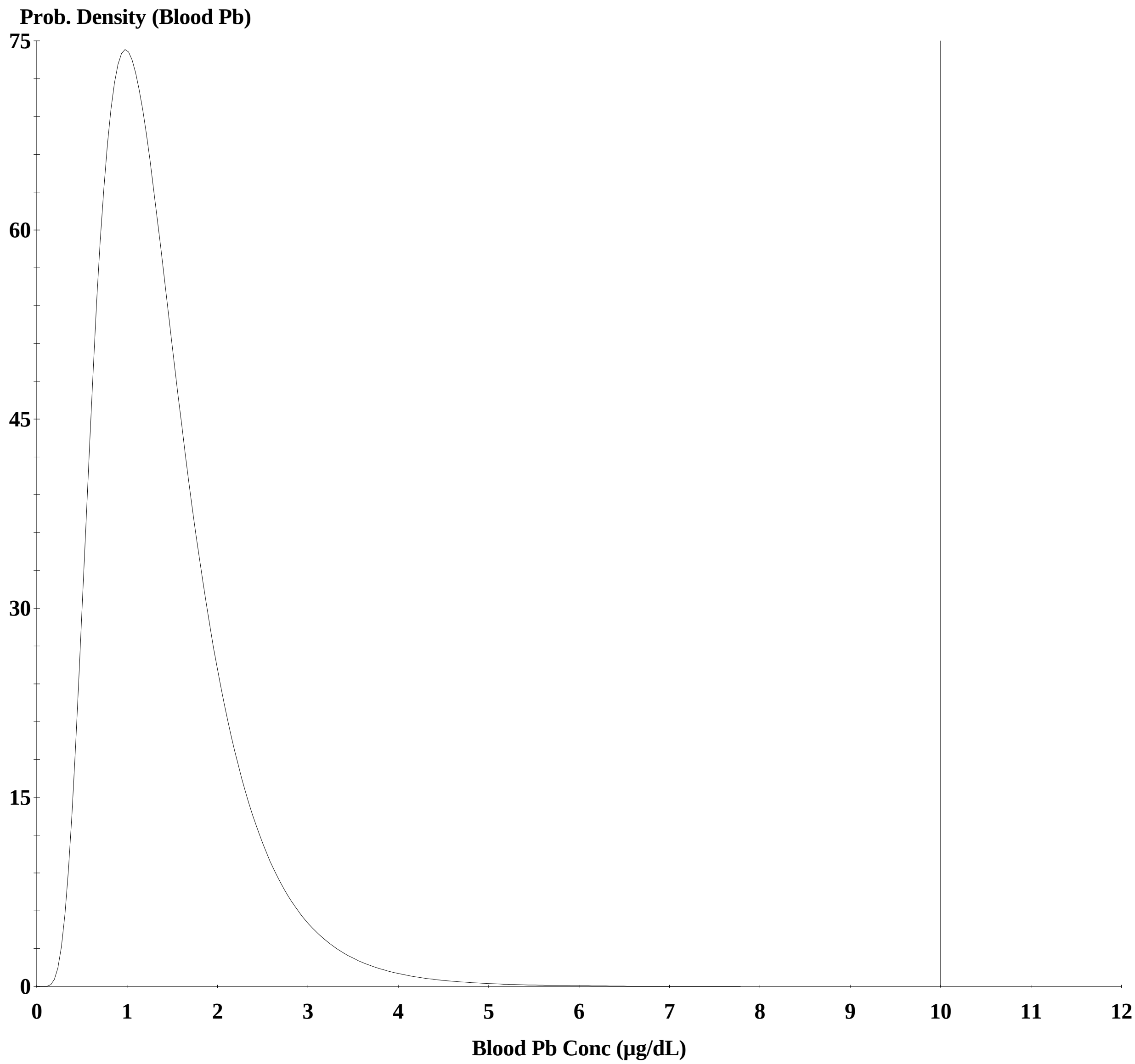
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 1.410
GSD = 1.600
% Above = 0.353
% Below = 99.647

Age Range = 0 to 84 months

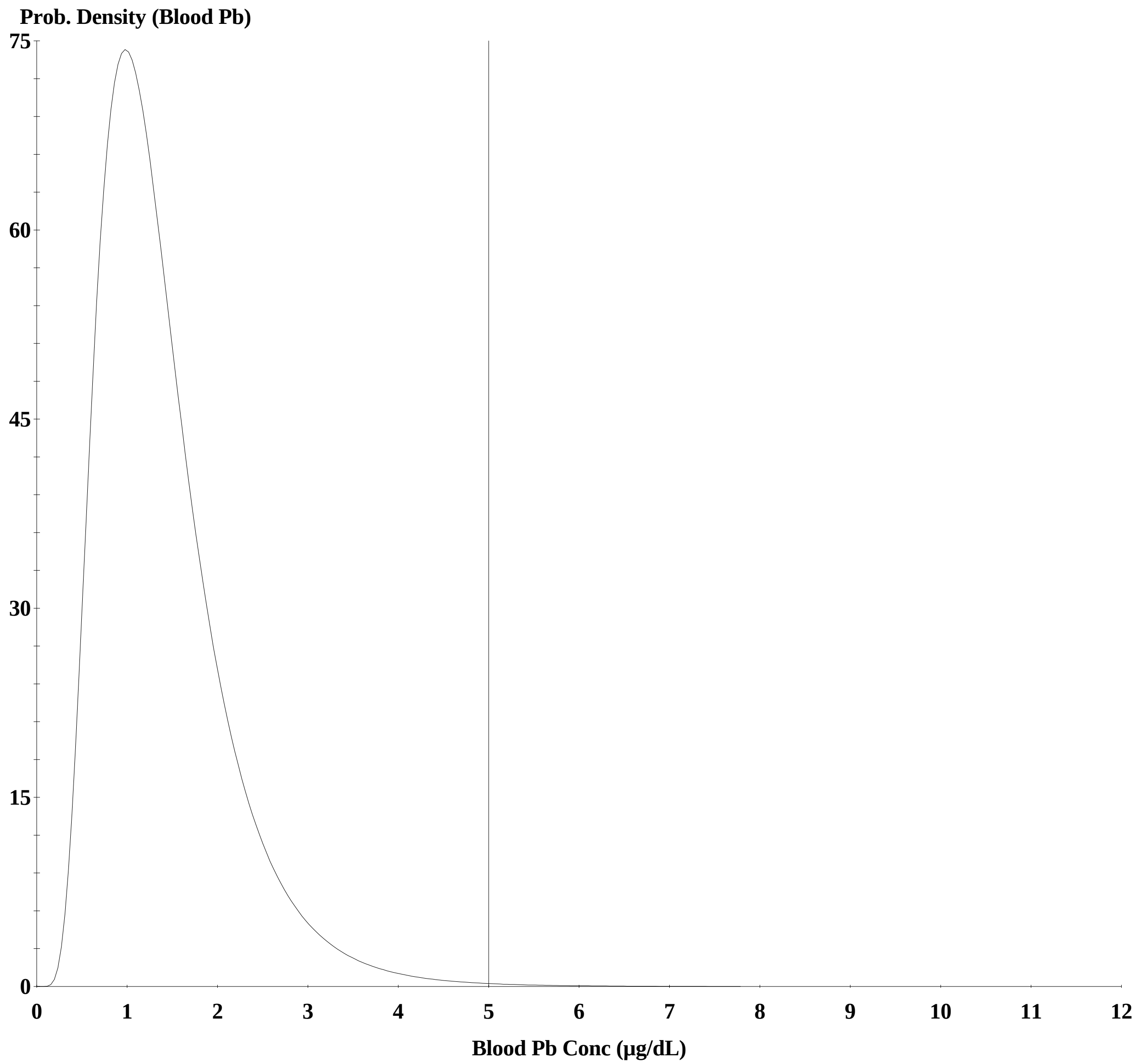
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 1.274
GSD = 1.600
% Above = 0.001
% Below = 99.999

Age Range = 0 to 84 months

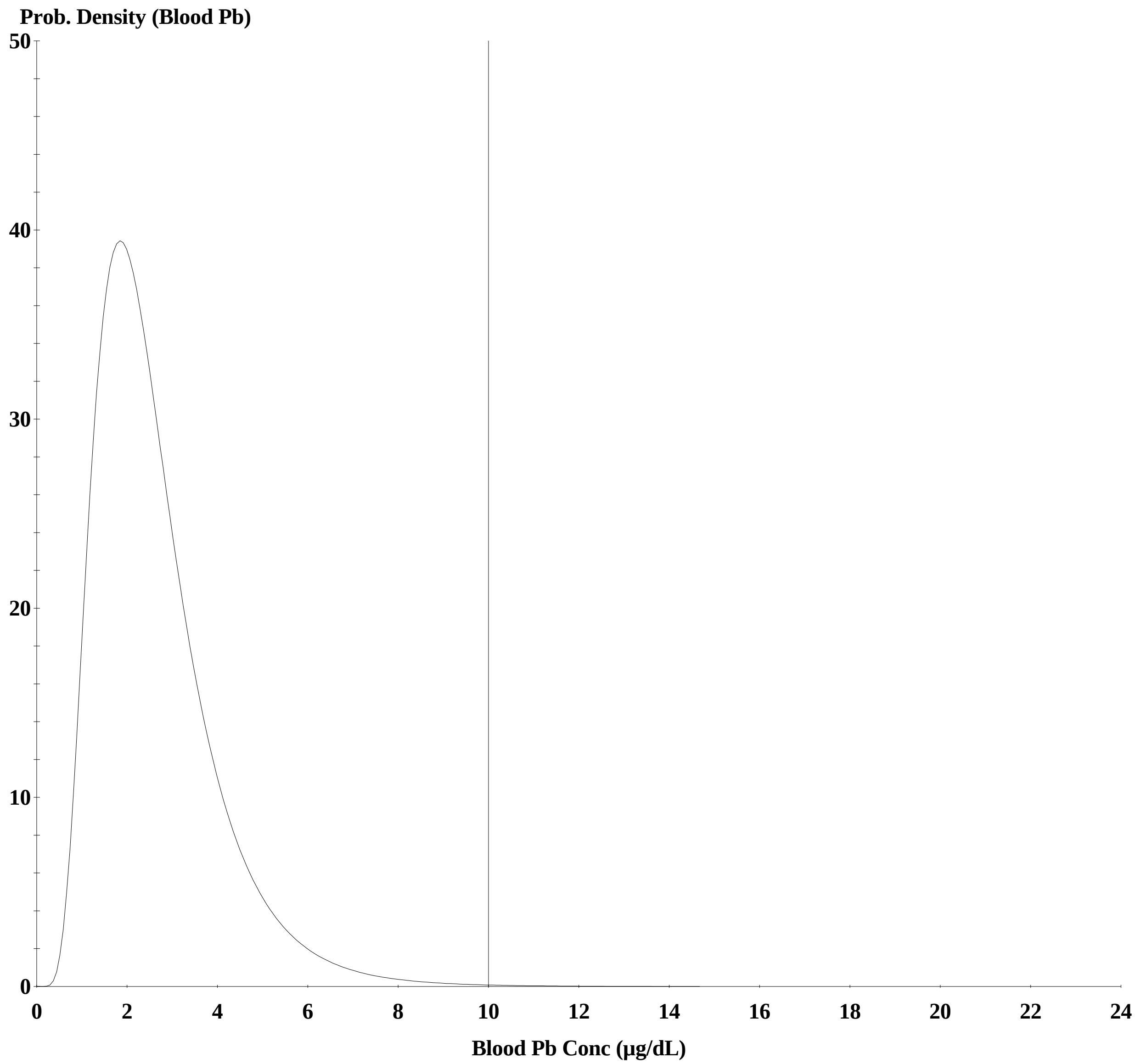
Run Mode = Research



Cutoff = 5.000 μg/dl
Geo Mean = 1.274
GSD = 1.600
% Above = 0.181
% Below = 99.819

Age Range = 0 to 84 months

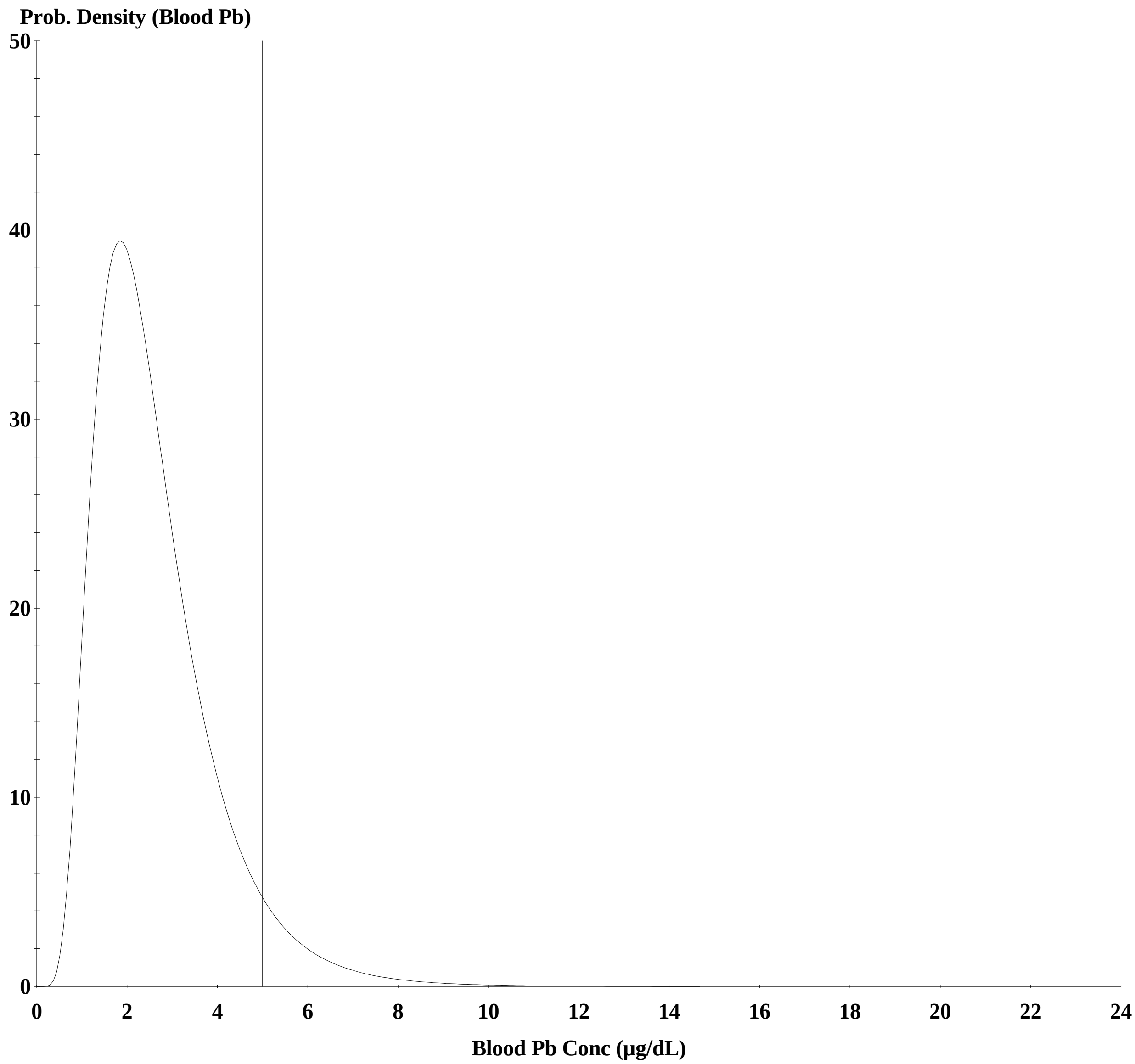
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 2.401
GSD = 1.600
% Above = 0.120
% Below = 99.880

Age Range = 0 to 84 months

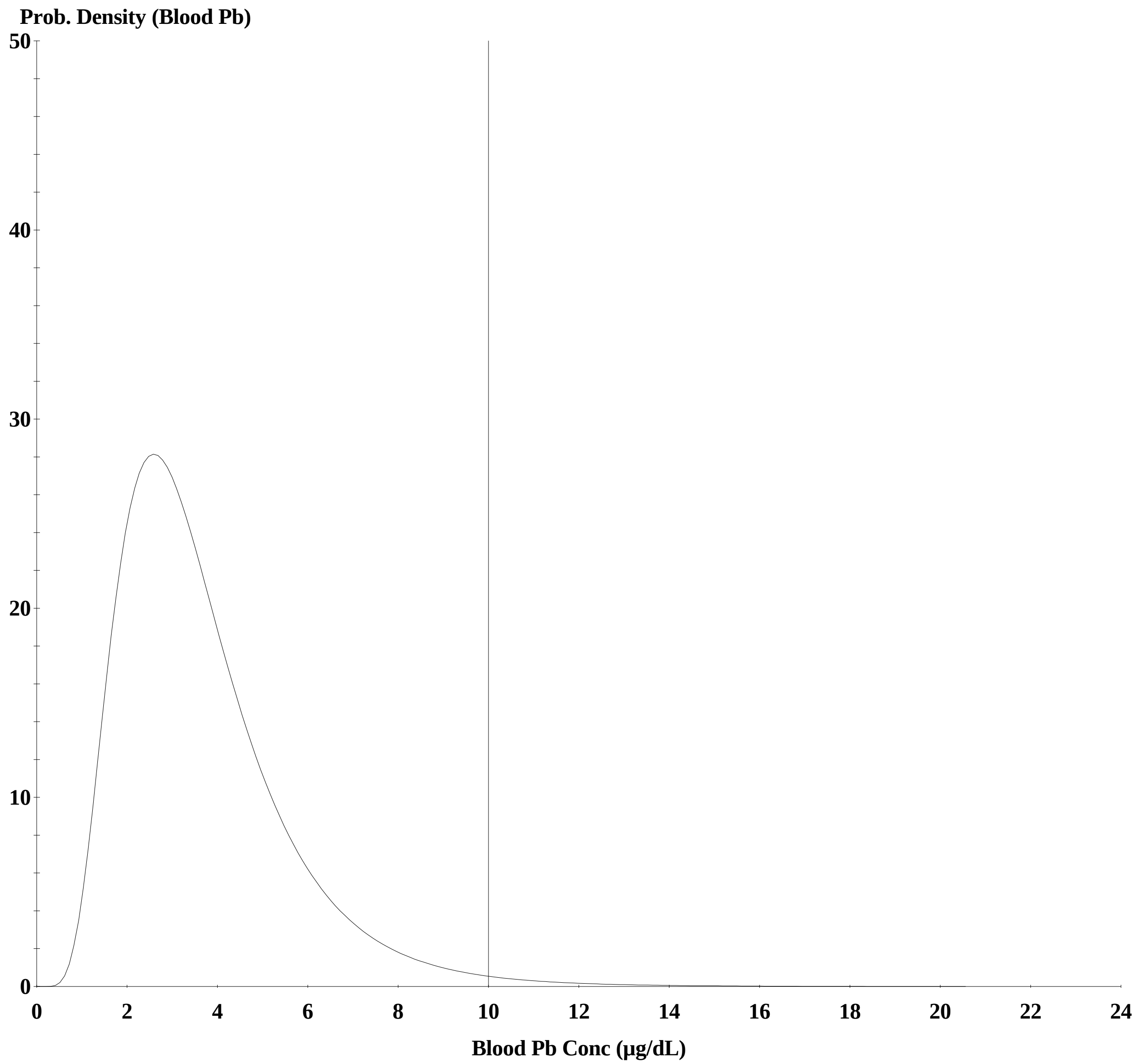
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 2.401
GSD = 1.600
% Above = 5.925
% Below = 94.075

Age Range = 0 to 84 months

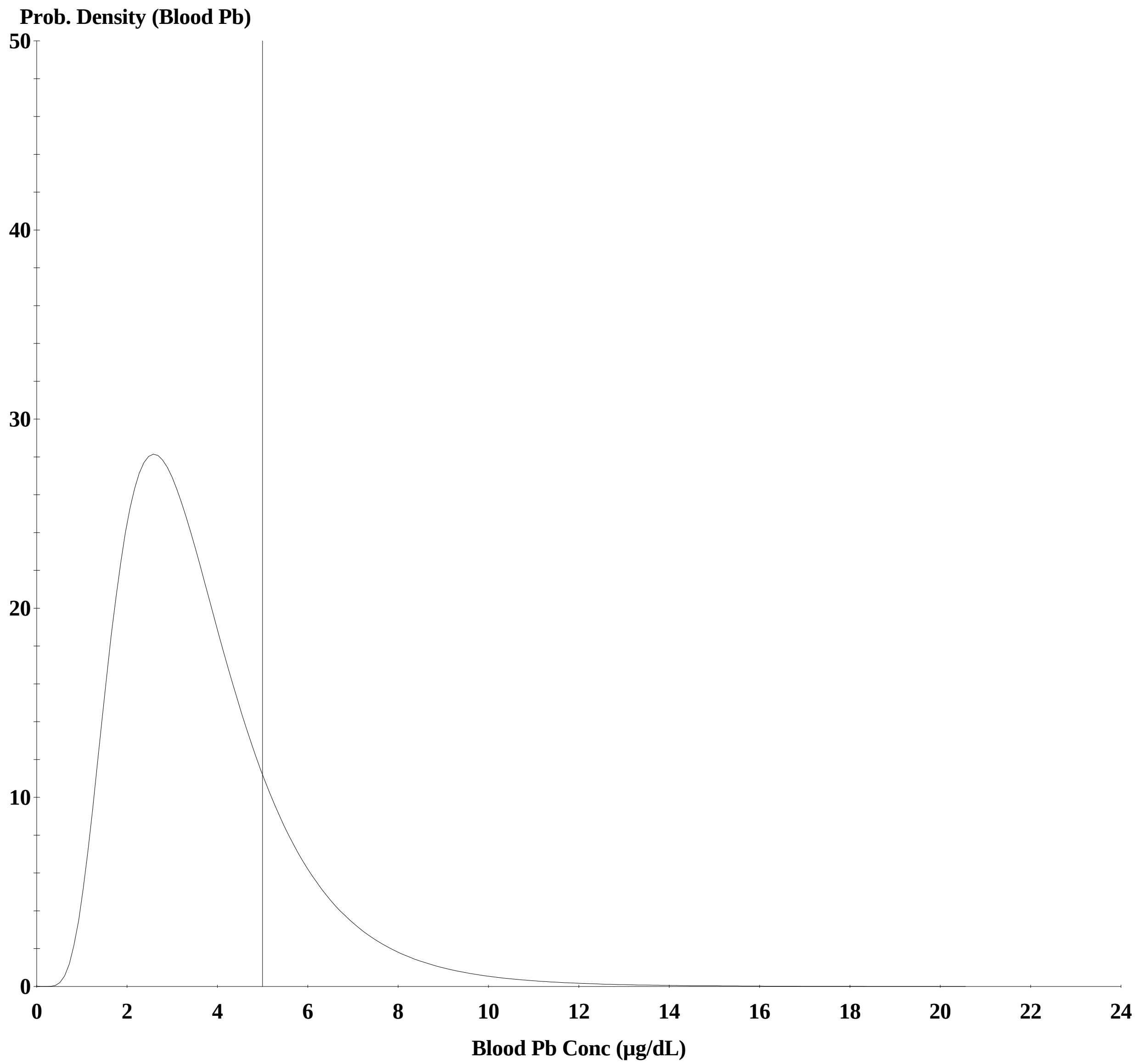
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 3.363
GSD = 1.600
% Above = 1.021
% Below = 98.979

Age Range = 0 to 84 months

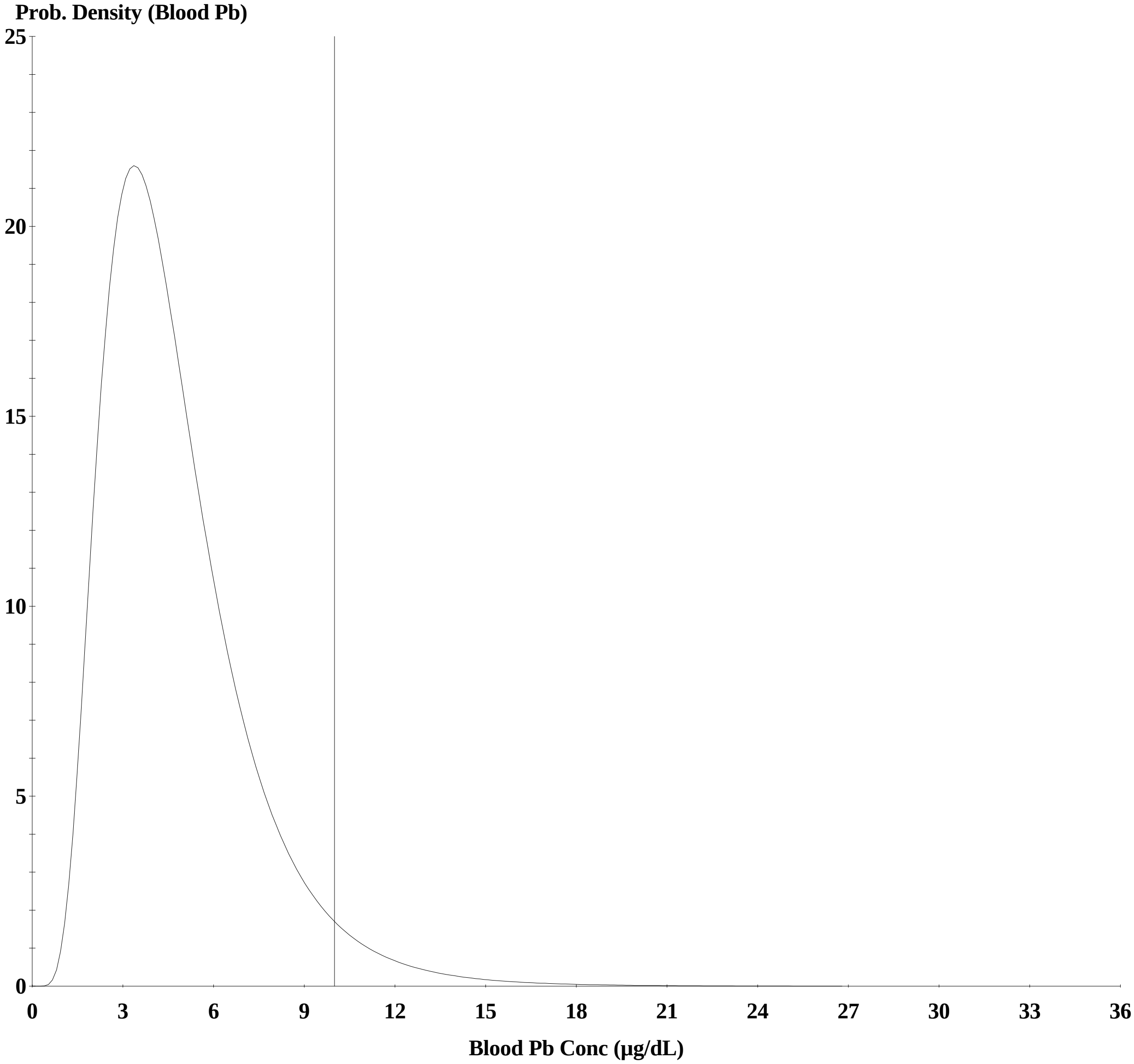
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 3.363
GSD = 1.600
% Above = 19.937
% Below = 80.063

Age Range = 0 to 84 months

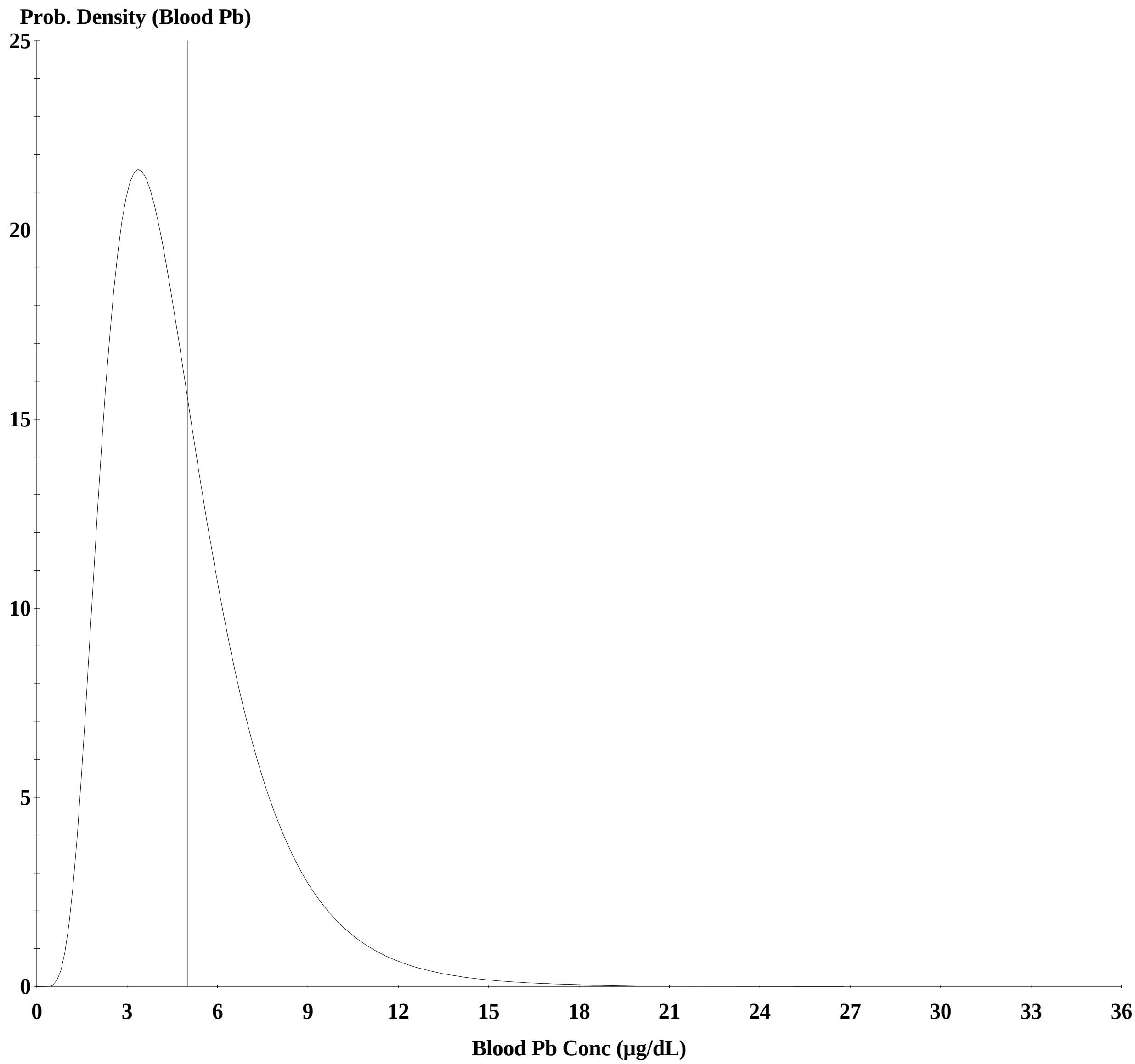
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 4.382
GSD = 1.600
% Above = 3.960
% Below = 96.040

Age Range = 0 to 84 months

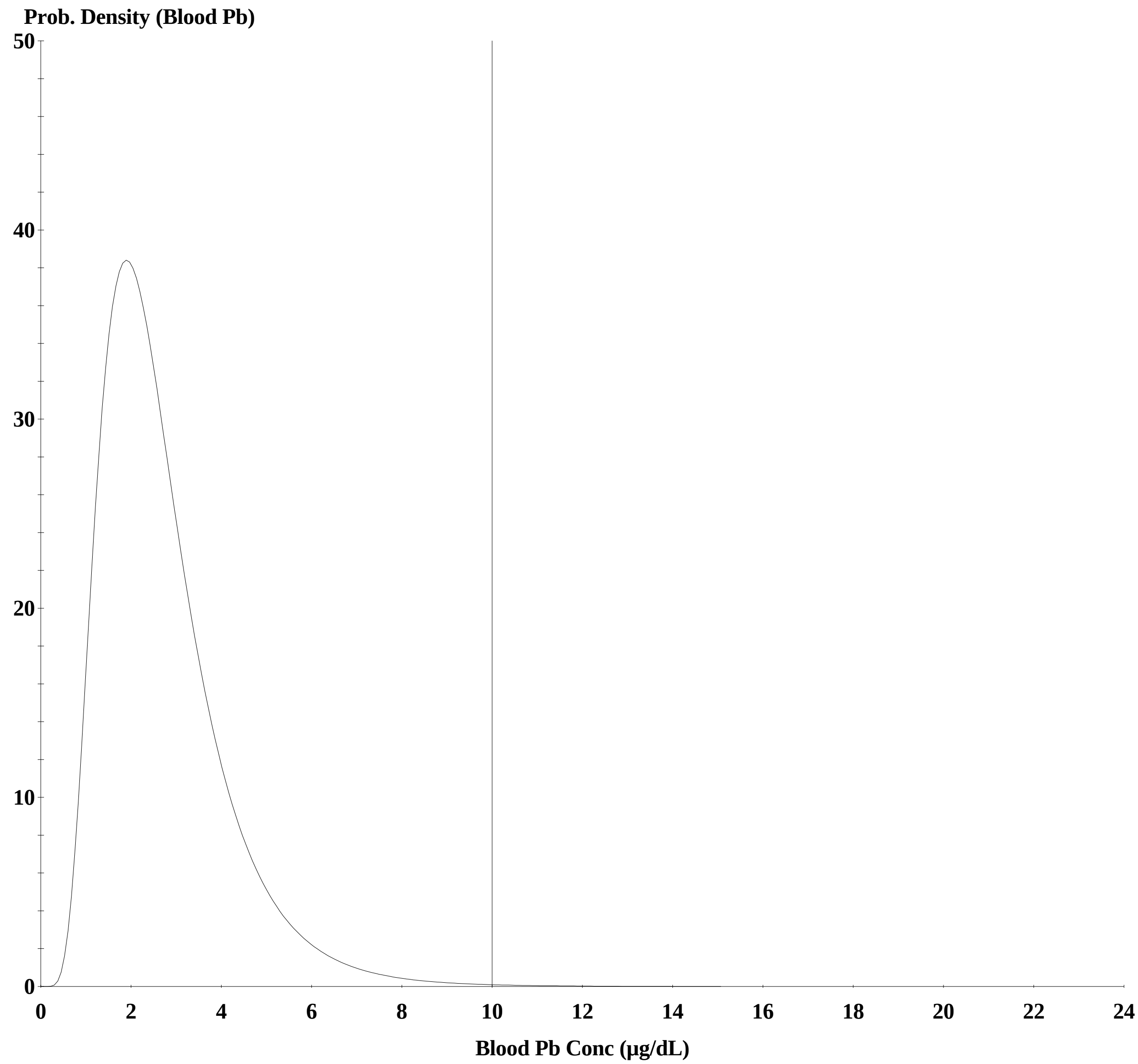
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 4.382
GSD = 1.600
% Above = 38.952
% Below = 61.048

Age Range = 0 to 84 months

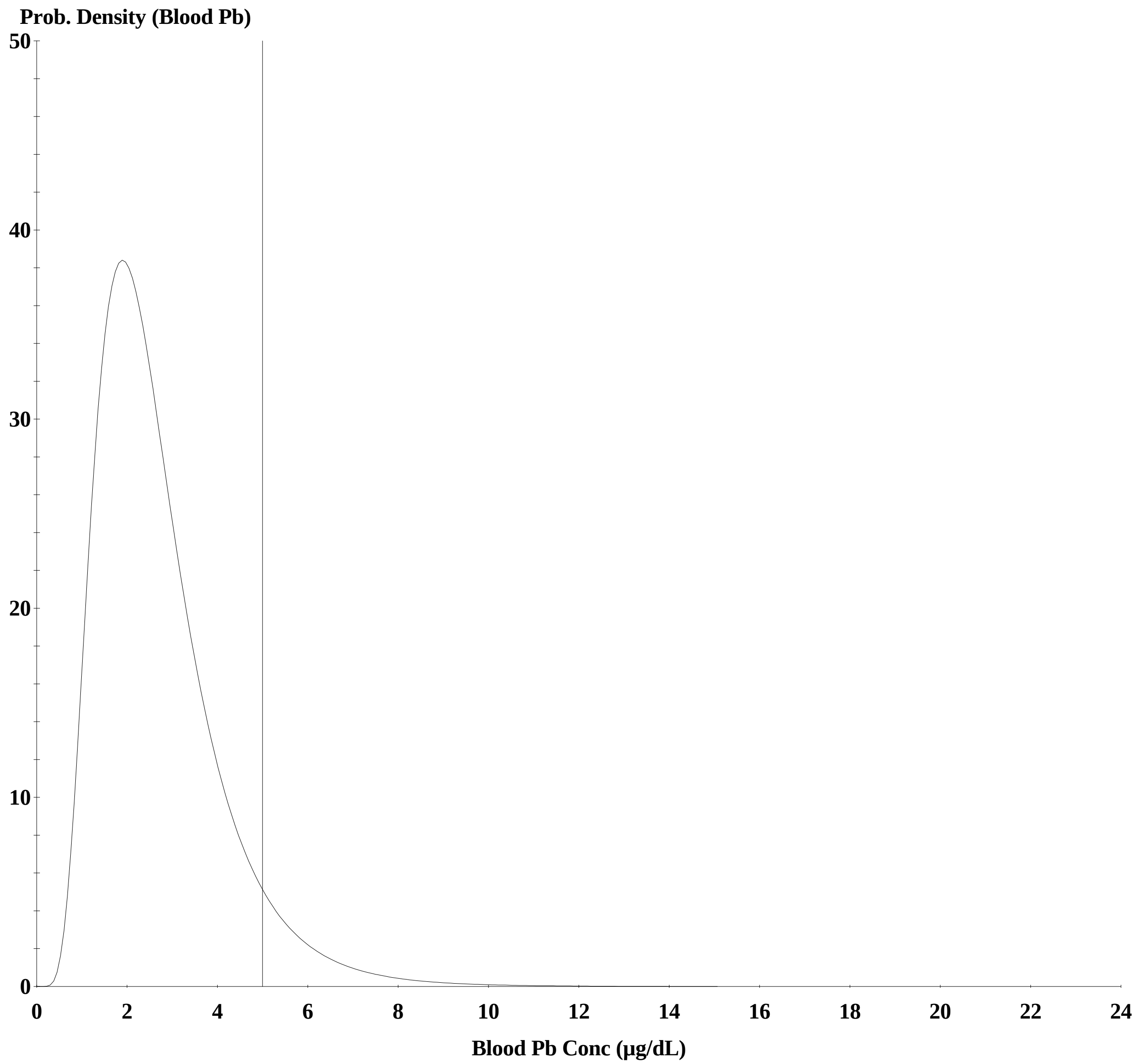
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 2.465
GSD = 1.600
% Above = 0.144
% Below = 99.856

Age Range = 0 to 84 months

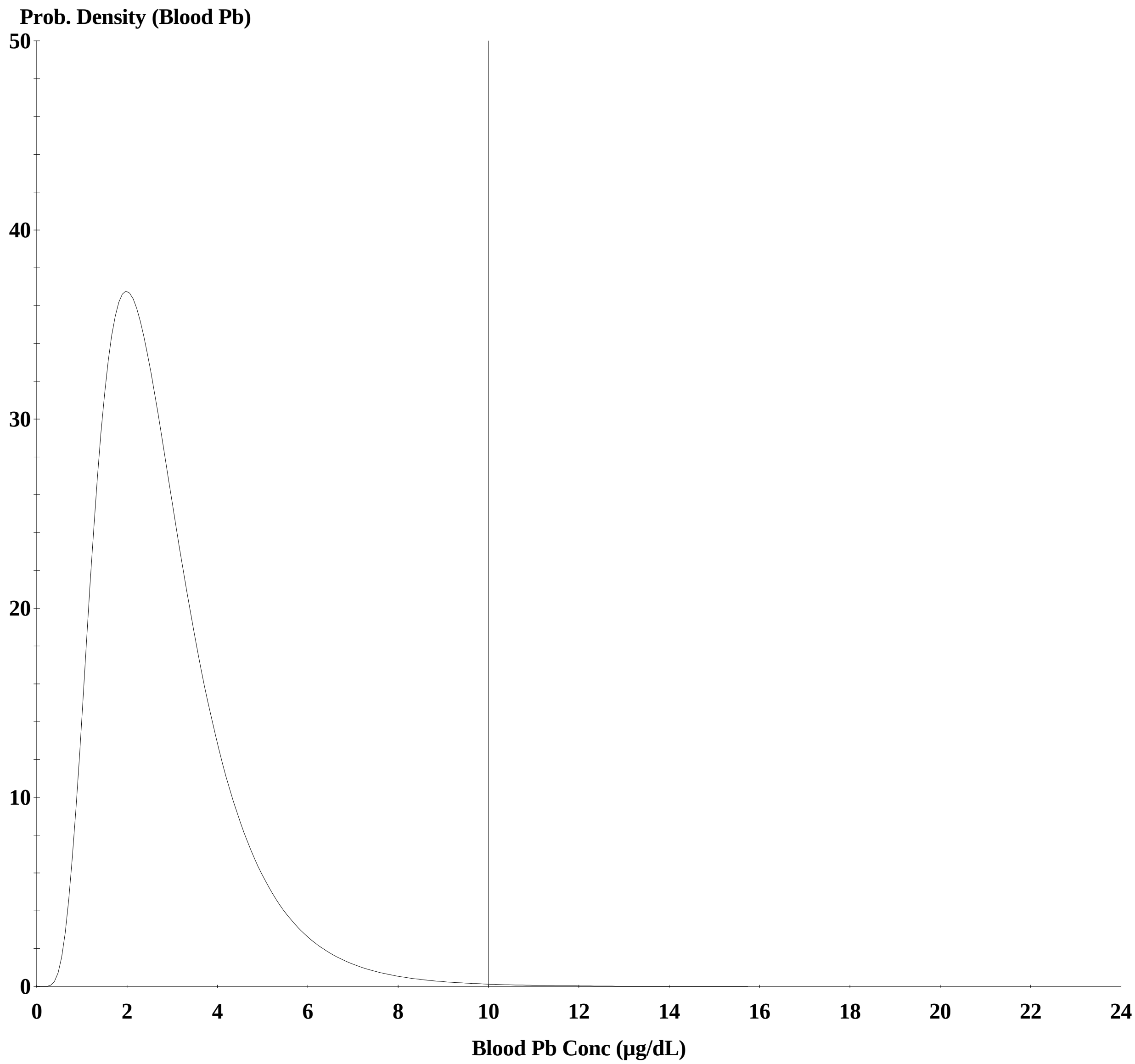
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 2.465
GSD = 1.600
% Above = 6.619
% Below = 93.381

Age Range = 0 to 84 months

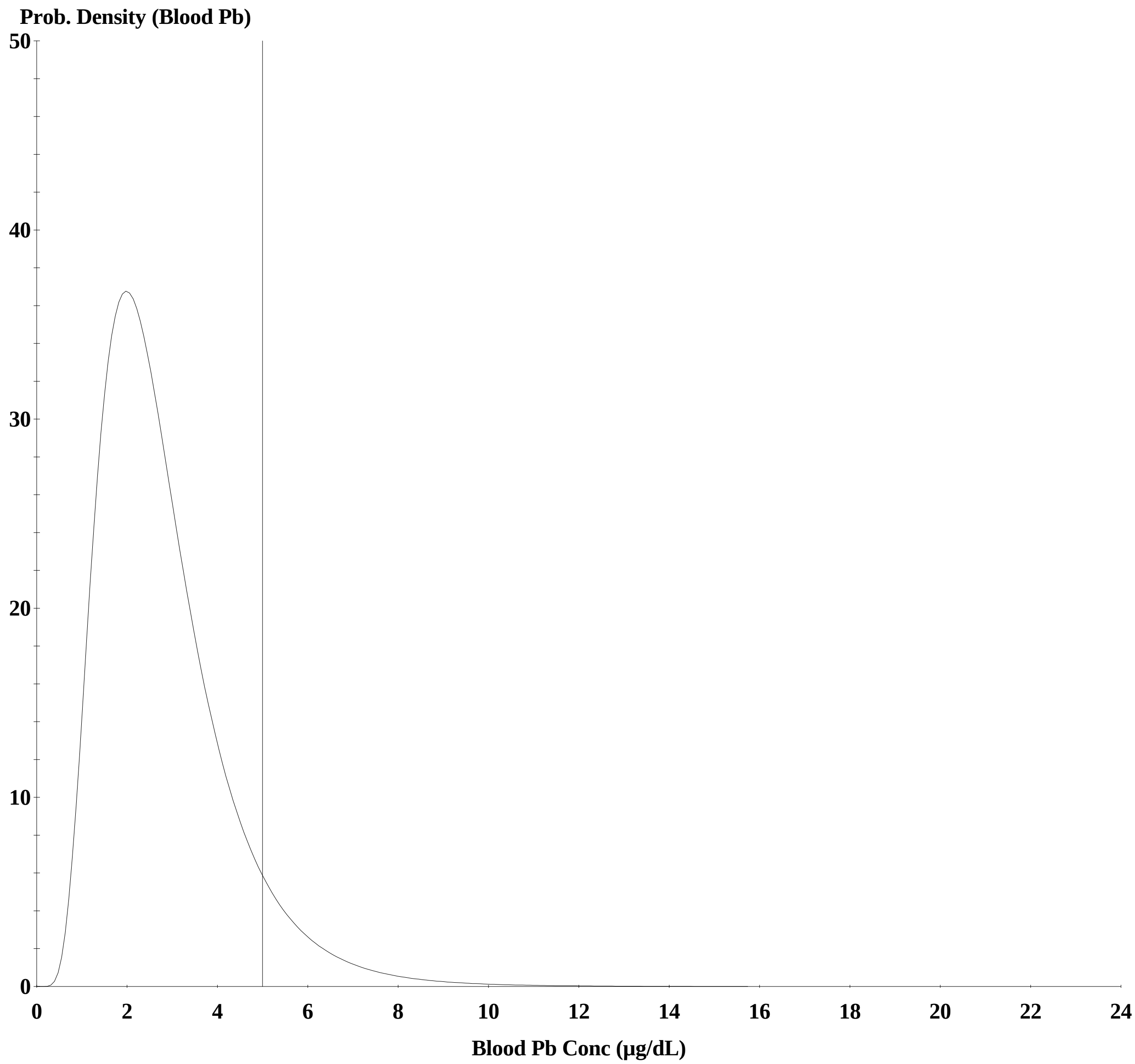
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 2.575
GSD = 1.600
% Above = 0.195
% Below = 99.805

Age Range = 0 to 84 months

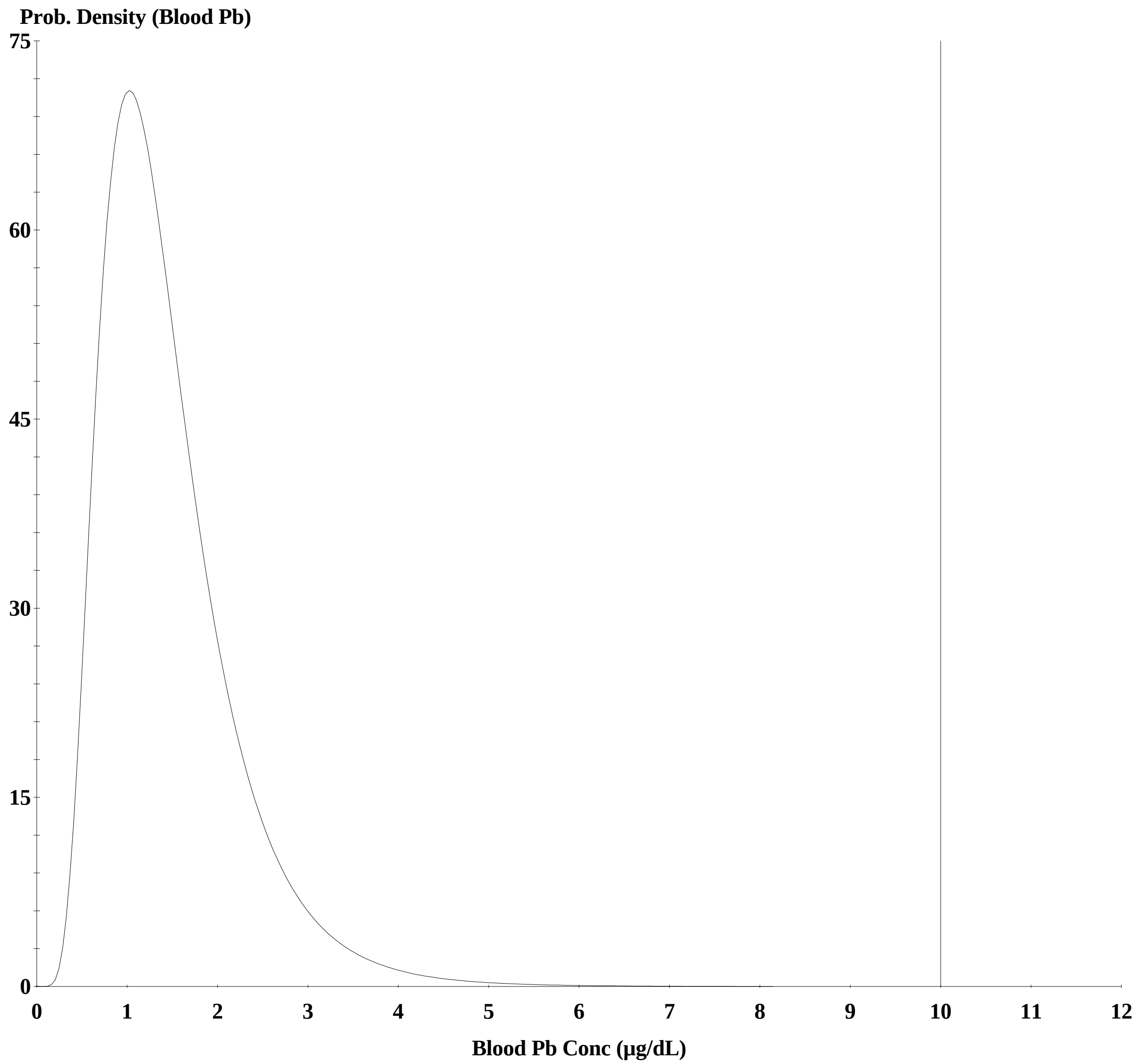
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 2.575
GSD = 1.600
% Above = 7.898
% Below = 92.102

Age Range = 0 to 84 months

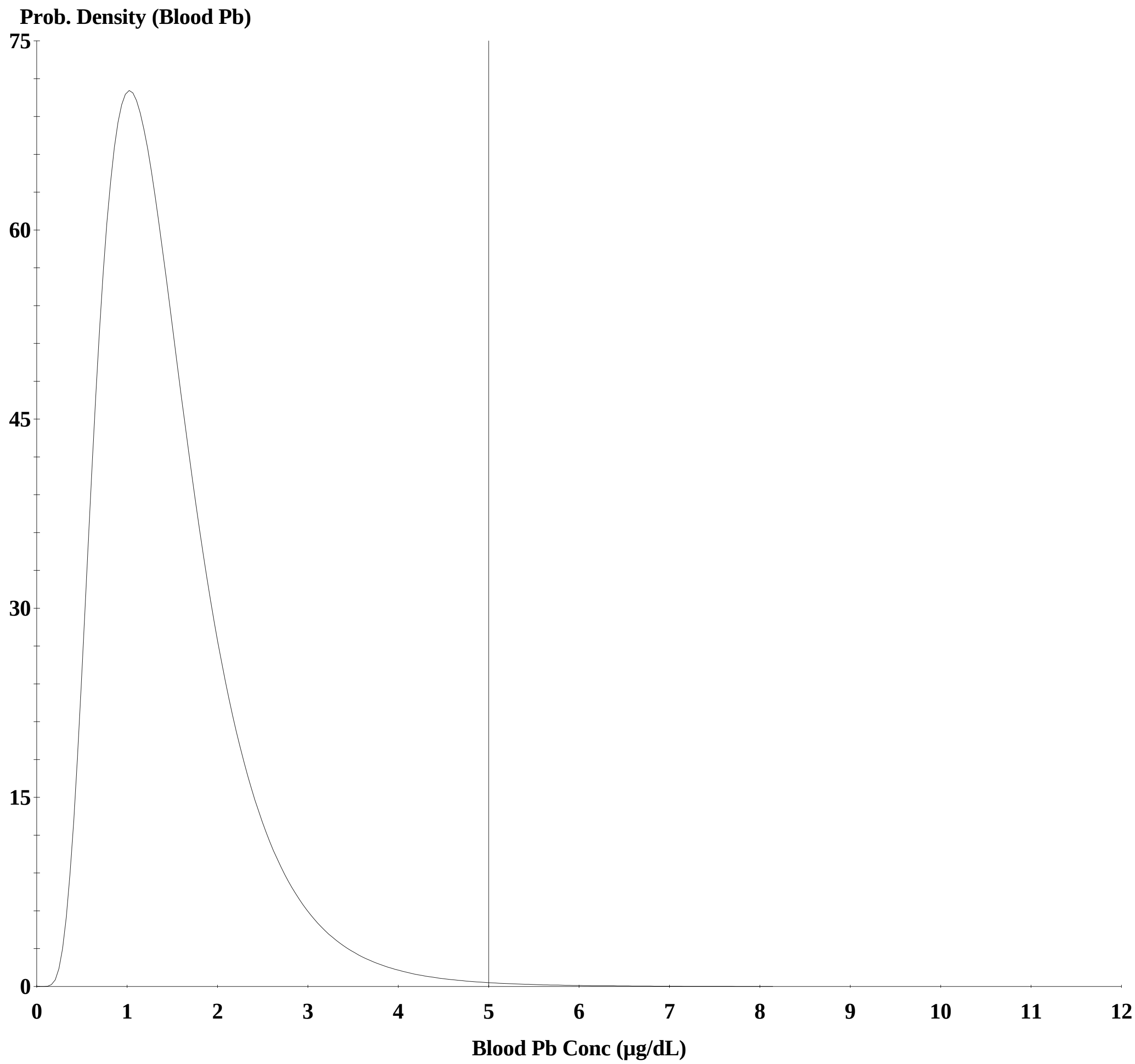
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 1.332
GSD = 1.600
% Above = 0.001
% Below = 99.999

Age Range = 0 to 84 months

Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 1.332
GSD = 1.600
% Above = 0.245
% Below = 99.755

Age Range = 0 to 84 months

Run Mode = Research

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**14%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**54%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.6**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.6**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**9%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.03%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.007%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.4%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.004%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**9%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**18%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	5.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**3.2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**20.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	49.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**86%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**20.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	49.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**99%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	17.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**24%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	**Description of Variable**	**Units**	**GSDi and PbBo from Analysis of NHANES 1999-2004**
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	17.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**68%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.0**
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	7.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**15%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.09%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.4**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.02%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.4**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	10.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	10.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**34%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	16.5
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**22%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**7.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	16.5
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**65%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**9.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	23.5
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**42%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**9.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	23.5
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**84%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	10.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	10.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**36%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2221
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	11.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**8%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2221
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	11.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**41%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.05%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Industrial Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,\,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\,D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S,\,D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal,\,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**30.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	73.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**96%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	11540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**30.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	73.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**100%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**10.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	24.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**46%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3674
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**10.5**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	24.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**86%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1583
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	12.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**9%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1583
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	12.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**44%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	9.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**4%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1182
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	9.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**30%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	441
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.06%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	248
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**15%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1942
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**55%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**10.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	23.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**43%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	3480
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**10.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	23.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**84%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**14.4**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	34.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**67%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	5175
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**14.4**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	34.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**95%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**17%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2044
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.3**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	14.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**58%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	4540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**12.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	30.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**59%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	4540
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**12.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	30.2
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**92%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2221
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	16.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**20%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	2221
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**6.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	16.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**63%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	656
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.8%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	656
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.7**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	6.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**11%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Calculations of Blood Lead Concentrations (PbBs) for Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	337
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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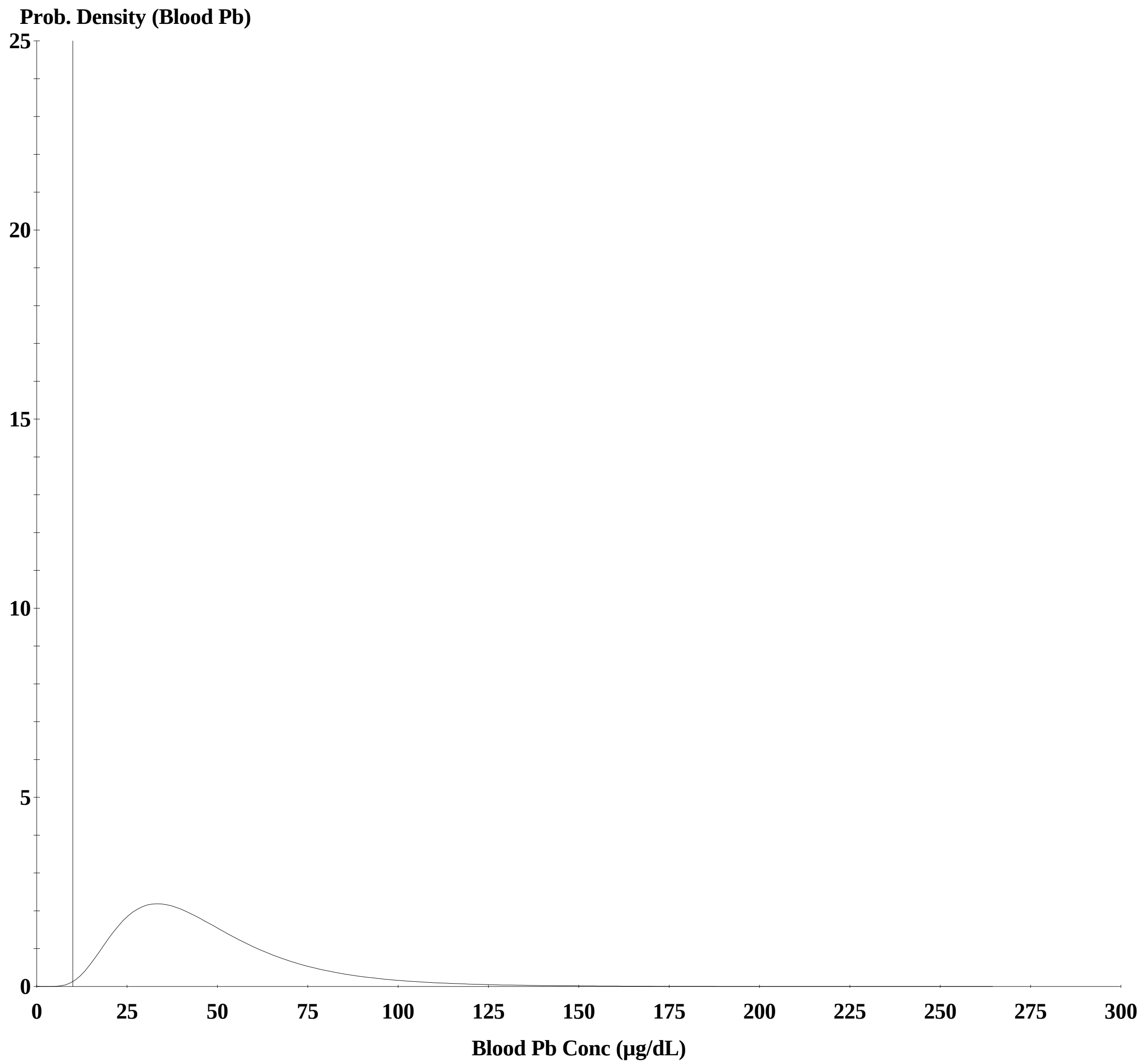
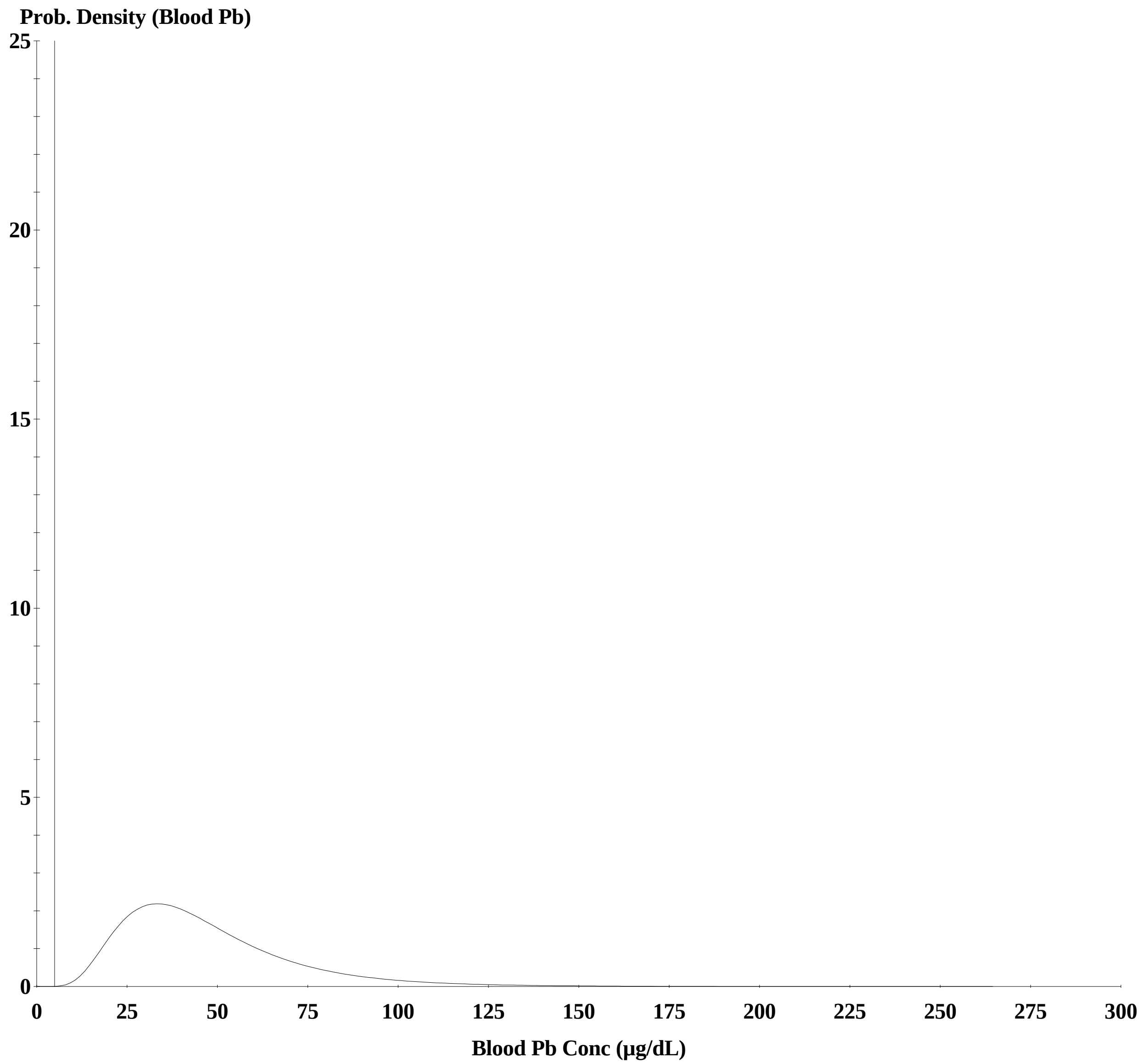


Cutoff = 10.000 µg/dl
Geo Mean = 43.275
GSD = 1.600
% Above = 99.909
% Below = 0.091

Age Range = 0 to 84 months

Run Mode = Research

Environmental exposures associated with blood lead levels above 30 µg/dl are above the range of values that have been used in the calibration and empirical validation of this model. (Zaragoza, L. and Hogan, K. 1998. The Integrated Exposure Uptake Biokinetic Model for Lead In Children: Independent Validation and Verification. Environmental Health Perspectives 106 (supplement 6). p. 1555)

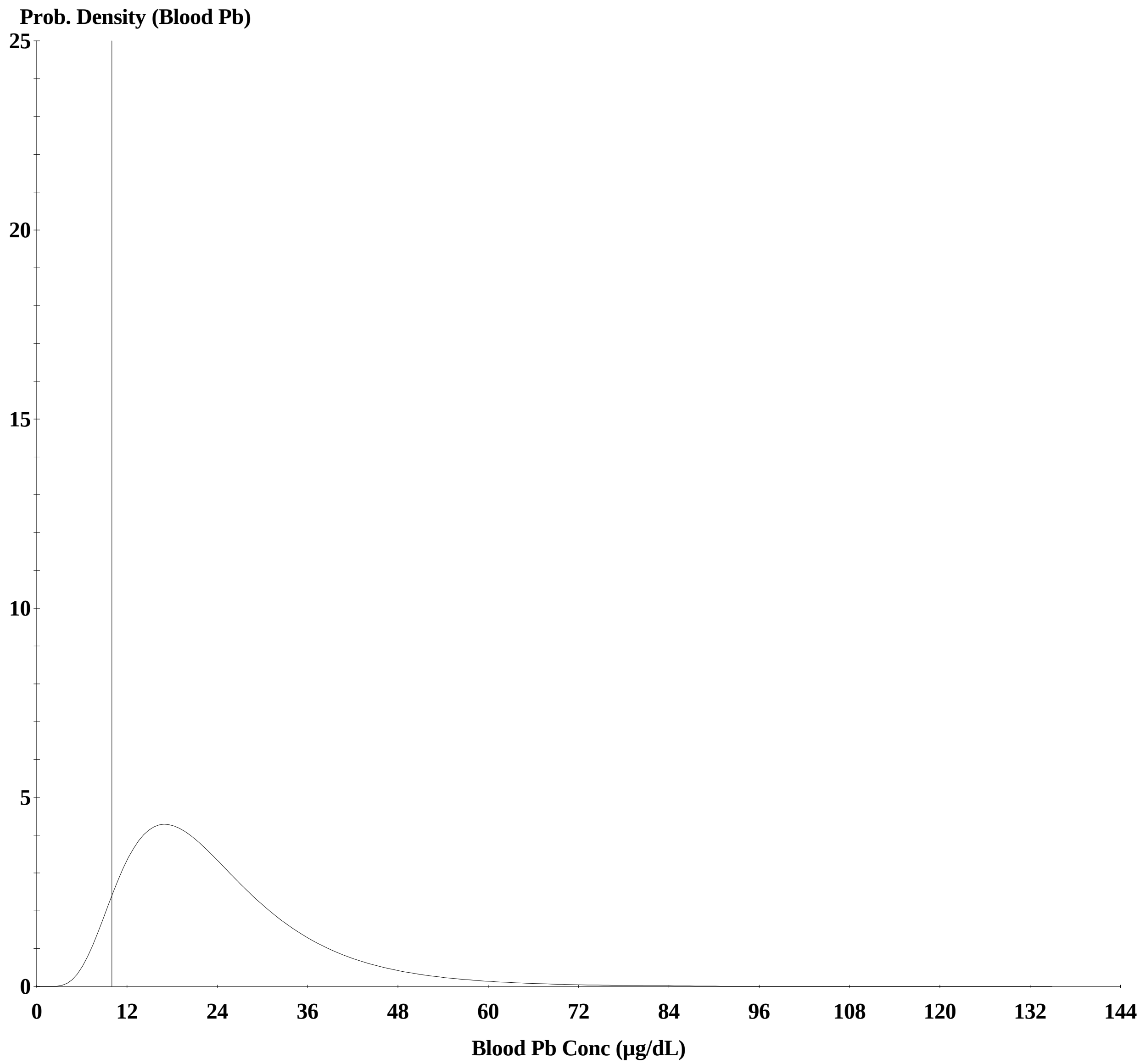


Cutoff = 5.000 µg/dl
Geo Mean = 43.275
GSD = 1.600
% Above = 100.000
% Below = 0.000

Age Range = 0 to 84 months

Run Mode = Research

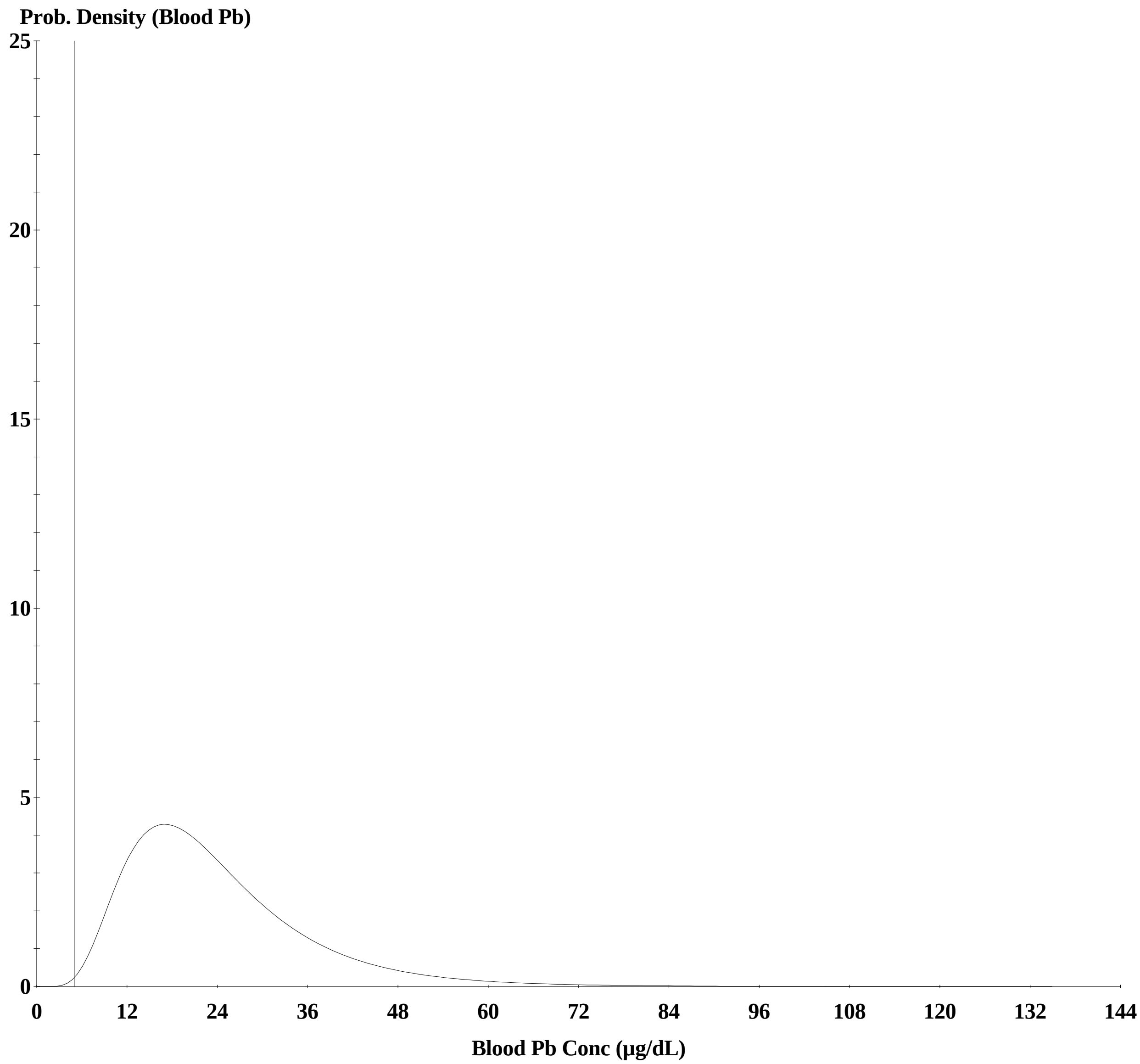
Environmental exposures associated with blood lead levels above 30 µg/dl are above the range of values that have been used in the calibration and empirical validation of this model. (Zaragoza, L. and Hogan, K. 1998. The Integrated Exposure Uptake Biokinetic Model for Lead In Children: Independent Validation and Verification. Environmental Health Perspectives 106 (supplement 6). p. 1555)



Cutoff = 10.000 µg/dl
Geo Mean = 22.070
GSD = 1.600
% Above = 95.394
% Below = 4.606

Age Range = 0 to 84 months

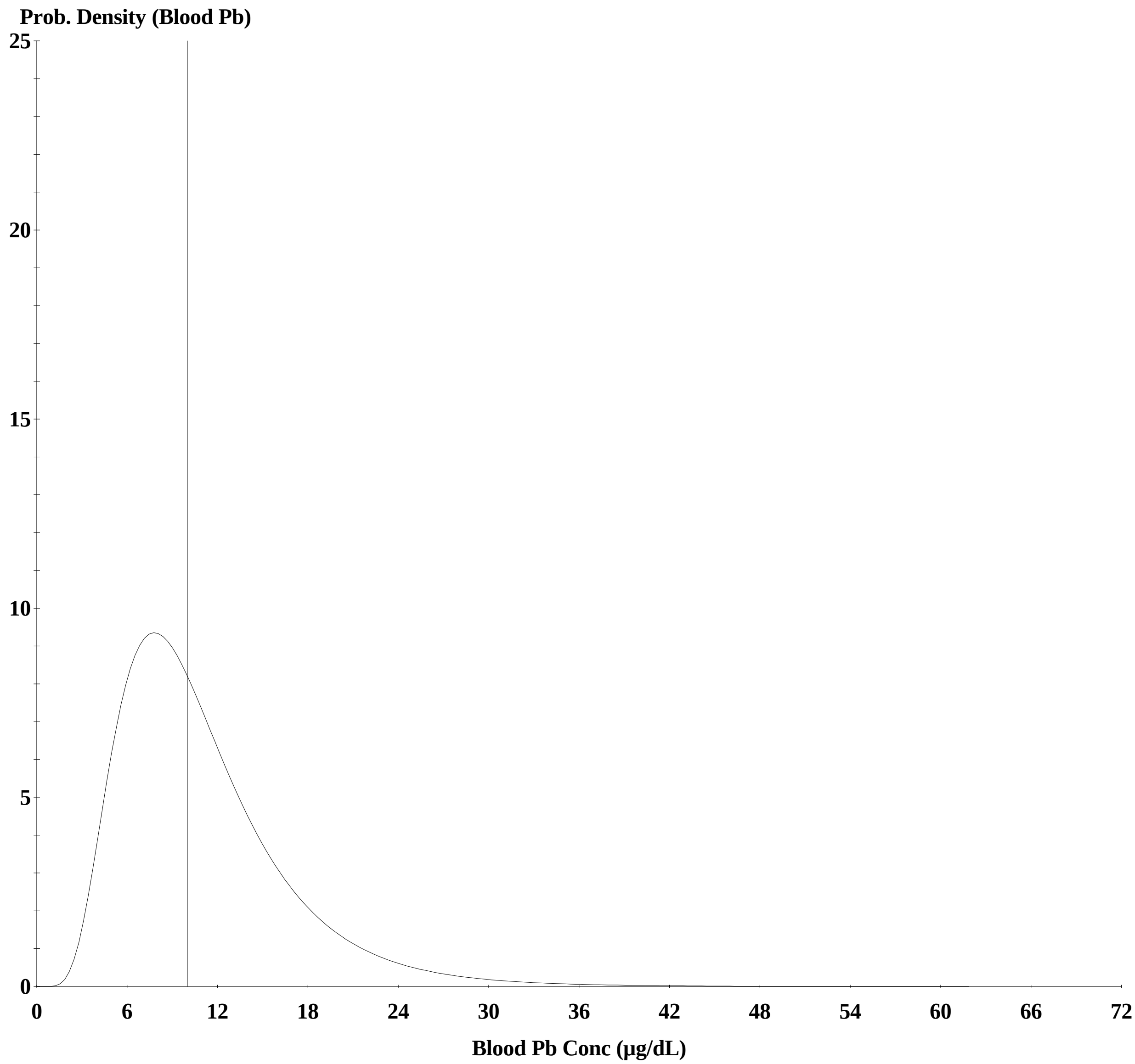
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 22.070
GSD = 1.600
% Above = 99.921
% Below = 0.079

Age Range = 0 to 84 months

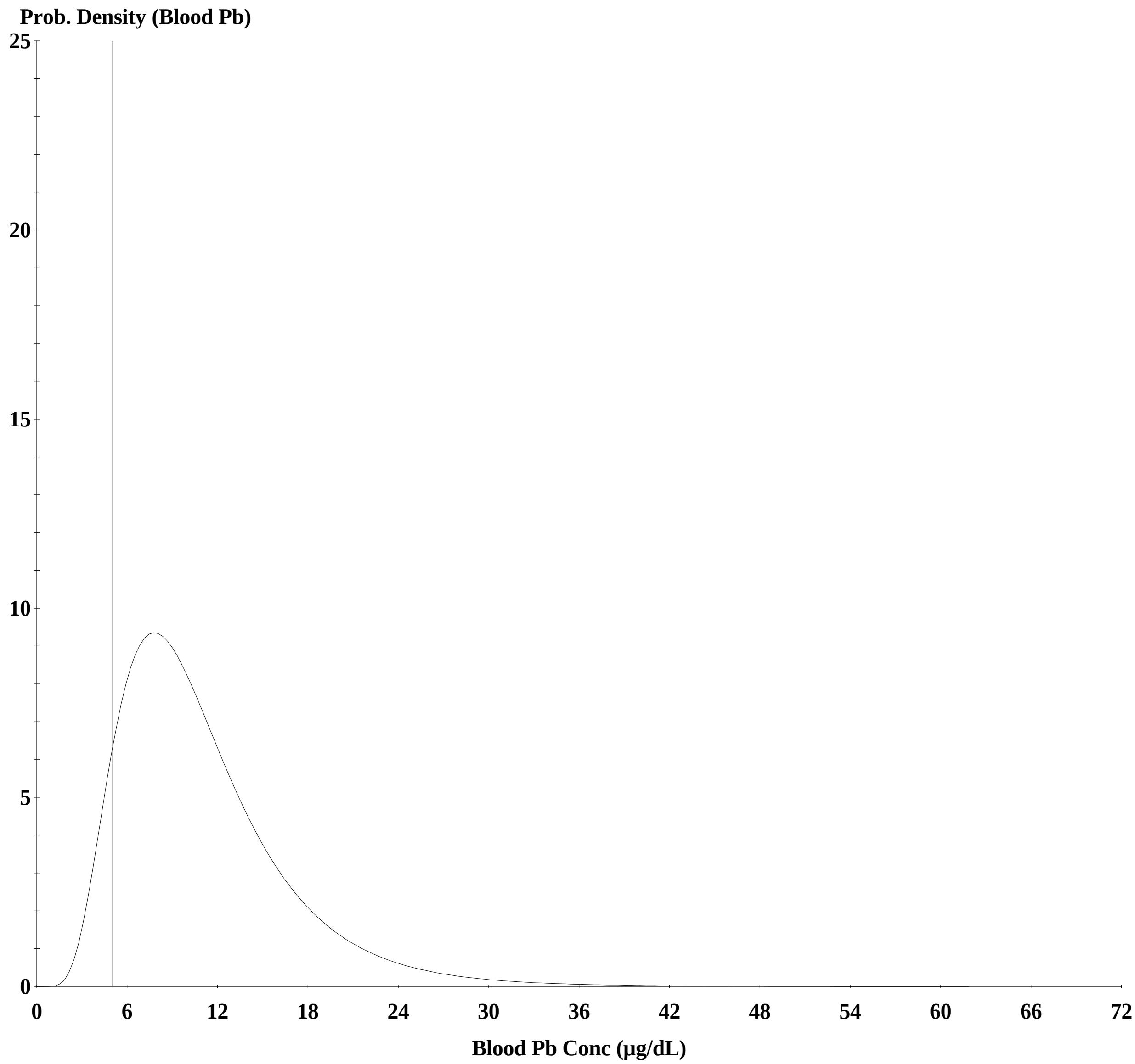
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 10.121
GSD = 1.600
% Above = 51.019
% Below = 48.981

Age Range = 0 to 84 months

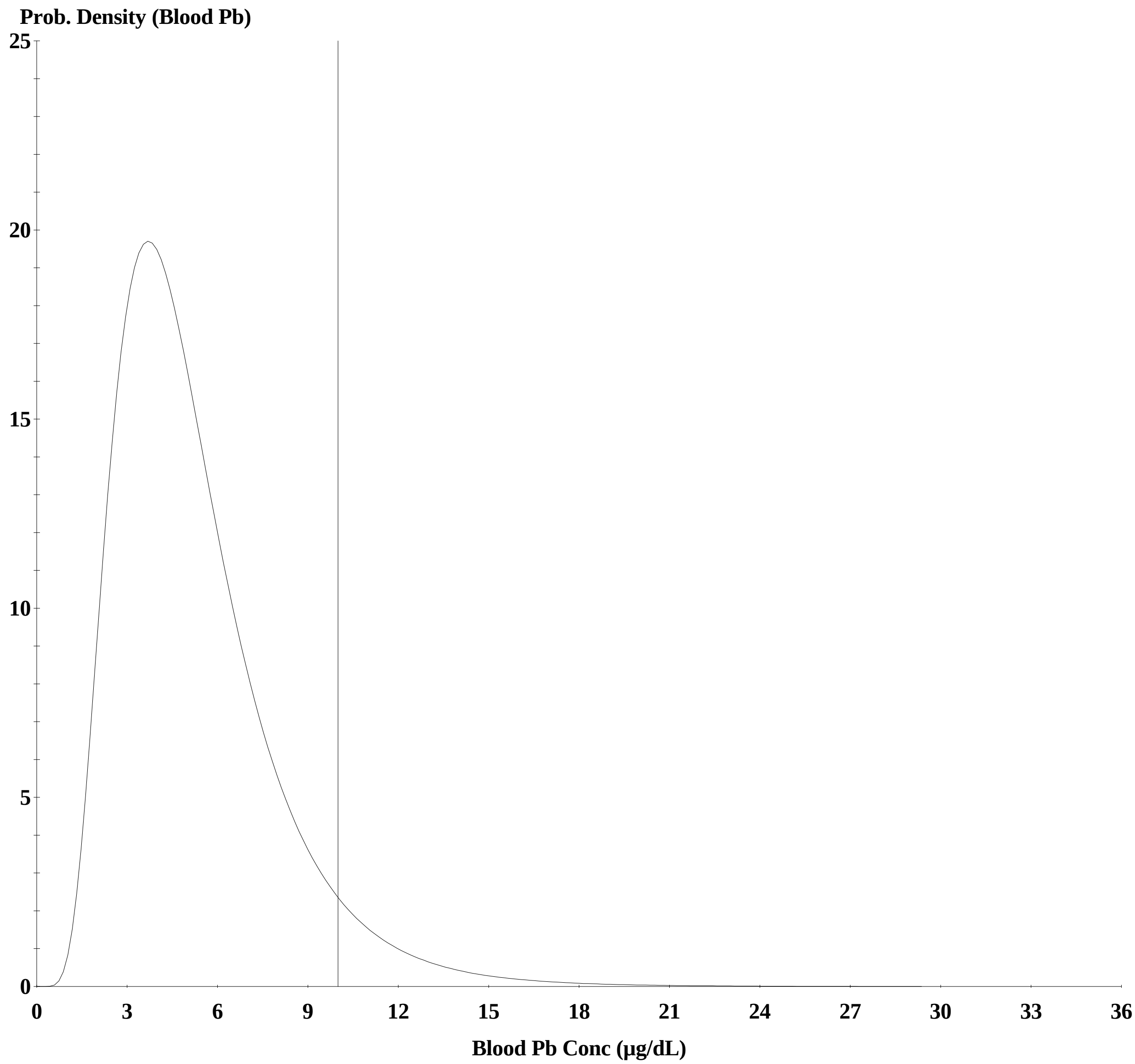
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 10.121
GSD = 1.600
% Above = 93.323
% Below = 6.677

Age Range = 0 to 84 months

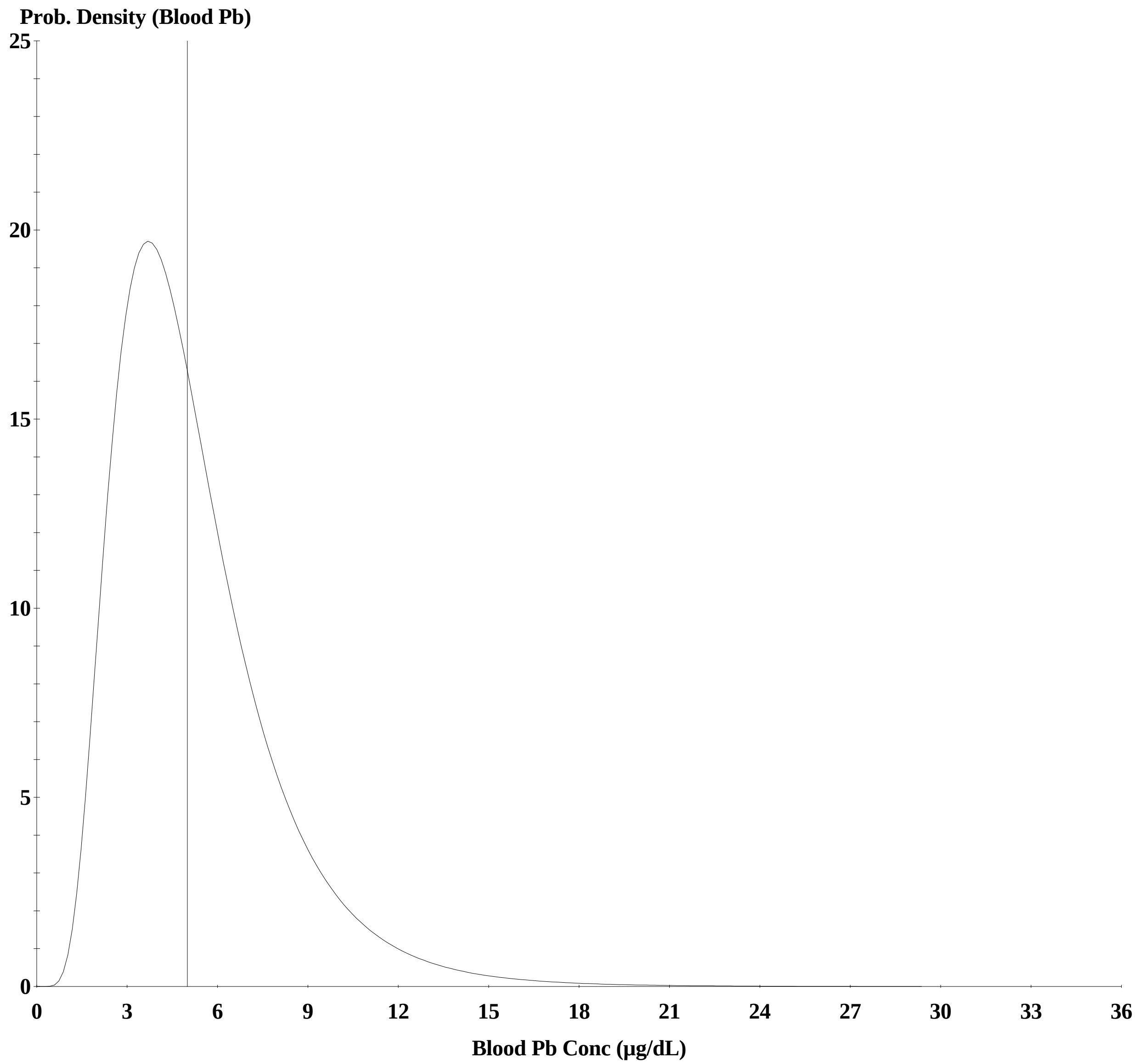
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 4.804
GSD = 1.600
% Above = 5.940
% Below = 94.060

Age Range = 0 to 84 months

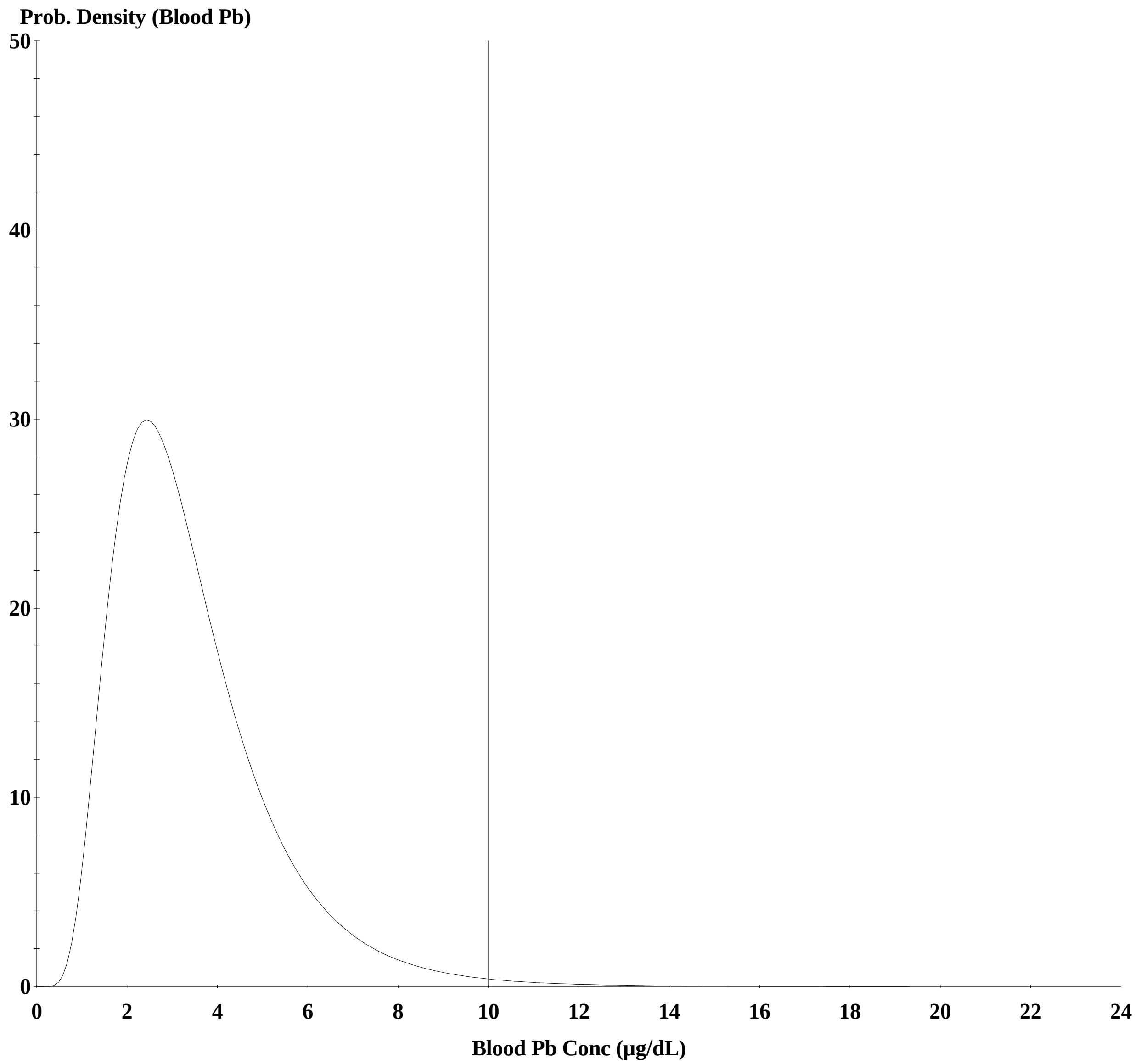
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 4.804
GSD = 1.600
% Above = 46.609
% Below = 53.391

Age Range = 0 to 84 months

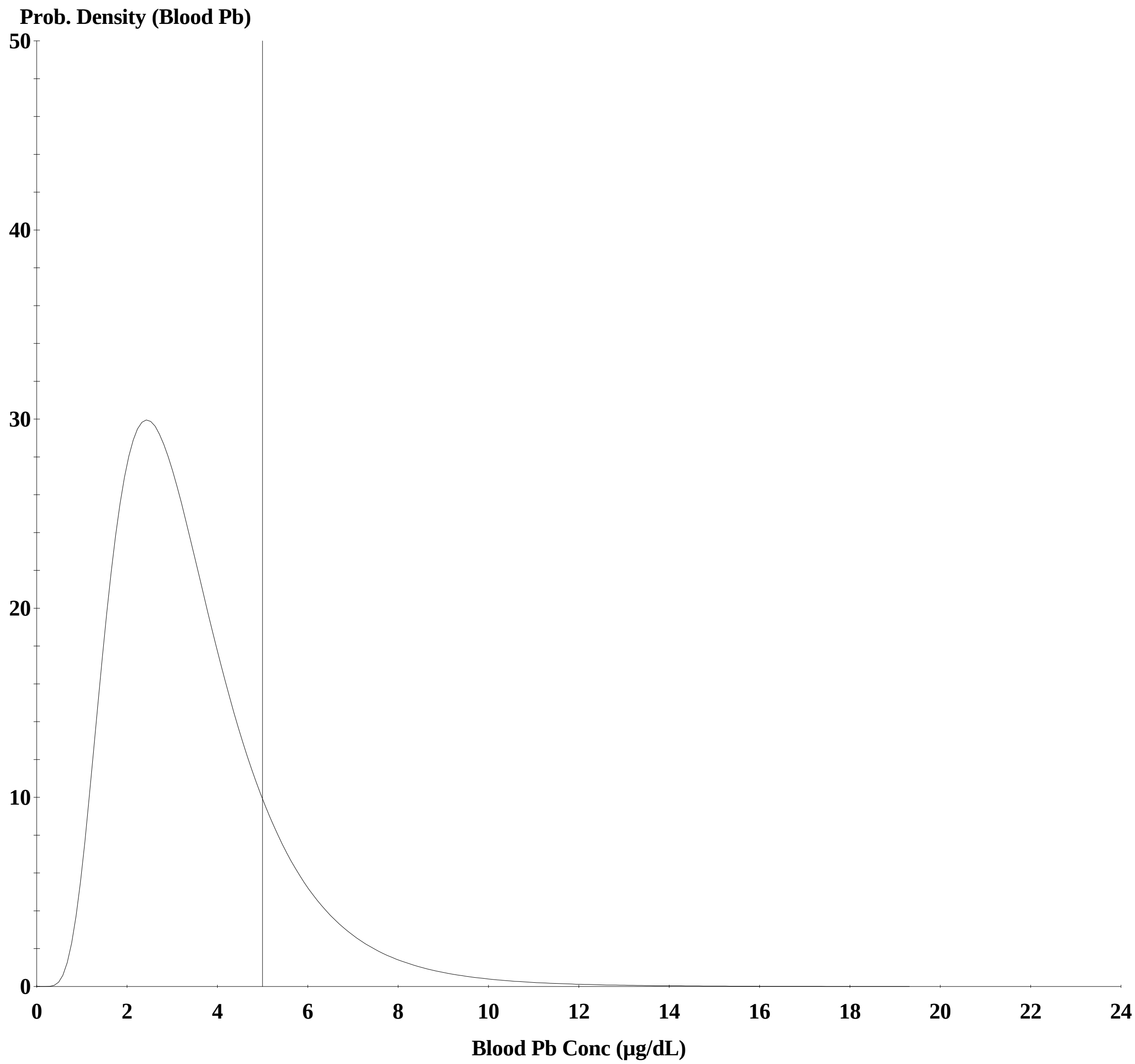
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 3.160
GSD = 1.600
% Above = 0.712
% Below = 99.288

Age Range = 0 to 84 months

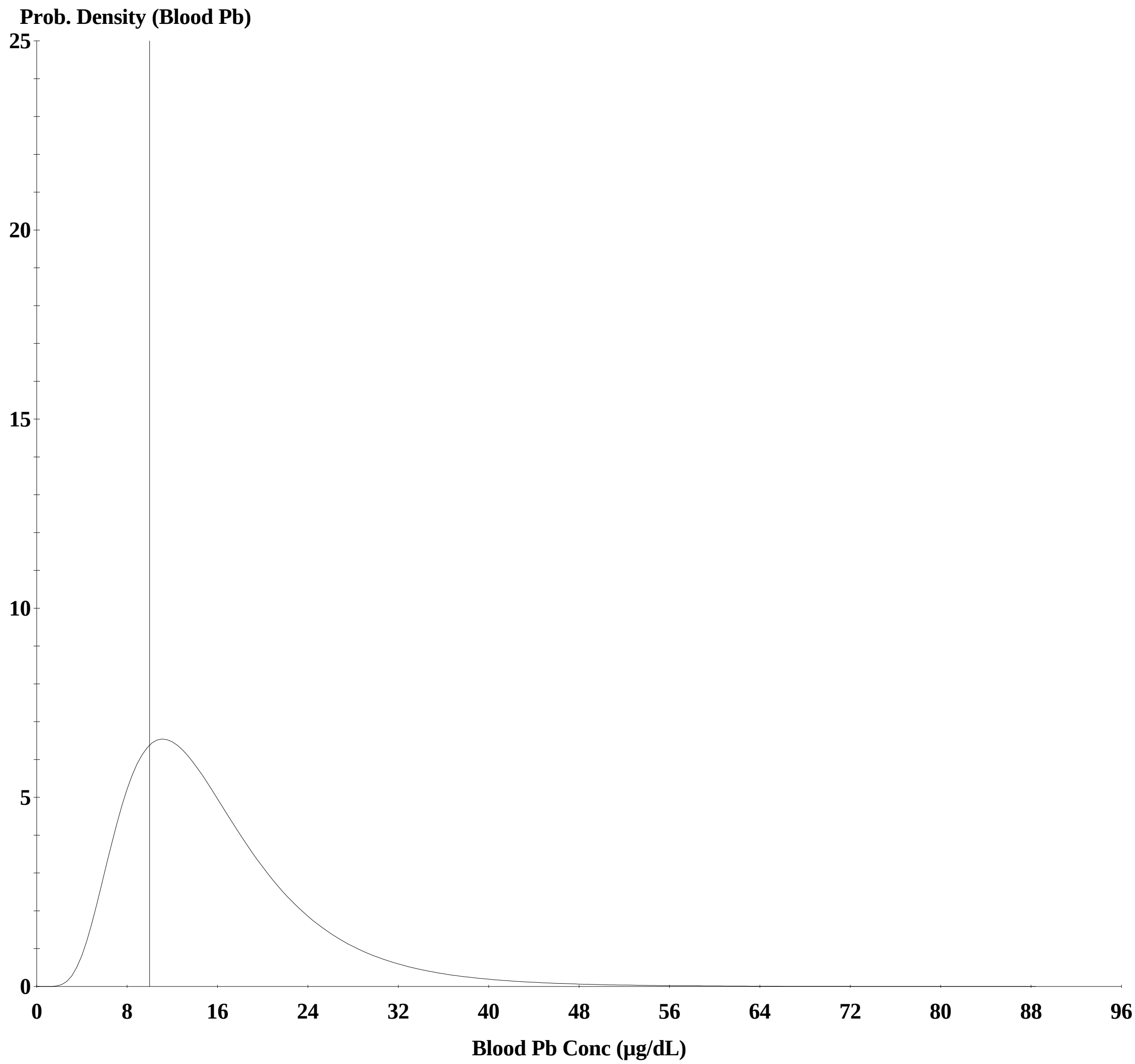
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 3.160
GSD = 1.600
% Above = 16.444
% Below = 83.556

Age Range = 0 to 84 months

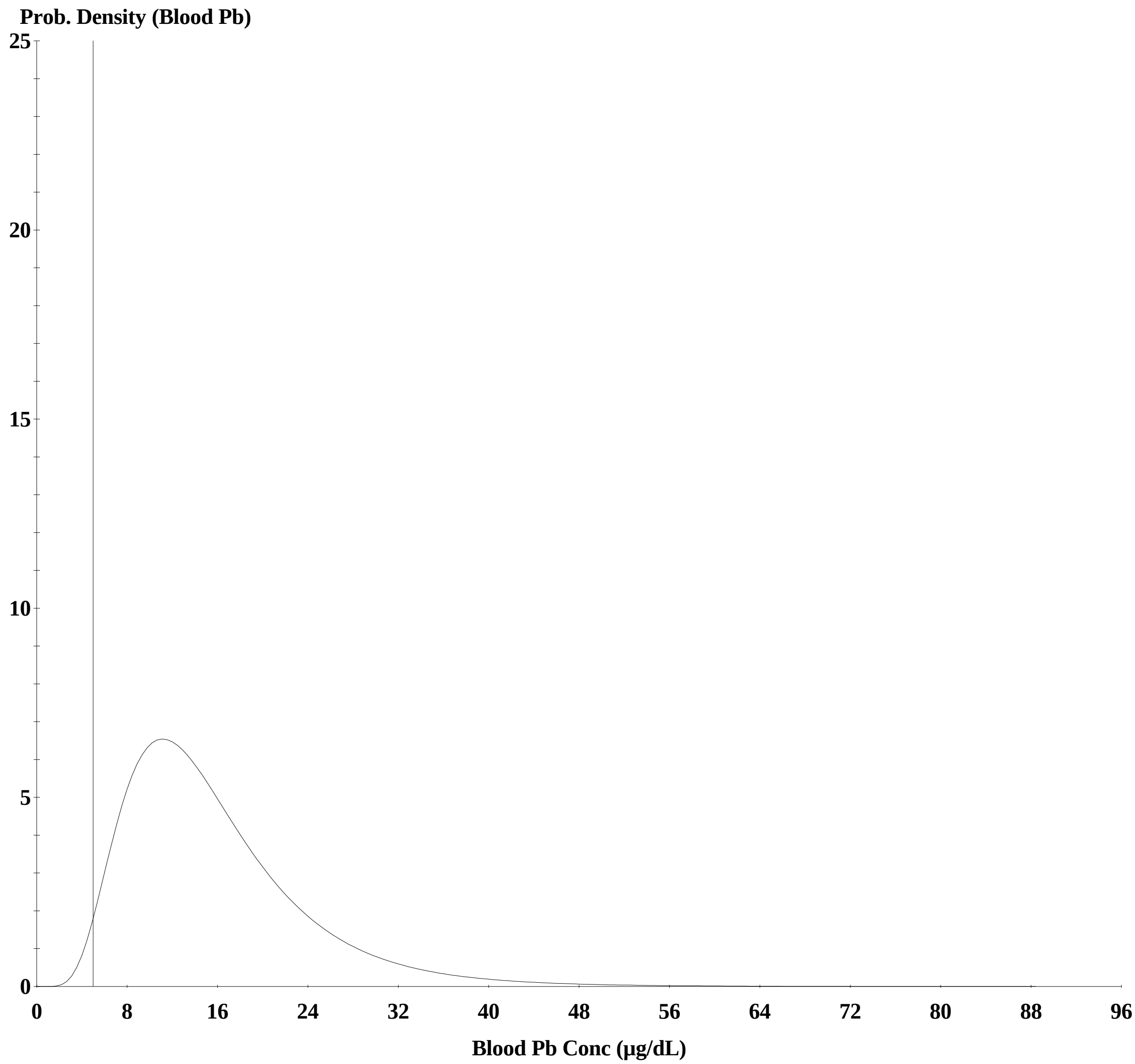
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 14.466
GSD = 1.600
% Above = 78.393
% Below = 21.607

Age Range = 0 to 84 months

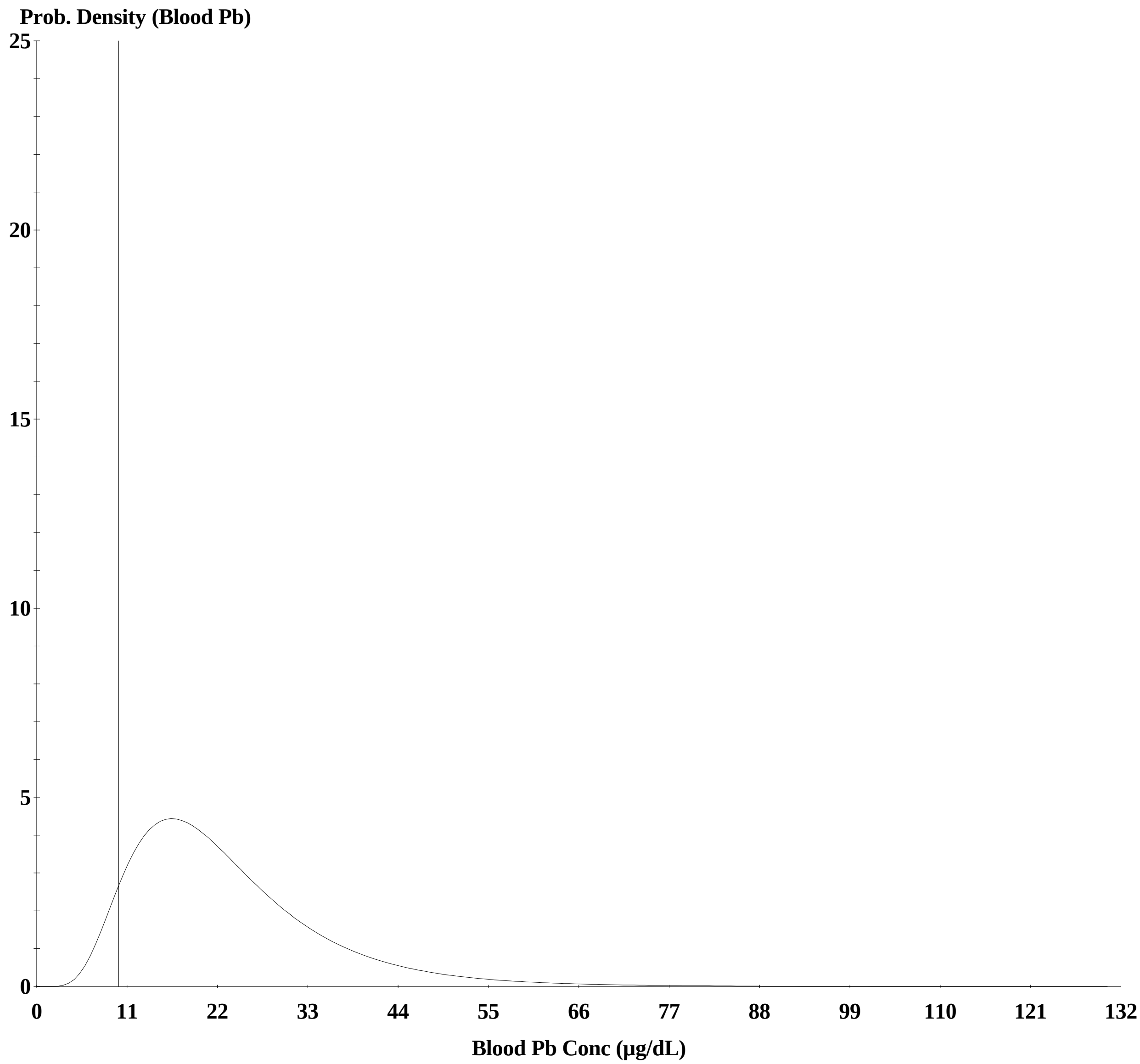
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 14.466
GSD = 1.600
% Above = 98.810
% Below = 1.190

Age Range = 0 to 84 months

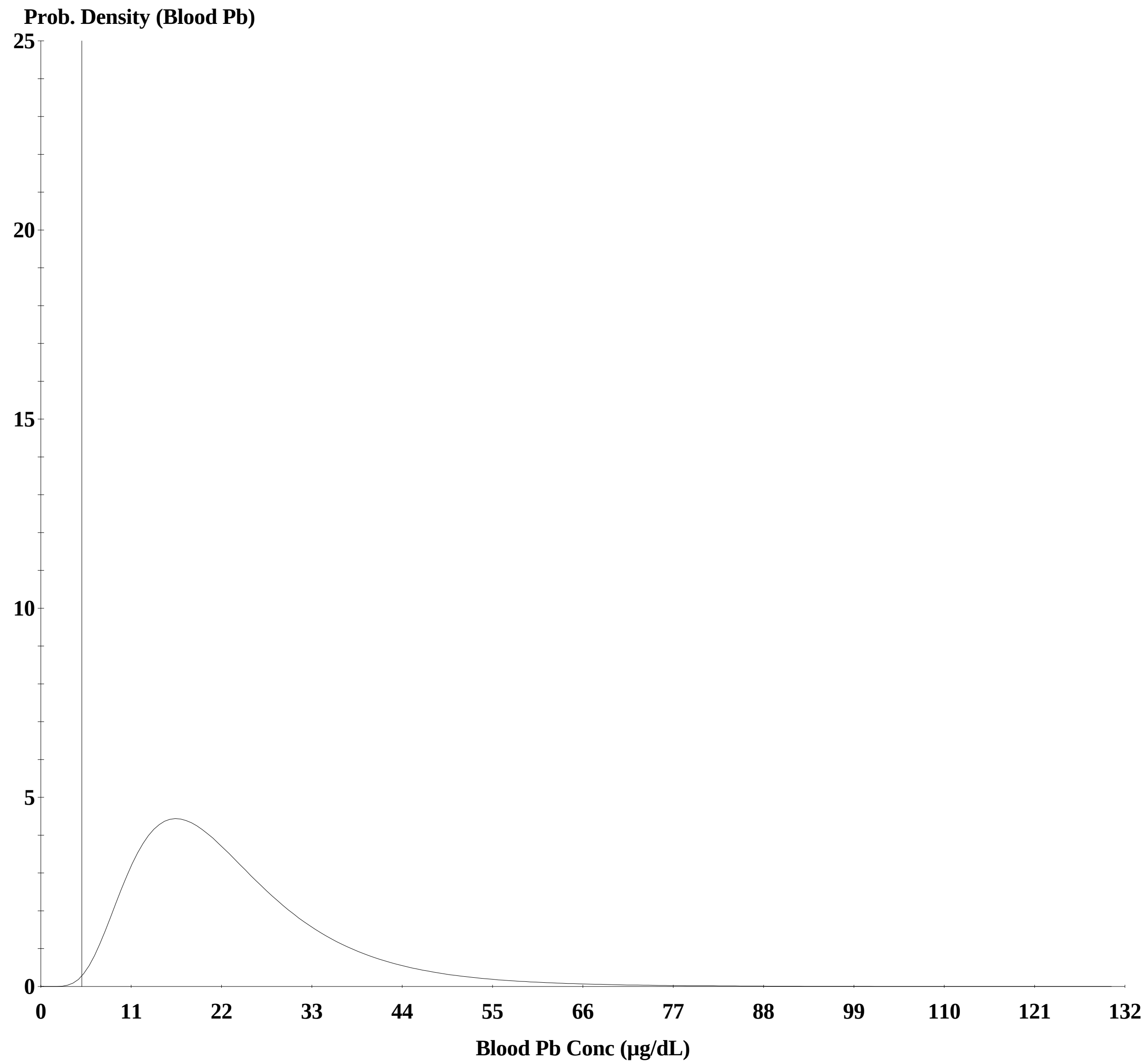
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 21.326
GSD = 1.600
% Above = 94.645
% Below = 5.355

Age Range = 0 to 84 months

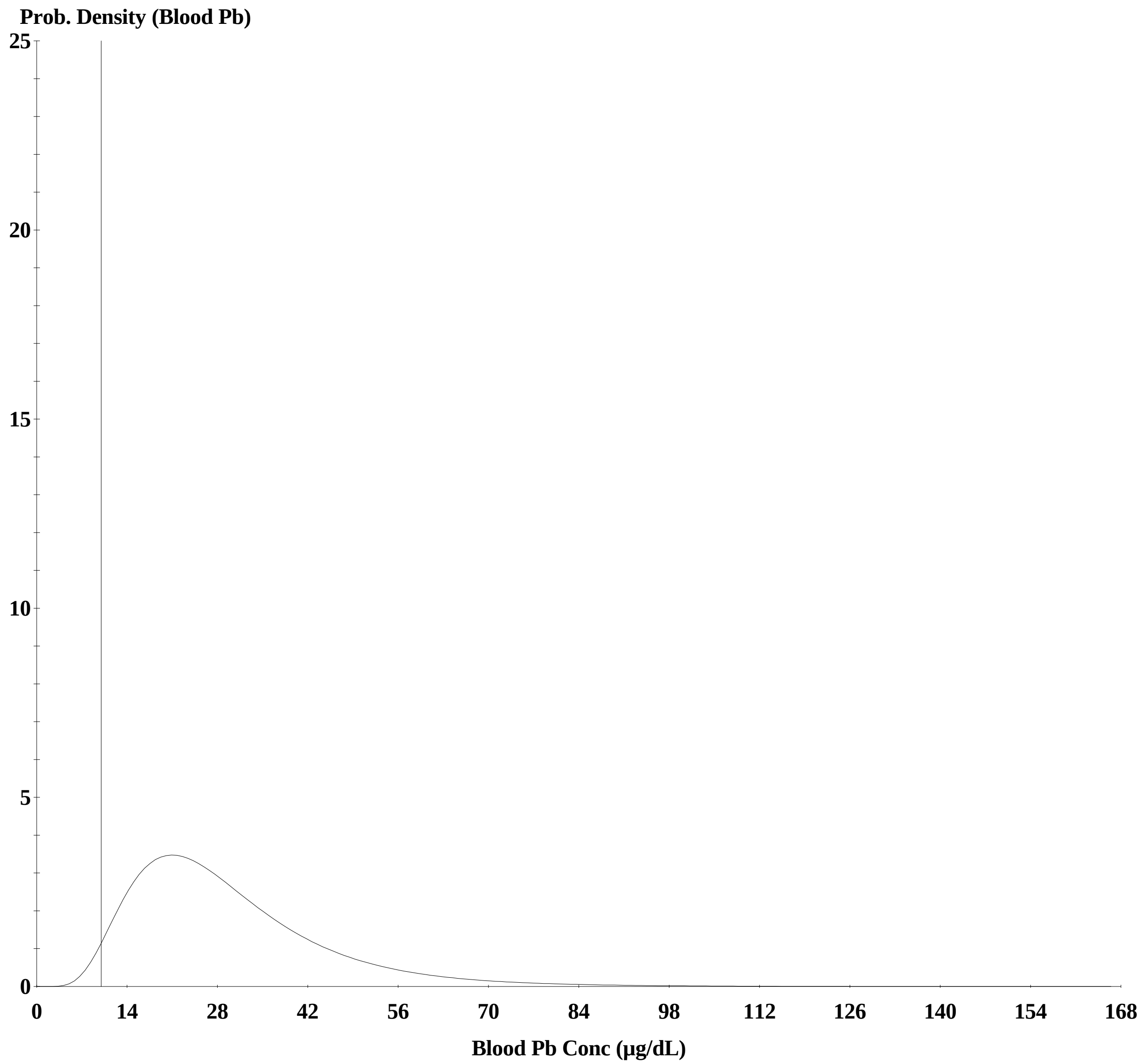
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 21.326
GSD = 1.600
% Above = 99.899
% Below = 0.101

Age Range = 0 to 84 months

Run Mode = Research

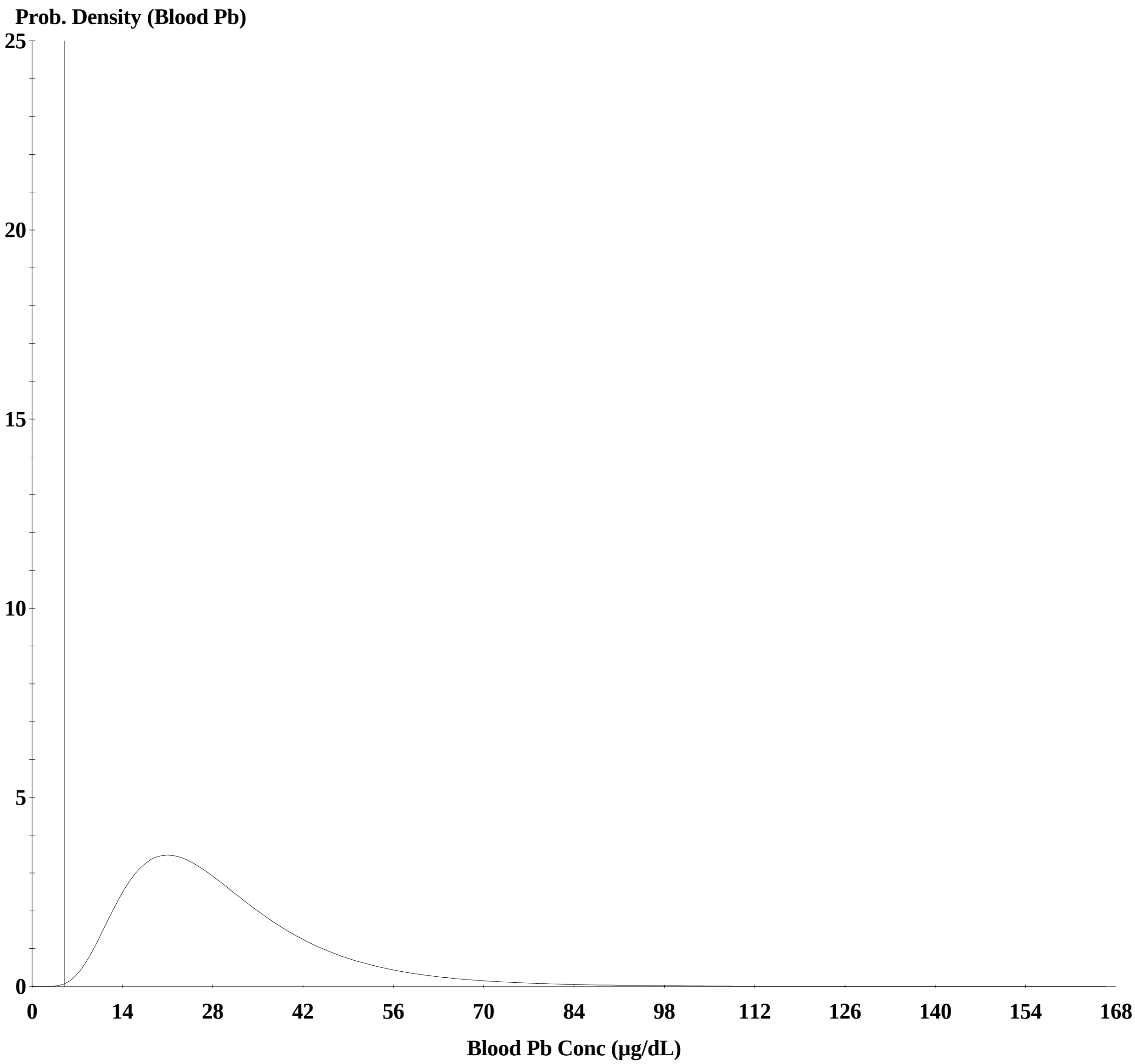


Cutoff = 10.000 µg/dl
Geo Mean = 27.230
GSD = 1.600
% Above = 98.347
% Below = 1.653

Age Range = 0 to 84 months

Run Mode = Research

Environmental exposures associated with blood lead levels above 30 µg/dl are above the range of values that have been used in the calibration and empirical validation of this model. (Zaragoza, L. and Hogan, K. 1998. The Integrated Exposure Uptake Biokinetic Model for Lead In Children: Independent Validation and Verification. Environmental Health Perspectives 106 (supplement 6). p. 1555)

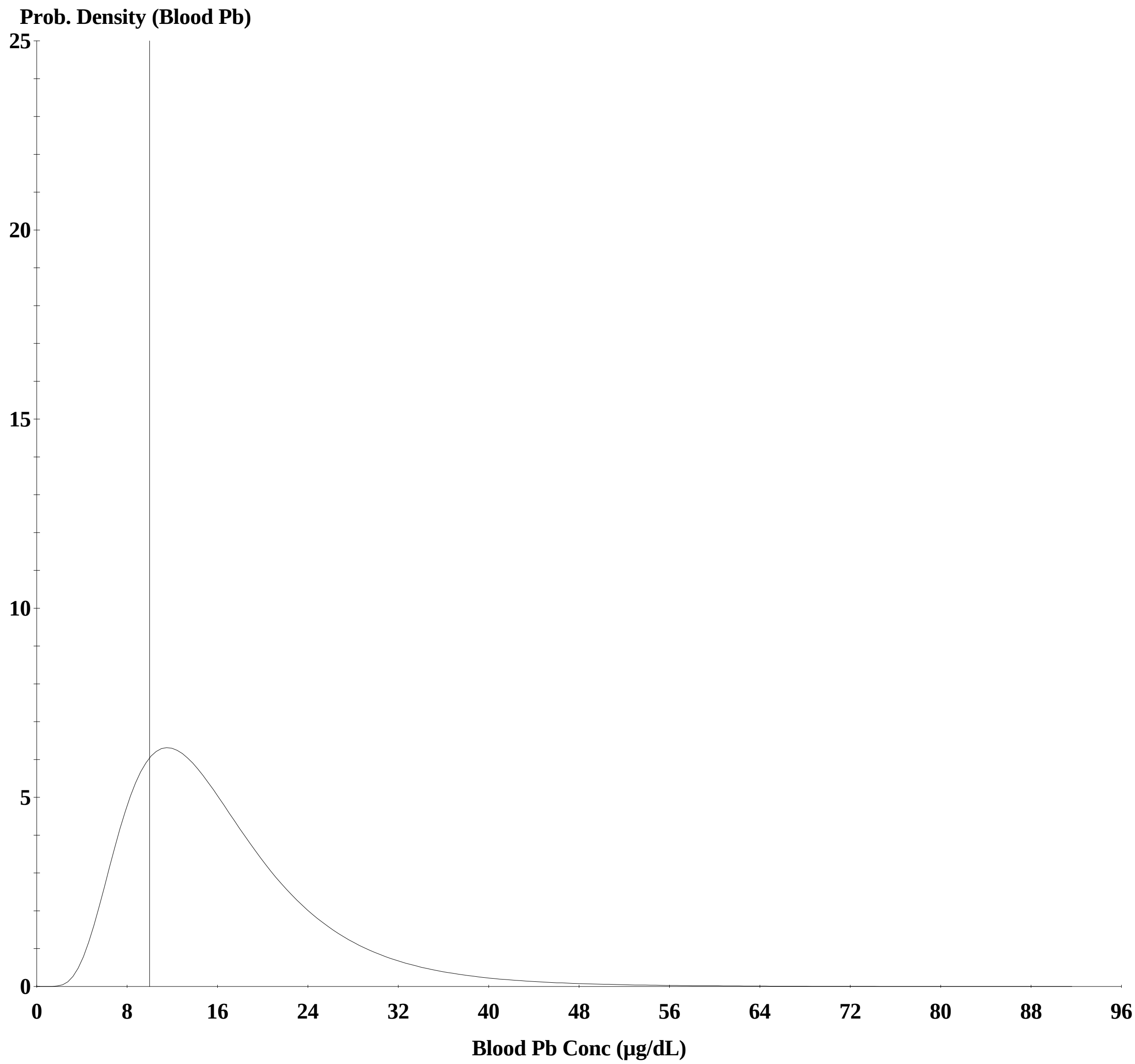


Cutoff = 5.000 µg/dl
Geo Mean = 27.230
GSD = 1.600
% Above = 99.984
% Below = 0.016

Age Range = 0 to 84 months

Run Mode = Research

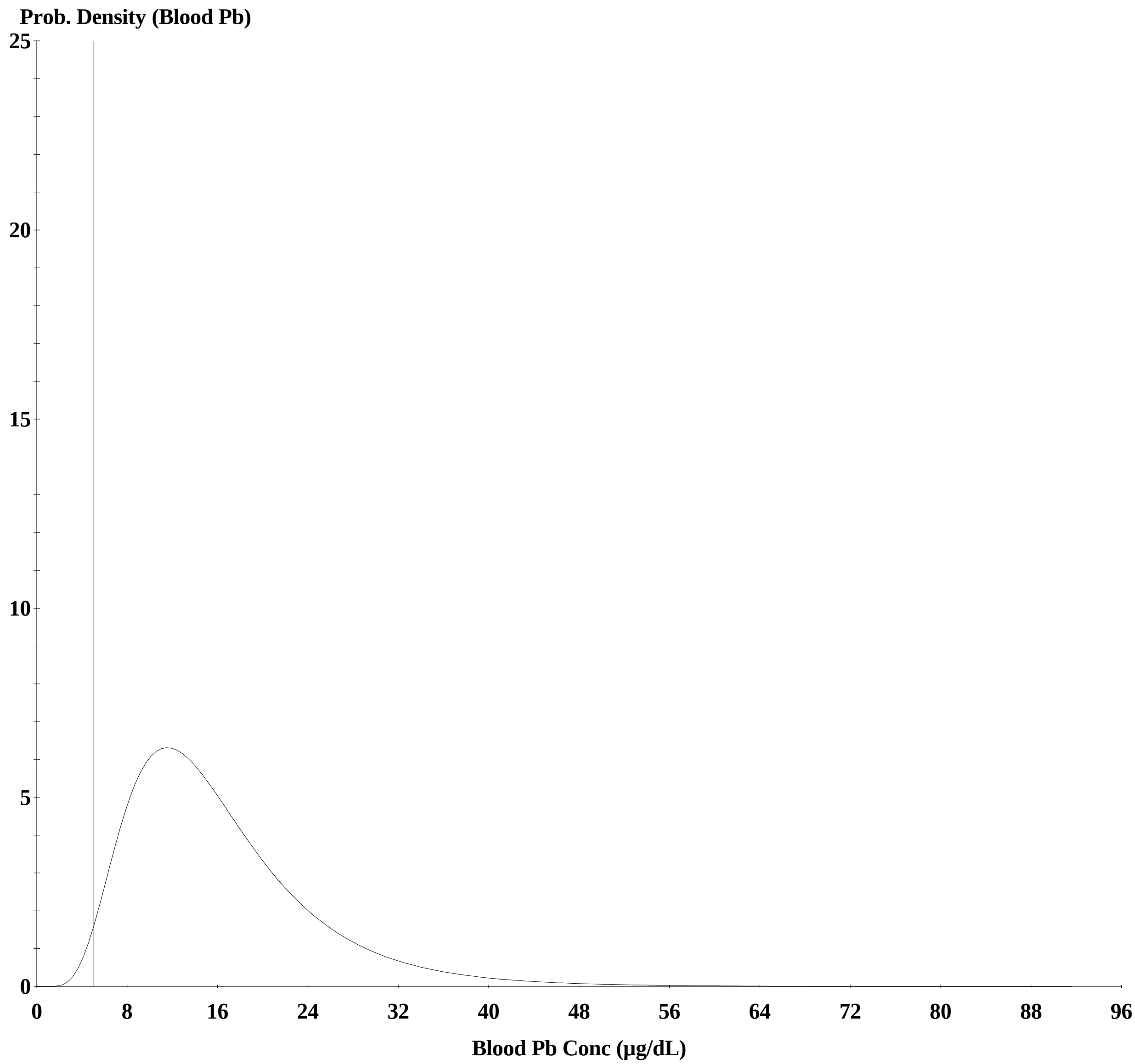
Environmental exposures associated with blood lead levels above 30 µg/dl are above the range of values that have been used in the calibration and empirical validation of this model. (Zaragoza, L. and Hogan, K. 1998. The Integrated Exposure Uptake Biokinetic Model for Lead In Children: Independent Validation and Verification. Environmental Health Perspectives 106 (supplement 6). p. 1555)



Cutoff = 10.000 µg/dl
Geo Mean = 14.989
GSD = 1.600
% Above = 80.540
% Below = 19.460

Age Range = 0 to 84 months

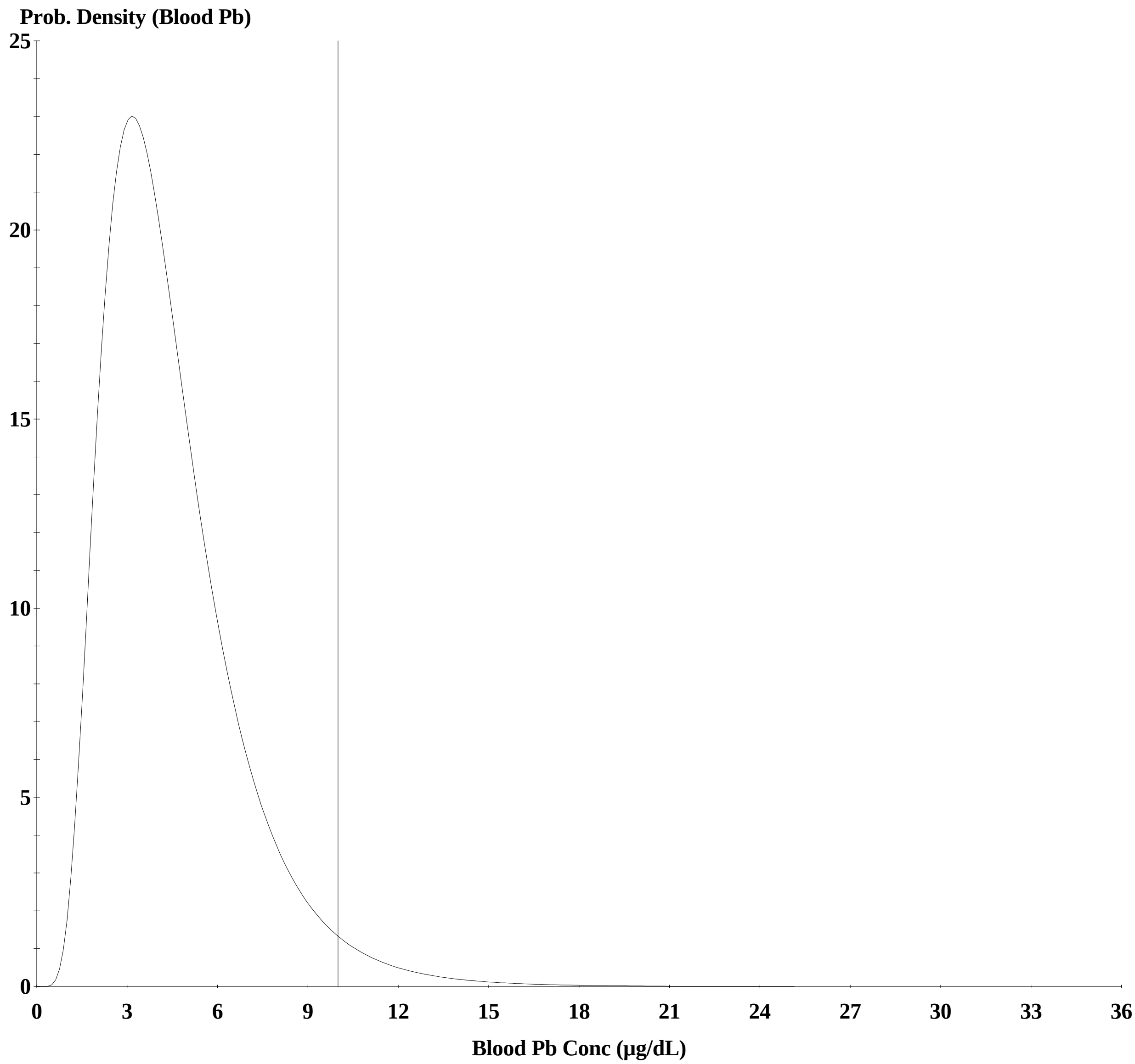
Run Mode = Research



Cutoff = 5.000 μg/dl
Geo Mean = 14.989
GSD = 1.600
% Above = 99.025
% Below = 0.975

Age Range = 0 to 84 months

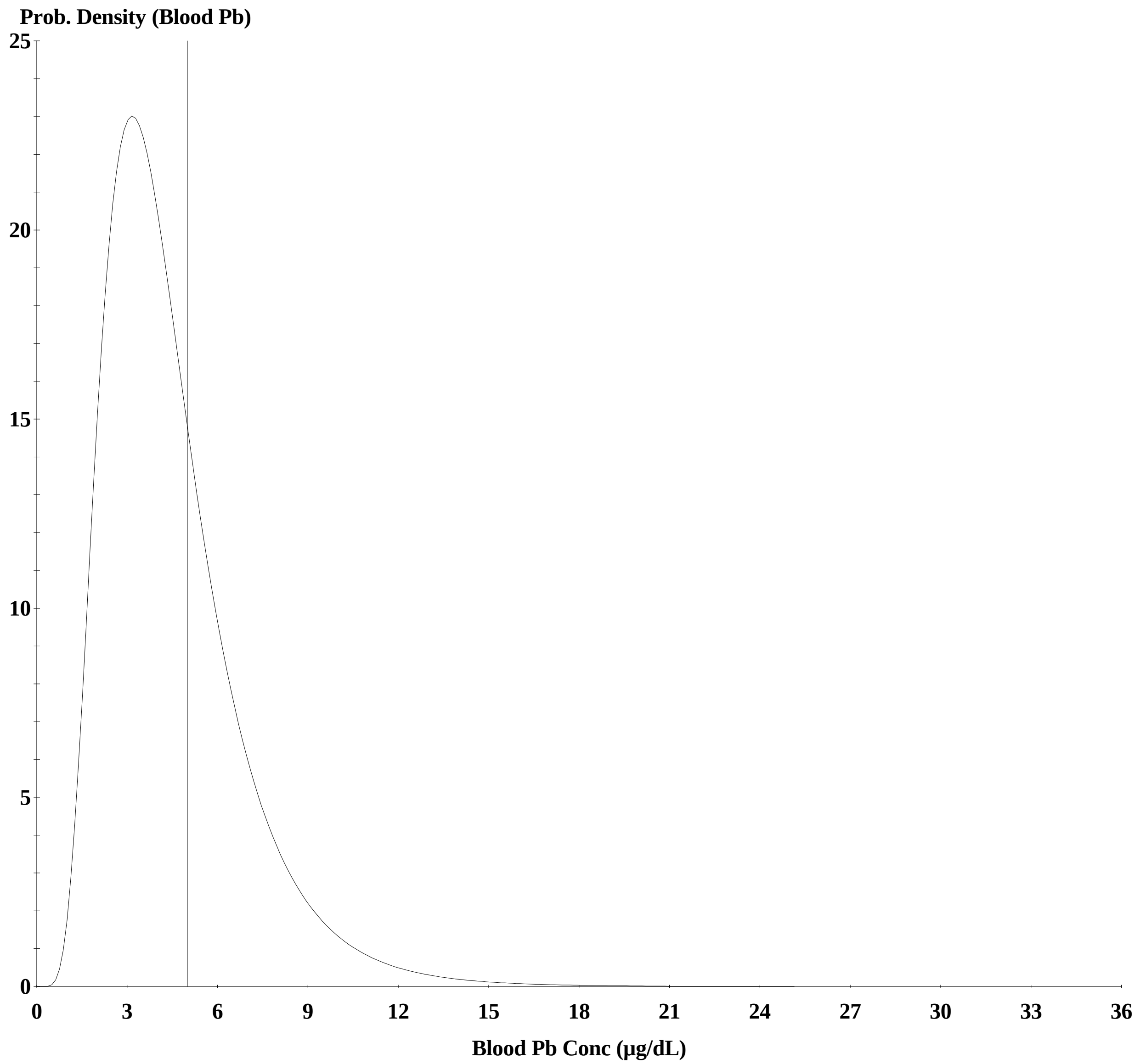
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 4.113
GSD = 1.600
% Above = 2.937
% Below = 97.063

Age Range = 0 to 84 months

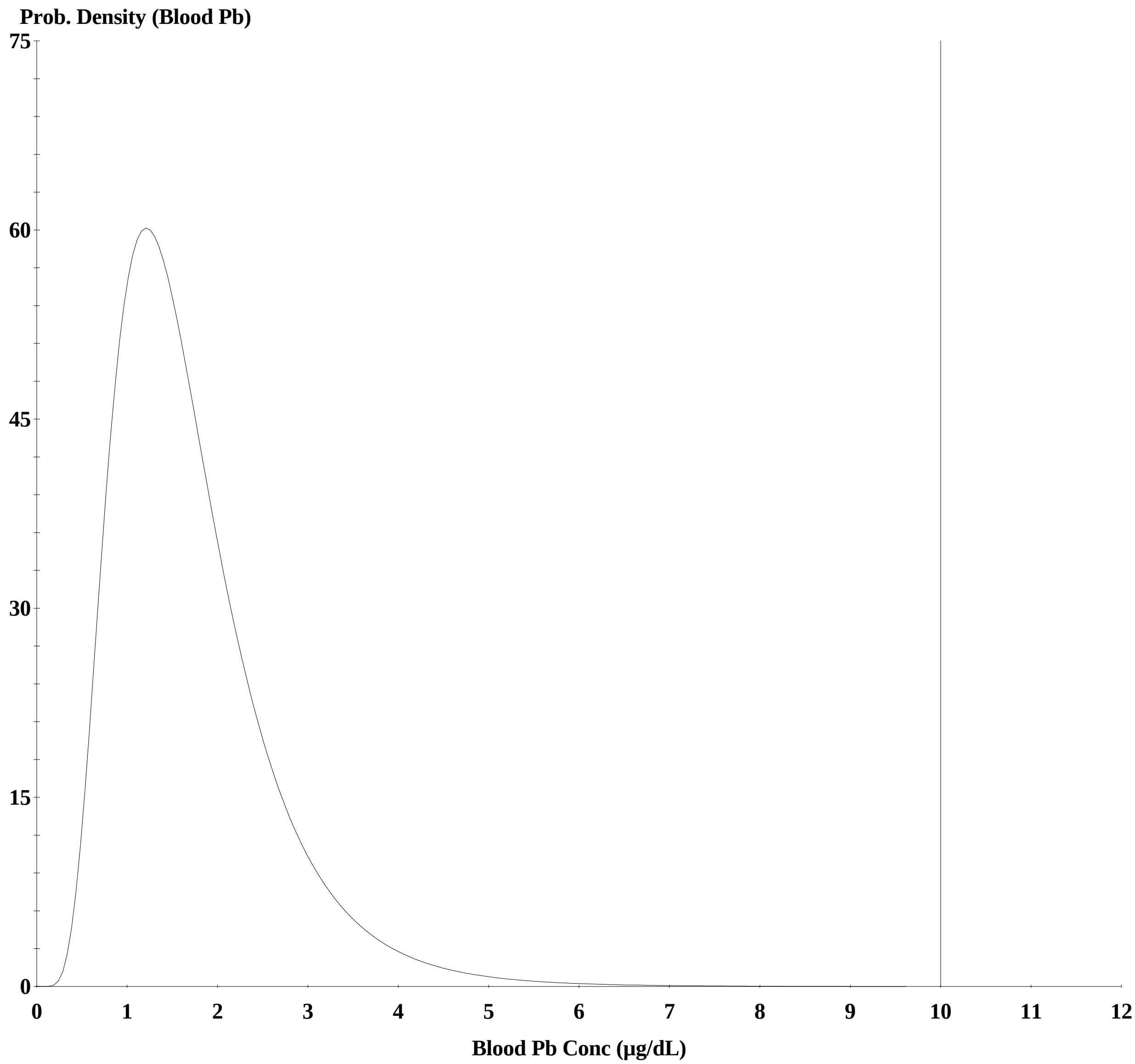
Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 4.113
GSD = 1.600
% Above = 33.891
% Below = 66.109

Age Range = 0 to 84 months

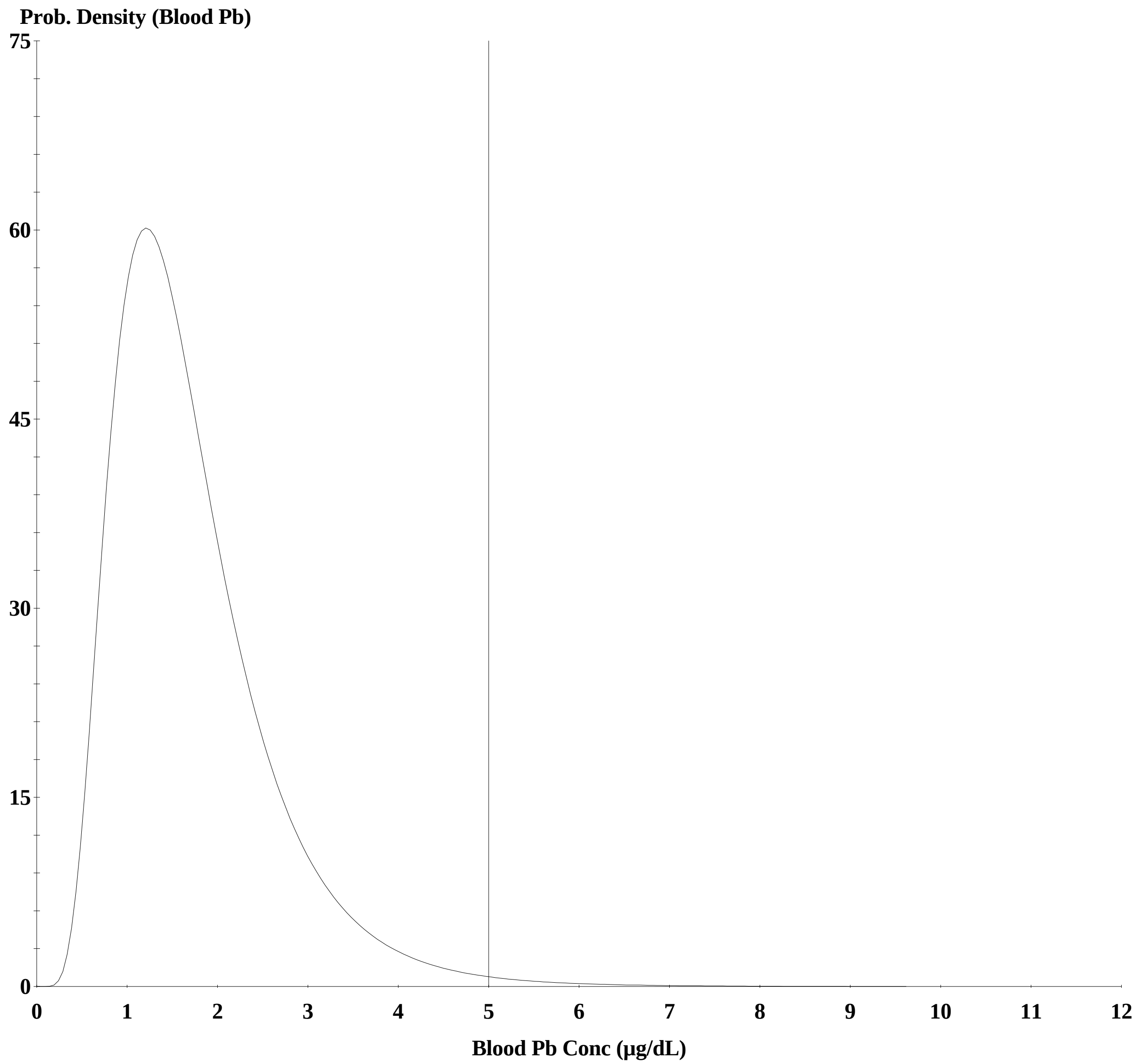
Run Mode = Research



Cutoff = 10.000 µg/dl
Geo Mean = 1.573
GSD = 1.600
% Above = 0.004
% Below = 99.996

Age Range = 0 to 84 months

Run Mode = Research



Cutoff = 5.000 µg/dl
Geo Mean = 1.573
GSD = 1.600
% Above = 0.695
% Below = 99.305

Age Range = 0 to 84 months

Run Mode = Research

Calculations of Preliminary Remediation Goals (PRGs) - ATV/Motorcyle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PRG		**ppm**	**5,701**

Calculations of Preliminary Remediation Goals (PRGs) - ATV/Motorcyle Rider

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.165
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PRG		**ppm**	**1,967**

Calculations of Preliminary Remediation Goals (PRGs) - Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95^{th} percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PRG		**ppm**	**9,406**

Calculations of Preliminary Remediation Goals (PRGs) - Fisherman

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	24
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	168
PRG		**ppm**	**3,245**

Calculations of Preliminary Remediation Goals (PRGs) - Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PRG		**ppm**	**7,559**

Calculations of Preliminary Remediation Goals (PRGs) - Hunter

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	16
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
PRG		**ppm**	**2,608**

Calculations of Preliminary Remediation Goals (PRGs) - Industrial Workers

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PRG		**ppm**	**1,873**

Calculations of Preliminary Remediation Goals (PRGs) - Industrial Workers

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	165
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PRG		**ppm**	**646**

Calculations of Preliminary Remediation Goals (PRGs) - Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal,\ 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
$AF_{S,\ D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\ D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S,\ D}$	Averaging time (same for soil and dust)	days/yr	230
PRG		**ppm**	**1,246**

Calculations of Preliminary Remediation Goals (PRGs) - Construction Worker

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	124
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	230
PRG		**ppm**	**430**

APPENDIX F
DATA USED IN THE HUMAN HEALTH RISK ASSESSMENT

LIST OF FIGURES

LIST OF TABLES

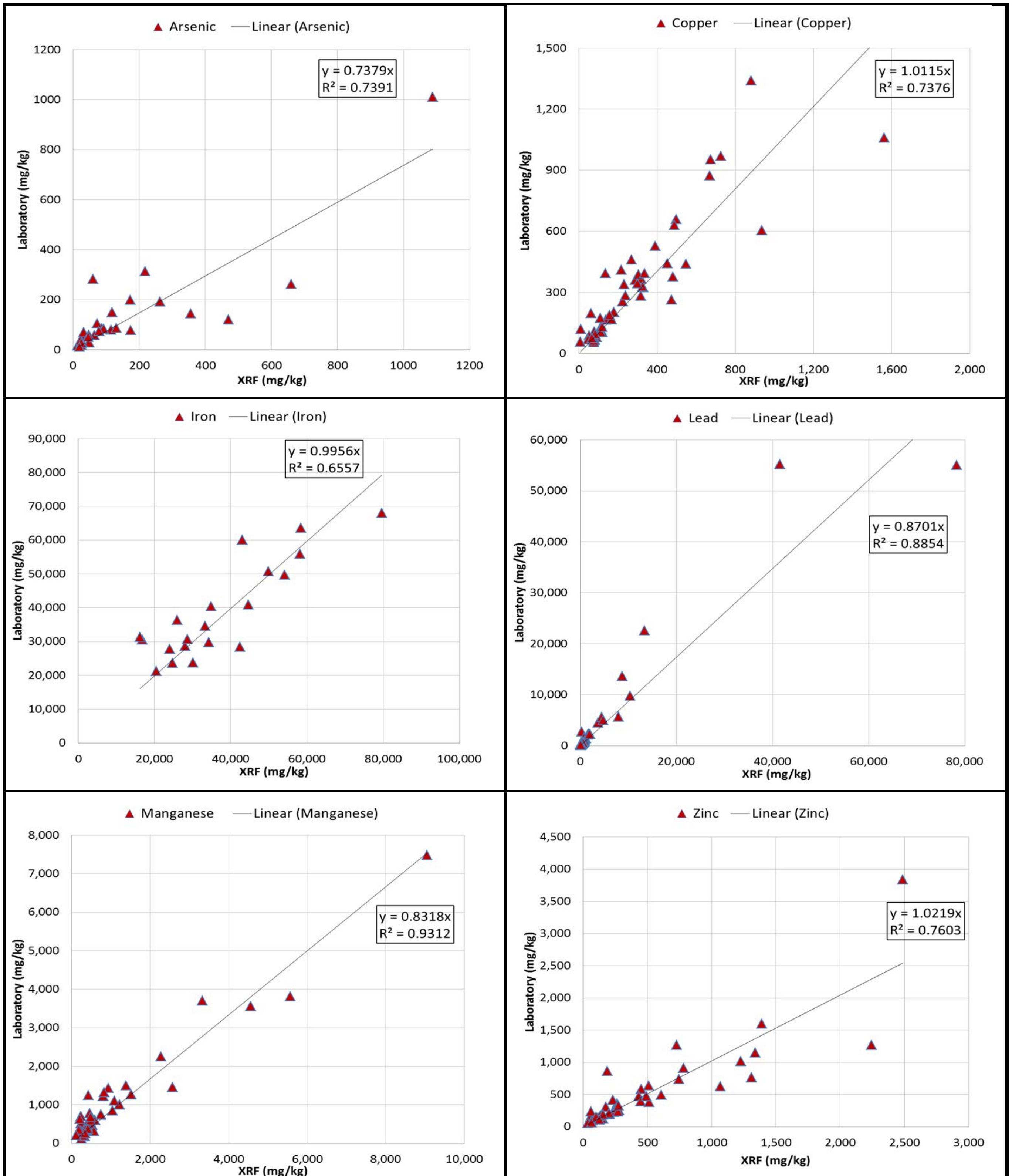
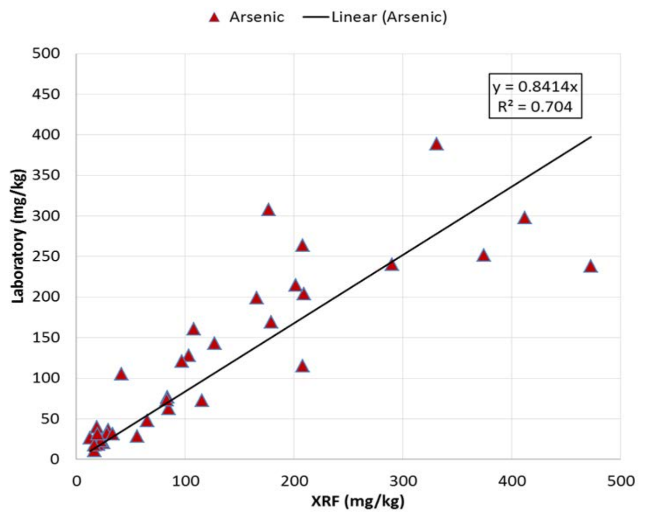


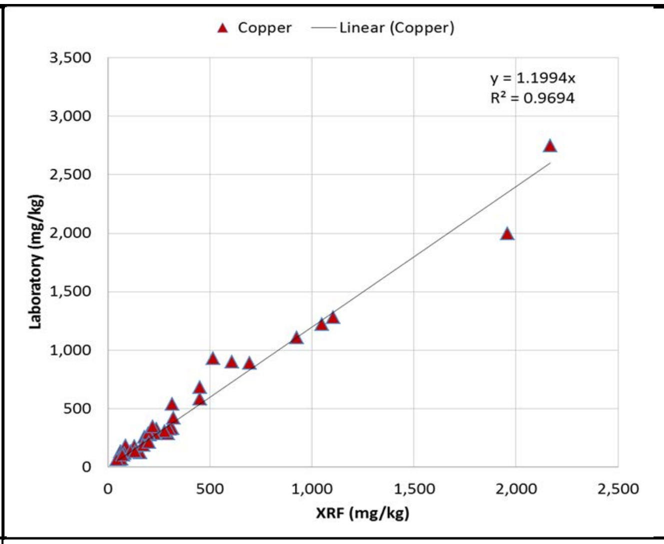
Figure F-1

Correlation Plots for Tetra Tech XRF and Laboratory Data, EUs 1, 3, 4, 5, 6, 7, 8, 9, and 10

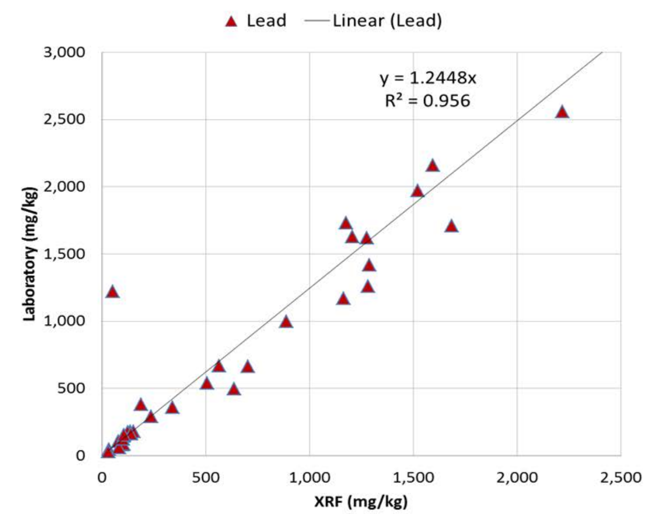
Baseline Human Health Risk Assessment

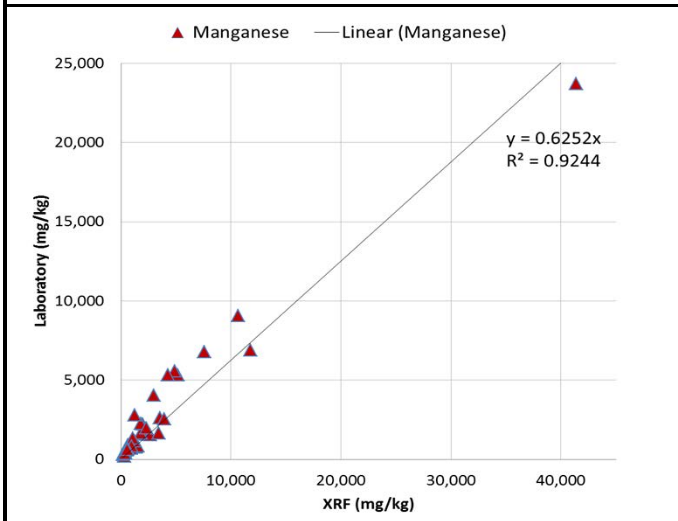
Upper Blackfoot Mining Complex





No XRF correlation was developed for iron. Only one sample had both laboratory and XRF results. A 1:1 conversion factor was assumed for the iron results for EUs 2 and 11.





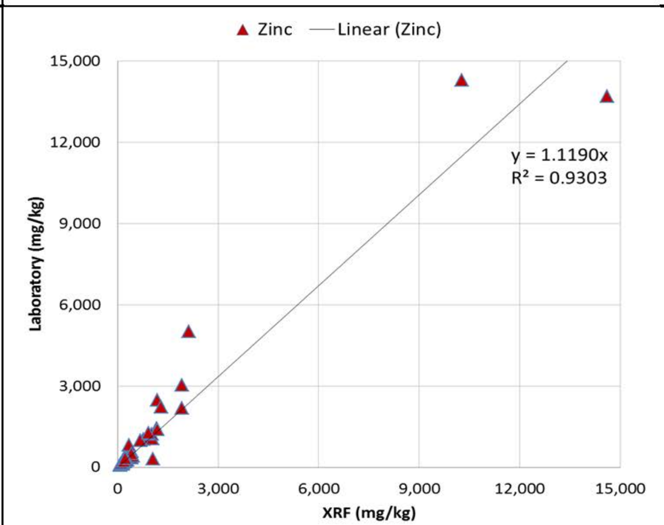


Figure F-2

Correlation Plots for Tetra Tech XRF and Laboratory Data, EUs 2 and 11

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex

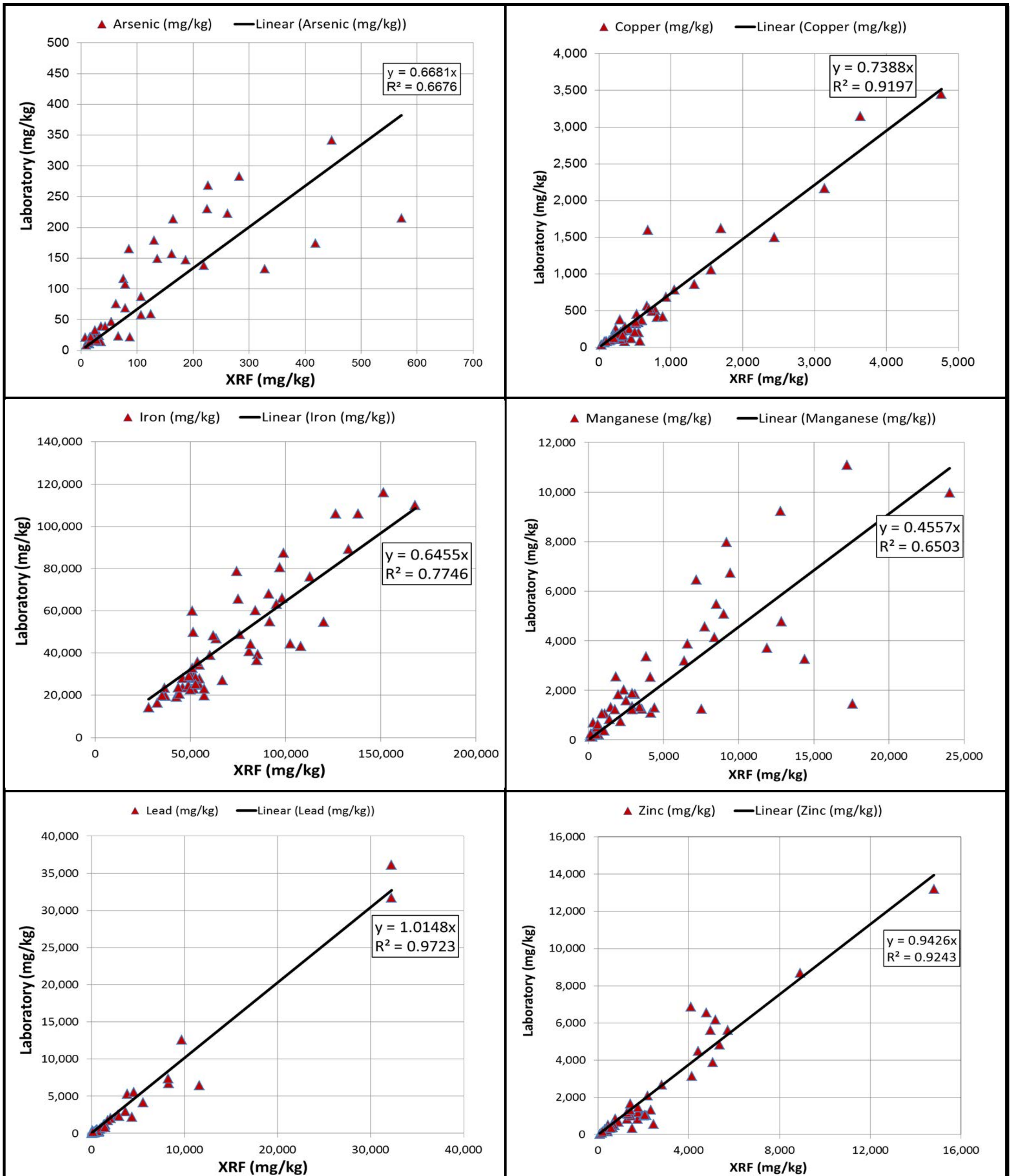
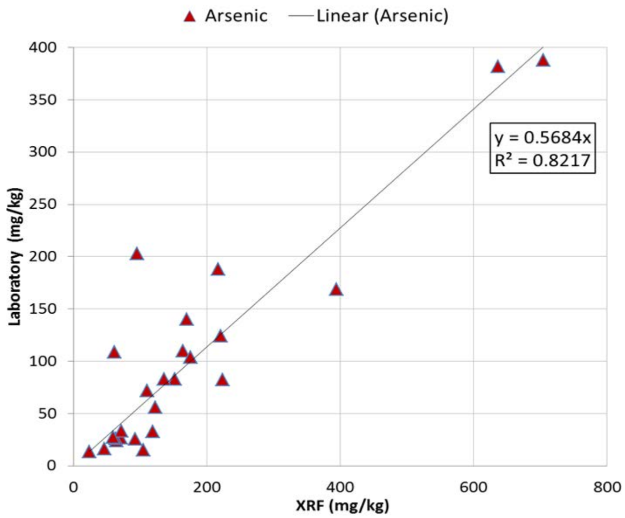


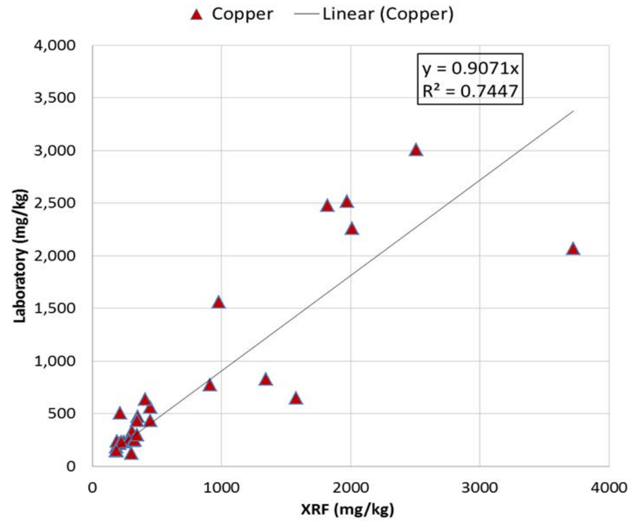
Figure F-3

Correlation Plots for Pioneer XRF and Laboratory Data, Eus 2, 11, and 12

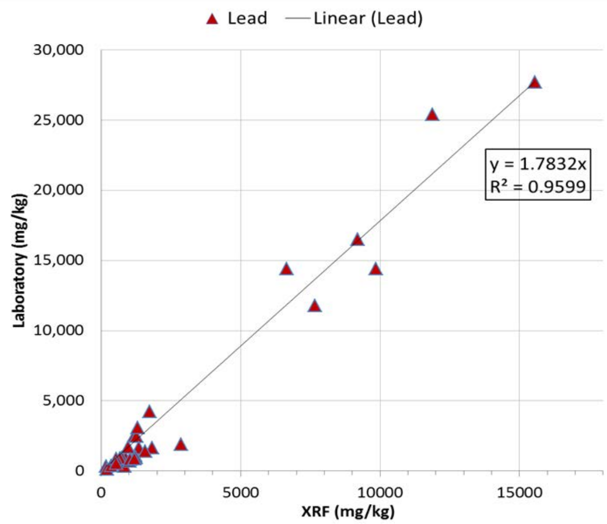
Baseline Human Health Risk Assessment

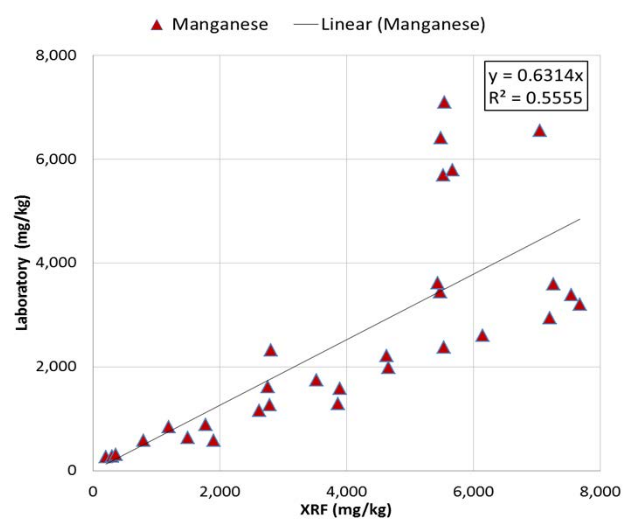
Upper Blackfoot Mining Complex





No XRF correlation was developed for iron. No samples had XRF results.





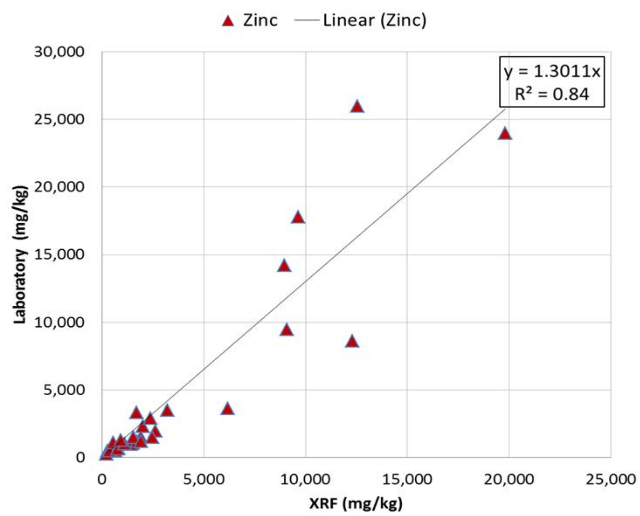


Figure F-4

Correlation Plots for Hydrometrics XRF and Laboratory Data, EU 8

Baseline Human Health Risk Assessment

Upper Blackfoot Mining Complex

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Aluminum	Lab		18200	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Aluminum	Lab		14800	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Aluminum	Lab		14600	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Aluminum	Lab		10600	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Aluminum	Lab		8950	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Aluminum	Lab		17000	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Aluminum	Lab		15800	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Aluminum	Lab		2510	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Aluminum	Lab		1400	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	170.37	126	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	143.48	106	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		79	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		78	
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	85.68	63	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	84.54	62	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	78.86	58	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	77.16	57	
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	68.99	51	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		51	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	61.36	45	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	59.06	44	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		40	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	47.44	35	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	45.26	33	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	43.2	32	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	41.4	31	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	39.38	29	U
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Arsenic	XRF	38.88	29	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	38.2	28	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	38.19	28	U
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	37.71	28	U
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	36.9	27	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	35.67	26	U
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	34.83	26	U
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	34.52	25	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	34.3	25	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	33.27	25	U
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	32.2	24	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	31.9	24	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	31.5	23	U
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	26.7	20	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	26.6	20	U
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	23.6	17	U
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	22.7	17	U

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	22.12	16	U
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	16.62	12	U
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	345.79	255	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		253	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	321.02	237	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		158	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	208.77	154	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		121	JM74
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	116.96	86	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Arsenic	Lab		53	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Arsenic	XRF	22.09	16	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Cadmium	Lab		7.3	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Cadmium	Lab		6.7	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Cadmium	Lab		4.4	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		2.1	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Cadmium	Lab		1.5	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		1.0	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		1.0	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		0.4	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		15.3	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Cadmium	Lab		6.9	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Cadmium	Lab		3.5	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		3.4	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		1.4	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Copper	XRF	760.97	770	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Copper	Lab		661	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Copper	Lab		631	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Copper	XRF	583	590	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Copper	XRF	455.48	461	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Copper	XRF	382.98	387	
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Copper	XRF	370.47	375	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Copper	XRF	359.5	364	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Copper	XRF	351.41	355	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Copper	XRF	317.23	321	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Copper	XRF	304	307	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Copper	XRF	302.42	306	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Copper	Lab		255	
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Copper	XRF	232	235	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Copper	XRF	215.82	218	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	Lab		198	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Copper	XRF	183.99	186	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Copper	XRF	174.4	176	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Copper	XRF	151.36	153	
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Copper	XRF	148	150	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Copper	XRF	140.12	142	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Copper	XRF	140	142	
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Copper	XRF	130	131	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Copper	XRF	123.79	125	
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Copper	XRF	122.65	124	
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Copper	XRF	100.35	102	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Copper	XRF	93	94	
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Copper	XRF	91.32	92	
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Copper	XRF	90.58	92	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Copper	XRF	62	63	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Copper	XRF	54.75	55	
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Copper	XRF	53.38	54	
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Copper	XRF	51	52	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Copper	XRF	48.36	49	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Copper	XRF	37.65	38	
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Copper	XRF	37	37	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Copper	XRF	37	37	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	Lab		3050	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	Lab		1060	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	Lab		954	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Copper	XRF	175.02	177	
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Copper	XRF	139.15	141	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Copper	XRF	133.45	135	
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Copper	XRF	130.39	132	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Copper	Lab		80	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Copper	XRF	45.49	46	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Iron	XRF	136002.23	135404	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Iron	XRF	88744.96	88354	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Iron	XRF	83484.1	83117	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Iron	XRF	68840.46	68538	
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Iron	XRF	63221.84	62944	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Iron	XRF	55875.84	55630	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Iron	XRF	52489.47	52259	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Iron	XRF	51199.4	50974	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Iron	XRF	46431.86	46228	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Iron	XRF	45251.4	45052	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Iron	XRF	38930.27	38759	
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Iron	XRF	35951.05	35793	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Iron	XRF	34289.75	34139	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Iron	XRF	32345.37	32203	
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Iron	XRF	32038.15	31897	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Iron	XRF	31987.18	31846	
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Iron	XRF	31088.1	30951	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Iron	XRF	31001.9	30865	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	Lab		30600	
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Iron	XRF	30083	29951	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Iron	XRF	28364.7	28240	
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Iron	XRF	26737.85	26620	
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Iron	XRF	25450.3	25338	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Iron	XRF	24248.53	24142	
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Iron	XRF	23706.17	23602	
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Iron	XRF	23455.7	23352	
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Iron	XRF	22492.31	22393	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Iron	XRF	22246.46	22149	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Iron	XRF	22091.98	21995	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Iron	XRF	21357.99	21264	
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Iron	XRF	21308	21214	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Iron	XRF	20497.2	20407	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Iron	XRF	20474.4	20384	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Iron	XRF	18002.29	17923	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Iron	XRF	17486.62	17410	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Iron	XRF	15995.31	15925	
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Iron	XRF	15793.78	15724	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Iron	XRF	132863.22	132279	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	Lab		97300	
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Iron	XRF	85327.69	84952	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	Lab		68100	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	XRF	55688	55443	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Iron	XRF	38174.68	38007	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Iron	Lab		27800	
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Iron	XRF	24215.78	24109	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Iron	XRF	22511.1	22412	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Lead	Lab		5600	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Lead	Lab		4540	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Lead	XRF	4541.9	3952	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	Lab		2740	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Lead	XRF	2554.73	2223	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Lead	Lab		1140	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Lead	XRF	1218.52	1060	
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Lead	XRF	1180.38	1027	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Lead	XRF	1053.81	917	
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Lead	XRF	940.45	818	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Lead	XRF	925.42	805	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Lead	XRF	859.28	748	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Lead	XRF	820.68	714	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Lead	XRF	755.83	658	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Lead	XRF	753.63	656	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Lead	XRF	723.53	630	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Lead	XRF	704.1	613	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Lead	XRF	680.64	592	
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Lead	XRF	654.3	569	
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Lead	XRF	608.22	529	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Lead	XRF	562.84	490	
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Lead	XRF	512.6	446	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Lead	XRF	508.2	442	
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Lead	XRF	474	412	
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Lead	XRF	462.2	402	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Lead	XRF	461.5	402	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Lead	XRF	409.6	356	
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Lead	XRF	377.2	328	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Lead	XRF	375.76	327	
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Lead	XRF	317	276	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Lead	XRF	316.64	276	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Lead	XRF	274.2	239	
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Lead	XRF	250.1	218	
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Lead	XRF	187.87	163	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Lead	XRF	147.9	129	
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Lead	XRF	125.46	109	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Lead	XRF	48	42	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	Lab		55200	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	Lab		55100	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	Lab		22600	JM10
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Lead	XRF	11077.1	9638	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Lead	XRF	6211.6	5405	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Lead	XRF	2478.43	2156	
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Lead	XRF	1688.61	1469	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Lead	Lab		771	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Lead	XRF	340.46	296	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Manganese	XRF	3914	3256	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Manganese	XRF	3297.61	2743	
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2551.96	2123	
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Manganese	XRF	2551.95	2123	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Manganese	XRF	2551	2122	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Manganese	XRF	2483.5	2066	
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Manganese	XRF	2227	1852	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2020.32	1681	
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Manganese	XRF	1908	1587	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Manganese	XRF	1799	1496	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1758.51	1463	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1755.07	1460	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Manganese	XRF	1728.32	1438	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Manganese	Lab		1430	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1702.57	1416	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Manganese	XRF	1436	1194	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1333.51	1109	
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1263.97	1051	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1224.76	1019	
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1142.14	950	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1062.18	884	
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Manganese	XRF	1048	872	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Manganese	XRF	934.85	778	
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Manganese	XRF	878.32	731	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Manganese	XRF	845.08	703	
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Manganese	XRF	823.62	685	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Manganese	XRF	777.82	647	
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Manganese	XRF	774	644	
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Manganese	XRF	732	609	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Manganese	Lab		601	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	Lab		489	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Manganese	XRF	562.99	468	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Manganese	XRF	484.65	403	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Manganese	Lab		363	
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Manganese	XRF	436.29	363	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Manganese	XRF	366.76	305	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Manganese	XRF	292.73	243	
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Manganese	XRF	2854.17	2374	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Manganese	Lab		2250	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Manganese	XRF	2016.71	1677	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Manganese	XRF	630.71	525	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Manganese	XRF	477.79	397	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	Lab		224	
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Manganese	XRF	195.09	162	U
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	Lab		117	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	Lab		39	
1A	UAW5-300 (0-6")	10/17/2007	0	0.5	Zinc	XRF	923.18	943	
1A	UAW5-300+75 (0-6")	7/17/2008	0	0.5	Zinc	XRF	831.3	850	
1A	UAW5-500+50 (0-6")	7/17/2008	0	0.5	Zinc	XRF	769.4	786	
1A	UAW5-150+50 (0-6")	7/17/2008	0	0.5	Zinc	XRF	725	741	
1A	UAW2-00+225 (0-6")	7/16/2008	0	0.5	Zinc	XRF	715.9	732	
1A	UAW5-550 (0-6")	10/17/2007	0	0.5	Zinc	XRF	705.36	721	
1A	UAW5-100+25 (0-6")	7/17/2008	0	0.5	Zinc	XRF	684.7	700	
1A	UAW2-350 (0-6")	10/12/2007	0	0.5	Zinc	XRF	666.33	681	
1A	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Zinc	Lab		588	
1A	UAW5-600 (0-6")	10/16/2007	0	0.5	Zinc	XRF	559.14	571	
1A	UAW5-400 (0-6")	10/16/2007	0	0.5	Zinc	XRF	541.71	554	
1A	UAW2-450 (0-6")	10/12/2007	0	0.5	Zinc	XRF	504.1	515	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
1A	UAW2-250+50 (0-6")	7/17/2008	0	0.5	Zinc	XRF	499.4	510	
1A	UAW5-250 (0-6")	10/16/2007	0	0.5	Zinc	XRF	472.1	482	
1A	UAW5-50 (0-6")	10/17/2007	0	0.5	Zinc	XRF	470.17	480	
1A	UAW2-100 (0-6")	10/12/2007	0	0.5	Zinc	XRF	457.53	468	
1A	UAW2-100+250 (0-6")	7/17/2008	0	0.5	Zinc	XRF	433.1	443	
1A	UAW5-00 (0-6")	10/16/2007	0	0.5	Zinc	XRF	431.92	441	
1A	UAW5-150 (0-6")	10/16/2007	0	0.5	Zinc	XRF	428.91	438	
1A	UAW2-1000 (0-6")	7/21/2008	0	0.5	Zinc	XRF	428.21	438	
1A	UAW5-100 (0-6")	10/17/2007	0	0.5	Zinc	XRF	421.91	431	
1A	UAW2-350+50 (0-6")	7/16/2008	0	0.5	Zinc	XRF	414.2	423	
1A	UAW2-450+50 (0-6")	7/16/2008	0	0.5	Zinc	XRF	411.3	420	
1A	UAW5-250+50 (0-6")	7/17/2008	0	0.5	Zinc	XRF	399.3	408	
1A	UAW2-00 (0-6")	10/12/2007	0	0.5	Zinc	XRF	385.06	393	
1A	UAW5-500 (0-6")	10/16/2007	0	0.5	Zinc	XRF	374.64	383	
1A	UAW5-200 (0-6")	10/17/2007	0	0.5	Zinc	XRF	354.25	362	
1A	UAW2-200 (0-6")	10/12/2007	0	0.5	Zinc	Lab		362	
1A	UAW2-400+150 (0-6")	7/16/2008	0	0.5	Zinc	XRF	315.8	323	
1A	UAW2-250 (0-6")	10/12/2007	0	0.5	Zinc	Lab		312	
1A	UAW5-450 (0-6")	10/16/2007	0	0.5	Zinc	XRF	202.37	207	
1A	UAW2-300 (0-6")	10/12/2007	0	0.5	Zinc	XRF	198	202	
1A	UAW5-350 (0-6")	10/16/2007	0	0.5	Zinc	XRF	163.6	167	
1A	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	Lab		156	
1A	UAW2-50 (0-6")	10/12/2007	0	0.5	Zinc	XRF	138.05	141	
1A	UAW2-400 (0-6")	10/12/2007	0	0.5	Zinc	XRF	137.03	140	
1A	UAW2-150 (0-6")	10/12/2007	0	0.5	Zinc	XRF	67.27	69	
1B	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	Lab		3200	
1B	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	Lab		1270	
1B	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Zinc	Lab		1020	
1B	UAW1-50 (0-6")	10/12/2007	0	0.5	Zinc	XRF	832.75	851	
1B	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	Lab		641	
1B	UAW1-00+25 (0-6")	7/21/2008	0	0.5	Zinc	XRF	480.63	491	
1B	UAW1-150 (0-6")	10/12/2007	0	0.5	Zinc	XRF	423.28	433	
1B	UAW1-00 (0-6")	10/12/2007	0	0.5	Zinc	XRF	390.21	399	
1B	UAW1-100 (0-6")	10/12/2007	0	0.5	Zinc	XRF	56.43	58	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		25500	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		19500	
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		18600	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		17800	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		12200	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		11000	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		10600	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Aluminum	Lab		18500	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Aluminum	Lab		16700	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Aluminum	Lab		15700	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Aluminum	Lab		13800	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Aluminum	Lab		8810	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Aluminum	Lab		7080	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Aluminum	Lab		7060	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Aluminum	Lab		4260	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Aluminum	Lab		4060	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Aluminum	Lab		3140	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	1256.09	1057	
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	1224.98	1031	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	1065.06	896	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	729.53	614	
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	698.6	588	
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	625.48	526	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Arsenic	Lab		429	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	479.81	404	
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	465.4	392	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		389	JM74
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Arsenic	Lab		388	JM20
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Arsenic	Lab		382	JM20
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	441.08	371	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	414.94	349	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Arsenic	Lab		342	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		298	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	337.73	284	
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	328.83	277	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	322.92	272	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		264	
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	303.37	255	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		252	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Arsenic	XRF	376.81	252	
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	292.16	246	
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	290.69	245	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		240	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		238	
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	281.43	237	
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	274.98	231	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Arsenic	Lab		230	
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	273.1	230	
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	272.98	230	
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	266.89	225	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	263.91	222	
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Arsenic	XRF	329.96	220	
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	259.46	218	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		215	JM74

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	254.28	214	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	250	210	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	248.11	209	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	244.76	206	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	243.16	205	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		204	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	242.38	204	
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	241.81	203	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Arsenic	Lab		203	JM20
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	239.13	201	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	238.91	201	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Arsenic	Lab		201	JM20
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	235.8	198	
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	231.38	195	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Arsenic	Lab		188	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	221.2	186	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	219.61	185	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	219.39	185	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	218.83	184	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	216.16	182	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	215.91	182	
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	213.9	180	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	212.11	178	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	207.81	175	
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	207.74	175	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	207.57	175	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Arsenic	XRF	258.09	172	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	202.07	170	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Arsenic	Lab		170	JM20
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Arsenic	Lab		169	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	199.13	168	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	199.12	168	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	198.28	167	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Arsenic	Lab		165	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	193.64	163	
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Arsenic	XRF	239.68	160	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	187.92	158	
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	187.43	158	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Arsenic	XRF	236.02	158	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	186.67	157	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	185.8	156	
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	185.17	156	
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	185.08	156	
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	184.79	155	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	184.37	155	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	177.21	149	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Arsenic	XRF	220.97	148	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Arsenic	Lab		147	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	173.78	146	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Arsenic	XRF	218.43	146	
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	172.31	145	
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Arsenic	XRF	216.3	145	
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	171.66	144	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		143	
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Arsenic	XRF	213.93	143	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	169.82	143	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	169.28	142	
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	169.13	142	
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	168.9	142	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Arsenic	Lab		140	JM20
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Arsenic	XRF	207.4	139	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	164.64	139	
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	164.44	138	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	163.39	137	
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	162.43	137	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	160.32	135	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	160.2	135	
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	159.78	134	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Arsenic	XRF	200.79	134	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	158.2	133	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Arsenic	Lab		133	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Arsenic	XRF	198.46	133	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	157.58	133	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	157.5	133	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	154.38	130	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		128	JM74
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	152.09	128	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	151.87	128	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	151.09	127	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Arsenic	XRF	190.17	127	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Arsenic	XRF	188.92	126	
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	148.62	125	
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	147.9	124	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Arsenic	Lab		124	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	147.02	124	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	146.87	124	
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	146.72	123	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	145.93	123	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Arsenic	XRF	181.53	121	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		121	
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Arsenic	XRF	179.65	120	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	141.25	119	
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	140.66	118	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Arsenic	XRF	177.09	118	
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	140.56	118	
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	139.83	118	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	138.67	117	
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	136.72	115	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		115	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	135.46	114	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Arsenic	XRF	168.03	112	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	131.54	111	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Arsenic	Lab		110	JM20
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Arsenic	Lab		109	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Arsenic	XRF	163.05	109	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	129.23	109	
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	128.14	108	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	127.73	107	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Arsenic	XRF	159.44	107	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Arsenic	XRF	158.81	106	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Arsenic	XRF	158.37	106	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		105	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	123.72	104	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Arsenic	Lab		104	JM20
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	123.09	104	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	121.13	102	
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Arsenic	XRF	152.54	102	
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	120.74	102	
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	119.03	100	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Arsenic	XRF	149.86	100	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	118.57	100	
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	116.27	98	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	115.53	97	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	115.48	97	
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		96	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	113.58	96	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	111.59	94	
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Arsenic	XRF	139.72	93	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	110.79	93	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	110.32	93	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	109.63	92	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	109.63	92	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Arsenic	XRF	137.45	92	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	108.22	91	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	107.14	90	
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Arsenic	XRF	133.43	89	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	105.74	89	
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	105.05	88	
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	104.9	88	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	104.46	88	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	104.37	88	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Arsenic	XRF	130.37	87	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	103.45	87	
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	102.3	86	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	102.1	86	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	101.91	86	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	100.94	85	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Arsenic	XRF	127.11	85	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	100.86	85	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	100.48	85	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	98.58	83	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Arsenic	Lab		83	JM20
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	97.67	82	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	97.45	82	
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	96.65	81	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	96.07	81	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		80	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	93.82	79	
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	92.49	78	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	92	77	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	91.95	77	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	91.84	77	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		77	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	87.86	74	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		73	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		73	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Arsenic	Lab		72	JM20
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Arsenic	XRF	107.49	72	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	85.14	72	
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	85.03	72	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	83.73	70	
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	82.75	70	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		70	
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	82.66	70	
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	81.3	68	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	79.51	67	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	79.5	67	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Arsenic	XRF	100.01	67	
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	79.02	66	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	78.73	66	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	75	63	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		62	JM74
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	73.74	62	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	72.02	61	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	69.46	58	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	68.12	57	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	67.39	57	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	67.01	56	
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	66.02	56	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	65.22	55	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	64.92	55	
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	64.12	54	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	64.02	54	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	62.85	53	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	62.53	53	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	62.4	53	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Arsenic	XRF	78.4	52	U
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Arsenic	XRF	78.19	52	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	60.32	51	
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Arsenic	XRF	73.28	49	U
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	58.18	49	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	57.22	48	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	56.88	48	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		48	
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Arsenic	XRF	71.18	48	
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	55.91	47	
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	55.27	47	
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	53.75	45	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	53.61	45	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	53.2	45	
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	52.5	44	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	51.98	44	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	51.42	43	
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Arsenic	XRF	62.91	42	U
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	48.88	41	
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	47.95	40	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	47.38	40	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	46.68	39	
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	46.54	39	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	45.54	38	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	44.74	38	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		36	JM74
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Arsenic	XRF	53.17	36	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	42.1	35	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	41.93	35	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		35	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Arsenic	XRF	50.73	34	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Arsenic	Lab		33	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	39.56	33	
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	39.54	33	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	39.4	33	
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		33	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Arsenic	Lab		33	JM20
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	38.85	33	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	38.78	33	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		32	JM74
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	37.48	32	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	37.04	31	
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	36.27	31	U
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		31	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	35.65	30	U
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	35.51	30	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	35.23	30	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	35.12	30	
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	34.78	29	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	34.73	29	
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	34.68	29	
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	34.57	29	U
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	34.53	29	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		29	
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	33.99	29	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	33.93	29	U
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Arsenic	XRF	41.43	28	
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	32.42	27	
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	32.41	27	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	31.94	27	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Arsenic	Lab		27	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	31.55	27	U
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	31.4	26	U
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Arsenic	XRF	39.53	26	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	31.14	26	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	30.56	26	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Arsenic	Lab		26	JM20
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Arsenic	XRF	38.11	25	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	30.22	25	
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	29.97	25	
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	29.85	25	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	29.41	25	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	29.39	25	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	29.19	25	U
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	28.97	24	
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	28.69	24	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Arsenic	Lab		24	
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	28.44	24	U
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		24	JM74
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	28.1	24	
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	27.44	23	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	27.3	23	
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	26.7	22	
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	26.68	22	
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	26.17	22	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	26.15	22	U
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	26.15	22	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Arsenic	Lab		22	
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	26.05	22	
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	25.98	22	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	25.9	22	U
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	25.82	22	U
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	25.5	21	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	25.34	21	U
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	25.18	21	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		21	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	24.88	21	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	24.73	21	
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	24.6	21	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	24.49	21	U
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	24.25	20	
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	24.1	20	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Arsenic	XRF	30.29	20	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	24.05	20	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	23.95	20	U
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Arsenic	XRF	29.91	20	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	23.36	20	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	23.3	20	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	23.11	19	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	22.86	19	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	22.81	19	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	22.74	19	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	22.74	19	U
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	22.72	19	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	22.62	19	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		19	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	22.52	19	U
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	22.15	19	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Arsenic	XRF	22.1	19	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	21.93	18	
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	21.57	18	U
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.49	18	U
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.41	18	U
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Arsenic	Lab		18	
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.09	18	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Arsenic	XRF	26.53	18	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	20.9	18	U
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	20.85	18	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	20.8	18	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	20.79	17	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	20.76	17	
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	20.4	17	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	20.3	17	
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	20.06	17	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	19.86	17	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	19.83	17	
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	19.73	17	U
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	19.7	17	U
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	19.7	17	U
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	19.41	16	U
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	19.23	16	U
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	19.12	16	U
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Arsenic	Lab		16	
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	18.98	16	U
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.8	16	U
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.7	16	U
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	18.52	16	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	18.48	16	U
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.48	16	U
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.46	16	
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	18.29	15	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	18.25	15	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.22	15	U
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	18.1	15	U
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	18.1	15	U
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	18.07	15	U

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.04	15	U
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		15	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Arsenic	Lab		15	JM20
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	17.92	15	U
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	17.87	15	U
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	17.72	15	U
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	17.7	15	U
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	17.57	15	U
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	17.5	15	U
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	17.49	15	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	17.43	15	U
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	17.39	15	U
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		14	
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	16.97	14	U
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	16.9	14	U
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		14	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Arsenic	XRF	21.25	14	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	16.6	14	U
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Arsenic	XRF	20.83	14	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	16.44	14	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	16.41	14	U
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	16.2	14	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	15.8	13	U
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	15.8	13	U
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	15.75	13	U
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	15.73	13	U
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	15.14	13	U
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Arsenic	XRF	18.92	13	U
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	14.98	13	U
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	14.6	12	U
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	14.43	12	U
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	14.25	12	
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	14.12	12	U
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	13.8	12	
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	13.49	11	U
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Arsenic	XRF	16.79	11	
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	13.24	11	U
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Arsenic	XRF	16.5	11	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		11	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Arsenic	XRF	15.69	10	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	12.2	10	U
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	11.83	10	U
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	10.9	9	U
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	10.74	9	U

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	10.18	9	
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	10.14	9	U
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Arsenic	XRF	12.21	8	
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	9.65	8	U
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Arsenic	XRF	10.43	7	
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Arsenic	XRF	10.12	7	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Arsenic	XRF	9.93	7	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Cadmium	Lab		161.0	JM270, 30
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Cadmium	Lab		98.7	JM270, 30
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		84.8	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Cadmium	Lab		78.6	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Cadmium	Lab		66.4	JM270, 30
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Cadmium	Lab		65.4	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Cadmium	Lab		52.3	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Cadmium	Lab		38.7	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Cadmium	Lab		37.3	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		30.0	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Cadmium	Lab		28.7	JM270, 30
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Cadmium	Lab		19.9	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Cadmium	Lab		19.0	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Cadmium	Lab		18.2	JM270, 30
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		17.2	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Cadmium	Lab		17.2	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		15.7	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Cadmium	Lab		12.8	JM270, 30
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Cadmium	Lab		10.1	JM270, 30
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		10.0	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		9.1	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Cadmium	Lab		8.3	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Cadmium	Lab		7.6	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Cadmium	Lab		7.0	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		6.0	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Cadmium	Lab		5.7	JM270, 30
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		5.4	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		5.1	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		4.8	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		4.4	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Cadmium	Lab		3.6	JM270, 30
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		3.4	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		3.2	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Cadmium	Lab		3.2	JM270, 30
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		3.0	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		2.8	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		2.6	

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Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		2.5	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		2.4	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		2.4	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Cadmium	Lab		2.3	JM270, 30
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		2.2	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Cadmium	Lab		2.2	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		1.8	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Cadmium	Lab		1.8	JM270, 30
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		1.6	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		1.5	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		1.5	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		1.5	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		1.4	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		1.4	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		1.4	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		1.3	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		1.3	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Cadmium	Lab		1.2	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Cadmium	Lab		1.2	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		1.1	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		1.1	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		1.1	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Cadmium	Lab		1.0	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Cadmium	Lab		0.7	JM270, 30
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		0.7	
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		0.7	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		0.6	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		0.6	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		0.3	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.3	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.2	
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.2	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	3539.8	4246	
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Copper	XRF	5091.8	3762	
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Copper	XRF	2950.39	3539	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Copper	Lab		3450	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Copper	XRF	4491.04	3318	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	2678.15	3212	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Copper	Lab		3150	
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	2510.37	3011	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Copper	XRF	4074.78	3010	
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Copper	Lab		3010	JM31
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Copper	XRF	2473.12	2966	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Copper	Lab		2750	J

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	2113.74	2535	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Copper	Lab		2520	JM31
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Copper	Lab		2480	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	1910.45	2291	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Copper	Lab		2260	JM31
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Copper	XRF	3048.15	2252	
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Copper	XRF	3038	2244	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Copper	Lab		2070	JM31
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	1644.49	1972	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Copper	XRF	1619.17	1942	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	1570.12	1883	
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	1482.71	1778	
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	1378.14	1653	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Copper	XRF	2222.04	1642	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Copper	Lab		1620	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	1312.45	1574	
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Copper	Lab		1560	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	1288.16	1545	
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	1266.31	1519	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Copper	XRF	1245.76	1494	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Copper	XRF	1230.19	1475	
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	1100.35	1320	
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Copper	XRF	1096.87	1316	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Copper	Lab		1280	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Copper	XRF	1035.92	1242	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Copper	Lab		1220	
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	1006.99	1208	
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	947.46	1136	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Copper	Lab		1110	J
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	890.17	1068	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	878.21	1053	
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	870.37	1044	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	840.99	1009	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	822.74	987	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	817.06	980	
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	801.71	962	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Copper	XRF	798.23	957	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	795.07	954	
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Copper	XRF	1288.81	952	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	792.03	950	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Copper	XRF	791	949	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	775.49	930	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Copper	Lab		930	J
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	770.96	925	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Copper	Lab		889	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Copper	XRF	734.66	881	
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Copper	XRF	731.57	877	
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Copper	XRF	1169.45	864	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	677.22	812	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	669.92	804	
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	669	802	
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	644.26	773	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Copper	XRF	1025.34	758	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Copper	XRF	1018.53	752	
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	609	730	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	590.9	709	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	579.88	696	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Copper	Lab		683	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	563.05	675	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	563	675	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	551.62	662	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	548.05	657	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	544.9	654	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Copper	XRF	883.03	652	
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Copper	XRF	876.19	647	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	532.53	639	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Copper	Lab		638	JM31
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	530.65	636	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	522.73	627	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	521.31	625	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	520.88	625	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	517.26	620	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Copper	XRF	509.19	611	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Copper	XRF	814.65	602	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Copper	XRF	494.66	593	
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	493.42	592	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	491.31	589	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	490.06	588	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Copper	Lab		584	J
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	482.26	578	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	480.99	577	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	479.57	575	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	477.14	572	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Copper	Lab		563	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Copper	Lab		562	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Copper	XRF	757.8	560	
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	460.3	552	
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	452.95	543	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Copper	XRF	735.15	543	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Copper	Lab		541	J
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	450.44	540	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Copper	Lab		533	
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	443.81	532	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	443.04	531	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Copper	XRF	712.28	526	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	433.85	520	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	433.34	520	
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	428.73	514	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	428.71	514	
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	428.24	514	
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	428.06	513	
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Copper	XRF	689	509	
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Copper	XRF	683.26	505	
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	420.4	504	
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Copper	XRF	679.4	502	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Copper	Lab		495	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	409.08	491	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Copper	XRF	408.45	490	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	407.88	489	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	405.04	486	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	404.03	485	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	403.7	484	
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	402.02	482	
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	388.96	467	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Copper	XRF	628.17	464	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	382.97	459	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Copper	XRF	614.28	454	
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	378.29	454	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	370.95	445	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Copper	Lab		437	JM31
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	362.11	434	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Copper	Lab		434	JM31
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	361.3	433	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Copper	Lab		423	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	349.33	419	
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	348.81	418	
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	342.52	411	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Copper	XRF	554.47	410	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Copper	XRF	338.04	405	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	336.04	403	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Copper	XRF	544.03	402	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	333.89	400	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	327.21	392	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Copper	XRF	522.58	386	
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	321.5	386	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	321.38	385	
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	318.38	382	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	317.98	381	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	316.49	380	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	316.05	379	
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	315.63	379	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	313.27	376	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	312.86	375	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	309.09	371	
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	305.18	366	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	305.05	366	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Copper	XRF	304.59	365	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	303.46	364	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Copper	XRF	302.61	363	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	299.17	359	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Copper	XRF	296.99	356	
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Copper	XRF	296.71	356	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	295.95	355	
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	294.95	354	
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	293.75	352	
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	289.59	347	
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	289.43	347	
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	289.27	347	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	285.74	343	
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	283.61	340	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Copper	Lab		333	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Copper	Lab		330	J
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Copper	Lab		330	J
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Copper	Lab		328	J
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Copper	Lab		328	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Copper	Lab		328	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Copper	XRF	443.11	327	
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Copper	XRF	271	325	
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Copper	XRF	438.95	324	
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	268.75	322	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Copper	XRF	268.63	322	
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	267.49	321	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	266.22	319	
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	265.02	318	
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	264.13	317	
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	264.04	317	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	260.98	313	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	260.46	312	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Copper	Lab		310	
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	258.12	310	
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Copper	XRF	257.25	309	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	256.68	308	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	256.17	307	
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	255.75	307	
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Copper	XRF	412.72	305	
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	253.31	304	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Copper	XRF	252.21	303	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Copper	Lab		300	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	246.21	295	
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	244.68	293	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Copper	XRF	244.28	293	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Copper	XRF	244	293	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Copper	XRF	243.71	292	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	240.88	289	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	240.22	288	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	239.16	287	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Copper	XRF	239	287	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Copper	Lab		286	J
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Copper	Lab		286	J
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Copper	Lab		286	J
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Copper	XRF	237.52	285	
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	236.03	283	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	234.05	281	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	233.77	280	
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	231.47	278	
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	231.1	277	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	230.95	277	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Copper	XRF	373.89	276	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	230.15	276	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Copper	Lab		276	J
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	225.98	271	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Copper	XRF	365.93	270	
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Copper	XRF	365.87	270	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	222.91	267	
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	219.99	264	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Copper	XRF	217	260	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Copper	Lab		260	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	216.48	260	
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Copper	XRF	347.15	256	
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	212.73	255	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Copper	XRF	212.06	254	
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Copper	XRF	343.53	254	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Copper	XRF	211.29	253	
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Copper	XRF	342.77	253	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	210.69	253	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Copper	Lab		250	JM31
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	208.15	250	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Copper	Lab		249	JM31
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	206.34	247	
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Copper	XRF	205.35	246	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Copper	XRF	204.49	245	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Copper	Lab		245	JM31
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	201.96	242	
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	201.37	242	
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	200.87	241	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	199.69	240	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Copper	Lab		239	JM31
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	198.45	238	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Copper	Lab		238	
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	196.91	236	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	195.19	234	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Copper	XRF	316.58	234	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	194.6	233	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Copper	XRF	194.01	233	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	193.97	233	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	193.5	232	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Copper	Lab		230	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Copper	XRF	191.75	230	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	189.93	228	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	189.31	227	
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Copper	XRF	188.08	226	
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	187.98	225	
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	187.87	225	
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	186.74	224	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Copper	XRF	186.36	224	
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Copper	XRF	302.46	223	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	186.1	223	
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Copper	XRF	301.51	223	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Copper	XRF	184.16	221	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Copper	XRF	298.38	220	
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Copper	XRF	297.66	220	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	183.05	220	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	181.44	218	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Copper	Lab		217	JM31

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	180.52	217	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	179.88	216	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Copper	XRF	290.37	215	
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Copper	XRF	289.42	214	
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	177.18	213	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	176.57	212	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	176.25	211	
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Copper	XRF	285.19	211	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	173.54	208	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	173.02	208	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	172.5	207	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Copper	XRF	278.89	206	
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	171.43	206	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Copper	XRF	171.11	205	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	169.8	204	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	168.83	202	
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Copper	XRF	167.8	201	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	167.69	201	
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	167.55	201	
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Copper	XRF	166.82	200	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	165.31	198	
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	163.64	196	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Copper	XRF	163.42	196	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	162.15	194	
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	162.11	194	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Copper	XRF	161.45	194	
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	160.48	192	
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	159.29	191	
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Copper	XRF	158	190	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	157.89	189	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	157.39	189	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Copper	Lab		188	J
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Copper	Lab		188	JM73
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Copper	XRF	156.29	187	
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	156.06	187	
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	155.7	187	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	154.53	185	
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	153.7	184	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Copper	Lab		184	JM73
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	153.3	184	
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	153.24	184	
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Copper	XRF	153.22	184	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	152.16	183	
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Copper	XRF	150.86	181	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	149.27	179	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Copper	Lab		178	J
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Copper	XRF	148	178	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	147.83	177	
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Copper	XRF	239.25	177	
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Copper	XRF	237.43	175	
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	143.72	172	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	143.69	172	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Copper	XRF	141.21	169	
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	140.78	169	
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Copper	XRF	140.11	168	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Copper	XRF	138.44	166	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Copper	XRF	136.95	164	
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	136.1	163	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Copper	XRF	134.63	161	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	132.12	158	
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Copper	XRF	213.53	158	
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	130.35	156	
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	129.89	156	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Copper	XRF	210.4	155	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Copper	XRF	128.58	154	
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	128.43	154	
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Copper	XRF	128	154	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Copper	XRF	127	152	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	126.88	152	
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	126.87	152	
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	123.11	148	
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	123.1	148	
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	122.79	147	
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	122.22	147	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Copper	XRF	121.56	146	
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	121.52	146	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	120.1	144	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Copper	XRF	120.02	144	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	119.19	143	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Copper	Lab		141	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	114.98	138	
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Copper	XRF	114.74	138	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Copper	XRF	183.94	136	
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	111.55	134	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	111.1	133	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Copper	Lab		133	J
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Copper	Lab		131	
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Copper	XRF	108.7	130	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Copper	XRF	107.5	129	
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	107.24	129	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	107.19	129	
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	106.17	127	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Copper	Lab		127	JM31
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	105.6	127	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Copper	XRF	105.58	127	
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Copper	XRF	168.9	125	
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	103.48	124	
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	103.02	124	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Copper	Lab		123	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Copper	Lab		123	J
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	99.63	119	
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	99.42	119	
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	99.16	119	
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Copper	XRF	98.87	119	
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Copper	XRF	98.83	119	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	98.56	118	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Copper	Lab		118	JM73
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	97.85	117	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	94.63	113	
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	92.86	111	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	91.5	110	
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	90.99	109	
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	90.06	108	
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Copper	XRF	89.44	107	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Copper	XRF	144.93	107	
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	88.46	106	
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	87.44	105	
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Copper	XRF	86.72	104	
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	86.2	103	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Copper	XRF	84.16	101	
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	83.74	100	
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	83.17	100	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Copper	XRF	83	100	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	81.26	97	
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Copper	XRF	81.12	97	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Copper	XRF	79.7	96	
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	79.64	96	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	79.29	95	
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	78.5	94	
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	77.29	93	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	76.55	92	
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	76.28	91	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Copper	XRF	76	91	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Copper	XRF	122.19	90	
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	73.96	89	
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Copper	XRF	116.91	86	
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	71.3	86	
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Copper	Lab		85	JM73
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	69.6	83	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Copper	Lab		83	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	66.6	80	
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	66.41	80	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	65.9	79	
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	64.4	77	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	64.36	77	
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Copper	XRF	104.23	77	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	62.02	74	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Copper	Lab		74	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Copper	Lab		73	
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Copper	XRF	94.63	70	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Copper	Lab		70	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Copper	XRF	57.4	69	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	57.24	69	
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	55.82	67	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Copper	Lab		66	
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	52.26	63	
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Copper	XRF	50.85	61	
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Copper	XRF	50.18	60	
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Copper	XRF	45.78	55	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Copper	XRF	67.5	50	
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Copper	XRF	41.26	49	
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Copper	XRF	37	44	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	36.16	43	
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Copper	XRF	31.18	37	
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	201202.58	201203	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	182321.33	182321	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	173311.94	173312	
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	163908.13	163908	
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	149286.45	149286	
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Iron	XRF	144866.55	144867	
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	144128.05	144128	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Iron	XRF	129872.28	129872	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	123587.43	123587	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	123068.8	123069	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	122263.52	122264	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	120471.47	120471	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	119327.99	119328	
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	117652.57	117653	
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	106463.85	106464	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	105679.86	105680	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	105555.53	105556	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	102702.27	102702	
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	102038.8	102039	
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	101300.84	101301	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	101199.68	101200	
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Iron	XRF	100932.77	100933	
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	99666.63	99667	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	99549.42	99549	
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	99240.13	99240	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	98489.16	98489	
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	96506.27	96506	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	96201.8	96202	
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Iron	XRF	148501.84	95858	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Iron	XRF	147908.72	95475	
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	94590.21	94590	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	94585.44	94585	
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Iron	XRF	94350.59	94351	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	94124.91	94125	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Iron	XRF	143373.09	92547	
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Iron	XRF	89952.9	89953	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	89466.93	89467	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	89447.77	89448	
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	89411.81	89412	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	89409.3	89409	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Iron	Lab		89200	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	88026	88026	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	87349.92	87350	
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	87203.71	87204	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	87134.03	87134	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	85966.1	85966	
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Iron	XRF	131689.7	85006	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	83919.88	83920	
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	83235.52	83236	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Iron	XRF	128668.26	83055	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	82466.02	82466	
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	82178.23	82178	
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	81680.13	81680	
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Iron	XRF	81194.05	81194	
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	81026.39	81026	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	80916.92	80917	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	80870.24	80870	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Iron	XRF	80680.65	80681	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Iron	Lab		80500	
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Iron	Lab		80417	
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	80147.04	80147	
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	80024.82	80025	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	79611.2	79611	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	79544.09	79544	
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Iron	XRF	123175.05	79509	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	79303.23	79303	
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	79193.29	79193	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Iron	Lab		78800	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Iron	XRF	77697.92	77698	
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	77145.36	77145	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Iron	XRF	119458.11	77110	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	76967.59	76968	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Iron	XRF	119106.18	76883	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	76050.57	76051	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Iron	XRF	75834.41	75834	
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Iron	XRF	75558.52	75559	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	75408.95	75409	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	74921.03	74921	
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	74522.2	74522	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Iron	Lab		74386	
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Iron	XRF	74368.89	74369	
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Iron	XRF	115025.57	74249	
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	74194.39	74194	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Iron	Lab		73861	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	73567.61	73568	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	73274.38	73274	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	73179.26	73179	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Iron	XRF	112003.21	72298	
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Iron	XRF	111803.07	72169	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	71543.39	71543	
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	71193.38	71193	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	71036.03	71036	
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	70564.99	70565	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Iron	XRF	109309.01	70559	
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	70525.73	70526	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	70477.28	70477	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Iron	XRF	108697.66	70164	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	69947.83	69948	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	69904.97	69905	
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Iron	XRF	107821.38	69599	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Iron	XRF	106902.78	69006	
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	68977.8	68978	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	68878.15	68878	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Iron	Lab		68469	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	68467.45	68467	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	68439.65	68440	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	68364.45	68364	
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Iron	XRF	68289.68	68290	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Iron	XRF	105216.28	67917	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Iron	XRF	67815.13	67815	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	67231.92	67232	
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Iron	XRF	104098.36	67195	
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	66800.68	66801	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Iron	XRF	66392.2	66392	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Iron	Lab		66365	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	66138.01	66138	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Iron	Lab		66000	
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	65885.85	65886	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	65462.8	65463	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Iron	XRF	100527.91	64891	
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	64589.9	64590	
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Iron	XRF	64314.1	64314	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	64208.05	64208	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Iron	XRF	63977.57	63978	
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	63722.77	63723	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Iron	Lab		63677	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	63445.57	63446	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Iron	Lab		63300	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	63082.65	63083	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Iron	XRF	97114.7	62688	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	62248.19	62248	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Iron	XRF	62240.47	62240	
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	62177.36	62177	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Iron	XRF	96243.47	62125	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Iron	XRF	96023.54	61983	
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	61727.19	61727	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Iron	XRF	61361.74	61362	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	61227.13	61227	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Iron	XRF	61203.77	61204	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	61201.55	61202	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	61110	61110	
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Iron	XRF	94387.7	60927	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Iron	XRF	94139.66	60767	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	60427.34	60427	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	60343.97	60344	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Iron	XRF	93356.71	60262	
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	60094.91	60095	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	60048.89	60049	
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Iron	XRF	92571.95	59755	
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	59219	59219	
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Iron	XRF	91090.32	58799	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	57871.5	57872	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Iron	XRF	57716.9	57717	
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Iron	XRF	88607.13	57196	
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Iron	XRF	57010.96	57011	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Iron	Lab		56994	
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Iron	XRF	56933.51	56934	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	56771.73	56772	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Iron	XRF	87819.98	56688	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Iron	Lab		56552	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	56158.4	56158	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Iron	XRF	56084.38	56084	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Iron	XRF	86842.93	56057	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Iron	XRF	86692.41	55960	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	55784.01	55784	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	55685.36	55685	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	55347.01	55347	
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	54933.39	54933	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Iron	XRF	54828.24	54828	
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	54600.13	54600	
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	54307.73	54308	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Iron	XRF	53906.48	53906	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Iron	XRF	53785.61	53786	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Iron	Lab		53727	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	53648.51	53649	
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	53527.23	53527	
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Iron	XRF	82790.72	53441	
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Iron	XRF	82575.35	53302	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Iron	XRF	53163.46	53163	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	53148.98	53149	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	52850.21	52850	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Iron	XRF	52233.98	52234	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	51858.83	51859	
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Iron	XRF	51528.87	51529	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	51516.42	51516	
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	51495.34	51495	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Iron	XRF	51329.66	51330	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	51049.03	51049	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	50871.08	50871	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	50861.95	50862	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	50573.15	50573	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	50498.09	50498	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Iron	XRF	78086.88	50405	
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	50092.22	50092	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Iron	Lab		50000	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	49639.57	49640	
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	49508.59	49509	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	49479.66	49480	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	49313.34	49313	
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	49146.76	49147	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	49113.25	49113	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	48983.8	48984	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	48877.88	48878	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Iron	XRF	48845.83	48846	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	48776.36	48776	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Iron	Lab		48562	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	48145.24	48145	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	47771.95	47772	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Iron	XRF	47769.66	47770	
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Iron	XRF	73915.59	47713	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	47612.28	47612	
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	47480.16	47480	
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	47422.37	47422	
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	47362.05	47362	
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	47076.09	47076	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Iron	Lab		46644	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Iron	XRF	45699.88	45700	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	45639.89	45640	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Iron	Lab		45448	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Iron	XRF	45421.72	45422	
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	45392.96	45393	
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	45381.7	45382	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	45103.05	45103	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	44801.41	44801	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	44766.59	44767	
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Iron	XRF	44666.1	44666	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Iron	XRF	44442.73	44443	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	44441.57	44442	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	44367.87	44368	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Iron	XRF	44278.66	44279	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Iron	XRF	44071.7	44072	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	43815.69	43816	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	43609.91	43610	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Iron	XRF	66964.66	43226	
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	43209.01	43209	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	43068.36	43068	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	42965.69	42966	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Iron	Lab		42887	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	42644	42644	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	42343.3	42343	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	42314.22	42314	
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Iron	XRF	65299.59	42151	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	41793.28	41793	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	41721.08	41721	
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	41228.91	41229	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Iron	XRF	41166.38	41166	
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	41091.56	41092	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	41060.57	41061	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Iron	Lab		40904	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	40787.42	40787	
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Iron	Lab		39743	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	39720.71	39721	
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	39474.94	39475	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	39439.38	39439	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	38813.73	38814	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Iron	XRF	38561.9	38562	
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	38321.18	38321	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Iron	Lab		38158	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Iron	Lab		38145	
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	38133.99	38134	
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	37797.98	37798	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Iron	XRF	57733.19	37267	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	37170.14	37170	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	37077.14	37077	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	36768.56	36769	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	36752.48	36752	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Iron	XRF	36663.54	36664	
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Iron	XRF	36649.07	36649	
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	36413.82	36414	
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	36326.56	36327	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	36235.25	36235	
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Iron	XRF	36202.1	36202	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	35829.04	35829	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	35555.62	35556	
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Iron	XRF	54943.19	35466	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	35429.17	35429	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Iron	XRF	35319.9	35320	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Iron	XRF	35040.17	35040	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Iron	Lab		34993	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	34969.47	34969	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	34951.38	34951	
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Iron	XRF	34920.95	34921	
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Iron	XRF	34442.65	34443	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	34422.46	34422	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Iron	Lab		34400	
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Iron	XRF	34037.7	34038	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	34036.61	34037	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Iron	XRF	34014.22	34014	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	33975.06	33975	
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Iron	XRF	52393.96	33820	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	33545.93	33546	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	33520.24	33520	
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Iron	XRF	33191.55	33192	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	33096.13	33096	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	32609.67	32610	
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	32597.78	32598	
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	32571.46	32571	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	32443.17	32443	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Iron	XRF	32411.52	32412	
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	32316.83	32317	
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	31493.15	31493	
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	31121.22	31121	
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	31112.26	31112	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Iron	XRF	48009.55	30990	
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Iron	XRF	47680.77	30778	
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	30568.15	30568	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	30287.28	30287	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	30119.97	30120	
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	30038.21	30038	
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Iron	XRF	30010.2	30010	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Iron	XRF	46450.82	29984	
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	29888.81	29889	
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Iron	XRF	29617.83	29618	
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	29367.47	29367	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Iron	Lab		29300	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Iron	XRF	29293.48	29293	
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	29291.76	29292	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	29205.6	29206	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	29067.37	29067	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	29062.63	29063	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	28949.03	28949	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	28926.1	28926	
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	28895.46	28895	
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Iron	XRF	44627.38	28807	
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	28696.16	28696	
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Iron	XRF	44245.8	28561	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Iron	XRF	44175.79	28515	
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Iron	XRF	28511.05	28511	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	28418.2	28418	
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	28264.25	28264	
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Iron	XRF	43771.99	28255	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	27682.9	27683	
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Iron	XRF	42872.83	27674	
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	27664.14	27664	
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Iron	XRF	42832.48	27648	
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	27635.65	27636	
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	27520.57	27521	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	27376.67	27377	
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	27334.15	27334	
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	27306.43	27306	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Iron	XRF	27218.23	27218	
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	27177.63	27178	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Iron	XRF	27166.68	27167	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	26871.76	26872	
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Iron	XRF	41372.39	26706	
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	26705.24	26705	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	26555.77	26556	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Iron	XRF	41101.99	26531	
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	26499.3	26499	
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	26209.8	26210	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	26143.47	26143	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Iron	XRF	25945.06	25945	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	25799.36	25799	
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Iron	XRF	39705.68	25630	
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	25614.16	25614	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Iron	XRF	25495.27	25495	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Iron	XRF	39443.88	25461	
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Iron	XRF	39305.8	25372	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Iron	XRF	25251.81	25252	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	25099.54	25100	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	24937.12	24937	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Iron	XRF	24929.29	24929	
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	24924.88	24925	
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	24818.13	24818	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Iron	XRF	38262.61	24699	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	24593.81	24594	
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	24543.47	24543	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	24228.55	24229	
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	24118.28	24118	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	23843.7	23844	
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	23830.6	23831	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Iron	Lab		23700	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Iron	XRF	23682.3	23682	
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	23607.73	23608	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Iron	Lab		23400	
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	23391.16	23391	
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	23291.22	23291	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Iron	XRF	22781.46	22781	
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	22599.25	22599	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Iron	XRF	22566.37	22566	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Iron	XRF	22507.8	22508	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	22494.97	22495	
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	22455.02	22455	
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Iron	XRF	22399.66	22400	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	21845.12	21845	
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Iron	XRF	21649.11	21649	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	21616.49	21616	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Iron	XRF	21522.15	21522	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	21297.1	21297	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Iron	XRF	21258.5	21259	
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Iron	XRF	21186.73	21187	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	21179.54	21180	
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	21042.32	21042	
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	20772.21	20772	
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	20644.7	20645	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	20458.82	20459	
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	20437.26	20437	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	20377.93	20378	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	19977.27	19977	
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	19913.61	19914	
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	19887.68	19888	
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	19865.55	19866	
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	19687.3	19687	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Iron	XRF	19589	19589	
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	19579.67	19580	
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	19382.28	19382	
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	19142.46	19142	
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	18790.34	18790	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	18733.2	18733	
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	18701.46	18701	
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	18335.55	18336	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Iron	XRF	18327.55	18328	
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Iron	XRF	18021.14	18021	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	17734.45	17734	
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	17709.87	17710	
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	17175.37	17175	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Iron	Lab		16900	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	16895.21	16895	
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Iron	XRF	16859.22	16859	
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	16804.48	16804	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	16753.8	16754	
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	16652.27	16652	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	16412.08	16412	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Iron	XRF	16400.1	16400	
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	15854.9	15855	
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Iron	XRF	15667.58	15668	
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	15563.15	15563	
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	15508.6	15509	
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	15038.88	15039	
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Iron	XRF	14400.74	14401	
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Iron	XRF	13868.28	13868	
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Iron	XRF	12249.98	12250	
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	12138.93	12139	
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	11476.02	11476	
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Iron	XRF	8916.89	8917	
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Iron	XRF	8558.08	8558	
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	7855.8	7856	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Lead	XRF	38272.45	38839	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Lead	Lab		36100	
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Lead	XRF	34253.09	34760	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	26470.24	32950	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Lead	Lab		31700	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	23489.36	29240	
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Lead	XRF	28280.12	28699	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Lead	XRF	27676.08	28086	
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Lead	Lab		27700	
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Lead	XRF	21759.55	27086	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Lead	Lab		25400	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	13398.91	16679	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Lead	Lab		16500	
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	12764.57	15889	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Lead	Lab		15400	J

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	12254.56	15254	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Lead	Lab		14400	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Lead	Lab		14400	
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Lead	XRF	11328.4	14102	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Lead	Lab		12600	
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	9996.43	12444	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	9658.18	12023	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Lead	Lab		11900	J
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Lead	Lab		11800	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Lead	XRF	8804.76	10960	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Lead	XRF	8799.84	10954	
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	8704.79	10836	
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	8583.87	10685	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Lead	XRF	10113.38	10263	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	8164.14	10163	
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	7213.83	8980	
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Lead	XRF	6520.09	8116	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Lead	XRF	6356.76	7913	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	6230.34	7756	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Lead	Lab		7380	
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Lead	XRF	6960.74	7064	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Lead	XRF	6934.53	7037	
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	5023.64	6253	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	4728.84	5886	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	4602.45	5729	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Lead	XRF	4206.52	5236	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	4140.92	5155	
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Lead	XRF	4751.45	4822	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Lead	XRF	4535.64	4603	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	3596.13	4476	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	3485.39	4339	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	3367.38	4192	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	3357.1	4179	
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	3254.74	4052	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	3188.48	3969	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Lead	Lab		3960	J
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Lead	Lab		3950	J
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	3104.82	3865	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Lead	XRF	3020.51	3760	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Lead	XRF	2997.69	3732	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Lead	XRF	2988.56	3720	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Lead	Lab		3680	JM10
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	2905.39	3617	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	2862.04	3563	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	2858.47	3558	
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	2842.6	3538	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	2840.91	3536	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	2831.75	3525	
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Lead	XRF	2822.18	3513	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Lead	Lab		3390	J
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	2715.97	3381	
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Lead	XRF	3329.8	3379	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	2704.88	3367	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	2688.98	3347	
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	2666.37	3319	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Lead	Lab		3260	J
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Lead	XRF	3175.9	3223	
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	2555.23	3181	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Lead	Lab		3080	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	2468.14	3072	
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Lead	XRF	3003.06	3048	
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Lead	XRF	2980.73	3025	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Lead	XRF	2942.74	2986	
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	2396.22	2983	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	2379.34	2962	
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Lead	XRF	2891.03	2934	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Lead	XRF	2353.45	2930	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	2330.84	2901	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	2315.72	2883	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Lead	XRF	2287	2847	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	2278.72	2837	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	2266.23	2821	
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Lead	XRF	2225.06	2770	
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Lead	Lab		2760	J
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Lead	XRF	2676.11	2716	
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Lead	XRF	2631.27	2670	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Lead	XRF	2618.81	2658	
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	2116.98	2635	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Lead	Lab		2560	
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Lead	XRF	2521.2	2559	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Lead	XRF	2051.33	2553	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	2018	2512	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Lead	XRF	2475.37	2512	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Lead	Lab		2510	
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	2015.18	2508	
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Lead	XRF	2001.59	2492	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Lead	Lab		2490	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1987.72	2474	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Lead	XRF	1944.58	2421	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Lead	XRF	1938.67	2413	
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	1917.22	2387	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1895.94	2360	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Lead	XRF	2321.99	2356	
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Lead	XRF	1881.36	2342	
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	1858.91	2314	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Lead	XRF	1852.91	2307	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Lead	XRF	2250.79	2284	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Lead	XRF	2204.9	2238	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1781.14	2217	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1779.36	2215	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	1770.53	2204	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	1764.44	2196	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	1758.45	2189	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1751.65	2180	
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Lead	XRF	2143.9	2176	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Lead	XRF	2134.05	2166	
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Lead	XRF	2123.98	2155	
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	1731.16	2155	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1722.93	2145	
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1715.24	2135	
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	1700.3	2117	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Lead	XRF	2065.01	2096	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1626.17	2024	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1605.16	1998	
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1593.55	1984	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Lead	XRF	1954.32	1983	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Lead	Lab		1970	J
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1578.85	1965	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Lead	XRF	1928.83	1957	
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1570.29	1955	
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1553.67	1934	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Lead	XRF	1550.47	1930	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	1549.38	1929	
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1548.78	1928	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1544	1922	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	1541.1	1918	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1529	1903	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1528.85	1903	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Lead	XRF	1852.85	1880	
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1498.74	1866	
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	1479.3	1841	
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	1477.5	1839	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Lead	XRF	1788.77	1815	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1455.46	1812	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	1425.48	1774	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Lead	XRF	1421.68	1770	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Lead	XRF	1736.57	1762	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	1393	1734	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1377.1	1714	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Lead	Lab		1710	JM10
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Lead	XRF	1372.31	1708	
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	1365.89	1700	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1365.07	1699	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Lead	XRF	1365.01	1699	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Lead	XRF	1667.17	1692	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Lead	Lab		1680	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Lead	Lab		1670	
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1322.57	1646	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Lead	Lab		1640	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Lead	Lab		1630	J
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1291.74	1608	
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	1284.48	1599	
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Lead	XRF	1551.4	1574	
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	1259.1	1567	
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Lead	XRF	1540.06	1563	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1233.96	1536	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Lead	XRF	1508.56	1531	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	1198.64	1492	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Lead	XRF	1459.33	1481	
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1178.34	1467	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1165.52	1451	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	1164.15	1449	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1156.78	1440	
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	1147.33	1428	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Lead	XRF	1146.52	1427	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1146.16	1427	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Lead	Lab		1420	JM10
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1132.07	1409	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	1119.02	1393	
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	1113.98	1387	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Lead	XRF	1092.25	1360	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Lead	XRF	1090.75	1358	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	1084.65	1350	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	1081.13	1346	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1077.29	1341	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	1069.84	1332	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Lead	XRF	1284.86	1304	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	1033.66	1287	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	1014.57	1263	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Lead	XRF	1014.27	1263	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Lead	Lab		1260	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	1003.33	1249	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Lead	Lab		1220	J
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Lead	XRF	979.68	1220	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Lead	Lab		1200	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Lead	Lab		1170	
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	926.92	1154	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Lead	XRF	919.82	1145	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	917.05	1142	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Lead	Lab		1120	
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	890.89	1109	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Lead	XRF	888.73	1106	
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Lead	XRF	1068.45	1084	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Lead	Lab		1060	
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	822.27	1024	
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Lead	XRF	809.31	1007	
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Lead	XRF	804.79	1002	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	803.74	1000	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Lead	Lab		1000	J
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	795.42	990	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Lead	XRF	792.86	987	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	779.69	971	
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	778.34	969	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	776.21	966	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Lead	Lab		964	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Lead	Lab		931	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	703.41	876	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Lead	XRF	688.86	857	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Lead	XRF	678.76	845	
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	667.41	831	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	666.2	829	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Lead	Lab		822	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	648.58	807	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Lead	XRF	648.55	807	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Lead	XRF	630.8	785	
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	629.2	783	
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	622.51	775	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	621.75	774	
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	619.85	772	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	608.81	758	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	597.07	743	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Lead	Lab		716	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	561.97	700	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	552.21	687	
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	547.67	682	
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Lead	XRF	546.41	680	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	542.98	676	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	539.44	671	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Lead	Lab		668	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Lead	Lab		666	J
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Lead	XRF	522.97	651	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	518.46	645	
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	518.02	645	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	481.52	599	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	474.77	591	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	468.4	583	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	453.14	564	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Lead	Lab		540	JM10
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Lead	XRF	432.6	539	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Lead	XRF	430.07	535	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	427.76	532	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Lead	XRF	423.9	528	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	422.52	526	
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	407.9	508	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Lead	Lab		498	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	396.16	493	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	390.83	487	
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	386.57	481	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Lead	XRF	376.4	469	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	373.4	465	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	371.1	462	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	370.9	462	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Lead	Lab		437	
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Lead	XRF	334.02	416	
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Lead	XRF	329.07	410	
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	327.95	408	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	323.9	403	
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	293.67	366	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Lead	Lab		361	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Lead	XRF	280.3	349	
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	273.11	340	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	271.91	338	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Lead	Lab		338	
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Lead	XRF	270.37	337	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	266.35	332	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Lead	XRF	262.03	326	
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Lead	XRF	257.98	321	
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Lead	XRF	253.53	316	
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	245.15	305	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	244.51	304	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	243.67	303	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Lead	Lab		291	J
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Lead	XRF	282.17	286	
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Lead	XRF	281.85	286	
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	226.95	283	
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	224.4	279	
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	215.54	268	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	214.54	267	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	214.14	267	
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	213.65	266	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	212.19	264	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Lead	XRF	209.14	260	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	208.02	259	
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	205.82	256	
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Lead	XRF	192.6	240	
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	191.56	238	
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	189.66	236	
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	185.4	231	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	185.15	230	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	183.29	228	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Lead	XRF	222.28	226	
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Lead	XRF	221.3	225	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Lead	XRF	180.3	224	
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	179.45	223	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	176.39	220	
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	175.19	218	
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	175.15	218	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Lead	XRF	170.67	212	
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Lead	XRF	170.6	212	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	170.39	212	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	165.6	206	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	165.41	206	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Lead	XRF	165.03	205	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	164.66	205	
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	160.56	200	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	157.99	197	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	156.97	195	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Lead	XRF	154.1	192	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	150.78	188	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	150.55	187	
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Lead	XRF	184.1	187	
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	148.88	185	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	146.12	182	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Lead	Lab		181	J
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Lead	Lab		180	JM10
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	143.04	178	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Lead	Lab		175	JM10
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	138.22	172	
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	137.86	172	
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	137.76	171	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	136.8	170	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Lead	Lab		170	J
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	135.8	169	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Lead	Lab		169	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	133.1	166	
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Lead	XRF	132.95	165	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Lead	Lab		165	J
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Lead	Lab		165	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Lead	XRF	131.67	164	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	130.98	163	
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	129.01	161	
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	128.7	160	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Lead	XRF	157.81	160	
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	128.1	159	
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	125.25	156	
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	124.06	154	
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Lead	XRF	151.17	153	
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Lead	XRF	150.3	153	
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	122.44	152	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Lead	Lab		152	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Lead	XRF	149.19	151	
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	121.33	151	
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	121.18	151	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Lead	XRF	148.35	151	
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	120	149	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Lead	Lab		147	JM10
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Lead	XRF	144.11	146	
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	117.04	146	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Lead	XRF	116.88	145	
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Lead	XRF	115.09	143	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Lead	XRF	140.88	143	
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	114.56	143	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Lead	XRF	139.15	141	
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	113.09	141	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	110.55	138	
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	109.67	137	
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	108.72	135	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Lead	XRF	108.5	135	
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	108.12	135	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Lead	XRF	107.9	134	
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	105.61	131	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	105.17	131	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	103.98	129	
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	100.81	125	
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	100.58	125	
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	100.13	125	
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	99.38	124	
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	98.82	123	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Lead	Lab		123	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	97.96	122	
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	97.19	121	
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	97.18	121	
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	96.79	120	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Lead	Lab		120	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	94.58	118	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	92.8	116	
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	92.65	115	
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Lead	XRF	92.25	115	
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	90.88	113	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Lead	Lab		111	
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Lead	XRF	88.93	111	
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	88.08	110	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	87.85	109	
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	87.66	109	
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	85.63	107	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Lead	Lab		106	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	84.55	105	
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	82.3	102	
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	82.27	102	
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	81.51	101	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	80.28	100	
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	79.68	99	
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	79.05	98	
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	77	96	
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Lead	XRF	76.26	95	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Lead	XRF	75.4	94	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	75.36	94	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	75.04	93	
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	73.67	92	
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	73.28	91	
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	71.73	89	
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	69.48	86	
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Lead	XRF	67.68	84	
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	66.29	83	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Lead	XRF	81.27	82	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Lead	XRF	65.8	82	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Lead	Lab		80	
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	64.42	80	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Lead	XRF	62.3	78	
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	61.93	77	
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Lead	XRF	61.47	77	
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	60.92	76	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Lead	XRF	58.49	73	
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Lead	XRF	54.77	68	
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Lead	XRF	66.28	67	
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	50.48	63	
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Lead	XRF	45.17	56	
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	45	56	
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Lead	Lab		51	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	37.56	47	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Lead	XRF	36.7	46	
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	35.19	44	
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	34.38	43	
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Lead	XRF	29.73	37	
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	27.2	34	
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	24125.57	15083	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	16270.3	10172	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	15887.5	9933	
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Manganese	XRF	19399.6	8840	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Manganese	Lab		7980	
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Manganese	Lab		7100	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Manganese	Lab		6890	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Manganese	XRF	14931.08	6804	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Manganese	Lab		6790	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Manganese	Lab		6740	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	10554.89	6599	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	10544.95	6593	
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Manganese	Lab		6550	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Manganese	Lab		6470	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Manganese	Lab		6410	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	10092.37	6310	
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Manganese	XRF	13829.55	6302	
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	9986.95	6244	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	9280.42	5802	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Manganese	Lab		5790	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	9125.91	5706	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Manganese	Lab		5690	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Manganese	XRF	12279.22	5596	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Manganese	Lab		5580	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	8684.76	5430	
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Manganese	XRF	11855.49	5403	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Manganese	Lab		5350	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Manganese	Lab		5340	
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	8469.79	5295	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	8443.04	5279	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Manganese	XRF	11544.75	5261	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	8379.43	5239	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Manganese	XRF	11364.72	5179	
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Manganese	XRF	11352.81	5173	
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Manganese	XRF	11333.23	5165	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	8125.24	5080	
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Manganese	XRF	11105.78	5061	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	8051.61	5034	
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	7989.94	4995	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Manganese	Lab		4780	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Manganese	XRF	10430.86	4753	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	7601.47	4752	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	7537.71	4713	
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	7438.63	4651	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	7236.47	4524	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Manganese	XRF	7172.72	4484	
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Manganese	XRF	9820.81	4475	
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	7069.93	4420	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Manganese	XRF	9488.39	4324	
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	6826.54	4268	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	6686.6	4180	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Manganese	Lab		4140	
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	6606.73	4131	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Manganese	Lab		4050	
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	6387.23	3993	
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	6384.85	3992	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	6368.11	3981	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Manganese	XRF	8507.53	3877	
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	5987.63	3743	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	5808.09	3631	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Manganese	Lab		3620	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	5785.47	3617	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Manganese	XRF	7912.82	3606	
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Manganese	XRF	5761.55	3602	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Manganese	Lab		3600	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	5748.56	3594	
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	5701.72	3565	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Manganese	Lab		3440	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Manganese	XRF	7331.2	3341	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	5159.58	3226	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	5066.42	3168	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Manganese	XRF	6949.84	3167	
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	5015.07	3135	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4859.08	3038	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4818.56	3013	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4810.68	3008	
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4784.69	2991	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Manganese	Lab		2940	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4670.15	2920	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4630.16	2895	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4606.88	2880	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Manganese	XRF	6252.26	2849	
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4494.9	2810	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4276.43	2674	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Manganese	Lab		2610	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Manganese	Lab		2610	
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4167.08	2605	
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Manganese	XRF	5656.26	2578	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Manganese	Lab		2560	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4036.23	2523	
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	3990.06	2495	
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Manganese	XRF	3911.45	2445	
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	3822.52	2390	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	3749.33	2344	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	3743.47	2340	
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Manganese	XRF	3717.41	2324	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Manganese	Lab		2230	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	3565.84	2229	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Manganese	Lab		2210	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	3533	2209	
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	3453.89	2159	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	3405.17	2129	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Manganese	XRF	4670.93	2129	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Manganese	XRF	3300.97	2064	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	3261.49	2039	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Manganese	Lab		2030	
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	3164.87	1979	
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	3128.2	1956	
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	3069.52	1919	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2987.2	1868	
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Manganese	XRF	4085.79	1862	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Manganese	XRF	3967.88	1808	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2865.56	1792	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Manganese	XRF	3916.26	1785	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Manganese	Lab		1770	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Manganese	Lab		1750	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2725.66	1704	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2695.65	1685	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Manganese	Lab		1680	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Manganese	Lab		1670	
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	2662.86	1665	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2657.24	1661	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2654.83	1660	
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2611.95	1633	
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Manganese	XRF	3573.21	1628	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2582.15	1614	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Manganese	Lab		1600	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Manganese	Lab		1580	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Manganese	XRF	2487	1555	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Manganese	Lab		1540	
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	2445.48	1529	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Manganese	XRF	3264.33	1488	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2378.49	1487	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2259.84	1413	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2255.26	1410	
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2222.53	1390	
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	2218.08	1387	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2166.36	1354	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2158.76	1350	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Manganese	Lab		1320	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Manganese	Lab		1290	
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	2056.66	1286	
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Manganese	XRF	2761.93	1259	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1994.3	1247	
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1968.2	1231	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1901.45	1189	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1880.21	1176	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1837.59	1149	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1831.87	1145	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Manganese	Lab		1130	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Manganese	Lab		1060	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1673.95	1047	
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1660.51	1038	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1659.77	1038	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1656.67	1036	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1655.49	1035	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1652.02	1033	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1553.82	971	
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1551.78	970	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Manganese	Lab		969	
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1548.95	968	
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1538.91	962	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1535.26	960	
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1518.19	949	
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1509.92	944	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Manganese	Lab		922	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1465.33	916	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1464.2	915	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1444.43	903	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1434.83	897	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1403.29	877	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1381.49	864	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1375.17	860	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1375.09	860	
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1368.57	856	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1351.62	845	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Manganese	Lab		842	JM21
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1334.68	834	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1332.18	833	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Manganese	Lab		832	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1313.55	821	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Manganese	Lab		810	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1289.07	806	
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1286.58	804	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1277.86	799	
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Manganese	XRF	1271	795	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Manganese	Lab		789	
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1258.55	787	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1258.18	787	
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Manganese	XRF	1723.26	785	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Manganese	Lab		784	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1244.66	778	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1242.41	777	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1238.99	775	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1227.23	767	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1214.87	760	
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1203.67	753	
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1193.93	746	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1191.08	745	
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1181.81	739	
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1169.61	731	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1166.95	730	
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1163.37	727	
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1143.5	715	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1129.04	706	
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1127.85	705	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Manganese	XRF	1541.68	703	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Manganese	Lab		688	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1097.41	686	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1089.45	681	
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1075.94	673	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1073.24	671	
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1067.54	667	
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1064.53	666	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Manganese	XRF	1437.81	655	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Manganese	XRF	1436.25	654	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1046.75	654	
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1031.58	645	
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Manganese	XRF	1409.36	642	
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1011.7	633	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Manganese	XRF	995	622	
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	990.56	619	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	989.39	619	
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Manganese	Lab		616	
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	983.84	615	
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	981.07	613	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	980.99	613	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	976.85	611	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Manganese	XRF	974	609	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	973.28	608	
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	967.41	605	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	966.97	605	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	958.27	599	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	957.48	599	
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Manganese	XRF	957.27	598	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Manganese	Lab		596	
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	951.66	595	
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	949.76	594	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	947.49	592	
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	944.07	590	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Manganese	Lab		586	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	936.08	585	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Manganese	Lab		585	
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	930.83	582	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	930.4	582	
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	929.38	581	
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	925.79	579	
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Manganese	XRF	922	576	
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Manganese	XRF	1262.79	575	
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Manganese	XRF	1259.33	574	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	907.94	568	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	905.62	566	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	904.75	566	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Manganese	XRF	902	564	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Manganese	XRF	893.68	559	
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Manganese	XRF	884	553	
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	883.13	552	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	878.7	549	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	870.74	544	
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	865.35	541	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	865.03	541	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Manganese	XRF	862.7	539	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Manganese	Lab		538	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	859.55	537	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	854.87	534	
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	852.65	533	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	846.69	529	
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Manganese	XRF	843.42	527	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Manganese	XRF	838.78	524	
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	829.09	518	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Manganese	XRF	828	518	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Manganese	Lab		516	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Manganese	Lab		514	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Manganese	Lab		513	
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Manganese	XRF	1122.84	512	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	810	506	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	806.61	504	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	803.11	502	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Manganese	XRF	1097.38	500	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	797.15	498	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Manganese	XRF	1091.82	498	
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Manganese	XRF	791.45	495	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	786.61	492	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Manganese	XRF	785.1	491	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	785.02	491	
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Manganese	XRF	1075.63	490	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	783.81	490	
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	779.19	487	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	776.07	485	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	765.48	479	
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	762.62	477	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	762.32	477	
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	749.82	469	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Manganese	XRF	749.77	469	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Manganese	XRF	748.7	468	
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	745.62	466	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	736.05	460	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Manganese	XRF	1008.78	460	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	734.58	459	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	733.98	459	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Manganese	XRF	728	455	
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	721.63	451	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	713.58	446	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Manganese	XRF	704.95	441	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	698.72	437	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Manganese	XRF	698	436	
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	684.82	428	
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	679.13	425	
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	671.89	420	
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	665.14	416	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Manganese	XRF	664.38	415	
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	658.11	411	
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Manganese	XRF	898.51	409	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	650.34	407	
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	649.96	406	
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Manganese	XRF	888.08	405	
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	639.52	400	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Manganese	XRF	625.82	391	
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	620.79	388	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	619.91	388	
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	617.4	386	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	613.11	383	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	602.57	377	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Manganese	XRF	598	374	
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	589.71	369	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Manganese	Lab		368	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	588.38	368	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	567.06	355	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	565.89	354	
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	563.22	352	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Manganese	XRF	559.43	350	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Manganese	XRF	557.77	349	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Manganese	XRF	554.86	347	
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Manganese	XRF	758.16	345	
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Manganese	XRF	551.72	345	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	534.25	334	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	533.21	333	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Manganese	XRF	716.86	327	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	509.89	319	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	493.58	309	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	488.76	306	
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	480.19	300	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Manganese	Lab		298	
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Manganese	XRF	639.68	292	
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	457.95	286	
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Manganese	XRF	619.29	282	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Manganese	Lab		276	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Manganese	Lab		270	
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Manganese	XRF	431.4	270	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Manganese	XRF	586.2	267	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	422.44	264	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Manganese	XRF	567.17	258	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Manganese	XRF	386	241	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	384.72	241	
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	379.16	237	U
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	377.7	236	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Manganese	XRF	376.49	235	
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	376.17	235	
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	367.4	230	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	365.37	228	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	364.06	228	
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Manganese	XRF	339.04	212	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Manganese	XRF	337.61	211	
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Manganese	XRF	330.76	207	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	329.81	206	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Manganese	Lab		204	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	324.11	203	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Manganese	XRF	319.11	200	
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Manganese	XRF	315.97	198	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Manganese	XRF	431.17	196	
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	305.55	191	U
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	303.28	190	
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Manganese	XRF	407.49	186	
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Manganese	XRF	293.99	184	
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	286.63	179	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Manganese	Lab		178	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Manganese	XRF	277.25	173	
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Manganese	XRF	379.19	173	
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	275.11	172	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	273.97	171	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Manganese	Lab		171	
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	270.57	169	U
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	270.24	169	
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Manganese	XRF	270.23	169	U
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	264.37	165	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	261.53	164	
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Manganese	XRF	256.45	160	
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	249.19	156	U
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Manganese	XRF	246.91	154	
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	243.81	152	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	241.35	151	
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	239.23	150	U
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Manganese	XRF	236.91	148	
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	229.4	143	U
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	226.06	141	U
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	223.32	140	
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	220.71	138	
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Manganese	XRF	293.09	134	
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	209.62	131	U
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Manganese	XRF	204.03	128	U
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	202.94	127	U
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Manganese	XRF	202.9	127	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	202.87	127	U
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	196.48	123	U
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Manganese	XRF	266.87	122	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Manganese	XRF	185.43	116	U
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	184.33	115	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Manganese	XRF	174.97	109	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	171.9	107	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Manganese	XRF	203.33	93	
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	147.43	92	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Manganese	XRF	193.85	88	
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	139.9	87	
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	139.56	87	U
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	138.43	87	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Manganese	Lab		86	JM21
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	137.39	86	U
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	135.61	85	U
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Manganese	Lab		84	JM21
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Manganese	XRF	133.55	83	U
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Manganese	Lab		82	JM21
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	130.21	81	
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Manganese	XRF	129.95	81	U
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	128.81	81	U
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	123.73	77	U
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	115.11	72	U
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	114.89	72	U
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	113.84	71	U
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	111.71	70	U
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	111.56	70	U
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	110.04	69	U
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	108.89	68	U
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	105.12	66	U
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	99.41	62	U
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	98.06	61	U
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Manganese	XRF	97.87	61	U
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Manganese	XRF	90.74	57	U
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Manganese	XRF	83.71	52	U
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Manganese	XRF	75.38	47	U
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Manganese	XRF	81.68	37	
2	UBDT-TP-6 (12-24")	10/16/2007	1	2	Zinc	Lab		26000	JM31
2	UBDT-TP-6 (0-2")	10/16/2007	0	0.16666667	Zinc	Lab		24000	JM31
2	TP-FP-45(1.6-1.8)	10/1/2012	1.6	1.8	Zinc	XRF	24097	22714	
2	BREOT-N10-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	18327.25	20508	
2	UBDT-TP-1 (2-12")	10/17/2007	0.16666667	1	Zinc	Lab		17800	JM31
2	BREOT-N28-55 (0-6")	10/10/2007	0	0.5	Zinc	XRF	14964.78	16746	
2	BREOT-N29-30 (0-6")	10/10/2007	0	0.5	Zinc	XRF	13665.5	15292	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Zinc	Lab		14300	J
2	UBDT-TP-1 (0-2")	10/17/2007	0	0.16666667	Zinc	Lab		14200	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Zinc	Lab		13200	
2	BREOT-N26-50 (0-6")	10/10/2007	0	0.5	Zinc	XRF	11429.52	12790	
2	BREOT-N27-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	11285.22	12628	
2	BREOT-S14-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	11068.35	12385	
2	TP-FP-45A(0.5-1.0)	10/1/2012	0.5	1	Zinc	XRF	12953.72	12210	
2	TP-FP-44(0.7-1.0)	10/1/2012	0.7	1	Zinc	XRF	12487.33	11771	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S24-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	10498.43	11748	
2	BREOT-N13-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	10290.07	11515	
2	BREOT-N31+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	10115.01	11319	
2	BREOT-N15+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	9592.28	10734	
2	TP-FP-45(1.8-2.0)	10/1/2012	1.8	2	Zinc	XRF	10500.42	9898	
2	UBDT-TP-1 (12-24")	10/17/2007	1	2	Zinc	Lab		9470	
2	BREOT-S23-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	8416.19	9418	
2	BREOT-N25-50 (0-6")	10/10/2007	0	0.5	Zinc	XRF	7971.48	8920	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	0.7	Zinc	Lab		8690	
2	UBDT-TP-6 (2-12")	10/16/2007	0.16666667	1	Zinc	Lab		8640	JM31
2	BREOT-N23+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	7374.61	8252	
2	TP-FP-38A(0.5-1.0)	9/27/2012	0.5	1	Zinc	XRF	8625.54	8130	
2	BREOT-S11-12 (0-6")	10/8/2007	0	0.5	Zinc	XRF	7092.27	7936	
2	BREOT-N31-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	6523.66	7300	
2	BREOT-S12+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	6452.66	7221	
2	BREOT-S24-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	6368.59	7126	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	1.5	Zinc	Lab		6560	
2	BREOT-N26-75 (0-6")	10/10/2007	0	0.5	Zinc	XRF	5833.52	6528	
2	TP-FP-44A(0.0-0.7)	10/1/2012	0	0.7	Zinc	XRF	6228.06	5871	
2	BREOT-N30-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	5209.78	5830	
2	BREOT-S13-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	5154.71	5768	
2	BREOT-N10-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	4625.95	5176	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Zinc	Lab		5020	J
2	BREOT-S14+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	4443.9	4973	
2	BREOT-S42-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	4359.58	4878	
2	TP-FP-33(0.0-0.5)	9/24/2012	0	0.5	Zinc	XRF	5069.17	4778	
2	BREOT-S16+20 (0-6")	10/9/2007	0	0.5	Zinc	XRF	3869.97	4330	
2	TP-FP-48(0.0-0.4)	10/1/2012	0	0.4	Zinc	XRF	4489.57	4232	
2	BREOT-S26-40 (0-6")	10/10/2007	0	0.5	Zinc	XRF	3621.86	4053	
2	TP-FP-30(1.6-2.0)	9/19/2012	1.6	2	Zinc	XRF	4159.8	3921	
2	TP-FP-42(0.5-1.0)	9/27/2012	0.5	1	Zinc	XRF	4124.95	3888	
2	BREOT-N67-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	3379.49	3782	
2	UBDT-TP-2 (0-2")	10/17/2007	0	0.16666667	Zinc	Lab		3500	
2	BREOT-N67-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	3099.17	3468	
2	BREOT-S34-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	3059.99	3424	
2	UBDT-TP-2 (12-24")	10/17/2007	1	2	Zinc	Lab		3350	
2	BREOT-N22+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2993.38	3350	
2	BREOT-S28-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2980.96	3336	
2	BREOT-N36-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2974.94	3329	
2	BREOT-S37-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2958.26	3310	
2	TP-FP-49(0.7-1.2)	10/2/2012	0.7	1.2	Zinc	XRF	3452.56	3254	
2	TP-FP-41(0.5-0.8)	9/27/2012	0.5	0.8	Zinc	XRF	3449.56	3252	
2	BREOT-S12-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2904.55	3250	
2	BREOT-S13+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2886.53	3230	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S13-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2858.17	3198	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Zinc	Lab		3160	
2	TP-FP-45(1.2-1.6)	10/1/2012	1.2	1.6	Zinc	XRF	3264.95	3078	
2	TP-FP-30(0.8-1.0)	9/19/2012	0.8	1	Zinc	XRF	3248.98	3062	
2	BREOT-N15-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2709.06	3031	
2	BREOT-N27-30 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2635.83	2949	
2	BREOT-S36-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2619.57	2931	
2	UBDT-TP-4 (0-2")	10/16/2007	0	0.16666667	Zinc	Lab		2910	JM31
2	BREOT-N32-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2598.36	2908	
2	BREOT-N43-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2591.03	2899	
2	BREOT-S25-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2583.7	2891	
2	BREOT-N21-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2568.01	2874	
2	BREOT-S14-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	2558.11	2863	
2	BREOT-N26-25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2552.45	2856	
2	BREOT-S2-12.5 (0-6")	10/8/2007	0	0.5	Zinc	XRF	2539.69	2842	
2	BREOT-N55-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	2394.16	2679	
2	BREOT-N36+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2366.87	2649	
2	BREOT-S61-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	2339.82	2618	
2	BREOT-S41-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2296.9	2570	
2	BREOT-S62-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	2259.2	2528	
2	BREOT-N20-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	2243.01	2510	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Zinc	Lab		2490	J
2	BREOT-S35-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2205.73	2468	
2	BREOT-S40-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2125.03	2378	
2	UBDT-TP-2 (2-12")	10/17/2007	0.16666667	1	Zinc	Lab		2330	JM31
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Zinc	Lab		2230	
2	BREOT-S4-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1987.07	2224	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Zinc	Lab		2180	
2	BREOT-N24-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1925.8	2155	
2	BREOT-N17+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	1921.61	2150	
2	BREOT-N24+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1827.29	2045	
2	TP-FP-32(1.4-1.5)	9/24/2012	1.4	1.5	Zinc	XRF	2140.04	2017	
2	UBDT-TP-5 (0-2")	10/17/2007	0	0.16666667	Zinc	Lab		1980	JM31
2	BREOT-S23+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1763.01	1973	
2	BREOT-S12-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	1705.48	1908	
2	BREOT-S3-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1653.52	1850	
2	BREOT-N18-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	1599.79	1790	
2	BREOT-S19-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1589.57	1779	
2	BREOT-N28-110 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1554.62	1740	
2	TP-FP-43(1.2-1.4)	9/27/2012	1.2	1.4	Zinc	XRF	1795.01	1692	
2	TP-FP-50A(1.6-2.2)	10/3/2012	1.6	2.2	Zinc	XRF	1731.76	1632	
2	BREOT-S40-14 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1422.26	1592	
2	BREOT-N25-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1413.12	1581	
2	TP-FP-50(1.6-2.2)	10/2/2012	1.6	2.2	Zinc	XRF	1676.91	1581	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N19-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1409.23	1577	
2	TP-FP-47(0.1-0.3)	10/1/2012	0.1	0.3	Zinc	XRF	1615.89	1523	
2	UBDT-TP-5 (12-24")	10/17/2007	1	2	Zinc	Lab		1520	
2	BREOT-N40-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1356.23	1518	
2	BREOT-S39-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1330.47	1489	
2	BREOT-S25-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1322.52	1480	
2	BREOT-S11-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1300.42	1455	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Zinc	Lab		1440	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Zinc	Lab		1400	
2	BREOT-S30-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1205.32	1349	
2	BREOT-S33+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1188.03	1329	
2	BREOT-S39+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1186.81	1328	
2	BREOT-S42+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1138.94	1274	
2	BREOT-S38-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1130.16	1265	
2	BREOT-S31-5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1113.37	1246	
2	BREOT-N39-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1094.73	1225	
2	TP-FP-48A(1.0-1.5)	10/2/2012	1	1.5	Zinc	XRF	1298.64	1224	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Zinc	Lab		1220	
2	UBDT-TP-5 (2-12")	10/17/2007	0.16666667	1	Zinc	Lab		1200	JM31
2	BREOT-N32-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1062.19	1189	
2	BREOT-N49-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	1061.15	1187	
2	BREOT-S35+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1060.8	1187	
2	BREOT-S40+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1060.65	1187	
2	BREOT-S6-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1042.04	1166	
2	TP-FP-50A(0.5-1.0)	10/3/2012	0.5	1	Zinc	XRF	1199.36	1131	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0.4	Zinc	Lab		1130	
2	TP-FP-32(1.3-1.4)	9/24/2012	1.3	1.4	Zinc	XRF	1175.81	1108	
2	BREOT-N15-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	984.09	1101	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1.2	Zinc	Lab		1100	
2	TP-FP-50A(1.0-1.5)	10/3/2012	1	1.5	Zinc	XRF	1151.99	1086	
2	BREOT-N22-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	952.11	1065	
2	BREOT-S13+65 (0-6")	10/9/2007	0	0.5	Zinc	XRF	949.73	1063	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Zinc	Lab		1060	
2	TP-FP-52(1.0-1.5)	10/10/2012	1	1.5	Zinc	XRF	1109.43	1046	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Zinc	Lab		1040	J
2	BREOT-S29-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	916.43	1025	
2	BREOT-S36+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	899.24	1006	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Zinc	Lab		1000	
2	BREOT-N16-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	891.38	997	
2	UBDT-TP-4 (2-12")	10/16/2007	0.16666667	1	Zinc	Lab		988	JM31
2	BREOT-S26-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	870.32	974	
2	BREOT-S23-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	789.37	883	
2	BREOT-S41+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	784.54	878	
2	BREOT-S58-12 (0-6")	10/15/2007	0	0.5	Zinc	XRF	757.68	848	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-53(1.8-2.4)	10/10/2012	1.8	2.4	Zinc	XRF	896.61	845	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Zinc	Lab		820	
2	BREOT-N28-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	729.8	817	
2	BREOT-N47-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	723	809	
2	BREOT-N29+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	700.85	784	
2	BREOT-S33-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	697.13	780	
2	BREOT-N23-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	680.85	762	
2	TP-FP-54(1.8-2.4)	10/10/2012	1.8	2.4	Zinc	XRF	799.75	754	
2	BREOT-S44-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	669.67	749	
2	TP-FP-59(1.8-2.0)	10/15/2012	1.8	2	Zinc	XRF	776.13	732	
2	TP-FP-31(0.1-0.4)	9/19/2012	0.1	0.4	Zinc	XRF	767.86	724	
2	BREOT-N11-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	635.39	711	
2	BREOT-S12+60 (0-6")	10/9/2007	0	0.5	Zinc	XRF	628.49	703	
2	TP-FP-59(1.5-1.8)	10/15/2012	1.5	1.8	Zinc	XRF	737.34	695	
2	BREOT-N36-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	618.89	693	
2	BREOT-S60-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	612.29	685	
2	TP-FP-54(1.2-1.4)	10/10/2012	1.2	1.4	Zinc	XRF	711.82	671	
2	BREOT-S60-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	591.3	662	
2	BREOT-N31-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	586.17	656	
2	UBDT-TP-4 (12-24")	10/16/2007	1	2	Zinc	Lab		655	JM31
2	BREOT-S18-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	571.01	639	
2	BREOT-S22-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	552.33	618	
2	TP-FP-58A(0.1-0.3)	10/15/2012	0.1	0.3	Zinc	XRF	655.18	618	
2	BREOT-S46-40 (0-6")	10/12/2007	0	0.5	Zinc	XRF	551.67	617	
2	BREOT-S33-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	543.12	608	
2	TP-FP-37(0.5-1.0)	9/25/2012	0.5	1	Zinc	XRF	638.29	602	
2	BREOT-N18-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	522.43	585	
2	BREOT-S32+300 (0-6")	7/8/2008	0	0.5	Zinc	XRF	522.3	584	
2	BREOT-S37-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	520.65	583	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Zinc	Lab		581	
2	BREOT-N46+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	517.75	579	
2	TP-FP-58(0.1-0.3)	10/15/2012	0.1	0.3	Zinc	XRF	578.41	545	
2	BREOT-N11-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	485.28	543	
2	BREOT-N44-30 (0-6")	10/12/2007	0	0.5	Zinc	XRF	482.21	540	
2	TP-FP-59(0.2-0.4)	10/15/2012	0.2	0.4	Zinc	XRF	572.36	540	
2	BREOT-S7-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	479.35	536	
2	UBDT-TP-3 (2-12")	10/17/2007	0.16666667	1	Zinc	Lab		534	JM31
2	BREOT-S43-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	476.75	533	
2	BREOT-N35-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	476.49	533	
2	BREOT-N19-10 (0-6")	10/10/2007	0	0.5	Zinc	XRF	472.82	529	
2	BREOT-S36-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	470.67	527	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Zinc	Lab		523	
2	BREOT-S23+37.5 (0-6")	7/8/2008	0	0.5	Zinc	XRF	465.7	521	
2	BREOT-S45+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	458.52	513	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S16+75 (0-6")	7/8/2008	0	0.5	Zinc	XRF	456.2	510	
2	BREOT-S0-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	456.04	510	
2	BREOT-S11+63 (0-6")	10/8/2007	0	0.5	Zinc	Lab		504	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Zinc	Lab		499	J
2	BREOT-N46-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	444.26	497	
2	BREOT-S35-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	443.98	497	
2	BREOT-S43+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	441.68	494	
2	TP-FP-50(0.8-1.2)	10/2/2012	0.8	1.2	Zinc	XRF	521.7	492	
2	BREOT-N14+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	436.24	488	
2	BREOT-N17-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	434.23	486	
2	TP-FP-42A(0.5-0.8)	9/27/2012	0.5	0.8	Zinc	XRF	510.71	481	
2	BREOT-S32-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	428.19	479	
2	BREOT-S24+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	427.43	478	
2	BREOT-S17-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	420.72	471	
2	BREOT-N52-60 (0-6")	10/15/2007	0	0.5	Zinc	XRF	419.74	470	
2	BREOT-N44-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	419.4	469	
2	TP-FP-38B(0.5-1.0)	9/27/2012	0.5	1	Zinc	XRF	497.5	469	
2	TP-FP-30(0.5-0.8)	9/19/2012	0.5	0.8	Zinc	XRF	495.65	467	
2	BREOT-N22-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	413.84	463	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Zinc	Lab		462	
2	UBDT-TP-3 (0-2")	10/17/2007	0	0.16666667	Zinc	Lab		461	JM31
2	BREOT-S43-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	408.51	457	
2	BREOT-S32+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	406.65	455	
2	BREOT-S31-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	405.19	453	
2	TP-FP-49(1.7-2.4)	10/2/2012	1.7	2.4	Zinc	XRF	475.52	448	
2	BREOT-S11-63 (0-6")	10/8/2007	0	0.5	Zinc	XRF	400.17	448	
2	BREOT-S45-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	399.37	447	
2	BREOT-N11-125 (0-6")	10/9/2007	0	0.5	Zinc	XRF	398.8	446	
2	BREOT-N30+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	395.91	443	
2	TP-FP-41(0.3-0.7)	9/27/2012	0.3	0.7	Zinc	XRF	462.6	436	
2	BREOT-S21-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	386.01	432	
2	BREOT-N17-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	384.17	430	
2	TP-FP-54(0.6-1.0)	10/10/2012	0.6	1	Zinc	XRF	455.43	429	
2	BREOT-S6-12.5 (0-6")	10/8/2007	0	0.5	Zinc	XRF	382.85	428	
2	BREOT-S66-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	381.27	427	
2	BREOT-S45-6 (0-6")	10/11/2007	0	0.5	Zinc	XRF	379.02	424	
2	TP-FP-36(1.0-1.5)	9/24/2012	1	1.5	Zinc	XRF	449.5	424	
2	BREOT-N67+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	377.36	422	
2	TP-FP-46(1.0-1.5)	10/1/2012	1	1.5	Zinc	XRF	447.75	422	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Zinc	Lab		422	
2	BREOT-N16-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	376.59	421	
2	TP-FP-57(1.0-1.5)	10/15/2012	1	1.5	Zinc	XRF	444.7	419	
2	BREOT-S57-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	369.05	413	
2	BREOT-S46-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	368.02	412	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S27-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	367.11	411	
2	BREOT-N67+125 (0-6")	7/9/2008	0	0.5	Zinc	XRF	363	406	
2	BREOT-N23+115 (0-6")	7/8/2008	0	0.5	Zinc	XRF	362.5	406	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Zinc	Lab		400	
2	BREOT-S22+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	352.11	394	
2	BREOT-N59+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	351.54	393	
2	BREOT-S44-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	350.64	392	
2	BREOT-N45+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	349.68	391	
2	BREOT-S56-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	349.43	391	
2	BREOT-S0+25 (0-6")	10/8/2007	0	0.5	Zinc	XRF	349.15	391	
2	BREOT-N14-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	347.73	389	
2	BREOT-N34-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	346.9	388	
2	BREOT-S58-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	346.46	388	
2	BREOT-S46+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	346	387	
2	BREOT-N47+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	344.27	385	
2	BREOT-N49+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	341.71	382	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Zinc	Lab		381	J
2	BREOT-N45-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	338.5	379	
2	BREOT-S14+59 (0-6")	10/9/2007	0	0.5	Zinc	XRF	337.83	378	
2	TP-FP-56(0.3-0.7)	10/15/2012	0.3	0.7	Zinc	XRF	399.98	377	
2	BREOT-N51-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	336.24	376	
2	BREOT-S9-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	331.12	371	
2	BREOT-S63-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	330.92	370	
2	BREOT-N20-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	330.85	370	
2	BREOT-N58-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	328.9	368	
2	BREOT-S44+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	327.27	366	
2	BREOT-S42-25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	325.03	364	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Zinc	Lab		363	
2	BREOT-S8-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	321.27	360	
2	TP-FP-40(0.0-0.5)	9/27/2012	0	0.5	Zinc	XRF	381.05	359	
2	BREOT-N12-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	320.85	359	
2	BREOT-N60-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	315.5	353	
2	BREOT-N65-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	312.19	349	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Zinc	Lab		348	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Zinc	Lab		346	
2	BREOT-S30+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	307.76	344	
2	BREOT-N64+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	307.4	344	
2	BREOT-N18-25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	307.33	344	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Zinc	Lab		338	
2	BREOT-N15+50 (0-6")	7/9/2008	0	0.5	Zinc	XRF	301	337	
2	BREOT-N54-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	298.71	334	
2	BREOT-S25+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	298.39	334	
2	BREOT-S63-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	294.21	329	
2	BREOT-N64 (0-6")	10/16/2007	0	0.5	Zinc	XRF	292.59	327	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N57-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	291.39	326	
2	BREOT-N24+75 (0-6")	7/11/2008	0	0.5	Zinc	XRF	290.7	325	
2	BREOT-S2-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	290.36	325	
2	BREOT-S57-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	289.3	324	
2	TP-FP-34(0.0-0.6)	9/24/2012	0	0.6	Zinc	XRF	342.26	323	
2	TP-FP-57(0.0-0.5)	10/15/2012	0	0.5	Zinc	XRF	341.21	322	
2	BREOT-N20+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	286.82	321	
2	TP-FP-60(0.2-0.5)	10/15/2012	0.2	0.5	Zinc	XRF	339.97	320	
2	BREOT-N64-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	286.37	320	
2	BREOT-S21+25 (0-6")	10/9/2007	0	0.5	Zinc	Lab		320	
2	BREOT-S8+25 (0-6")	10/8/2007	0	0.5	Zinc	XRF	285.77	320	
2	BREOT-N48-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	282.63	316	
2	BREOT-S31+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	282.28	316	
2	BREOT-N63+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	274.29	307	
2	BREOT-S19-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	272.85	305	
2	BREOT-S26-12.5 (0-6")	10/10/2007	0	0.5	Zinc	XRF	269.12	301	
2	BREOT-N27+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	268.08	300	
2	TP-FP-58(1.3-1.6)	10/15/2012	1.3	1.6	Zinc	XRF	316.12	298	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	0.7	Zinc	Lab		297	
2	BREOT-N12+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	264.87	296	
2	BREOT-S1-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	263.49	295	
2	BREOT-N13+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	263.48	295	
2	BREOT-N53-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	261.47	293	
2	BREOT-N62+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	261.02	292	
2	BREOT-N66-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	256.9	287	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Zinc	Lab		284	JM73
2	BREOT-N62-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	251.83	282	
2	BREOT-S6+25 (0-6")	10/8/2007	0	0.5	Zinc	XRF	250.72	281	
2	BREOT-S26+37 (0-6")	10/10/2007	0	0.5	Zinc	XRF	248.41	278	
2	BREOT-N66+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	248.03	278	
2	BREOT-S0-12.5 (0-6")	10/8/2007	0	0.5	Zinc	XRF	247.57	277	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Zinc	Lab		276	J
2	BREOT-N59-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	244.14	273	
2	BREOT-S16-0 (0-6")	10/9/2007	0	0.5	Zinc	XRF	243.62	273	
2	BREOT-S34+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	239.82	268	
2	BREOT-S28-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	239.41	268	
2	BREOT-N45-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	237.58	266	
2	UBDT-TP-3 (12-24")	10/17/2007	1	2	Zinc	Lab		264	JM31
2	BREOT-S17-25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	233.77	262	
2	BREOT-S7-25 (0-6")	10/8/2007	0	0.5	Zinc	XRF	233.17	261	
2	BREOT-S29-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	230.37	258	
2	BREOT-S66-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	230.09	257	
2	BREOT-N55-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	229.41	257	
2	BREOT-N10+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	229.27	257	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S4+10 (0-6")	10/8/2007	0	0.5	Zinc	XRF	228.36	256	
2	BREOT-S65-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	228.17	255	
2	BREOT-N36+100 (0-6")	7/9/2008	0	0.5	Zinc	XRF	225.8	253	
2	BREOT-N44+55 (0-6")	10/11/2007	0	0.5	Zinc	XRF	225.63	252	
2	BREOT-N59-18 (0-6")	10/16/2007	0	0.5	Zinc	XRF	224.4	251	
2	BREOT-N38-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	220.84	247	
2	BREOT-N43+40 (0-6")	10/11/2007	0	0.5	Zinc	XRF	220.66	247	
2	BREOT-S28+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	220.08	246	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Zinc	Lab		246	
2	BREOT-N58-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	217.35	243	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Zinc	Lab		242	
2	BREOT-N64-20 (0-6")	10/16/2007	0	0.5	Zinc	XRF	214.43	240	
2	BREOT-N39-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	212.89	238	
2	BREOT-N58+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	212.21	237	
2	BREOT-S9 (0-6")	10/8/2007	0	0.5	Zinc	XRF	207.97	233	
2	BREOT-S32-6 (0-6")	10/10/2007	0	0.5	Zinc	XRF	206.88	231	
2	BREOT-N42-35 (0-6")	10/11/2007	0	0.5	Zinc	XRF	205.76	230	
2	BREOT-N22+150 (0-6")	7/8/2008	0	0.5	Zinc	XRF	204.7	229	
2	BREOT-S25-40 (0-6")	10/10/2007	0	0.5	Zinc	XRF	204.68	229	
2	BREOT-S57+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	203.95	228	
2	BREOT-N37-12.5 (0-6")	10/11/2007	0	0.5	Zinc	XRF	202.79	227	
2	BREOT-S18+25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	202.4	226	
2	BREOT-N43-0 (0-6")	10/12/2007	0	0.5	Zinc	XRF	201.76	226	
2	BREOT-N19+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	200.04	224	
2	TP-FP-34(1.2-1.7)	9/24/2012	1.2	1.7	Zinc	XRF	237.11	223	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Zinc	Lab		223	
2	BREOT-N31+75 (0-6")	7/9/2008	0	0.5	Zinc	XRF	198	222	
2	BREOT-S27+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	196.68	220	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Zinc	Lab		219	
2	BREOT-S63+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	193.9	217	
2	BREOT-S64-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	193.53	217	
2	BREOT-S3+6 (0-6")	10/8/2007	0	0.5	Zinc	XRF	193.15	216	
2	BREOT-S20-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	191.21	214	
2	BREOT-S51-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	190.66	213	
2	BREOT-N66-5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	189.89	212	
2	BREOT-S67-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	186.01	208	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Zinc	Lab		204	
2	BREOT-N57-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	178.39	200	
2	BREOT-S16-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	177.87	199	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Zinc	Lab		198	J
2	BREOT-N16-25 (0-6")	10/9/2007	0	0.5	Zinc	XRF	175.38	196	
2	BREOT-N40-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	169.12	189	
2	BREOT-S46-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	168.75	189	
2	BREOT-N52+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	167.71	188	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-N53+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	166.57	186	
2	BREOT-N51+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	166.35	186	
2	BREOT-S1-12.5 (0-6")	10/8/2007	0	0.5	Zinc	XRF	166.3	186	
2	BREOT-N35+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	156.6	175	
2	BREOT-S17-12.5 (0-6")	10/9/2007	0	0.5	Zinc	XRF	153.28	172	
2	TP-FP-51(1.5-2.0)	10/3/2012	1.5	2	Zinc	XRF	181.82	171	
2	BREOT-N26+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	152.98	171	
2	BREOT-S19+85 (0-6")	7/8/2008	0	0.5	Zinc	XRF	150.7	169	
2	BREOT-N32+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	148.97	167	
2	BREOT-S2+95 (0-6")	10/8/2007	0	0.5	Zinc	XRF	147.4	165	
2	BREOT-N55+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	146.57	164	
2	BREOT-N56+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	144.72	162	
2	BREOT-S8-12.5 (0-6")	10/8/2007	0	0.5	Zinc	XRF	144.55	162	
2	BREOT-N34+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	138.64	155	
2	TP-FP-31(1.0-1.8)	9/24/2012	1	1.8	Zinc	XRF	164.56	155	
2	BREOT-N33-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	137	153	
2	BREOT-S67-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	134.47	150	
2	BREOT-S51+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	133.95	150	
2	BREOT-N48+25 (0-6")	10/12/2007	0	0.5	Zinc	XRF	132.85	149	
2	BREOT-N46-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	127.57	143	
2	TP-FP-39(0.9-1.6)	9/27/2012	0.9	1.6	Zinc	XRF	150	141	
2	BREOT-N38-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	125.41	140	
2	BREOT-N57+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	124.54	139	
2	BREOT-N35-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	123.46	138	
2	BREOT-N62-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	121.08	135	
2	BREOT-S62+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	115.55	129	
2	BREOT-N41+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	115.25	129	
2	BREOT-N39+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	115.07	129	
2	BREOT-S47-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	114.45	128	
2	BREOT-N33+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	107.14	120	
2	BREOT-S47+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	105.83	118	
2	BREOT-S54-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	105.75	118	
2	BREOT-N25+25 (0-6")	10/10/2007	0	0.5	Zinc	XRF	104.64	117	
2	BREOT-N25-95 (0-6")	10/10/2007	0	0.5	Zinc	XRF	101.2	113	
2	BREOT-N41-0 (0-6")	10/10/2007	0	0.5	Zinc	XRF	96.8	108	
2	BREOT-S62-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	95.21	107	
2	BREOT-S53-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	94.89	106	
2	BREOT-S58+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	89.96	101	
2	BREOT-N38+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	84.05	94	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Zinc	Lab		92	
2	BREOT-S66+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	74.23	83	
2	BREOT-S55-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	67.73	76	
2	BREOT-N40+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	64.9	73	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Zinc	Lab		72	J

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	BREOT-S52-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	59.9	67	
2	BREOT-N42+25 (0-6")	10/11/2007	0	0.5	Zinc	XRF	57.58	64	
2	BREOT-S50-12.5 (0-6")	10/15/2007	0	0.5	Zinc	XRF	52.21	58	
2	BREOT-S64+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	50.83	57	U
2	BREOT-S64-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	47.68	53	U
2	BREOT-S60+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	44.25	50	U
2	BREOT-S67+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	42.86	48	U
2	BREOT-S65+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	42.31	47	U
2	BREOT-N42-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	41.49	46	
2	BREOT-S61+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	39.91	45	
2	BREOT-S54+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	39.77	45	
2	BREOT-S61-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	39.21	44	U
2	BREOT-S55+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	34.66	39	
2	BREOT-S56+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	33.43	37	U
2	BREOT-S48-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	31.35	35	U
2	BREOT-S49-2.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	31.2	35	U
2	BREOT-S50-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	29.64	33	U
2	BREOT-S53+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	28.78	32	U
2	BREOT-S48-12.5 (0-6")	10/12/2007	0	0.5	Zinc	XRF	28.74	32	U
2	BREOT-S49+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	28.5	32	U
2	BREOT-S52+25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	28.47	32	U
2	BREOT-S49-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	28.19	32	
2	BREOT-S53-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	26.9	30	U
2	BREOT-S50-25 (0-6")	10/15/2007	0	0.5	Zinc	XRF	26.22	29	U
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Zinc	Lab		29	JM73
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Zinc	Lab		29	JM73
2	BREOT-S50+25 (0-6")	10/15/2007	0	0.5	Zinc	Lab		28	JM73
2	BREOT-S52-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	23.87	27	U
2	BREOT-N52-0 (0-6")	10/15/2007	0	0.5	Zinc	XRF	21.6	24	U
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Aluminum	Lab		14900	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Aluminum	Lab		13500	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Aluminum	Lab		12500	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Aluminum	Lab		11100	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Aluminum	Lab		11100	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Aluminum	Lab		2850	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		1570	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	1250.57	923	
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	577.49	426	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		354	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	348.32	257	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		150	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	196.5	145	
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	110.45	82	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Arsenic	Lab		58	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Arsenic	Lab		52	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	48.4	36	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	47.68	35	U
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	37.17	27	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	29.2	22	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	24.6	18	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	19.2	14	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	15.9	12	U
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		3.0	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		3.0	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Cadmium	Lab		2.7	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Cadmium	Lab		1.1	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		1.0	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Cadmium	Lab		0.6	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Cadmium	Lab		0.5	U
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Copper	XRF	750.18	759	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Copper	Lab		529	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Copper	XRF	469.31	475	
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Copper	XRF	467.98	473	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Copper	Lab		462	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Copper	XRF	414.66	419	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Copper	XRF	406.88	412	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	Lab		361	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Copper	XRF	340.88	345	
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Copper	XRF	185.7	188	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Copper	Lab		166	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Copper	XRF	155	157	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Copper	Lab		130	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Copper	XRF	120	121	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Copper	XRF	106	107	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Copper	XRF	99	100	
3	CMWA-350+0 (0-6")	7/21/2008	0	0.5	Copper	XRF	91.33	92	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Copper	XRF	56.08	57	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Iron	XRF	225782.77	224789	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	Lab		194000	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Iron	XRF	94050.74	93637	
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Iron	XRF	79573.09	79223	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Iron	XRF	63127.3	62850	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Iron	Lab		51600	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Iron	XRF	49050.63	48835	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Iron	XRF	43766.41	43574	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Iron	Lab		40900	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Iron	Lab		34600	
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Iron	XRF	31842.34	31702	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Iron	XRF	31051.7	30915	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Iron	XRF	28691.6	28565	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Iron	XRF	26080.2	25965	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Iron	XRF	25048.86	24939	
3	CMWA-350+0 (0-6")	7/21/2008	0	0.5	Iron	XRF	25023.86	24914	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Iron	XRF	24716.2	24607	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Iron	XRF	21902.6	21806	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Lead	Lab		2270	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Lead	XRF	2554.66	2223	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	Lab		2140	
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Lead	XRF	1780.7	1549	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Lead	XRF	1311.73	1141	
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Lead	XRF	950.75	827	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Lead	XRF	808.93	704	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Lead	Lab		574	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Lead	Lab		476	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Lead	Lab		356	
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Lead	XRF	405.26	353	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Lead	XRF	401.4	349	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Lead	XRF	358.52	312	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Lead	XRF	292.1	254	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Lead	XRF	238.7	208	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Lead	XRF	206.8	180	
3	CMWA-350+0 (0-6")	7/21/2008	0	0.5	Lead	XRF	151.94	132	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Lead	XRF	144.2	125	
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1752.48	1458	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Manganese	Lab		1000	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Manganese	XRF	1165	969	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Manganese	XRF	940	782	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Manganese	Lab		741	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Manganese	Lab		712	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Manganese	XRF	803	668	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Manganese	XRF	710.14	591	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Manganese	XRF	418	348	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Manganese	XRF	408.38	340	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Manganese	Lab		258	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Manganese	XRF	291.04	242	U
3	CMWA-350+0 (0-6")	7/21/2008	0	0.5	Manganese	XRF	278.12	231	
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Manganese	XRF	267.37	222	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Manganese	XRF	236.21	196	
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Manganese	XRF	224.39	187	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	Lab		178	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Manganese	XRF	205.2	171	U
3	CMWA-100 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1834.58	1875	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Zinc	Lab		1230	
3	CMWA-50 (0-6")	10/8/2007	0	0.5	Zinc	XRF	1200.07	1226	
3	CMWA-00 (0-6")	10/8/2007	0	0.5	Zinc	XRF	791.94	809	
3	CMWA-150 (0-6")	10/8/2007	0	0.5	Zinc	XRF	647.9	662	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	Lab		628	
3	CMWA-300 (0-6")	10/8/2007	0	0.5	Zinc	XRF	575.73	588	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Zinc	Lab		475	
3	CMWA-150+12.5 (0-6")	7/16/2008	0	0.5	Zinc	XRF	342.8	350	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Zinc	Lab		343	
3	CMWA-100+12.5 (0-6")	7/16/2008	0	0.5	Zinc	XRF	242.2	248	
3	CMWA-50+12.5 (0-6")	7/16/2008	0	0.5	Zinc	XRF	211.1	216	
3	CMWA-350+0 (0-6")	7/21/2008	0	0.5	Zinc	XRF	175.14	179	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Zinc	Lab		132	
3	CMWA-300+25 (0-6")	7/16/2008	0	0.5	Zinc	XRF	124.7	127	
3	CMWA2-250 (0-6")	10/8/2007	0	0.5	Zinc	XRF	121.71	124	
3	CMWA-350 (0-6")	10/8/2007	0	0.5	Zinc	XRF	102.85	105	
3	CMWA-200 (0-6")	10/8/2007	0	0.5	Zinc	XRF	45.48	46	U
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		18800	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		16400	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		15000	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	66.33	49	U
4	CARM-100 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	40.97	30	U
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		28	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	38.28	28	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		28	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	36.39	27	U
4	CARM-150 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	35.72	26	U
4	CARM-550 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	35.43	26	U
4	CARM-200 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	35.15	26	U
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	34.1	25	U
4	CARM-300 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	33.14	24	U
4	CARM-250 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		24	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	32.38	24	U
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	31.87	24	U
4	CARM-600 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	31.33	23	U
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	31.15	23	U
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	27.1	20	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	26.31	19	
4	CARM-800 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	25.8	19	U
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	25.4	19	U
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	22.91	17	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	18.1	13	U
4	CARM-700 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	17.01	13	U
4	CARM-750 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	16.3	12	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Arsenic	XRF	15.97	12	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	12.29	9	U
4	CARM-650 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	10.6	8	U
4	CARM-850 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	10.26	8	U
4	CARM-500 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	8.61	6	U
4	CARM-400 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		11.1	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		9.5	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		8.9	
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		8.2	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		7.7	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		3.4	
4	CARM-800 (0-6")	10/16/2007	0	0.5	Copper	XRF	640.96	648	
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Copper	XRF	574.25	581	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Copper	XRF	570.97	578	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Copper	XRF	544	550	
4	CARM-600 (0-6")	10/16/2007	0	0.5	Copper	XRF	496.52	502	
4	CARM-300 (0-6")	10/15/2007	0	0.5	Copper	XRF	491.25	497	
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Copper	XRF	488.76	494	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Copper	XRF	486.84	492	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Copper	Lab		443	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Copper	Lab		439	
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Copper	XRF	431	436	
4	CARM-100 (0-6")	10/15/2007	0	0.5	Copper	XRF	412.71	417	
4	CARM-200 (0-6")	10/16/2007	0	0.5	Copper	XRF	391.3	396	
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Copper	XRF	386.34	391	
4	CARM-150 (0-6")	10/15/2007	0	0.5	Copper	XRF	376.92	381	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Copper	XRF	330.08	334	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Copper	Lab		324	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Copper	XRF	299.21	303	
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Copper	XRF	291	294	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Copper	XRF	268	271	
4	CARM-550 (0-6")	10/16/2007	0	0.5	Copper	XRF	215.84	218	
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Copper	XRF	169.63	172	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Copper	XRF	133.56	135	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Copper	XRF	114.51	116	
4	CARM-750 (0-6")	10/15/2007	0	0.5	Copper	XRF	95.42	97	
4	CARM-850 (0-6")	10/15/2007	0	0.5	Copper	XRF	93.68	95	
4	CARM-700 (0-6")	10/16/2007	0	0.5	Copper	XRF	80.49	81	
4	CARM-650 (0-6")	10/16/2007	0	0.5	Copper	XRF	32.62	33	U
4	CARM-500 (0-6")	10/16/2007	0	0.5	Copper	XRF	26.92	27	
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Iron	XRF	145052.41	144414	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Iron	XRF	127803.8	127241	
4	CARM-300 (0-6")	10/15/2007	0	0.5	Iron	XRF	120757.18	120226	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Iron	XRF	114508.66	114005	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Iron	XRF	113674.1	113174	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Iron	XRF	110609.64	110123	
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Iron	XRF	96673.06	96248	
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Iron	XRF	96279.74	95856	
4	CARM-100 (0-6")	10/15/2007	0	0.5	Iron	XRF	84306.55	83936	
4	CARM-800 (0-6")	10/16/2007	0	0.5	Iron	XRF	80370.27	80017	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Iron	XRF	79140.19	78792	
4	CARM-200 (0-6")	10/16/2007	0	0.5	Iron	XRF	77582.87	77242	
4	CARM-150 (0-6")	10/15/2007	0	0.5	Iron	XRF	73769.04	73444	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Iron	XRF	72423.84	72105	
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Iron	XRF	66945.55	66651	
4	CARM-600 (0-6")	10/16/2007	0	0.5	Iron	XRF	66433.4	66141	
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Iron	XRF	65860.2	65570	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Iron	XRF	60375.76	60110	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Iron	XRF	53484	53249	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Iron	XRF	40173	39996	
4	CARM-550 (0-6")	10/16/2007	0	0.5	Iron	XRF	40134.7	39958	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Iron	XRF	34525.38	34373	
4	CARM-750 (0-6")	10/15/2007	0	0.5	Iron	XRF	31405.64	31267	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Iron	XRF	22161.2	22064	
4	CARM-700 (0-6")	10/16/2007	0	0.5	Iron	XRF	20391.79	20302	
4	CARM-650 (0-6")	10/16/2007	0	0.5	Iron	XRF	15703.48	15634	
4	CARM-850 (0-6")	10/15/2007	0	0.5	Iron	XRF	15578.09	15510	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Iron	XRF	15133.63	15067	
4	CARM-500 (0-6")	10/16/2007	0	0.5	Iron	XRF	7014.35	6983	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Lead	XRF	2554.57	2223	
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Lead	XRF	619.1	539	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Lead	Lab		524	
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Lead	XRF	578.97	504	
4	CARM-100 (0-6")	10/15/2007	0	0.5	Lead	XRF	526.29	458	
4	CARM-550 (0-6")	10/16/2007	0	0.5	Lead	XRF	468.78	408	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Lead	Lab		405	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Lead	XRF	430.67	375	
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Lead	XRF	417.8	364	
4	CARM-150 (0-6")	10/15/2007	0	0.5	Lead	XRF	411.87	358	
4	CARM-200 (0-6")	10/16/2007	0	0.5	Lead	XRF	411.61	358	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Lead	XRF	351.3	306	
4	CARM-600 (0-6")	10/16/2007	0	0.5	Lead	XRF	343.45	299	
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Lead	XRF	326.74	284	
4	CARM-300 (0-6")	10/15/2007	0	0.5	Lead	XRF	311.93	271	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Lead	XRF	274.4	239	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Lead	XRF	271.8	236	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Lead	XRF	260.36	227	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Lead	Lab		226	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
4	CARM-800 (0-6")	10/16/2007	0	0.5	Lead	XRF	169.22	147	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Lead	XRF	146.1	127	
4	CARM-700 (0-6")	10/16/2007	0	0.5	Lead	XRF	108.24	94	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Lead	XRF	104.01	90	
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Lead	XRF	101.9	89	
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Lead	XRF	77.43	67	
4	CARM-850 (0-6")	10/15/2007	0	0.5	Lead	XRF	64.86	56	
4	CARM-750 (0-6")	10/15/2007	0	0.5	Lead	XRF	63.72	55	
4	CARM-650 (0-6")	10/16/2007	0	0.5	Lead	XRF	29.43	26	
4	CARM-500 (0-6")	10/16/2007	0	0.5	Lead	XRF	27.4	24	
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Manganese	XRF	17005.27	14145	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Manganese	XRF	13808	11485	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2216.93	1844	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Manganese	Lab		1460	
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Manganese	XRF	1744.76	1451	
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Manganese	XRF	1594.35	1326	
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Manganese	XRF	1591	1323	
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Manganese	XRF	1522	1266	
4	CARM-600 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1513.21	1259	
4	CARM-300 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1434.93	1194	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1378.57	1147	
4	CARM-100 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1343.94	1118	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Manganese	Lab		1100	
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Manganese	XRF	1280	1065	
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1215.88	1011	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Manganese	Lab		845	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1005.55	836	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Manganese	XRF	966.85	804	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Manganese	XRF	943.7	785	
4	CARM-200 (0-6")	10/16/2007	0	0.5	Manganese	XRF	928.25	772	
4	CARM-150 (0-6")	10/15/2007	0	0.5	Manganese	XRF	863.25	718	
4	CARM-800 (0-6")	10/16/2007	0	0.5	Manganese	XRF	760.81	633	
4	CARM-550 (0-6")	10/16/2007	0	0.5	Manganese	XRF	610.41	508	
4	CARM-700 (0-6")	10/16/2007	0	0.5	Manganese	XRF	557.43	464	
4	CARM-650 (0-6")	10/16/2007	0	0.5	Manganese	XRF	310.86	259	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Manganese	XRF	294.04	245	
4	CARM-750 (0-6")	10/15/2007	0	0.5	Manganese	XRF	291.13	242	
4	CARM-850 (0-6")	10/15/2007	0	0.5	Manganese	XRF	258.68	215	
4	CARM-500 (0-6")	10/16/2007	0	0.5	Manganese	XRF	126.71	105	
4	CARM-1050+6.25 (0-6")	7/10/2008	0	0.5	Zinc	XRF	814.9	833	
4	CARM-50+12.5 (0-6")	7/17/2008	0	0.5	Zinc	XRF	809.63	827	
4	CARM-100+25 (0-6")	7/10/2008	0	0.5	Zinc	XRF	762.6	779	
4	CARM-50 (0-6")	10/15/2007	0	0.5	Zinc	XRF	683.49	698	
4	CARM-100 (0-6")	10/15/2007	0	0.5	Zinc	XRF	599.57	613	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
4	CARM-200+25 (0-6")	7/10/2008	0	0.5	Zinc	XRF	561.7	574	
4	CARM-300 (0-6")	10/15/2007	0	0.5	Zinc	XRF	545.97	558	
4	CARM-150 (0-6")	10/15/2007	0	0.5	Zinc	XRF	540.32	552	
4	CARM-150+50 (0-6")	7/10/2008	0	0.5	Zinc	XRF	498.5	509	
4	CARM-COMP 1 (0-6")	10/15/2007	0	0.5	Zinc	XRF	466.13	476	
4	CARM-350 (0-6")	10/16/2007	0	0.5	Zinc	XRF	459.08	469	
4	CARM-600 (0-6")	10/16/2007	0	0.5	Zinc	XRF	398.32	407	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Zinc	Lab		399	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Zinc	Lab		384	
4	CARM-200 (0-6")	10/16/2007	0	0.5	Zinc	XRF	372.34	380	
4	CARM-1000 (0-6")	10/16/2007	0	0.5	Zinc	XRF	316.14	323	
4	CARM-1150+25 (0-6")	7/17/2008	0	0.5	Zinc	XRF	315.01	322	
4	CARM-00 (0-6")	10/16/2007	0	0.5	Zinc	XRF	305.74	312	
4	CARM-1100 (0-6")	10/15/2007	0	0.5	Zinc	XRF	294.74	301	
4	CARM-1050 (0-6")	10/15/2007	0	0.5	Zinc	XRF	273.63	280	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Zinc	Lab		260	
4	CARM-550 (0-6")	10/16/2007	0	0.5	Zinc	XRF	193.85	198	
4	CARM-700 (0-6")	10/16/2007	0	0.5	Zinc	XRF	171.31	175	
4	CARM-800 (0-6")	10/16/2007	0	0.5	Zinc	XRF	125.17	128	
4	CARM-950 (0-6")	10/15/2007	0	0.5	Zinc	XRF	104.28	107	
4	CARM-750 (0-6")	10/15/2007	0	0.5	Zinc	XRF	92.51	95	
4	CARM-850 (0-6")	10/15/2007	0	0.5	Zinc	XRF	77.1	79	
4	CARM-650 (0-6")	10/16/2007	0	0.5	Zinc	XRF	55.34	57	
4	CARM-500 (0-6")	10/16/2007	0	0.5	Zinc	XRF	35.2	36	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Aluminum	Lab		12200	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Aluminum	Lab		12100	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		85	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	37.58	28	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		28	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	37.33	28	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	35.5	26	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		25	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		22	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		21	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	27.73	20	
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	27.47	20	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	26.62	20	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	26.36	19	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		19	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	25.87	19	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Arsenic	Lab		19	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	24.17	18	U
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	24.04	18	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	23.98	18	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	23.63	17	U
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	23.36	17	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	23.31	17	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	22.69	17	U
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	22.61	17	U
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.62	16	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.58	16	U
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	21.38	16	U
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	20.96	15	
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	20.5	15	U
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	20.17	15	U
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	19.88	15	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	19.74	15	U
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	19.64	14	U
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	19.02	14	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	18.84	14	U
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.82	14	U
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	18.62	14	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.58	14	
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	18.3	14	U
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		13	JM74
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	16.7	12	
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	16.63	12	U
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	16.48	12	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	15.85	12	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	15.81	12	U
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	15.74	12	U
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		11	JM74
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	14.93	11	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Arsenic	XRF	14.64	11	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	13.24	10	
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	12.72	9	U
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	11.77	9	U
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	10.93	8	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	10.14	7	U
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	10.12	7	U
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Arsenic	XRF	36.71	27	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	29.6	22	U
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	26.58	20	
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	25.96	19	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		4.3	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		1.9	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		1.4	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.5	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		0.5	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.5	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		0.4	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		0.4	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Cadmium	Lab		0.2	
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Copper	XRF	1338.55	1354	
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Copper	XRF	1158.24	1172	
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Copper	XRF	489.88	496	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Copper	XRF	447.46	453	
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Copper	XRF	429.59	435	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Copper	XRF	349.38	353	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Copper	Lab		286	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Copper	XRF	243.65	246	
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Copper	XRF	196.52	199	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Copper	XRF	187.99	190	
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Copper	XRF	182.97	185	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Copper	Lab		175	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Copper	XRF	165.16	167	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	Lab		167	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Copper	XRF	164.03	166	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Copper	XRF	140.15	142	
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Copper	XRF	136.77	138	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Copper	XRF	134.97	137	
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	XRF	133.5	135	
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Copper	XRF	130.26	132	
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Copper	XRF	126.37	128	
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Copper	XRF	121.25	123	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Copper	XRF	119.7	121	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Copper	Lab		119	JM73
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Copper	XRF	112.87	114	
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Copper	XRF	112.37	114	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Copper	XRF	111.02	112	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Copper	XRF	107.09	108	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Copper	Lab		107	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Copper	Lab		105	JM73
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Copper	XRF	102.68	104	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Copper	XRF	99.34	100	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Copper	XRF	94.05	95	
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Copper	XRF	93.77	95	
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Copper	XRF	92.05	93	
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Copper	XRF	90.45	91	
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Copper	XRF	86.12	87	
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Copper	XRF	81.53	82	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Copper	Lab		79	JM73

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Copper	XRF	77.29	78	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Copper	XRF	77.22	78	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Copper	XRF	77.19	78	
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Copper	XRF	77.11	78	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Copper	XRF	70.31	71	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Copper	XRF	68.7	69	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Copper	Lab		66	
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Copper	XRF	64.84	66	
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	XRF	56.68	57	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Copper	XRF	56.03	57	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Copper	Lab		54	
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Copper	XRF	41.2	42	
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Copper	XRF	39.23	40	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Copper	XRF	36.85	37	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Copper	XRF	30.81	31	U
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Copper	XRF	382.86	387	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Copper	XRF	269.39	272	
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Copper	XRF	168.14	170	
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Copper	XRF	130.46	132	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Iron	XRF	53562.17	53326	
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Iron	XRF	53139.64	52906	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Iron	XRF	49312.75	49096	
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Iron	XRF	46088.84	45886	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Iron	XRF	43559.09	43367	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Iron	XRF	41494.34	41312	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Iron	XRF	38280.55	38112	
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Iron	XRF	37267.45	37103	
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Iron	XRF	36107.77	35949	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Iron	XRF	34464.88	34313	
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Iron	XRF	33540.54	33393	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Iron	XRF	32996.01	32851	
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Iron	XRF	31998.06	31857	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Iron	XRF	31611.13	31472	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Iron	XRF	31545.82	31407	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Iron	Lab		31400	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Iron	XRF	31206.59	31069	
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Iron	XRF	30834.43	30699	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Iron	XRF	30292.46	30159	
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Iron	XRF	29595.34	29465	
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Iron	XRF	29334.42	29205	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	Lab		28700	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Iron	XRF	28526.84	28401	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Iron	XRF	27209.6	27090	
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Iron	XRF	26667.58	26550	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Iron	XRF	26389.82	26274	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Iron	XRF	26057.88	25943	
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Iron	XRF	25747.52	25634	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Iron	XRF	25744.3	25631	
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Iron	XRF	25525.83	25414	
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Iron	XRF	24688.74	24580	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Iron	XRF	24095.59	23990	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Iron	XRF	24019.08	23913	
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Iron	XRF	23723.54	23619	
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	XRF	23331.11	23228	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Iron	XRF	23022.43	22921	
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Iron	XRF	22197.87	22100	
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Iron	XRF	22068.4	21971	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Iron	XRF	21374.5	21280	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Iron	XRF	21350.1	21256	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Iron	XRF	21156.72	21064	
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Iron	XRF	20936.8	20845	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Iron	XRF	20407.45	20318	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Iron	XRF	19400.57	19315	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Iron	XRF	18538.59	18457	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Iron	XRF	18375.36	18295	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Iron	XRF	18038.91	17960	
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Iron	XRF	17463.23	17386	
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	XRF	17107.56	17032	
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Iron	XRF	16672.16	16599	
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Iron	XRF	16355.18	16283	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Iron	XRF	15663.03	15594	
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Iron	XRF	15544.56	15476	
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Iron	XRF	15492.63	15424	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Iron	XRF	171530.84	170776	
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Iron	XRF	165784.69	165055	
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Iron	XRF	27869.06	27746	
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Iron	XRF	71921.23	71605	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Lead	Lab		1380	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Lead	XRF	372.13	324	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	Lab		284	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Lead	Lab		246	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Lead	Lab		242	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Lead	Lab		224	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Lead	XRF	244.35	213	
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Lead	XRF	232.11	202	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Lead	Lab		198	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Lead	XRF	188.79	164	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Lead	XRF	181.64	158	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Lead	XRF	175.93	153	
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Lead	XRF	172.91	150	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Lead	XRF	164.89	143	
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Lead	XRF	156.4	136	
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Lead	XRF	154.58	135	
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Lead	XRF	152.12	132	
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Lead	XRF	141.92	123	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Lead	XRF	140.23	122	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Lead	XRF	139.29	121	
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Lead	XRF	138.76	121	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Lead	Lab		120	JM10
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Lead	XRF	134.24	117	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Lead	XRF	133.29	116	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Lead	XRF	130.68	114	
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Lead	XRF	126.33	110	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Lead	XRF	117.24	102	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Lead	XRF	115.74	101	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Lead	XRF	113.99	99	
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Lead	XRF	113.18	98	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Lead	XRF	111.93	97	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Lead	Lab		96	
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	XRF	109.13	95	
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Lead	XRF	108.4	94	
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Lead	XRF	104.87	91	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Lead	XRF	103.84	90	
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Lead	XRF	100.26	87	
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Lead	XRF	99.4	86	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Lead	XRF	95.1	83	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Lead	XRF	94.03	82	
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Lead	XRF	89.74	78	
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Lead	XRF	88.48	77	
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Lead	XRF	88.15	77	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Lead	Lab		76	JM10
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Lead	XRF	86.04	75	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Lead	XRF	73.71	64	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Lead	XRF	62.02	54	
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	XRF	41.47	36	
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Lead	XRF	40.17	35	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Lead	XRF	36.18	31	
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Lead	XRF	33.89	29	
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Lead	XRF	30.53	27	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Lead	XRF	30.43	26	
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Lead	XRF	24.37	21	
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Lead	XRF	424.71	370	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Lead	XRF	234.47	204	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Lead	XRF	190.11	165	
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Lead	XRF	104.36	91	
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Manganese	XRF	3347.14	2784	
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Manganese	XRF	2581	2147	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1930.43	1606	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1512.64	1258	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1389.89	1156	
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1387.08	1154	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1372.48	1142	
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1287.26	1071	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1260.28	1048	
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1222.27	1017	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1183.79	985	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Manganese	XRF	1049.94	873	
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Manganese	XRF	957.74	797	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Manganese	XRF	849.33	706	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Manganese	XRF	836.71	696	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Manganese	XRF	823.34	685	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Manganese	XRF	704.9	586	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Manganese	XRF	695.33	578	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Manganese	XRF	634.49	528	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Manganese	Lab		524	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Manganese	Lab		518	
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Manganese	XRF	599.92	499	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Manganese	XRF	594.32	494	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Manganese	Lab		488	
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Manganese	XRF	559.87	466	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Manganese	Lab		461	JM21
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	XRF	523.36	435	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Manganese	XRF	514.59	428	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Manganese	XRF	493.22	410	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Manganese	Lab		396	JM21
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Manganese	XRF	451.43	375	
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Manganese	XRF	447.34	372	
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Manganese	XRF	446.71	372	
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	XRF	430.7	358	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Manganese	XRF	414.7	345	
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Manganese	XRF	406.49	338	
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Manganese	XRF	403.92	336	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Manganese	XRF	401.96	334	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Manganese	Lab		324	JM21
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Manganese	XRF	389.16	324	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Manganese	XRF	376.27	313	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	Lab		302	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Manganese	Lab		300	
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Manganese	XRF	340.53	283	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Manganese	Lab		243	
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Manganese	XRF	263.95	220	
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Manganese	XRF	249.57	208	
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Manganese	XRF	238.24	198	
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Manganese	XRF	213.55	178	
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Manganese	XRF	125.34	104	U
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Manganese	XRF	119.9	100	U
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Manganese	XRF	112.66	94	U
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Manganese	XRF	81	67	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Manganese	XRF	66	55	
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Manganese	XRF	505.31	420	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Manganese	XRF	318.8	265	U
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Manganese	XRF	312.11	260	U
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Manganese	XRF	231.26	192	
5A	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Zinc	Lab		868	
5A	CEA1-3-500 (0-6")	10/15/2007	0	0.5	Zinc	XRF	323.29	330	
5A	WEA1-100 (0-6")	10/15/2007	0	0.5	Zinc	XRF	306.84	314	
5A	WEA1-450 (0-6")	10/15/2007	0	0.5	Zinc	XRF	304.94	312	
5A	WEA1-250 (0-6")	10/15/2007	0	0.5	Zinc	XRF	280.93	287	
5A	CEA1-3-350 (0-6")	10/15/2007	0	0.5	Zinc	XRF	280.86	287	
5A	WEA1-200 (0-6")	10/15/2007	0	0.5	Zinc	XRF	256.56	262	
5A	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Zinc	Lab		256	JM73
5A	CEA1-3-650 (0-6")	10/15/2007	0	0.5	Zinc	XRF	237	242	
5A	WEA1-300 (0-6")	10/15/2007	0	0.5	Zinc	XRF	236.9	242	
5A	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Zinc	Lab		234	
5A	WEA1-550 (0-6")	10/15/2007	0	0.5	Zinc	XRF	227.23	232	
5A	CEA1-3-300 (0-6")	10/15/2007	0	0.5	Zinc	XRF	223.57	228	
5A	CEA1-3-400 (0-6")	10/15/2007	0	0.5	Zinc	XRF	214.77	219	
5A	EEA2-50 (0-6")	10/11/2007	0	0.5	Zinc	XRF	207.28	212	
5A	WEA1-150 (0-6")	10/15/2007	0	0.5	Zinc	XRF	199.92	204	
5A	EEA1-400 (0-6")	10/12/2007	0	0.5	Zinc	XRF	197.12	201	
5A	CEA1-3-100 (0-6")	10/15/2007	0	0.5	Zinc	XRF	191.91	196	
5A	EEA1-500 (0-6")	10/12/2007	0	0.5	Zinc	XRF	178.89	183	
5A	WEA1-COMP 2 (0-6")	10/15/2007	0	0.5	Zinc	XRF	178.86	183	
5A	WEA1-500 (0-6")	10/15/2007	0	0.5	Zinc	XRF	175.37	179	
5A	CEA1-3-450 (0-6")	10/15/2007	0	0.5	Zinc	XRF	173.62	177	
5A	CEA1-3-150 (0-6")	10/15/2007	0	0.5	Zinc	XRF	166.1	170	
5A	CEA1-3-600 (0-6")	10/15/2007	0	0.5	Zinc	XRF	163.87	167	
5A	WEA1-350 (0-6")	10/15/2007	0	0.5	Zinc	XRF	154.96	158	
5A	WEA1-COMP 1 (0-6")	10/15/2007	0	0.5	Zinc	XRF	148.33	152	
5A	CEA1-3-00 (0-6")	10/15/2007	0	0.5	Zinc	XRF	141.88	145	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
5A	EEA2-100 (0-6")	10/11/2007	0	0.5	Zinc	XRF	138.38	141	
5A	EEA2-300 (0-6")	10/11/2007	0	0.5	Zinc	XRF	135.65	139	
5A	CEA1-3-50 (0-6")	10/15/2007	0	0.5	Zinc	XRF	134.15	137	
5A	WEA1-00 (0-6")	10/15/2007	0	0.5	Zinc	Lab		129	JM73
5A	EEA1-350 (0-6")	10/12/2007	0	0.5	Zinc	XRF	121.09	124	
5A	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	Lab		117	
5A	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Zinc	Lab		114	
5A	CEA1-3-700 (0-6")	10/12/2007	0	0.5	Zinc	XRF	110.19	113	
5A	CEA1-3-200 (0-6")	10/15/2007	0	0.5	Zinc	XRF	100.98	103	
5A	EEA2-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	XRF	98.2	100	
5A	WEA1-400 (0-6")	10/15/2007	0	0.5	Zinc	Lab		97	JM73
5A	CEA1-3-250 (0-6")	10/15/2007	0	0.5	Zinc	XRF	90.99	93	
5A	EEA1-450 (0-6")	10/12/2007	0	0.5	Zinc	XRF	82.08	84	
5A	EEA2-200 (0-6")	10/11/2007	0	0.5	Zinc	Lab		73	
5A	EEA1-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	XRF	65.1	67	
5A	EEA2-150 (0-6")	10/11/2007	0	0.5	Zinc	Lab		65	
5A	EEA2-250 (0-6")	10/11/2007	0	0.5	Zinc	XRF	63.41	65	
5A	EEA1-50 (0-6")	10/12/2007	0	0.5	Zinc	XRF	55.23	56	
5A	EEA1-300 (0-6")	10/12/2007	0	0.5	Zinc	XRF	52.04	53	
5A	EEA1-100 (0-6")	10/12/2007	0	0.5	Zinc	XRF	51.62	53	
5A	CEA1-3-750 (0-6")	10/15/2007	0	0.5	Zinc	XRF	48.65	50	
5A	EEA2-00 (0-6")	10/11/2007	0	0.5	Zinc	XRF	47.4	48	
5A	EEA1-150 (0-6")	10/12/2007	0	0.5	Zinc	XRF	44.69	46	
5A	EEA1-00 (0-6")	10/12/2007	0	0.5	Zinc	XRF	44.59	46	
5A	EEA1-250 (0-6")	10/12/2007	0	0.5	Zinc	XRF	41.77	43	
5A	CEA1-3-800 (0-6")	10/12/2007	0	0.5	Zinc	XRF	34.11	35	
5A	EEA1-200 (0-6")	10/12/2007	0	0.5	Zinc	XRF	30.75	31	
5B	CEA4-40 (0-6")	10/12/2007	0	0.5	Zinc	XRF	212.9	218	
5B	CEA4-COMP (0-6")	10/12/2007	0	0.5	Zinc	XRF	101.78	104	
5B	CEA4-00 (0-6")	10/12/2007	0	0.5	Zinc	XRF	50.67	52	U
5B	CEA4-20 (0-6")	10/12/2007	0	0.5	Zinc	XRF	46.92	48	U
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		27000	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		23700	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		23400	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Aluminum	Lab		21000	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Aluminum	Lab		20900	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Aluminum	Lab		20200	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Aluminum	Lab		14700	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		11700	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		1010	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		673	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	525.92	388	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		283	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		148	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Arsenic	Lab		105	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		84	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	91.45	67	U
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	71.92	53	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	63.09	47	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	52.9	39	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	49.4	36	U
6	CONM-450 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	45.36	33	
6	CONM-50 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	45.36	33	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	41.47	31	U
6	CONM-350 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	37.81	28	U
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	37.6	28	
6	CONM-400 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	37.04	27	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	35.37	26	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	34.15	25	U
6	CONM-200 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	33.01	24	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	30.84	23	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	29.9	22	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	29.7	22	
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	29	21	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Arsenic	Lab		21	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	26.5	20	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	26.4	19	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	25.97	19	U
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	23.2	17	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Arsenic	Lab		16	
6	CONM-500 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	21.73	16	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	21.65	16	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	20.9	15	U
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	20.9	15	U
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Arsenic	XRF	15	11	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		6.7	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		3.4	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		3.2	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		2.1	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		1.9	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		1.6	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Cadmium	Lab		1.6	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		1.5	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		1.2	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Cadmium	Lab		0.9	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.6	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Copper	Lab		410	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Copper	Lab		394	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-250 (0-6")	10/9/2007	0	0.5	Copper	Lab		366	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Copper	XRF	297.27	301	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Copper	Lab		296	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Copper	Lab		282	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Copper	XRF	234.21	237	
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Copper	XRF	233	236	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Copper	XRF	221.67	224	
6	CONM-350 (0-6")	10/10/2007	0	0.5	Copper	XRF	216.87	219	
6	CONM-50 (0-6")	10/10/2007	0	0.5	Copper	XRF	202.95	205	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Copper	Lab		203	
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Copper	XRF	186.92	189	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Copper	XRF	164.49	166	
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Copper	XRF	146	148	
6	CONM-400 (0-6")	10/10/2007	0	0.5	Copper	XRF	145.11	147	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Copper	XRF	141.5	143	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Copper	XRF	129.33	131	
6	CONM-450 (0-6")	10/9/2007	0	0.5	Copper	XRF	108.92	110	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Copper	Lab		107	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Copper	XRF	103.73	105	
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Copper	XRF	101	102	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Copper	XRF	93	94	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Copper	XRF	78	79	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Copper	XRF	67	68	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Copper	XRF	64	65	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Copper	XRF	61	62	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Copper	XRF	58	59	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Copper	XRF	57.97	59	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Copper	Lab		57	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Copper	XRF	51	52	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Copper	XRF	43.99	44	
6	CONM-200 (0-6")	10/10/2007	0	0.5	Copper	XRF	41.93	42	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Copper	XRF	40.59	41	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Copper	XRF	26.61	27	U
6	CONM-500 (0-6")	10/10/2007	0	0.5	Copper	XRF	4	4	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Iron	XRF	77779.7	77437	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Iron	Lab		73600	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Iron	Lab		65700	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Iron	Lab		60100	
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Iron	XRF	52251.3	52021	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Iron	XRF	46773.5	46568	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Iron	XRF	46216.98	46014	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Iron	XRF	44378.57	44183	
6	CONM-350 (0-6")	10/10/2007	0	0.5	Iron	XRF	43490.79	43299	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Iron	XRF	42162.87	41977	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-50 (0-6")	10/10/2007	0	0.5	Iron	XRF	41748.38	41565	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Iron	Lab		40400	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Iron	XRF	40084.43	39908	
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Iron	XRF	37698.37	37532	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Iron	XRF	35371.36	35216	
6	CONM-400 (0-6")	10/10/2007	0	0.5	Iron	XRF	29850.18	29719	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Iron	XRF	29146.5	29018	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Iron	XRF	29124.13	28996	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Iron	XRF	28686.25	28560	
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Iron	XRF	28447.2	28322	
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Iron	XRF	27228.4	27109	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Iron	XRF	23874	23769	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Iron	Lab		23700	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Iron	XRF	22296.42	22198	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Iron	XRF	21693.4	21598	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Iron	XRF	19887.5	19800	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Iron	XRF	19350.96	19266	
6	CONM-450 (0-6")	10/9/2007	0	0.5	Iron	XRF	19231.49	19147	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Iron	XRF	19123.5	19039	
6	CONM-200 (0-6")	10/10/2007	0	0.5	Iron	XRF	18586.02	18504	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Iron	XRF	18004.4	17925	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Iron	XRF	16994.29	16920	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Iron	XRF	16703.18	16630	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Iron	XRF	16512.4	16440	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Iron	XRF	16258.81	16187	
6	CONM-500 (0-6")	10/10/2007	0	0.5	Iron	XRF	11844.54	11792	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Lead	Lab		6780	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Lead	Lab		5010	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Lead	XRF	3580.49	3115	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Lead	Lab		2350	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Lead	XRF	1898.68	1652	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Lead	Lab		1600	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Lead	Lab		1540	
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Lead	XRF	1206.06	1049	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Lead	Lab		942	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Lead	XRF	968.31	843	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Lead	XRF	722.26	628	
6	CONM-50 (0-6")	10/10/2007	0	0.5	Lead	XRF	637.03	554	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Lead	XRF	567.7	494	
6	CONM-400 (0-6")	10/10/2007	0	0.5	Lead	XRF	565.76	492	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Lead	XRF	552.46	481	
6	CONM-350 (0-6")	10/10/2007	0	0.5	Lead	XRF	546.01	475	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Lead	Lab		410	
6	CONM-450 (0-6")	10/9/2007	0	0.5	Lead	XRF	413.53	360	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Lead	XRF	407.1	354	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Lead	XRF	397.89	346	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Lead	XRF	385.1	335	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Lead	XRF	348.7	303	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Lead	XRF	346.1	301	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Lead	XRF	338.2	294	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Lead	XRF	336.38	293	
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Lead	XRF	282.8	246	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Lead	XRF	280.5	244	
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Lead	XRF	275.2	239	
6	CONM-200 (0-6")	10/10/2007	0	0.5	Lead	XRF	260.65	227	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Lead	XRF	259.7	226	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Lead	XRF	206.08	179	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Lead	XRF	204.72	178	
6	CONM-500 (0-6")	10/10/2007	0	0.5	Lead	XRF	188.91	164	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Lead	XRF	175.6	153	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Lead	Lab		125	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Lead	XRF	125.07	109	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Manganese	XRF	2400	1996	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Manganese	Lab		1500	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1687.26	1403	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Manganese	XRF	1525	1268	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Manganese	Lab		1250	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Manganese	Lab		1220	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Manganese	XRF	1441	1199	
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Manganese	XRF	1330	1106	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Manganese	XRF	1180	982	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Manganese	Lab		747	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Manganese	XRF	888.31	739	
6	CONM-450 (0-6")	10/9/2007	0	0.5	Manganese	XRF	851.66	708	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Manganese	Lab		702	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Manganese	XRF	728.86	606	
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Manganese	XRF	726.44	604	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Manganese	XRF	723	601	
6	CONM-200 (0-6")	10/10/2007	0	0.5	Manganese	XRF	721.13	600	
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Manganese	XRF	717	596	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Manganese	XRF	713.72	594	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Manganese	XRF	661	550	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Manganese	XRF	657.43	547	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Manganese	XRF	651.07	542	
6	CONM-350 (0-6")	10/10/2007	0	0.5	Manganese	XRF	648.21	539	
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Manganese	XRF	614	511	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Manganese	Lab		476	
6	CONM-50 (0-6")	10/10/2007	0	0.5	Manganese	XRF	515.37	429	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-400 (0-6")	10/10/2007	0	0.5	Manganese	XRF	501.74	417	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Manganese	XRF	483	402	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Manganese	XRF	396.11	329	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Manganese	Lab		313	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Manganese	Lab		232	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Manganese	XRF	274.22	228	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Manganese	XRF	267.51	223	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Manganese	XRF	211.94	176	
6	CONM-500 (0-6")	10/10/2007	0	0.5	Manganese	XRF	183.53	153	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Manganese	XRF	140.12	117	U
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Zinc	Lab		914	
6	CONM-900 (0-6")	10/10/2007	0	0.5	Zinc	XRF	814.67	833	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Zinc	Lab		740	
6	CONM-850 (0-6")	10/9/2007	0	0.5	Zinc	XRF	577.82	590	
6	CONM-450 (0-6")	10/9/2007	0	0.5	Zinc	XRF	511.25	522	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Zinc	Lab		498	
6	CONM-50+50 (0-6")	7/9/2008	0	0.5	Zinc	XRF	479.9	490	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Zinc	Lab		474	
6	CONM-300 (0-6")	10/10/2007	0	0.5	Zinc	XRF	460.93	471	
6	CONM-600+12.5 (0-6")	7/9/2008	0	0.5	Zinc	XRF	427.1	436	
6	CONM-100+25 (0-6")	7/9/2008	0	0.5	Zinc	XRF	417.5	427	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Zinc	Lab		419	
6	CONM-350+50 (0-6")	7/9/2008	0	0.5	Zinc	XRF	402.7	412	
6	CONM-550 (0-6")	10/9/2007	0	0.5	Zinc	XRF	388.19	397	
6	CONM-300+25 (0-6")	7/9/2008	0	0.5	Zinc	XRF	378.7	387	
6	CONM-650 (0-6")	10/9/2007	0	0.5	Zinc	XRF	360.44	368	
6	CONM-200 (0-6")	10/10/2007	0	0.5	Zinc	XRF	349.92	358	
6	CONM-400+25 (0-6")	7/9/2008	0	0.5	Zinc	XRF	337.6	345	
6	CONM-150 (0-6")	10/9/2007	0	0.5	Zinc	XRF	335.43	343	
6	CONM-100 (0-6")	10/9/2007	0	0.5	Zinc	XRF	330.88	338	
6	CONM-450+25 (0-6")	7/9/2008	0	0.5	Zinc	XRF	328.7	336	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Zinc	Lab		333	
6	CONM-800+25 (0-6")	7/10/2008	0	0.5	Zinc	XRF	325.4	333	
6	CONM-1000+35 (0-6")	7/10/2008	0	0.5	Zinc	XRF	315.8	323	
6	CONM-600 (0-6")	10/10/2007	0	0.5	Zinc	XRF	281.92	288	
6	CONM-50 (0-6")	10/10/2007	0	0.5	Zinc	XRF	255.68	261	
6	CONM-900+12.5 (0-6")	7/10/2008	0	0.5	Zinc	XRF	252.8	258	
6	CONM-1000 (0-6")	10/10/2007	0	0.5	Zinc	XRF	252.26	258	
6	CONM-350 (0-6")	10/10/2007	0	0.5	Zinc	XRF	249.12	255	
6	CONM-000 (0-6")	10/9/2007	0	0.5	Zinc	XRF	224.53	229	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Zinc	Lab		228	
6	CONM-950 (0-6")	10/10/2007	0	0.5	Zinc	XRF	214.87	220	
6	CONM-400 (0-6")	10/10/2007	0	0.5	Zinc	XRF	205.02	210	
6	CONM-500 (0-6")	10/10/2007	0	0.5	Zinc	XRF	143.28	146	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Zinc	Lab		126	
6	CONM-800 (0-6")	10/9/2007	0	0.5	Zinc	XRF	106.65	109	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Aluminum	Lab		12900	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Aluminum	Lab		12800	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		7170	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Arsenic	XRF	156.6	116	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	82.42	61	U
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	59.68	44	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	44.64	33	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Arsenic	Lab		30	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	35.95	27	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	23.32	17	U
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Arsenic	XRF	19.28	14	U
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Cadmium	Lab		0.9	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Cadmium	Lab		0.6	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.5	U
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Copper	XRF	572.87	579	
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Copper	XRF	481.4	487	
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Copper	XRF	424.21	429	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Copper	XRF	392.44	397	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Copper	Lab		377	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Copper	XRF	279.24	282	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Copper	XRF	146.94	149	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Copper	XRF	87.34	88	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Iron	XRF	96328.47	95905	
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Iron	XRF	73553.48	73230	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Iron	XRF	67683.81	67386	
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Iron	XRF	54491.54	54252	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Iron	XRF	48930.95	48716	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Iron	XRF	47780.5	47570	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Iron	XRF	39348.39	39175	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Iron	Lab		28400	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Lead	XRF	3999.89	3480	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Lead	XRF	591.37	515	
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Lead	XRF	569.81	496	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Lead	XRF	332.68	289	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Lead	XRF	326.06	284	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Lead	Lab		268	
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Lead	XRF	246.6	215	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Lead	XRF	141.85	123	
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Manganese	XRF	1084.53	902	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Manganese	XRF	960.77	799	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Manganese	XRF	877.72	730	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Manganese	XRF	871.5	725	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Manganese	XRF	634.86	528	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Manganese	XRF	601.96	501	
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Manganese	XRF	512.38	426	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Manganese	Lab		190	
7	MPWA-50+39 (0-6")	7/16/2008	0	0.5	Zinc	XRF	513.71	525	
7	MPWA-0 (0-6")	7/16/2008	0	0.5	Zinc	XRF	275.58	282	
7	MPWA-100+25 (0-6")	7/16/2008	0	0.5	Zinc	XRF	260.31	266	
7	MPWA-200+25 (0-6")	7/16/2008	0	0.5	Zinc	XRF	194.64	199	
7	MPWA-230+25 (0-6")	7/16/2008	0	0.5	Zinc	XRF	162.55	166	
7	MPWA-100+15 (0-6")	7/16/2008	0	0.5	Zinc	XRF	148.84	152	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Zinc	Lab		123	
7	MPWA-75+20 (0-6")	7/10/2008	0	0.5	Zinc	XRF	81.84	84	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Aluminum	Lab		20200	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		19200	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		16200	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		16000	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		15500	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		14300	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		13700	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Aluminum	Lab		12000	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Aluminum	Lab		11200	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Aluminum	Lab		10400	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Aluminum	Lab		9780	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Aluminum	Lab		9770	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Aluminum	Lab		6900	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Aluminum	Lab		6170	
8	UMH-C3	9/14/2006	0	0.16666667	Arsenic	Lab		952	
8	UMH-A1	9/14/2006	0	0.16666667	Arsenic	XRF	935.36	853	
8	UMH-E2	9/14/2006	0	0.16666667	Arsenic	XRF	738.69	674	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	904.3	667	
8	UMH-D2	9/14/2006	0	0.16666667	Arsenic	XRF	710.18	648	
8	UMH-J2	9/14/2006	0	0.16666667	Arsenic	XRF	705.02	643	
8	UMH-D1	9/14/2006	0	0.16666667	Arsenic	XRF	690.13	629	
8	UMH-F4	9/14/2006	0	0.16666667	Arsenic	XRF	670.41	611	
8	UMH-B1	9/14/2006	0	0.16666667	Arsenic	XRF	640	584	
8	UMH-C4	9/14/2006	0	0.16666667	Arsenic	XRF	638.01	582	
8	UMH-C2	9/14/2006	0	0.16666667	Arsenic	XRF	632.61	577	
8	UMH-E1	9/14/2006	0	0.16666667	Arsenic	XRF	625.8	571	
8	UMH-C1	9/14/2006	0	0.16666667	Arsenic	XRF	582.96	532	
8	UMH-D3	9/14/2006	0	0.16666667	Arsenic	XRF	548.87	501	
8	UMH-E3	9/14/2006	0	0.16666667	Arsenic	XRF	502.11	458	
8	UMH-J1	9/14/2006	0	0.16666667	Arsenic	XRF	482.56	440	
8	UMH-A3	9/14/2006	0	0.16666667	Arsenic	XRF	480	438	
8	UMH-B2	9/14/2006	0	0.16666667	Arsenic	XRF	476.11	434	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-G5	9/14/2006	0	0.16666667	Arsenic	XRF	458.06	418	
8	UMH-F3	9/14/2006	0	0.16666667	Arsenic	XRF	457.25	417	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	535.04	395	
8	UMH-C6	9/14/2006	0	0.16666667	Arsenic	XRF	431.95	394	
8	UMH-B8	9/14/2006	0	0.16666667	Arsenic	XRF	430.72	393	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	498.62	368	
8	UMH-B3	9/14/2006	0	0.16666667	Arsenic	XRF	395.06	360	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	484.56	358	
8	UMH-D5	9/14/2006	0	0.16666667	Arsenic	Lab		348	
8	UMH-F7	9/14/2006	0	0.16666667	Arsenic	Lab		342	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	454.93	336	
8	UMH-G3	9/14/2006	0	0.16666667	Arsenic	XRF	360.59	329	
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	440.27	325	
8	UMH-I3	9/14/2006	0	0.16666667	Arsenic	XRF	352.67	322	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		313	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	418.39	309	
8	UMH-H1	9/14/2006	0	0.16666667	Arsenic	XRF	337.65	308	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	411.61	304	
8	UMH-G4	9/14/2006	0	0.16666667	Arsenic	XRF	333.05	304	
8	UMH-F6	9/14/2006	0	0.16666667	Arsenic	XRF	331.55	302	
8	UMH-H3	9/14/2006	0	0.16666667	Arsenic	XRF	330.37	301	
8	UMH-A4	9/14/2006	0	0.16666667	Arsenic	XRF	328.57	300	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	401.34	296	
8	UMH-D4	9/14/2006	0	0.16666667	Arsenic	XRF	302.13	276	
8	UMH-C5	9/14/2006	0	0.16666667	Arsenic	XRF	297.4	271	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		262	
8	UMH-F5	9/14/2006	0	0.16666667	Arsenic	XRF	284.29	259	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	343.61	254	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	338.24	250	
8	UMH-A8	9/14/2006	0	0.16666667	Arsenic	XRF	268.7	245	
8	UMH-A10	9/14/2006	0	0.16666667	Arsenic	XRF	267.12	244	
8	UMH-A9	9/14/2006	0	0.16666667	Arsenic	XRF	260.09	237	
8	UMH-F1	9/14/2006	0	0.16666667	Arsenic	XRF	252.95	231	
8	UMH-B5	9/14/2006	0	0.16666667	Arsenic	XRF	241.63	220	
8	UMH-A4.5	9/14/2006	0	0.16666667	Arsenic	XRF	239.3	218	
8	UMH-A2	9/14/2006	0	0.16666667	Arsenic	XRF	237.31	216	
8	UMH-G7	9/14/2006	0	0.16666667	Arsenic	XRF	226.37	206	
8	UMH-H2	9/14/2006	0	0.16666667	Arsenic	XRF	221.92	202	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	271.19	200	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Arsenic	Lab		200	
8	UMH-D8	9/14/2006	0	0.16666667	Arsenic	XRF	219.23	200	
8	UMH-B4	9/14/2006	0	0.16666667	Arsenic	XRF	217.77	199	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		193	
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	260.15	192	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-F2	9/14/2006	0	0.16666667	Arsenic	XRF	210.22	192	
8	UMH-B6	9/14/2006	0	0.16666667	Arsenic	XRF	210.1	192	
8	UMH-B7	9/14/2006	0	0.16666667	Arsenic	XRF	208.12	190	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	249.21	184	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	243.97	180	
8	UMH-I2	9/14/2006	0	0.16666667	Arsenic	XRF	196.09	179	
8	UMH-G8	9/14/2006	0	0.16666667	Arsenic	Lab		177	
8	UMH-G2	9/14/2006	0	0.16666667	Arsenic	XRF	190.69	174	
8	UMH-G1	9/14/2006	0	0.16666667	Arsenic	XRF	174.44	159	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	215.29	159	
8	UMH-D6	9/14/2006	0	0.16666667	Arsenic	XRF	172.51	157	
8	UMH-J3	9/14/2006	0	0.16666667	Arsenic	XRF	165.23	151	
8	UMH-C8	9/14/2006	0	0.16666667	Arsenic	XRF	163.41	149	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		144	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	192.21	142	
8	UMH-H4	9/14/2006	0	0.16666667	Arsenic	XRF	153.64	140	
8	UMH-H5	9/14/2006	0	0.16666667	Arsenic	XRF	153.06	140	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	188.82	139	
8	UMH-I1	9/14/2006	0	0.16666667	Arsenic	XRF	151.56	138	
8	UMH-C9	9/14/2006	0	0.16666667	Arsenic	XRF	147.17	134	
8	UMH-E5	9/14/2006	0	0.16666667	Arsenic	XRF	146.38	133	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	177.6	131	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	173.14	128	
8	UMH-E4	9/14/2006	0	0.16666667	Arsenic	XRF	136.73	125	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	156.35	115	
8	UMH-A6	9/14/2006	0	0.16666667	Arsenic	XRF	125.31	114	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	150.3	111	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	147.24	109	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	146.85	108	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	143.45	106	
8	UMH-I4	9/14/2006	0	0.16666667	Arsenic	XRF	115.41	105	
8	UMH-F8	9/14/2006	0	0.16666667	Arsenic	XRF	111.87	102	
8	UMH-J4	9/14/2006	0	0.16666667	Arsenic	Lab		100	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	135.42	100	
8	UMH-I5	9/14/2006	0	0.16666667	Arsenic	XRF	106.27	97	
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	129.77	96	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	124.28	92	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	121.78	90	
8	UMH-A7	9/14/2006	0	0.16666667	Arsenic	Lab		89	
8	UMH-B9	9/14/2006	0	0.16666667	Arsenic	XRF	95.86	87	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Arsenic	Lab		87	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	112.51	83	
8	UMH-A5	9/14/2006	0	0.16666667	Arsenic	XRF	86.23	79	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	106.03	78	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs)		Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
			Top	Bottom					
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		75	JM74
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	100.43	74	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	100.4	74	
8	UMH-C7	9/14/2006	0	0.16666667	Arsenic	Lab		71	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		70	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	92.84	69	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	92.7	68	U
8	UMH-H7	9/14/2006	0	0.16666667	Arsenic	Lab		68	
8	UMH-D7	9/14/2006	0	0.16666667	Arsenic	XRF	71.29	65	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	87.04	64	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	85.11	63	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	80.39	59	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Arsenic	Lab		59	
8	UMH-H6	9/14/2006	0	0.16666667	Arsenic	XRF	59.53	54	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	71.85	53	
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	63.82	47	U
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	62.9	46	U
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	57.39	42	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	55.12	41	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	52.4	39	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	52.07	38	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	51.49	38	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	50.42	37	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		37	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	49.78	37	U
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	49.19	36	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	48.33	36	U
8	UMH2-50+25b (0-6")	7/21/2008	0	0.5	Arsenic	XRF	47.63	35	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	46.58	34	U
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	46.5	34	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	45.88	34	
8	UMH-G6	9/14/2006	0	0.16666667	Arsenic	XRF	34.35	31	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	40.99	30	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Arsenic	XRF	40.87	30	U
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	39.9	29	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Arsenic	Lab		29	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	39.48	29	U
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	38.14	28	U
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	37.62	28	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	37.6	28	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	37.5	28	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Arsenic	XRF	37.46	28	U
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	36.2	27	
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	35.5	26	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	35.04	26	
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	34.68	26	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	33.9	25	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	33.11	24	U
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	32.8	24	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	32.5	24	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	31.7	23	U
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	31.48	23	U
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	31.2	23	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	30.61	23	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	30.18	22	
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	28.97	21	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	28.85	21	U
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	25.5	19	U
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Arsenic	Lab		18	JM74
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	22.7	17	U
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Arsenic	Lab		17	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	22.2	16	
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	22.05	16	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	20.9	15	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	20.7	15	
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Arsenic	XRF	20.3	15	U
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	20.09	15	U
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	19.47	14	U
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	19.19	14	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	18.74	14	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	18.5	14	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	17.97	13	U
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Arsenic	XRF	17.86	13	U
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Arsenic	XRF	17.8	13	U
8	UMH-C3	9/14/2006	0	0.16666667	Cadmium	Lab		33.4	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		15.9	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Cadmium	Lab		11.2	
8	UMH-A7	9/14/2006	0	0.16666667	Cadmium	Lab		10.9	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Cadmium	Lab		9.7	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		9.1	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		5.7	
8	UMH-D5	9/14/2006	0	0.16666667	Cadmium	Lab		5.3	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		5.0	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		4.7	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Cadmium	Lab		4.3	
8	UMH-F7	9/14/2006	0	0.16666667	Cadmium	Lab		3.4	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Cadmium	Lab		3.0	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		2.2	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		1.9	
8	UMH-C7	9/14/2006	0	0.16666667	Cadmium	Lab		1.8	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		1.5	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		1.5	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		1.4	
8	UMH-G8	9/14/2006	0	0.16666667	Cadmium	Lab		1.0	U
8	UMH-H7	9/14/2006	0	0.16666667	Cadmium	Lab		1.0	U
8	UMH-J4	9/14/2006	0	0.16666667	Cadmium	Lab		1.0	U
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		1.0	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Cadmium	Lab		0.8	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		0.7	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		0.4	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Cadmium	Lab		0.4	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Cadmium	Lab		0.3	
8	UMH-C3	9/14/2006	0	0.16666667	Copper	Lab		4940	
8	UMH-C4	9/14/2006	0	0.16666667	Copper	XRF	2000.36	3372	
8	UMH-A1	9/14/2006	0	0.16666667	Copper	XRF	1816.38	3062	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Copper	XRF	2848.96	2882	
8	UMH-C1	9/14/2006	0	0.16666667	Copper	XRF	1667.31	2810	
8	UMH-E1	9/14/2006	0	0.16666667	Copper	XRF	1639.53	2763	
8	UMH-D5	9/14/2006	0	0.16666667	Copper	Lab		2590	
8	UMH-D2	9/14/2006	0	0.16666667	Copper	XRF	1520.95	2564	
8	UMH-D1	9/14/2006	0	0.16666667	Copper	XRF	1502.35	2532	
8	UMH-E2	9/14/2006	0	0.16666667	Copper	XRF	1451.13	2446	
8	UMH-B1	9/14/2006	0	0.16666667	Copper	XRF	1423.04	2399	
8	UMH-C6	9/14/2006	0	0.16666667	Copper	XRF	1414.7	2384	
8	UMH-C2	9/14/2006	0	0.16666667	Copper	XRF	1413.23	2382	
8	UMH-E3	9/14/2006	0	0.16666667	Copper	XRF	1396.07	2353	
8	UMH-B2	9/14/2006	0	0.16666667	Copper	XRF	1322.35	2229	
8	UMH-D3	9/14/2006	0	0.16666667	Copper	XRF	1306.4	2202	
8	UMH-A3	9/14/2006	0	0.16666667	Copper	XRF	1244.59	2098	
8	UMH-A9	9/14/2006	0	0.16666667	Copper	XRF	1182.73	1993	
8	UMH-G5	9/14/2006	0	0.16666667	Copper	XRF	1160.98	1957	
8	UMH-A10	9/14/2006	0	0.16666667	Copper	XRF	1128.48	1902	
8	UMH-F4	9/14/2006	0	0.16666667	Copper	XRF	1116.79	1882	
8	UMH-A4.5	9/14/2006	0	0.16666667	Copper	XRF	1003.52	1691	
8	UMH-A8	9/14/2006	0	0.16666667	Copper	XRF	993.98	1675	
8	UMH-B5	9/14/2006	0	0.16666667	Copper	XRF	975.54	1644	
8	UMH-B3	9/14/2006	0	0.16666667	Copper	XRF	969.62	1634	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Copper	XRF	1607.95	1626	
8	UMH-F6	9/14/2006	0	0.16666667	Copper	XRF	928.43	1565	
8	UMH-F3	9/14/2006	0	0.16666667	Copper	XRF	922.71	1555	
8	UMH-F5	9/14/2006	0	0.16666667	Copper	XRF	915.72	1543	
8	UMH-H1	9/14/2006	0	0.16666667	Copper	XRF	887.71	1496	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-I3	9/14/2006	0	0.16666667	Copper	XRF	848.02	1429	
8	UMH-F7	9/14/2006	0	0.16666667	Copper	Lab		1420	
8	UMH-J1	9/14/2006	0	0.16666667	Copper	XRF	836.87	1411	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Copper	XRF	1374.83	1391	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Copper	Lab		1340	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Copper	XRF	1317.3	1332	
8	UMH-B4	9/14/2006	0	0.16666667	Copper	XRF	781.59	1317	
8	UMH-B8	9/14/2006	0	0.16666667	Copper	XRF	748.35	1261	
8	UMH-J4	9/14/2006	0	0.16666667	Copper	Lab		1260	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Copper	XRF	1212.31	1226	
8	UMH-B6	9/14/2006	0	0.16666667	Copper	XRF	723.83	1220	
8	UMH-C5	9/14/2006	0	0.16666667	Copper	XRF	712.04	1200	
8	UMH-G7	9/14/2006	0	0.16666667	Copper	XRF	708.58	1194	
8	UMH-B7	9/14/2006	0	0.16666667	Copper	XRF	670.83	1131	
8	UMH-H2	9/14/2006	0	0.16666667	Copper	XRF	666.49	1123	
8	UMH-D4	9/14/2006	0	0.16666667	Copper	XRF	636.63	1073	
8	UMH-G3	9/14/2006	0	0.16666667	Copper	XRF	632.7	1066	
8	UMH-E5	9/14/2006	0	0.16666667	Copper	XRF	632.49	1066	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Copper	XRF	993.8	1005	
8	UMH-B9	9/14/2006	0	0.16666667	Copper	XRF	589.08	993	
8	UMH-A6	9/14/2006	0	0.16666667	Copper	XRF	586.03	988	
8	UMH-A4	9/14/2006	0	0.16666667	Copper	XRF	578.25	975	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Copper	XRF	946.94	958	
8	UMH-A2	9/14/2006	0	0.16666667	Copper	XRF	561.66	947	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Copper	XRF	886.97	897	
8	UMH-J2	9/14/2006	0	0.16666667	Copper	XRF	530.21	894	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Copper	Lab		873	
8	UMH-C9	9/14/2006	0	0.16666667	Copper	XRF	514.5	867	
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Copper	XRF	849.12	859	
8	UMH-E4	9/14/2006	0	0.16666667	Copper	XRF	505.71	852	
8	UMH-G4	9/14/2006	0	0.16666667	Copper	XRF	485.3	818	
8	UMH-D6	9/14/2006	0	0.16666667	Copper	XRF	484.91	817	
8	UMH-G8	9/14/2006	0	0.16666667	Copper	Lab		798	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Copper	XRF	784.14	793	
8	UMH-H5	9/14/2006	0	0.16666667	Copper	XRF	468.58	790	
8	UMH-F8	9/14/2006	0	0.16666667	Copper	XRF	468.43	790	
8	UMH-C8	9/14/2006	0	0.16666667	Copper	XRF	458.13	772	
8	UMH-I4	9/14/2006	0	0.16666667	Copper	XRF	454.94	767	
8	UMH-I5	9/14/2006	0	0.16666667	Copper	XRF	451.8	762	
8	UMH-D8	9/14/2006	0	0.16666667	Copper	XRF	435.27	734	
8	UMH-F2	9/14/2006	0	0.16666667	Copper	XRF	407.8	687	
8	UMH-D7	9/14/2006	0	0.16666667	Copper	XRF	396.08	668	
8	UMH-G1	9/14/2006	0	0.16666667	Copper	XRF	395.51	667	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Copper	XRF	657.76	665	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Copper	XRF	642.35	650	
8	UMH-I1	9/14/2006	0	0.16666667	Copper	XRF	365.52	616	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Copper	Lab		605	
8	UMH-A7	9/14/2006	0	0.16666667	Copper	Lab		572	
8	UMH-J3	9/14/2006	0	0.16666667	Copper	XRF	335.02	565	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Copper	XRF	556.94	563	
8	UMH-F1	9/14/2006	0	0.16666667	Copper	XRF	333.35	562	
8	UMH-G2	9/14/2006	0	0.16666667	Copper	XRF	332.07	560	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Copper	XRF	543.88	550	
8	UMH-A5	9/14/2006	0	0.16666667	Copper	XRF	312.53	527	
8	UMH-H4	9/14/2006	0	0.16666667	Copper	XRF	308.48	520	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Copper	XRF	503.63	509	
8	UMH-H7	9/14/2006	0	0.16666667	Copper	Lab		505	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Copper	XRF	489.1	495	
8	UMH-H3	9/14/2006	0	0.16666667	Copper	XRF	290.79	490	
8	UMH-H6	9/14/2006	0	0.16666667	Copper	XRF	280.73	473	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Copper	XRF	463.31	469	
8	UMH-I2	9/14/2006	0	0.16666667	Copper	XRF	271.79	458	
8	UMH-G6	9/14/2006	0	0.16666667	Copper	XRF	271.76	458	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Copper	XRF	450.24	455	
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Copper	XRF	442.88	448	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Copper	XRF	434.98	440	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Copper	XRF	405.32	410	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Copper	XRF	396.32	401	
8	UMH-C7	9/14/2006	0	0.16666667	Copper	Lab		399	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Copper	XRF	385.88	390	
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Copper	XRF	351.59	356	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Copper	XRF	310.56	314	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Copper	XRF	299.65	303	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Copper	XRF	267.14	270	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	Lab		264	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Copper	XRF	234.47	237	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Copper	XRF	216.33	219	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Copper	XRF	208.93	211	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Copper	XRF	201.85	204	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Copper	XRF	186.19	188	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Copper	XRF	179.36	181	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Copper	XRF	171.75	174	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Copper	XRF	161.19	163	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Copper	XRF	141.08	143	
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Copper	XRF	135.59	137	
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Copper	XRF	134.88	136	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Copper	Lab		130	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Copper	XRF	125.43	127	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Copper	XRF	118.89	120	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Copper	XRF	116	117	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Copper	Lab		116	J
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Copper	XRF	104	105	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	Lab		105	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Copper	XRF	102.83	104	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Copper	XRF	101.56	103	
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Copper	XRF	100	101	
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Copper	XRF	98.74	100	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Copper	XRF	94	95	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Copper	XRF	93.42	94	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Copper	Lab		94	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Copper	Lab		88	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	XRF	85.96	87	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Copper	XRF	84.3	85	
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Copper	XRF	78.88	80	
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Copper	XRF	77.65	79	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Copper	XRF	77.41	78	
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Copper	XRF	74.53	75	
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Copper	XRF	71.78	73	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Copper	Lab		69	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Copper	XRF	64.26	65	
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Copper	XRF	63.35	64	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Copper	Lab		64	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Copper	XRF	57	58	
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Copper	XRF	56.62	57	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Copper	XRF	55.61	56	
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Copper	XRF	54.86	55	
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Copper	XRF	54.13	55	
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Copper	XRF	53.44	54	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Copper	XRF	52.87	53	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Copper	XRF	52.24	53	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Copper	XRF	51	52	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Copper	XRF	50.63	51	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Copper	XRF	48.83	49	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	47	48	
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	43.02	44	
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Copper	XRF	42.91	43	
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Copper	XRF	42.04	43	
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	39	39	
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Copper	XRF	37.71	38	
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	37	37	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Copper	XRF	36.03	36	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Copper	XRF	35.71	36	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-50+25b (0-6")	7/21/2008	0	0.5	Copper	XRF	35.46	36	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Copper	XRF	35.09	35	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Copper	XRF	35	35	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Copper	XRF	34.38	35	U
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	34	34	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Copper	Lab		34	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Copper	XRF	32.43	33	U
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Copper	XRF	32	32	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Copper	XRF	31.95	32	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Copper	XRF	31.72	32	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Copper	XRF	30	30	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Copper	XRF	28.96	29	U
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Copper	XRF	28.57	29	U
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Copper	XRF	28	28	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Copper	XRF	27.5	28	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Copper	XRF	23.02	23	U
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Copper	XRF	22.47	23	U
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Copper	Lab		19	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Iron	XRF	222135.42	221158	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Iron	XRF	168585.16	167843	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Iron	XRF	76737.85	76400	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Iron	XRF	57228.44	56977	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Iron	XRF	53619.91	53384	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Iron	XRF	51800.26	51572	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Iron	XRF	51585.38	51358	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Iron	Lab		50700	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Iron	XRF	49552.5	49334	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Iron	XRF	48452.46	48239	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Iron	XRF	45886.02	45684	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Iron	XRF	42834.7	42646	
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Iron	XRF	41743.84	41560	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Iron	XRF	41460.98	41279	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	XRF	40563.73	40385	
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Iron	XRF	39235.63	39063	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Iron	XRF	39205.56	39033	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Iron	XRF	38921.87	38751	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Iron	XRF	38455.53	38286	
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Iron	XRF	37811.12	37645	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Iron	XRF	37763.4	37597	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Iron	XRF	37436.8	37272	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Iron	Lab		36400	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Iron	XRF	35970.31	35812	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Iron	XRF	35922.1	35764	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Iron	XRF	35664.51	35508	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Iron	XRF	35352.9	35197	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Iron	XRF	35071.17	34917	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Iron	XRF	34063.89	33914	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Iron	XRF	34062.31	33912	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Iron	XRF	33487.76	33340	
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Iron	XRF	31717.42	31578	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Iron	Lab		30700	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Iron	XRF	30305.29	30172	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Iron	Lab		29800	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Iron	XRF	29900.39	29769	
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Iron	XRF	29425.5	29296	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Iron	XRF	28654.02	28528	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Iron	XRF	28214.67	28091	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Iron	XRF	27885.22	27763	
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Iron	XRF	27598.05	27477	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Iron	XRF	26161	26046	
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Iron	XRF	25767.27	25654	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Iron	XRF	25445.14	25333	
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Iron	XRF	25273.54	25162	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Iron	XRF	25184.63	25074	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Iron	XRF	24708.69	24600	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Iron	XRF	24288.21	24181	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	Lab		23800	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Iron	XRF	23807.28	23703	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Iron	XRF	23690.3	23586	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Iron	XRF	23558.51	23455	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Iron	XRF	22766.99	22667	
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Iron	XRF	22596	22497	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Iron	XRF	22587.21	22488	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Iron	XRF	22039.7	21943	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Iron	XRF	21745.79	21650	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Iron	XRF	21523.98	21429	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Iron	XRF	21434.2	21340	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Iron	Lab		21300	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Iron	XRF	21326.02	21232	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Iron	XRF	21272.76	21179	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Iron	XRF	20806.49	20715	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Iron	XRF	20374.05	20284	
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Iron	XRF	20264.13	20175	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	20254.3	20165	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Iron	XRF	20253.53	20164	
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	20124.5	20036	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Iron	XRF	19915.83	19828	
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Iron	XRF	19771.9	19685	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	19656.6	19570	
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Iron	XRF	19380.61	19295	
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	19328.9	19244	
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Iron	XRF	19317.34	19232	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Iron	XRF	19105.68	19022	
8	UMH2-50+25b (0-6")	7/21/2008	0	0.5	Iron	XRF	19002.03	18918	
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Iron	XRF	18544.52	18463	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Iron	Lab		18400	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Iron	XRF	18470.76	18389	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Iron	XRF	18196.14	18116	
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Iron	XRF	18149.1	18069	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Iron	XRF	18009.78	17931	
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Iron	XRF	17964.16	17885	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Iron	XRF	17883.3	17805	
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Iron	XRF	17667.86	17590	
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Iron	XRF	17567.02	17490	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Iron	XRF	17191.41	17116	
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Iron	XRF	17169.54	17094	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	16964.7	16890	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Iron	XRF	16872.3	16798	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Iron	XRF	16816.54	16743	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	XRF	16654.73	16581	
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Iron	XRF	16282.3	16211	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Iron	XRF	15987.2	15917	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Iron	XRF	15796.72	15727	
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Iron	XRF	15784.67	15715	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Iron	XRF	15479.89	15412	
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Iron	XRF	15422.7	15355	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Iron	XRF	15154.5	15088	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Iron	XRF	14999.79	14934	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Iron	XRF	14696.13	14631	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Iron	XRF	14400.68	14337	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Iron	XRF	13553.31	13494	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Iron	XRF	12719.16	12663	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Iron	XRF	12179.9	12126	
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Iron	XRF	6959	6928	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Lead	Lab		30700	
8	UMH-A1	9/14/2006	0	0.16666667	Lead	XRF	23105.42	26604	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Lead	XRF	16817.24	14633	
8	UMH-J2	9/14/2006	0	0.16666667	Lead	XRF	12023.34	13844	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Lead	Lab		13600	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Lead	XRF	15468.85	13459	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Lead	XRF	15449.31	13442	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Lead	XRF	14940.59	13000	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-C1	9/14/2006	0	0.16666667	Lead	XRF	10693.27	12312	
8	UMH-B1	9/14/2006	0	0.16666667	Lead	XRF	9459.49	10892	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Lead	XRF	12377.3	10769	
8	UMH-D3	9/14/2006	0	0.16666667	Lead	XRF	8693.38	10010	
8	UMH-D2	9/14/2006	0	0.16666667	Lead	XRF	8628.33	9935	
8	UMH-B2	9/14/2006	0	0.16666667	Lead	XRF	8558.3	9854	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Lead	XRF	11296.28	9829	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Lead	Lab		9820	
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Lead	XRF	11060.14	9623	
8	UMH-D1	9/14/2006	0	0.16666667	Lead	XRF	8215.7	9460	
8	UMH-E3	9/14/2006	0	0.16666667	Lead	XRF	8108.09	9336	
8	UMH-C3	9/14/2006	0	0.16666667	Lead	Lab		9300	
8	UMH-C6	9/14/2006	0	0.16666667	Lead	XRF	8018.47	9232	
8	UMH-C2	9/14/2006	0	0.16666667	Lead	XRF	7592.38	8742	
8	UMH-E1	9/14/2006	0	0.16666667	Lead	XRF	7348.67	8461	
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Lead	XRF	9593.95	8348	
8	UMH-E2	9/14/2006	0	0.16666667	Lead	XRF	7237.92	8334	
8	UMH-A3	9/14/2006	0	0.16666667	Lead	XRF	7108.5	8185	
8	UMH-C4	9/14/2006	0	0.16666667	Lead	XRF	6882.95	7925	
8	UMH-D5	9/14/2006	0	0.16666667	Lead	Lab		7740	
8	UMH-J1	9/14/2006	0	0.16666667	Lead	XRF	6609.54	7610	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Lead	XRF	8648.34	7525	
8	UMH-A8	9/14/2006	0	0.16666667	Lead	XRF	5907.88	6802	
8	UMH-B8	9/14/2006	0	0.16666667	Lead	XRF	5736.18	6605	
8	UMH-G4	9/14/2006	0	0.16666667	Lead	XRF	5734.56	6603	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Lead	XRF	7300.29	6352	
8	UMH-F4	9/14/2006	0	0.16666667	Lead	XRF	5232.1	6024	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Lead	XRF	6826.62	5940	
8	UMH-J3	9/14/2006	0	0.16666667	Lead	XRF	4972.26	5725	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Lead	XRF	6572.28	5719	
8	UMH-A4.5	9/14/2006	0	0.16666667	Lead	XRF	4927.48	5674	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	Lab		5660	
8	UMH-G2	9/14/2006	0	0.16666667	Lead	XRF	4700.12	5412	
8	UMH-B3	9/14/2006	0	0.16666667	Lead	XRF	4637.86	5340	
8	UMH-H2	9/14/2006	0	0.16666667	Lead	XRF	4425.65	5096	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Lead	XRF	5700.98	4960	
8	UMH-D4	9/14/2006	0	0.16666667	Lead	XRF	4281.52	4930	
8	UMH-G5	9/14/2006	0	0.16666667	Lead	XRF	4263.52	4909	
8	UMH-G3	9/14/2006	0	0.16666667	Lead	XRF	4249.73	4893	
8	UMH-I3	9/14/2006	0	0.16666667	Lead	XRF	4200.28	4836	
8	UMH-E5	9/14/2006	0	0.16666667	Lead	XRF	4183.66	4817	
8	UMH-A4	9/14/2006	0	0.16666667	Lead	XRF	4080.04	4698	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Lead	XRF	5398.81	4698	
8	UMH-H3	9/14/2006	0	0.16666667	Lead	XRF	4035.17	4646	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-B5	9/14/2006	0	0.16666667	Lead	XRF	3974.54	4576	
8	UMH-B6	9/14/2006	0	0.16666667	Lead	XRF	3947.18	4545	
8	UMH-F3	9/14/2006	0	0.16666667	Lead	XRF	3907.81	4499	
8	UMH-A9	9/14/2006	0	0.16666667	Lead	XRF	3712.66	4275	
8	UMH-F5	9/14/2006	0	0.16666667	Lead	XRF	3674.62	4231	
8	UMH-E4	9/14/2006	0	0.16666667	Lead	XRF	3624.01	4173	
8	UMH-A2	9/14/2006	0	0.16666667	Lead	XRF	3573.73	4115	
8	UMH-I2	9/14/2006	0	0.16666667	Lead	XRF	3497.67	4027	
8	UMH-B7	9/14/2006	0	0.16666667	Lead	XRF	3482.4	4010	
8	UMH-D6	9/14/2006	0	0.16666667	Lead	XRF	3448.82	3971	
8	UMH-B4	9/14/2006	0	0.16666667	Lead	XRF	3374.15	3885	
8	UMH-G8	9/14/2006	0	0.16666667	Lead	Lab		3870	
8	UMH-I1	9/14/2006	0	0.16666667	Lead	XRF	3347.68	3855	
8	UMH-C5	9/14/2006	0	0.16666667	Lead	XRF	3301.32	3801	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Lead	XRF	4247.16	3695	
8	UMH-F6	9/14/2006	0	0.16666667	Lead	XRF	3156.13	3634	
8	UMH-H4	9/14/2006	0	0.16666667	Lead	XRF	3146.39	3623	
8	UMH-A7	9/14/2006	0	0.16666667	Lead	Lab		3620	
8	UMH-F7	9/14/2006	0	0.16666667	Lead	Lab		3580	
8	UMH-J4	9/14/2006	0	0.16666667	Lead	Lab		3560	
8	UMH-A6	9/14/2006	0	0.16666667	Lead	XRF	3083.05	3550	
8	UMH-D8	9/14/2006	0	0.16666667	Lead	XRF	3059.47	3523	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Lead	XRF	3891.43	3386	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Lead	XRF	3869.36	3367	
8	UMH-A10	9/14/2006	0	0.16666667	Lead	XRF	2871.42	3306	
8	UMH-H1	9/14/2006	0	0.16666667	Lead	XRF	2834.3	3263	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Lead	XRF	3701.36	3221	
8	UMH-F1	9/14/2006	0	0.16666667	Lead	XRF	2754.85	3172	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Lead	XRF	3576.09	3112	
8	UMH-G1	9/14/2006	0	0.16666667	Lead	XRF	2658.53	3061	
8	UMH-F2	9/14/2006	0	0.16666667	Lead	XRF	2636.06	3035	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Lead	XRF	3452.65	3004	
8	UMH-A5	9/14/2006	0	0.16666667	Lead	XRF	2562.86	2951	
8	UMH-G7	9/14/2006	0	0.16666667	Lead	XRF	2556.44	2943	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Lead	XRF	3370.59	2933	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Lead	XRF	3308.55	2879	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Lead	XRF	3085.67	2685	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Lead	XRF	3029.14	2636	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Lead	XRF	3027.21	2634	
8	UMH-C9	9/14/2006	0	0.16666667	Lead	XRF	2163.76	2491	
8	UMH-C8	9/14/2006	0	0.16666667	Lead	XRF	2149.96	2475	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Lead	XRF	2733.62	2379	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Lead	XRF	2711.28	2359	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Lead	XRF	2682.77	2334	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2633.5	2291	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Lead	Lab		2240	
8	UMH-B9	9/14/2006	0	0.16666667	Lead	XRF	1837.41	2116	
8	UMH-D7	9/14/2006	0	0.16666667	Lead	XRF	1835.3	2113	
8	UMH-I5	9/14/2006	0	0.16666667	Lead	XRF	1795.43	2067	
8	UMH-H5	9/14/2006	0	0.16666667	Lead	XRF	1789.22	2060	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Lead	XRF	2181.51	1898	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Lead	XRF	2104.21	1831	
8	UMH-C7	9/14/2006	0	0.16666667	Lead	Lab		1770	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Lead	XRF	1977.5	1721	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Lead	XRF	1947.86	1695	
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Lead	XRF	1892.01	1646	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Lead	XRF	1771.29	1541	
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Lead	XRF	1764.07	1535	
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Lead	XRF	1698.17	1478	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Lead	XRF	1571.8	1368	
8	UMH-H6	9/14/2006	0	0.16666667	Lead	XRF	1176.93	1355	
8	UMH-H7	9/14/2006	0	0.16666667	Lead	Lab		1340	
8	UMH-I4	9/14/2006	0	0.16666667	Lead	XRF	1134.33	1306	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Lead	XRF	1496.71	1302	
8	UMH-F8	9/14/2006	0	0.16666667	Lead	XRF	1116.71	1286	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Lead	XRF	1163.46	1012	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Lead	XRF	1141.04	993	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Lead	XRF	1032.57	898	
8	UMH-G6	9/14/2006	0	0.16666667	Lead	XRF	681.04	784	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Lead	XRF	872.09	759	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Lead	XRF	847	737	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Lead	XRF	827.51	720	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Lead	XRF	807.89	703	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Lead	XRF	760.43	662	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	XRF	730.29	635	
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Lead	XRF	659.8	574	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Lead	XRF	652.02	567	
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Lead	XRF	618.16	538	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Lead	Lab		534	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Lead	XRF	604.25	526	
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Lead	XRF	580.8	505	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Lead	XRF	562.17	489	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	Lab		460	JM10
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Lead	Lab		447	J
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Lead	XRF	472.9	411	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Lead	XRF	468.57	408	
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Lead	XRF	446.11	388	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Lead	Lab		380	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Lead	XRF	409.6	356	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Lead	XRF	342.51	298	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Lead	XRF	341.56	297	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Lead	XRF	318.5	277	
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Lead	XRF	314.4	274	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Lead	XRF	303.08	264	
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Lead	XRF	291.84	254	
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	270.3	235	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Lead	XRF	261.4	227	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Lead	Lab		217	
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Lead	XRF	240.71	209	
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	229.77	200	
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Lead	XRF	224.49	195	
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Lead	XRF	219.24	191	
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Lead	XRF	212.49	185	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	207.8	181	
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Lead	XRF	194.63	169	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Lead	XRF	183.6	160	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Lead	Lab		153	JM10
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Lead	XRF	171.1	149	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Lead	XRF	166.42	145	
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Lead	XRF	164.66	143	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Lead	XRF	159.7	139	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Lead	XRF	145.72	127	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Lead	Lab		116	
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Lead	XRF	130.54	114	
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	126	110	
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	123.9	108	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Lead	XRF	122.7	107	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Lead	XRF	115.4	100	
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Lead	XRF	114.4	100	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Lead	XRF	109.29	95	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Lead	Lab		90	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Lead	XRF	103	90	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Lead	XRF	103	90	
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Lead	XRF	99.25	86	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Lead	XRF	87.22	76	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Lead	XRF	61.63	54	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Lead	XRF	49.48	43	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Manganese	XRF	11572.65	9626	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Manganese	Lab		7540	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Manganese	Lab		7480	
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Manganese	XRF	8503.19	7073	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Manganese	XRF	7990.29	6646	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Manganese	XRF	7807.35	6494	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	7156.68	5953	
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	7052.56	5866	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Manganese	XRF	6952.92	5783	
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Manganese	XRF	6613.12	5501	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	6332.25	5267	
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	6086	5062	
8	UMH-A8	9/14/2006	0	0.16666667	Manganese	XRF	9805.59	5062	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Manganese	XRF	6021	5008	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Manganese	XRF	5748.86	4782	
8	UMH-B8	9/14/2006	0	0.16666667	Manganese	XRF	8701.9	4492	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Manganese	XRF	5295.28	4405	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	5129.02	4266	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Manganese	XRF	5016.67	4173	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Manganese	XRF	4638.1	3858	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Manganese	Lab		3820	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Manganese	XRF	4503.95	3746	
8	UMH-A9	9/14/2006	0	0.16666667	Manganese	XRF	7236.98	3736	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	4490.45	3735	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4489.5	3734	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Manganese	XRF	4445	3697	
8	UMH-B7	9/14/2006	0	0.16666667	Manganese	XRF	6960.68	3593	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	Lab		3560	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Manganese	XRF	4100.26	3411	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Manganese	XRF	4074.31	3389	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Manganese	XRF	4056.8	3374	
8	UMH-G8	9/14/2006	0	0.16666667	Manganese	Lab		3000	
8	UMH-G4	9/14/2006	0	0.16666667	Manganese	XRF	5602.37	2892	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Manganese	XRF	3472.38	2888	
8	UMH-D4	9/14/2006	0	0.16666667	Manganese	XRF	5367.78	2771	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	3330.84	2771	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Manganese	XRF	3286	2733	
8	UMH-G2	9/14/2006	0	0.16666667	Manganese	XRF	4714.92	2434	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2909.77	2420	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Manganese	Lab		2340	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Manganese	XRF	2802.84	2331	
8	UMH-A6	9/14/2006	0	0.16666667	Manganese	XRF	4489.13	2317	
8	UMH-A10	9/14/2006	0	0.16666667	Manganese	XRF	4483.24	2314	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2769.55	2304	
8	UMH-E4	9/14/2006	0	0.16666667	Manganese	XRF	4360.26	2251	
8	UMH-J1	9/14/2006	0	0.16666667	Manganese	XRF	4321.38	2231	
8	UMH-E5	9/14/2006	0	0.16666667	Manganese	XRF	4318.9	2229	
8	UMH-A7	9/14/2006	0	0.16666667	Manganese	Lab		2220	
8	UMH-A1	9/14/2006	0	0.16666667	Manganese	XRF	4269.18	2204	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-D6	9/14/2006	0	0.16666667	Manganese	XRF	4068.27	2100	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	2413	2007	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2389.45	1988	
8	UMH-F5	9/14/2006	0	0.16666667	Manganese	XRF	3831.68	1978	
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Manganese	XRF	2368	1970	
8	UMH-D8	9/14/2006	0	0.16666667	Manganese	XRF	3804.56	1964	
8	UMH-A2	9/14/2006	0	0.16666667	Manganese	XRF	3784.08	1953	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Manganese	XRF	2307.65	1920	
8	UMH-B6	9/14/2006	0	0.16666667	Manganese	XRF	3718.4	1919	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2276.89	1894	
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2266.76	1885	
8	UMH-D3	9/14/2006	0	0.16666667	Manganese	XRF	3652.41	1885	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2265.69	1885	
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Manganese	XRF	2256.24	1877	
8	UMH-J2	9/14/2006	0	0.16666667	Manganese	XRF	3609	1863	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2194.24	1825	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Manganese	XRF	2188.17	1820	
8	UMH-C7	9/14/2006	0	0.16666667	Manganese	Lab		1810	
8	UMH-A3	9/14/2006	0	0.16666667	Manganese	XRF	3486.69	1800	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2151.86	1790	
8	UMH-C1	9/14/2006	0	0.16666667	Manganese	XRF	3351.39	1730	
8	UMH-F7	9/14/2006	0	0.16666667	Manganese	Lab		1670	
8	UMH-C6	9/14/2006	0	0.16666667	Manganese	XRF	3218.47	1661	
8	UMH-A4.5	9/14/2006	0	0.16666667	Manganese	XRF	3205	1654	
8	UMH-G7	9/14/2006	0	0.16666667	Manganese	XRF	3179.4	1641	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1967.95	1637	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1959.96	1630	
8	UMH-B1	9/14/2006	0	0.16666667	Manganese	XRF	3107.28	1604	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1910	1589	
8	UMH-A5	9/14/2006	0	0.16666667	Manganese	XRF	3056.75	1578	
8	UMH-H3	9/14/2006	0	0.16666667	Manganese	XRF	3029.36	1564	
8	UMH-C4	9/14/2006	0	0.16666667	Manganese	XRF	2962.86	1529	
8	UMH-C8	9/14/2006	0	0.16666667	Manganese	XRF	2962.38	1529	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1811	1506	
8	UMH-E1	9/14/2006	0	0.16666667	Manganese	XRF	2887.45	1491	
8	UMH-H2	9/14/2006	0	0.16666667	Manganese	XRF	2880.93	1487	
8	UMH-F4	9/14/2006	0	0.16666667	Manganese	XRF	2867.62	1480	
8	UMH-B5	9/14/2006	0	0.16666667	Manganese	XRF	2852.85	1473	
8	UMH-G5	9/14/2006	0	0.16666667	Manganese	XRF	2846.55	1469	
8	UMH-C3	9/14/2006	0	0.16666667	Manganese	Lab		1460	
8	UMH2-50+25b (0-6")	7/21/2008	0	0.5	Manganese	XRF	1731	1440	
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1725.3	1435	
8	UMH-H6	9/14/2006	0	0.16666667	Manganese	XRF	2746.75	1418	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1697.15	1412	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-D1	9/14/2006	0	0.16666667	Manganese	XRF	2733.4	1411	
8	UMH-F6	9/14/2006	0	0.16666667	Manganese	XRF	2700.7	1394	
8	UMH-I4	9/14/2006	0	0.16666667	Manganese	XRF	2689.43	1388	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Manganese	XRF	1656	1377	
8	UMH-C2	9/14/2006	0	0.16666667	Manganese	XRF	2651.03	1368	
8	UMH-C9	9/14/2006	0	0.16666667	Manganese	XRF	2637.68	1362	
8	UMH-H7	9/14/2006	0	0.16666667	Manganese	Lab		1360	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1610.82	1340	
8	UMH-J3	9/14/2006	0	0.16666667	Manganese	XRF	2586.16	1335	
8	UMH-H1	9/14/2006	0	0.16666667	Manganese	XRF	2585.72	1335	
8	UMH-B2	9/14/2006	0	0.16666667	Manganese	XRF	2579.87	1332	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Manganese	Lab		1320	
8	UMH-D2	9/14/2006	0	0.16666667	Manganese	XRF	2540.7	1312	
8	UMH-H5	9/14/2006	0	0.16666667	Manganese	XRF	2539.66	1311	
8	UMH-A4	9/14/2006	0	0.16666667	Manganese	XRF	2535.82	1309	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1567.38	1304	
8	UMH-F3	9/14/2006	0	0.16666667	Manganese	XRF	2513.92	1298	
8	UMH-G1	9/14/2006	0	0.16666667	Manganese	XRF	2494.55	1288	
8	UMH-I1	9/14/2006	0	0.16666667	Manganese	XRF	2494.12	1287	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1544	1284	
8	UMH-B3	9/14/2006	0	0.16666667	Manganese	XRF	2480.9	1281	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Manganese	Lab		1270	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1525.85	1269	
8	UMH-D7	9/14/2006	0	0.16666667	Manganese	XRF	2403.96	1241	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1491.37	1241	
8	UMH-G3	9/14/2006	0	0.16666667	Manganese	XRF	2396.5	1237	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1466	1219	
8	UMH-D5	9/14/2006	0	0.16666667	Manganese	Lab		1210	
8	UMH-I3	9/14/2006	0	0.16666667	Manganese	XRF	2342.12	1209	
8	UMH-C5	9/14/2006	0	0.16666667	Manganese	XRF	2333.38	1204	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1445.66	1202	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Manganese	XRF	1383.59	1151	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1322.12	1100	
8	UMH-E2	9/14/2006	0	0.16666667	Manganese	XRF	2128.07	1099	
8	UMH-E3	9/14/2006	0	0.16666667	Manganese	XRF	2111.76	1090	
8	UMH-H4	9/14/2006	0	0.16666667	Manganese	XRF	2109.93	1089	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1306	1086	
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1304.11	1085	
8	UMH-F8	9/14/2006	0	0.16666667	Manganese	XRF	2068.9	1068	
8	UMH-F1	9/14/2006	0	0.16666667	Manganese	XRF	2053.76	1060	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1260	1048	
8	UMH-I5	9/14/2006	0	0.16666667	Manganese	XRF	1970.04	1017	
8	UMH-F2	9/14/2006	0	0.16666667	Manganese	XRF	1917.36	990	
8	UMH-I2	9/14/2006	0	0.16666667	Manganese	XRF	1872.08	966	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs)		Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
			Top	Bottom					
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1158.36	964	
8	UMH-B4	9/14/2006	0	0.16666667	Manganese	XRF	1865.56	963	
8	UMH-B9	9/14/2006	0	0.16666667	Manganese	XRF	1856.42	958	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1118.49	930	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Manganese	XRF	1099.06	914	
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	1075	894	
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1029.04	856	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Manganese	XRF	1012.97	843	
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Manganese	XRF	986.73	821	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Manganese	XRF	977.94	813	
8	UMH-G6	9/14/2006	0	0.16666667	Manganese	XRF	1563.54	807	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Manganese	Lab		784	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Manganese	XRF	854.07	710	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Manganese	XRF	848.51	706	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Manganese	XRF	824.81	686	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Manganese	Lab		684	
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Manganese	XRF	807.11	671	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Manganese	XRF	793.72	660	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Manganese	XRF	767.51	638	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Manganese	XRF	758.55	631	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Manganese	Lab		624	
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	745.07	620	
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Manganese	XRF	722.48	601	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Manganese	Lab		588	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	646.68	538	
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Manganese	XRF	618	514	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Manganese	XRF	617.48	514	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	XRF	608.1	506	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	Lab		496	
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Manganese	XRF	587.71	489	
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Manganese	XRF	551	458	
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Manganese	XRF	546.68	455	
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Manganese	XRF	529.17	440	
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Manganese	XRF	511.85	426	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Manganese	Lab		425	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Manganese	XRF	462.52	385	
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Manganese	XRF	435.12	362	
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Manganese	XRF	414.03	344	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Manganese	XRF	413.93	344	
8	UMH-J4	9/14/2006	0	0.16666667	Manganese	Lab		314	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Manganese	XRF	322.32	268	
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Manganese	XRF	257.4	214	
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Manganese	XRF	223.66	186	
8	UMH-A1	9/14/2006	0	0.16666667	Zinc	XRF	3829.12	7824	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-C3	9/14/2006	0	0.16666667	Zinc	Lab		7610	
8	UMH-A8	9/14/2006	0	0.16666667	Zinc	XRF	3171.07	6479	
8	UMH-B8	9/14/2006	0	0.16666667	Zinc	XRF	2914.35	5955	
8	UMH-C4	9/14/2006	0	0.16666667	Zinc	XRF	2218.65	4533	
8	UMH-B7	9/14/2006	0	0.16666667	Zinc	XRF	2194.73	4484	
8	UMH-A9	9/14/2006	0	0.16666667	Zinc	XRF	1892.21	3866	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Zinc	Lab		3840	
8	UMH-A2	9/14/2006	0	0.16666667	Zinc	XRF	1682.4	3437	
8	UMH-E1	9/14/2006	0	0.16666667	Zinc	XRF	1625.82	3322	
8	MHCS-600-W10 (0-6")	10/16/2007	0	0.5	Zinc	XRF	3205.39	3276	
8	UMH-C1	9/14/2006	0	0.16666667	Zinc	XRF	1529.87	3126	
8	UMH-C6	9/14/2006	0	0.16666667	Zinc	XRF	1509.21	3084	
8	UMH-A3	9/14/2006	0	0.16666667	Zinc	XRF	1508.19	3082	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Zinc	Lab		2940	
8	UMH-B6	9/14/2006	0	0.16666667	Zinc	XRF	1380.38	2820	
8	MHCS-1000-W5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	2745.53	2806	
8	UMH-E3	9/14/2006	0	0.16666667	Zinc	XRF	1354.83	2768	
8	UMH-D3	9/14/2006	0	0.16666667	Zinc	XRF	1320.48	2698	
8	UMH-B1	9/14/2006	0	0.16666667	Zinc	XRF	1234.99	2523	
8	UMH-B2	9/14/2006	0	0.16666667	Zinc	XRF	1219.18	2491	
8	UMH2-550 (0-6")	10/11/2007	0	0.5	Zinc	XRF	2418.11	2471	
8	MHCS-525-W15 (0-6")	10/17/2007	0	0.5	Zinc	XRF	2350.79	2402	
8	UMH-D2	9/14/2006	0	0.16666667	Zinc	XRF	1169.73	2390	
8	UMH-F4	9/14/2006	0	0.16666667	Zinc	XRF	1165.46	2381	
8	UMH-A4.5	9/14/2006	0	0.16666667	Zinc	XRF	1130.22	2309	
8	UMH-D1	9/14/2006	0	0.16666667	Zinc	XRF	1106.63	2261	
8	UMH-A5	9/14/2006	0	0.16666667	Zinc	XRF	1097.13	2242	
8	UMH-B5	9/14/2006	0	0.16666667	Zinc	XRF	1027.38	2099	
8	UMH-A10	9/14/2006	0	0.16666667	Zinc	XRF	1012.73	2069	
8	UMH-A7	9/14/2006	0	0.16666667	Zinc	Lab		2020	
8	UMH-C2	9/14/2006	0	0.16666667	Zinc	XRF	971.67	1985	
8	UMH-B3	9/14/2006	0	0.16666667	Zinc	XRF	966.69	1975	
8	MHCS-00-E25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	1830.97	1871	
8	UMH-A6	9/14/2006	0	0.16666667	Zinc	XRF	875.74	1789	
8	UMH1-100 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1659.67	1696	
8	UMH-F3	9/14/2006	0	0.16666667	Zinc	XRF	823.7	1683	
8	MHCS-800-E5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1628.09	1664	
8	UMH-D5	9/14/2006	0	0.16666667	Zinc	Lab		1660	
8	UMH-D4	9/14/2006	0	0.16666667	Zinc	XRF	808.02	1651	
8	UMH2-100 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1615.43	1651	
8	UMH2-200 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1612.04	1647	
8	UMH-E2	9/14/2006	0	0.16666667	Zinc	XRF	792.51	1619	
8	UMH-D6	9/14/2006	0	0.16666667	Zinc	XRF	789.5	1613	
8	UMH2-250 (0-6")	10/10/2007	0	0.5	Zinc	XRF	1573.59	1608	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Zinc	Lab		1600	
8	MHCS-700-W10 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1549.04	1583	
8	UMH-G7	9/14/2006	0	0.16666667	Zinc	XRF	766.02	1565	
8	UMH1-350 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1522.2	1556	
8	UMH1-300 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1463.65	1496	
8	UMH-H1	9/14/2006	0	0.16666667	Zinc	XRF	728.86	1489	
8	MHCS-1300-E20 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1428.74	1460	
8	MHCS-900-E5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	1407.2	1438	
8	MHCS-700-E10 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1374.02	1404	
8	UMH-G5	9/14/2006	0	0.16666667	Zinc	XRF	680.9	1391	
8	UMH-E5	9/14/2006	0	0.16666667	Zinc	XRF	647.49	1323	
8	MHCS-100-W1 (0-6")	10/16/2007	0	0.5	Zinc	XRF	1278.74	1307	
8	UMH-H2	9/14/2006	0	0.16666667	Zinc	XRF	624.62	1276	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Zinc	Lab		1270	
8	UMH-F7	9/14/2006	0	0.16666667	Zinc	Lab		1260	
8	UMH-B9	9/14/2006	0	0.16666667	Zinc	XRF	610.48	1247	
8	MHCS-100-E25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	1211.82	1238	
8	UMH-C5	9/14/2006	0	0.16666667	Zinc	XRF	598.78	1223	
8	UMH2-350+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	1185.2	1211	
8	UMH-F6	9/14/2006	0	0.16666667	Zinc	XRF	590.33	1206	
8	UMH-C9	9/14/2006	0	0.16666667	Zinc	XRF	588.47	1202	
8	UMH2-300+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	1164.6	1190	
8	UMH-G1	9/14/2006	0	0.16666667	Zinc	XRF	573.99	1173	
8	UMH-F5	9/14/2006	0	0.16666667	Zinc	XRF	568.82	1162	
8	UMH-A4	9/14/2006	0	0.16666667	Zinc	XRF	563.63	1152	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Zinc	Lab		1150	
8	UMH-D7	9/14/2006	0	0.16666667	Zinc	XRF	554.8	1134	
8	UMH-B4	9/14/2006	0	0.16666667	Zinc	XRF	546.44	1116	
8	MHCS-600-E10 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1089.25	1113	
8	UMH-D8	9/14/2006	0	0.16666667	Zinc	XRF	540.91	1105	
8	UMH-E4	9/14/2006	0	0.16666667	Zinc	XRF	535.41	1094	
8	UMH-F1	9/14/2006	0	0.16666667	Zinc	XRF	524.38	1071	
8	UMH3-350 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1001.82	1024	
8	UMH3-550 (0-6")	10/11/2007	0	0.5	Zinc	XRF	1000.99	1023	
8	UMH-G8	9/14/2006	0	0.16666667	Zinc	Lab		1010	
8	UMH-J1	9/14/2006	0	0.16666667	Zinc	XRF	493.4	1008	
8	UMH-I1	9/14/2006	0	0.16666667	Zinc	XRF	489.16	999	
8	UMH1-250 (0-6")	10/11/2007	0	0.5	Zinc	XRF	965.78	987	
8	UMH-C8	9/14/2006	0	0.16666667	Zinc	XRF	478.58	978	
8	UMH3-600 (0-6")	10/11/2007	0	0.5	Zinc	XRF	947.9	969	
8	UMH-F8	9/14/2006	0	0.16666667	Zinc	XRF	471.14	963	
8	MHCS-1100-E10 (0-6")	10/16/2007	0	0.5	Zinc	XRF	939.94	961	
8	UMH-I3	9/14/2006	0	0.16666667	Zinc	XRF	464.93	950	
8	MHCS-200-E10 (0-6")	10/16/2007	0	0.5	Zinc	XRF	929.21	950	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH-G3	9/14/2006	0	0.16666667	Zinc	XRF	456.48	933	
8	UMH1-00 (0-6")	10/11/2007	0	0.5	Zinc	XRF	897.44	917	
8	UMH-H5	9/14/2006	0	0.16666667	Zinc	XRF	445.19	910	
8	UMH2-00 (0-6")	10/11/2007	0	0.5	Zinc	XRF	887.75	907	
8	UMH3-650 (0-6")	10/11/2007	0	0.5	Zinc	XRF	869.37	888	
8	UMH2-500 (0-6")	10/10/2007	0	0.5	Zinc	XRF	823.28	841	
8	UMH1-150 (0-6")	10/11/2007	0	0.5	Zinc	XRF	795.76	813	
8	UMH1-400+12.5 (0-6")	7/14/2008	0	0.5	Zinc	XRF	787.3	805	
8	UMH1-450 (0-6")	10/11/2007	0	0.5	Zinc	XRF	775.63	793	
8	UMH1-450+12.5 (0-6")	7/14/2008	0	0.5	Zinc	XRF	774.5	791	
8	UMH3-250 (0-6")	10/11/2007	0	0.5	Zinc	XRF	766.79	784	
8	UMH1-400 (0-6")	10/10/2007	0	0.5	Zinc	XRF	754.37	771	
8	MHCS-1200-E15 (0-6")	10/18/2007	0	0.5	Zinc	XRF	754.2	771	
8	UMH1-50 (0-6")	10/11/2007	0	0.5	Zinc	XRF	753.82	770	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	Lab		765	
8	UMH2-350 (0-6")	10/11/2007	0	0.5	Zinc	XRF	720.69	736	
8	UMH2-300 (0-6")	10/11/2007	0	0.5	Zinc	XRF	677.89	693	
8	AMHR-600 (0-6")	10/12/2007	0	0.5	Zinc	XRF	676.93	692	
8	UMH-F2	9/14/2006	0	0.16666667	Zinc	XRF	331.01	676	
8	UMH3-400 (0-6")	10/11/2007	0	0.5	Zinc	XRF	656.08	670	
8	UMH3-700 (0-6")	10/11/2007	0	0.5	Zinc	XRF	649.66	664	
8	UMH-C7	9/14/2006	0	0.16666667	Zinc	Lab		662	
8	MHCS-800-W5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	637.07	651	
8	MHCS-1000-E10 (0-6")	10/16/2007	0	0.5	Zinc	XRF	618.63	632	
8	UMH2-500+75 (0-6")	7/15/2008	0	0.5	Zinc	XRF	610.7	624	
8	UMH-H6	9/14/2006	0	0.16666667	Zinc	XRF	296.92	607	
8	UMH2-450+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	592.1	605	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Zinc	Lab		587	
8	UMH-H3	9/14/2006	0	0.16666667	Zinc	XRF	286.73	586	
8	AMHR-400 (0-6")	10/12/2007	0	0.5	Zinc	XRF	558.19	570	
8	UMH2-150 (0-6")	10/11/2007	0	0.5	Zinc	XRF	549.66	562	
8	UMH3-150 (0-6")	10/11/2007	0	0.5	Zinc	XRF	547.02	559	
8	MHCS-900-W5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	543.78	556	
8	UMH-H4	9/14/2006	0	0.16666667	Zinc	XRF	268.32	548	
8	UMH-I5	9/14/2006	0	0.16666667	Zinc	XRF	266.34	544	
8	UMH2-600 (0-6")	10/11/2007	0	0.5	Zinc	XRF	510.54	522	
8	UMH-G4	9/14/2006	0	0.16666667	Zinc	XRF	243.44	497	
8	UMH-G2	9/14/2006	0	0.16666667	Zinc	XRF	243.1	497	
8	UMH1-350+12.5 (0-6")	7/14/2008	0	0.5	Zinc	XRF	476.9	487	
8	UMH2-650 (0-6")	10/11/2007	0	0.5	Zinc	XRF	472.11	482	
8	UMH-I4	9/14/2006	0	0.16666667	Zinc	XRF	229.99	470	
8	UMH2-50 (0-6")	10/11/2007	0	0.5	Zinc	XRF	457.82	468	
8	UMH3-200 (0-6")	10/11/2007	0	0.5	Zinc	XRF	437.44	447	
8	UMH3-50+50 (0-6")	7/15/2008	0	0.5	Zinc	XRF	427.64	437	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	UMH2-650+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	420.61	430	
8	UMH-J3	9/14/2006	0	0.16666667	Zinc	XRF	209.33	428	
8	UMH-J4	9/14/2006	0	0.16666667	Zinc	Lab		424	
8	UMH2-100+35 (0-6")	7/14/2008	0	0.5	Zinc	XRF	412.2	421	
8	UMH1-250+25 (0-6")	7/14/2008	0	0.5	Zinc	XRF	410	419	
8	MHCS-1300-E35 (0-6")	10/16/2007	0	0.5	Zinc	XRF	401.63	410	
8	UMH2-450 (0-6")	10/11/2007	0	0.5	Zinc	XRF	397.76	406	
8	UMH2-550+75 (0-6")	7/15/2008	0	0.5	Zinc	XRF	393.64	402	
8	UMH2-250+75 (0-6")	7/15/2008	0	0.5	Zinc	XRF	388.05	397	
8	UMH2-00+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	383.3	392	
8	UMH2-600+25 (0-6")	7/15/2008	0	0.5	Zinc	XRF	377.7	386	
8	UMH3-500 (0-6")	10/11/2007	0	0.5	Zinc	XRF	377.36	386	
8	UMH3-50 (0-6")	10/11/2007	0	0.5	Zinc	XRF	374.51	383	
8	UMH-H7	9/14/2006	0	0.16666667	Zinc	Lab		382	
8	UMH2-50+25b (0-6")	7/21/2008	0	0.5	Zinc	XRF	370.78	379	
8	UMH-I2	9/14/2006	0	0.16666667	Zinc	XRF	168.25	344	
8	UMH-G6	9/14/2006	0	0.16666667	Zinc	XRF	167.53	342	
8	MHCS-900-E15 (0-6")	10/16/2007	0	0.5	Zinc	XRF	308.59	315	
8	UMH3-350+75 (0-6")	7/15/2008	0	0.5	Zinc	XRF	307.5	314	
8	UMH2-400 (0-6")	10/11/2007	0	0.5	Zinc	XRF	297.7	304	
8	UMH3-800 (0-6")	10/10/2007	0	0.5	Zinc	XRF	297.17	304	
8	UMH1-300+14 (0-6")	7/14/2008	0	0.5	Zinc	XRF	288.4	295	
8	UMH3-750 (0-6")	10/11/2007	0	0.5	Zinc	XRF	285.15	291	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Zinc	Lab		291	
8	UMH2-200+85 (0-6")	7/15/2008	0	0.5	Zinc	XRF	272.6	279	
8	MHCS-200-W10 (0-6")	10/16/2007	0	0.5	Zinc	XRF	269.23	275	
8	MHCS-00-W25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	246.09	251	
8	MHCS-00-W5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	236.52	242	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Zinc	Lab		240	
8	UMH3-100 (0-6")	10/11/2007	0	0.5	Zinc	XRF	231.61	237	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	Lab		212	
8	AMHR-0 (0-6")	10/11/2007	0	0.5	Zinc	XRF	203.51	208	
8	MHCS-1200-E30 (0-6")	10/16/2007	0	0.5	Zinc	XRF	202.3	207	
8	UMH3-300 (0-6")	10/11/2007	0	0.5	Zinc	XRF	198.73	203	
8	UMH3-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	XRF	197.63	202	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Zinc	Lab		194	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Zinc	Lab		190	
8	MHCS-100-W25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	175.96	180	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Zinc	Lab		173	
8	MHCS-800-E15 (0-6")	10/17/2007	0	0.5	Zinc	XRF	161.78	165	
8	MHCS-1100-E35 (0-6")	10/16/2007	0	0.5	Zinc	XRF	159.28	163	
8	UMH2-150+60 (0-6")	7/14/2008	0	0.5	Zinc	XRF	157.8	161	
8	UMH3-450 (0-6")	10/11/2007	0	0.5	Zinc	XRF	151.78	155	
8	UMH-J2	9/14/2006	0	0.16666667	Zinc	XRF	74.94	153	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
8	MHTS-COMP 3 (0-6")	10/11/2007	0	0.5	Zinc	XRF	140.1	143	
8	UMH3-00 (0-6")	10/11/2007	0	0.5	Zinc	XRF	123.15	126	
8	UMH1-200 (0-6")	10/11/2007	0	0.5	Zinc	XRF	101.77	104	
9	PMWA1-100+25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		19200	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Aluminum	Lab		18200	
9	PMWA2-200+25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		18000	
9	PMWA1-100+15 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		16200	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Aluminum	Lab		16200	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Aluminum	Lab		16000	
9	PMWA1-230+25 (0-6")	7/10/2008	0	0.5	Aluminum	Lab		13600	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	53.8	40	U
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	50.36	37	U
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	43.25	32	U
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	39.93	29	U
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		21	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	27.65	20	U
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		20	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		19	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	25.61	19	U
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	24.69	18	U
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		18	
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	22.03	16	U
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	18.98	14	U
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		10	
9	PMWA2-200+25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.7	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.7	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.5	
9	PMWA1-100+15 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.5	U
9	PMWA1-100+25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.5	U
9	PMWA1-230+25 (0-6")	7/10/2008	0	0.5	Cadmium	Lab		0.5	U
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.5	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.5	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.4	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Copper	XRF	601.18	608	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Copper	XRF	411.72	416	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Copper	Lab		395	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Copper	Lab		388	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Copper	XRF	355.21	359	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	Lab		344	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Copper	Lab		339	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	Lab		328	
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Copper	XRF	315.78	319	
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Copper	XRF	280.8	284	
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Copper	XRF	280.18	283	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Copper	XRF	269.12	272	
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	166.88	169	
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Copper	XRF	88.85	90	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Iron	XRF	73551.64	73228	
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Iron	XRF	64290.52	64008	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Iron	Lab		63600	
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Iron	XRF	60189.92	59925	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Iron	XRF	58316.75	58060	
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Iron	XRF	56363.86	56116	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	Lab		55900	
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Iron	XRF	52661.43	52430	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	Lab		49800	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Iron	XRF	48023.07	47812	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Iron	XRF	47958.98	47748	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Iron	XRF	39433.75	39260	
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	35441.59	35286	
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Iron	XRF	24082.85	23977	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Lead	XRF	851.42	741	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Lead	Lab		725	
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Lead	XRF	796.6	693	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	Lab		679	
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Lead	XRF	644.74	561	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	Lab		559	
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Lead	XRF	577.52	503	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Lead	Lab		330	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Lead	Lab		290	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Lead	XRF	237.28	206	
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Lead	XRF	230.9	201	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Lead	XRF	222.72	194	
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	178.32	155	
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Lead	XRF	153.52	134	
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Manganese	XRF	916.34	762	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Manganese	XRF	526.29	438	
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Manganese	XRF	513.79	427	
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Manganese	XRF	460.91	383	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	Lab		376	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Manganese	Lab		359	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Manganese	XRF	421.1	350	
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Manganese	XRF	413.66	344	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	Lab		343	
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Manganese	XRF	333.43	277	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Manganese	Lab		269	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Manganese	Lab		264	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Manganese	XRF	221.44	184	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	171.43	143	
9	PMWA2-50 (0-6")	10/8/2007	0	0.5	Zinc	XRF	157.6	161	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	Lab		149	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	Lab		142	
9	PMWA2-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	130.67	134	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Zinc	Lab		133	
9	PMWA1-150 (0-6")	10/8/2007	0	0.5	Zinc	XRF	127.05	130	
9	PMWA2-200 (0-6")	10/8/2007	0	0.5	Zinc	XRF	119.9	123	
9	PMWA1-200 (0-6")	10/8/2007	0	0.5	Zinc	XRF	116.22	119	
9	PMWA1-230 (0-6")	10/8/2007	0	0.5	Zinc	XRF	113.28	116	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Zinc	Lab		115	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Zinc	Lab		109	
9	PMWA1-100 (0-6")	10/8/2007	0	0.5	Zinc	XRF	92.66	95	
9	PMWA2-100 (0-6")	10/8/2007	0	0.5	Zinc	XRF	78.72	80	
9	PMWA1-1 (0-6")	10/8/2007	0	0.5	Zinc	XRF	66.33	68	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	71.46	53	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Arsenic	Lab		50	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	64.44	48	U
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	37.41	28	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	Lab		27	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	31.34	23	
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Arsenic	XRF	28.99	21	U
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	28.37	21	U
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	28.27	21	
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	26.39	19	U
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	25.8	19	U
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	24.93	18	
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	24.36	18	U
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	24.06	18	U
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	22.15	16	
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	22	16	
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	21.42	16	
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	21.11	16	U
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	20.75	15	
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	19.85	15	
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	19.56	14	
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	19.27	14	U
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	18.97	14	U
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	18.69	14	U
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	17.09	13	U
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	16.39	12	U
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Arsenic	XRF	15.37	11	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Arsenic	Lab		11	
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Arsenic	XRF	13.67	10	U

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Arsenic	XRF	12.09	9	U
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Cadmium	Lab		1.4	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Cadmium	Lab		0.4	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Cadmium	Lab		0.2	
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Copper	XRF	989.82	1001	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Copper	Lab		970	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Copper	XRF	755.03	764	
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Copper	XRF	653.3	661	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Copper	XRF	279.79	283	
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Copper	XRF	257.75	261	
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Copper	XRF	225.59	228	
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Copper	XRF	224.07	227	
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Copper	XRF	216.92	219	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Copper	XRF	216.39	219	
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Copper	XRF	216.12	219	
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Copper	XRF	196.57	199	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	Lab		188	
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Copper	XRF	179.61	182	
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Copper	XRF	176.23	178	
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Copper	XRF	172.57	175	
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Copper	XRF	168.31	170	
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Copper	XRF	163.62	166	
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Copper	XRF	143.03	145	
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Copper	XRF	140.42	142	
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Copper	XRF	139.66	141	
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Copper	XRF	126.71	128	
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Copper	XRF	124.9	126	
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Copper	XRF	114.77	116	
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Copper	XRF	111.22	112	
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Copper	XRF	103.98	105	
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Copper	XRF	103.84	105	
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Copper	XRF	90.18	91	
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Copper	XRF	81.7	83	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Copper	Lab		76	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Iron	XRF	83696.45	83328	
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Iron	XRF	81978.98	81618	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Iron	XRF	46138.58	45936	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Iron	XRF	45480.27	45280	
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Iron	XRF	37004.28	36841	
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Iron	XRF	36663.04	36502	
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Iron	XRF	36481.82	36321	
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Iron	XRF	36166.35	36007	
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Iron	XRF	36133.1	35974	
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Iron	XRF	36034.8	35876	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Iron	XRF	35589.76	35433	
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Iron	XRF	34251.34	34101	
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Iron	XRF	34146.42	33996	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Iron	XRF	33766.71	33618	
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Iron	XRF	33628.4	33480	
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Iron	XRF	31695.01	31556	
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Iron	XRF	31556.42	31418	
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Iron	XRF	30661.28	30526	
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Iron	XRF	28399.75	28275	
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Iron	XRF	28221.13	28097	
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Iron	XRF	25304.89	25194	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	XRF	25189.75	25079	
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Iron	XRF	24935	24825	
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Iron	XRF	23386.93	23284	
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Iron	XRF	21458.7	21364	
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Iron	XRF	20943.83	20852	
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Iron	XRF	19174.29	19090	
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Iron	XRF	18954.38	18871	
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Iron	XRF	17427.6	17351	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Iron	XRF	17214.89	17139	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Lead	XRF	814.17	708	
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Lead	XRF	385.97	336	
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Lead	XRF	366.89	319	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Lead	XRF	320.23	279	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Lead	Lab		246	
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Lead	XRF	261.86	228	
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Lead	XRF	227.54	198	
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Lead	XRF	167.82	146	
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Lead	XRF	164.9	143	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Lead	Lab		143	
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Lead	XRF	137.88	120	
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Lead	XRF	127.27	111	
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Lead	XRF	126.39	110	
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Lead	XRF	125.74	109	
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Lead	XRF	117.86	103	
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Lead	XRF	116.29	101	
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Lead	XRF	108	94	
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Lead	XRF	103.22	90	
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Lead	XRF	94.66	82	
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Lead	XRF	85.11	74	
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Lead	XRF	83.67	73	
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Lead	XRF	78.56	68	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	Lab		62	
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Lead	XRF	70.77	62	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Lead	XRF	68.08	59	
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Lead	XRF	62.78	55	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Lead	XRF	58.16	51	
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Lead	XRF	57.23	50	
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Lead	XRF	46.06	40	
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Lead	XRF	42.59	37	
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Manganese	XRF	6193.92	5152	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Manganese	Lab		3700	
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Manganese	XRF	2676.19	2226	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Manganese	XRF	1865.34	1552	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Manganese	XRF	1287.61	1071	
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Manganese	XRF	480.57	400	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	Lab		348	
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Manganese	XRF	334.93	279	
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Manganese	XRF	259.82	216	U
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Manganese	XRF	244.47	203	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Manganese	Lab		200	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Manganese	XRF	213.75	178	U
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Manganese	XRF	210.35	175	
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Manganese	XRF	201.04	167	
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Manganese	XRF	199.08	166	U
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Manganese	XRF	197.12	164	U
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Manganese	XRF	150.78	125	U
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Manganese	XRF	145.17	121	U
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Manganese	XRF	144.97	121	U
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Manganese	XRF	144.8	120	U
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Manganese	XRF	141.27	118	U
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Manganese	XRF	140.09	117	U
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Manganese	XRF	139.19	116	U
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Manganese	XRF	136.44	113	U
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Manganese	XRF	131.55	109	U
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Manganese	XRF	127.62	106	U
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Manganese	XRF	126.62	105	U
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Manganese	XRF	120.86	101	U
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Manganese	XRF	119.16	99	U
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Manganese	XRF	118.12	98	U
10	N3TA-800 (0-6")	10/9/2007	0	0.5	Zinc	XRF	697.46	713	
10	N3TA-Pile #1 (0-6")	10/9/2007	0	0.5	Zinc	XRF	645.12	659	
10	N3TA-COMP 3 (0-6")	10/8/2007	0	0.5	Zinc	XRF	601.63	615	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Zinc	Lab		330	
10	N3TA-700 (0-6")	10/9/2007	0	0.5	Zinc	XRF	185.89	190	
10	N3TA-850 (0-6")	10/9/2007	0	0.5	Zinc	XRF	152.72	156	
10	N3TA-1050 (0-6")	10/9/2007	0	0.5	Zinc	XRF	143.7	147	
10	N3TA-Pile #2 (0-6")	10/8/2007	0	0.5	Zinc	XRF	86.61	89	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
10	N3TA-900 (0-6")	10/8/2007	0	0.5	Zinc	XRF	73.98	76	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Zinc	Lab		67	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	Lab		59	
10	N3TA-100 (0-6")	10/8/2007	0	0.5	Zinc	XRF	45.19	46	U
10	N3TA-50 (0-6")	10/8/2007	0	0.5	Zinc	XRF	44.23	45	U
10	N3TA-Det Pond (0-6")	10/9/2007	0	0.5	Zinc	XRF	42.21	43	
10	N3TA-200 (0-6")	10/8/2007	0	0.5	Zinc	XRF	41.5	42	U
10	N3TA-1000 (0-6")	10/9/2007	0	0.5	Zinc	XRF	40.9	42	
10	N3TA-150 (0-6")	10/8/2007	0	0.5	Zinc	XRF	38.72	40	U
10	N3TA-250 (0-6")	10/8/2007	0	0.5	Zinc	XRF	36.15	37	U
10	N3TA-500 (0-6")	10/9/2007	0	0.5	Zinc	XRF	33.43	34	U
10	N3TA-600 (0-6")	10/8/2007	0	0.5	Zinc	XRF	32.69	33	U
10	N3TA-300 (0-6")	10/9/2007	0	0.5	Zinc	XRF	30.63	31	U
10	N3TA-550 (0-6")	10/8/2007	0	0.5	Zinc	XRF	30.4	31	U
10	N3TA-COMP 2 (0-6")	10/8/2007	0	0.5	Zinc	XRF	29.8	30	U
10	N3TA-650 (0-6")	10/8/2007	0	0.5	Zinc	XRF	29.74	30	U
10	N3TA-950 (0-6")	10/8/2007	0	0.5	Zinc	XRF	29.09	30	U
10	N3TA fine tail (0-6")	10/8/2007	0	0.5	Zinc	XRF	28.21	29	U
10	N3TA-400 (0-6")	10/9/2007	0	0.5	Zinc	XRF	27.96	29	U
10	N3TA-350 (0-6")	10/9/2007	0	0.5	Zinc	XRF	27.61	28	U
10	N3TA-0 (0-6")	10/8/2007	0	0.5	Zinc	XRF	26.97	28	U
10	N3TA-450 (0-6")	10/9/2007	0	0.5	Zinc	XRF	3	3	U
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Aluminum	Lab		11500	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Aluminum	Lab		9360	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Aluminum	Lab		9010	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Aluminum	Lab		9910	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Aluminum	Lab		3880	
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	732.62	616	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	683.17	575	
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Arsenic	XRF	661.12	442	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Arsenic	XRF	659.61	441	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Arsenic	XRF	654.27	437	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Arsenic	XRF	559.68	374	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Arsenic	XRF	559.07	374	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Arsenic	XRF	533.3	356	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Arsenic	XRF	480.04	321	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		308	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Arsenic	XRF	429.57	287	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Arsenic	XRF	422.52	282	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Arsenic	Lab		268	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Arsenic	XRF	394.7	264	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	301.99	254	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	300.35	253	
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	295.86	249	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	281.19	237	
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	274.12	231	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	265.08	223	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Arsenic	XRF	318.57	213	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	251.5	212	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Arsenic	XRF	312.3	209	
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Arsenic	XRF	311.34	208	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Arsenic	XRF	310.46	207	
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	242.83	204	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Arsenic	XRF	302.93	202	
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	239.15	201	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		199	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Arsenic	XRF	292.12	195	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Arsenic	XRF	288.38	193	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Arsenic	XRF	280.04	187	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	220.88	186	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Arsenic	XRF	275.89	184	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Arsenic	XRF	270.1	180	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Arsenic	XRF	266.55	178	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Arsenic	Lab		174	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Arsenic	XRF	260.3	174	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	205.16	173	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	202.38	170	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		169	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Arsenic	XRF	251.47	168	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	198.93	167	
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	192.7	162	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	192.09	162	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	Lab		161	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Arsenic	Lab		157	
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Arsenic	XRF	218.97	146	
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	169.72	143	
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Arsenic	XRF	211.01	141	
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	163.28	137	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	161.92	136	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Arsenic	XRF	201.93	135	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Arsenic	XRF	201.74	135	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	156.81	132	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	152.02	128	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	150.65	127	
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	148.3	125	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	143.09	120	
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Arsenic	XRF	172.25	115	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Arsenic	XRF	163.7	109	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	129.22	109	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	125.57	106	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	125.19	105	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Arsenic	XRF	155.92	104	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	123.16	104	
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	120.08	101	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Arsenic	XRF	149.77	100	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	116.94	98	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	113.49	95	
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	110.62	93	
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	108.69	91	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	108.03	91	
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	104.26	88	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	102.42	86	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	99.59	84	
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	99.53	84	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	98.54	83	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	98.37	83	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		82	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	94.44	79	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	91.72	77	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	91.31	77	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	89.56	75	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	88.95	75	
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	88.51	74	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	83.49	70	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Arsenic	Lab		70	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	82.51	69	
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Arsenic	XRF	99.64	67	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	76.38	64	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	76.13	64	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	76.1	64	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	72.75	61	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	69.33	58	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	66.67	56	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	64.22	54	
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	61.31	52	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	59.55	50	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Arsenic	XRF	74.19	50	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		49	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	55.47	47	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	54.88	46	
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	54.2	46	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	53.81	45	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Arsenic	XRF	66.7	45	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	52.17	44	
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Arsenic	XRF	64.82	43	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	50.48	42	
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	49.5	42	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	49.31	41	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	49.1	41	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	48.87	41	
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	47.9	40	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		40	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	46.13	39	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	45.77	39	
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	45.38	38	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	45.16	38	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	42.05	35	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	41.92	35	
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	40.85	34	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	38.18	32	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	38.04	32	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	38.03	32	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	37.89	32	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		32	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	37.39	31	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		31	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	33.28	28	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	33.19	28	
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Arsenic	XRF	32.63	27	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	32.36	27	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	32.07	27	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	30.43	26	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Arsenic	XRF	38.26	26	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Arsenic	XRF	38.07	25	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	29.97	25	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	28.94	24	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	28.79	24	U
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Arsenic	Lab		24	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Arsenic	XRF	35.78	24	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	28.14	24	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	27.71	23	
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	27.47	23	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		23	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	27.15	23	
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	26.27	22	
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	26.25	22	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	25.92	22	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Arsenic	XRF	32.35	22	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	25.24	21	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	24.55	21	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	24.51	21	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	24.35	20	
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	24.33	20	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	24.31	20	
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Arsenic	XRF	29.58	20	
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	23.35	20	U
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	23.09	19	U
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	23.01	19	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	22.7	19	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	22.23	19	U
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	22.03	19	U
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		18	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		18	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Arsenic	XRF	20.98	18	
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	20.89	18	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Arsenic	XRF	20.81	18	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	20.81	18	U
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	20.77	17	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	20.62	17	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	19.24	16	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	19.06	16	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Arsenic	XRF	23.95	16	
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	18.68	16	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	18.02	15	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	18	15	U
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	17.83	15	U
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		14	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	16.08	14	U
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	15.82	13	U
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.87	13	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.85	12	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.81	12	U
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.6	12	U
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.45	12	U
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	14.23	12	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	13.38	11	U
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Arsenic	Lab		11	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	13.07	11	U
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	11.77	10	U
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	11.5	10	U

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	11.42	10	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Arsenic	XRF	13.84	9	
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Arsenic	XRF	10.08	8	U
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		72.2	BJ
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		18.1	BJM29
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Cadmium	Lab		11.0	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Cadmium	Lab		7.0	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Cadmium	Lab		6.4	BJM29
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Cadmium	Lab		4.8	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Cadmium	Lab		2.0	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		1.9	BJ
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		1.9	BJ
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		1.6	BJM29
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Cadmium	Lab		1.6	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		1.5	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		1.2	JM29
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		1.0	BJ
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		0.7	BJ
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Cadmium	Lab		0.7	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		0.5	BJ
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		0.4	BJ
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		0.3	BJ
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Cadmium	Lab		0.2	BJ
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	2694.94	3232	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Copper	XRF	2180.04	2615	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Copper	Lab		2000	
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Copper	XRF	1611.19	1190	
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	954.34	1145	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Copper	Lab		1060	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Copper	XRF	1326.97	980	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		903	J
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	708.82	850	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Copper	XRF	1043.7	771	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	593.23	712	
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Copper	XRF	943.72	697	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Copper	XRF	922.55	682	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Copper	XRF	904.53	668	
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	556.93	668	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Copper	XRF	861.29	636	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Copper	XRF	833.27	616	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Copper	XRF	826.38	611	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Copper	XRF	825.87	610	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Copper	XRF	823.68	609	
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Copper	XRF	794.36	587	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	484.55	581	
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Copper	XRF	779.67	576	
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Copper	XRF	773.17	571	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Copper	XRF	764.92	565	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Copper	XRF	763.87	564	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	440.34	528	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	425.87	511	
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Copper	XRF	418.05	501	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Copper	XRF	668.96	494	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Copper	XRF	667.49	493	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Copper	XRF	402.98	483	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	389.55	467	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	386.59	464	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	386.31	463	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Copper	XRF	596.64	441	
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Copper	XRF	584.8	432	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	355.77	427	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Copper	XRF	567.81	419	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Copper	XRF	565.55	418	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Copper	XRF	558.82	413	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Copper	XRF	532.37	393	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Copper	XRF	521.5	385	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Copper	XRF	518.02	383	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Copper	Lab		377	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	301.66	362	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	296.71	356	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	295.03	354	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		348	J
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	288.51	346	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Copper	XRF	446.17	330	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	271.86	326	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Copper	XRF	432.16	319	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Copper	XRF	412.39	305	
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	236.55	284	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	235.41	282	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	233.65	280	
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	226	271	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	225.45	270	
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Copper	XRF	364.47	269	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Copper	Lab		254	
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	208.02	249	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Copper	XRF	331.16	245	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	203.29	244	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	202.39	243	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	201.9	242	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Copper	XRF	325.36	240	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Copper	XRF	199.51	239	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	198.11	238	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Copper	XRF	319.64	236	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	190.58	229	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	186.9	224	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	184.01	221	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	182.7	219	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Copper	Lab		214	J
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Copper	XRF	174.61	209	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	172.62	207	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	172.47	207	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	169.34	203	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Copper	XRF	268.28	198	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	162.51	195	
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	161.21	193	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	160.23	192	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	159.58	191	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	158	190	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	155.62	187	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	154.61	185	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	150.5	181	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	148.7	178	
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	144.79	174	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	141.84	170	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	139.43	167	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	137.4	165	
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Copper	XRF	222.62	164	
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	136.1	163	
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	132.78	159	
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	129.42	155	
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	128	154	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	126.39	152	
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	126.08	151	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	124.73	150	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	123.76	148	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Copper	XRF	121.43	146	
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	117.61	141	
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	117.32	141	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Copper	Lab		140	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	115.59	139	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	112.92	135	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Copper	Lab		134	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Copper	Lab		134	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	108.12	130	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	107.57	129	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	107.55	129	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	107.16	129	
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	107.05	128	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	105.41	126	
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	105.11	126	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	104.87	126	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Copper	XRF	169.77	125	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	104.29	125	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Copper	Lab		125	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	103.21	124	
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Copper	XRF	102.88	123	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	102.66	123	
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	100.27	120	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Copper	Lab		120	
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	98.01	118	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	97.46	117	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	95.48	115	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Copper	XRF	93.92	113	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	93.69	112	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	91.9	110	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	89.51	107	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	87.14	105	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		103	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Copper	Lab		103	J
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Copper	XRF	137.31	101	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		101	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	84	101	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	82.85	99	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	82.76	99	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	82.31	99	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	82.19	99	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Copper	XRF	81.53	98	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	79.19	95	
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Copper	XRF	76.43	92	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Copper	XRF	122.8	91	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	75.35	90	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	75.2	90	
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	74.43	89	
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	73.01	88	
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	72.75	87	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	71.83	86	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Copper	XRF	71.8	86	
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	70.91	85	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Copper	XRF	113.71	84	
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	69.15	83	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	66.45	80	
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	66.1	79	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	65.55	79	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	65.22	78	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	65.06	78	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	62.37	75	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	62.36	75	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	61.49	74	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	60.14	72	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Copper	XRF	94.99	70	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	57.97	70	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Copper	Lab		68	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	56.3	68	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	55.1	66	
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	54.85	66	
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	54.82	66	
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Copper	XRF	53.06	64	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Copper	XRF	50.32	60	
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Copper	XRF	46.98	56	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	46.33	56	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	46.01	55	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Copper	XRF	45.42	54	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	44.21	53	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	43.41	52	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Copper	XRF	42.9	51	
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	42.75	51	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	40.15	48	
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	36.77	44	
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	35.95	43	
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Copper	XRF	34.39	41	
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	30.5	37	U
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Copper	XRF	29.6	36	U
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	28	34	U
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Copper	XRF	27.76	33	U
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		31	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Copper	Lab		27	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Copper	XRF	34.18	25	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Copper	XRF	32.14	24	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Copper	Lab		17	
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	152093.95	152094	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	137186.19	137186	
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	133862.8	133863	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Iron	XRF	199969.47	129080	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Iron	XRF	194434.56	125508	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Iron	XRF	192763.56	124429	
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Iron	XRF	188823.3	121885	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	120304.84	120305	
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Iron	XRF	186164.53	120169	
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	119489.67	119490	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Iron	XRF	183908.03	118713	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	118436.83	118437	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Iron	Lab		116000	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	114786	114786	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	112047.25	112047	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Iron	XRF	168837.88	108985	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	105175.15	105175	
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	101373.51	101374	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Iron	XRF	155315.92	100256	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Iron	XRF	154516.77	99741	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	99276.98	99277	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Iron	XRF	149031.09	96200	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	95024.49	95024	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	94568.86	94569	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Iron	XRF	145626.95	94002	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Iron	XRF	144989.09	93590	
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	92746.97	92747	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	92029.69	92030	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Iron	XRF	140678.27	90808	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Iron	XRF	140217.36	90510	
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Iron	XRF	138725.5	89547	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Iron	XRF	138160.92	89183	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	89161.79	89162	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Iron	XRF	137343.72	88655	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	86709.16	86709	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Iron	XRF	133120.17	85929	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Iron	XRF	132069.22	85251	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	84571.55	84572	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Iron	XRF	129950.16	83883	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	81865.24	81865	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Iron	XRF	126569.29	81700	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	80668.34	80668	
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	79983.55	79984	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Iron	XRF	123042.5	79424	
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Iron	XRF	121488.73	78421	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	74934.24	74934	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Iron	XRF	115685.85	74675	
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	73687.42	73687	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Iron	XRF	113311.68	73143	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	72695.1	72695	
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	72545.72	72546	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Iron	XRF	112365.37	72532	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	69411.09	69411	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	67570.32	67570	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	65768.58	65769	
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Iron	XRF	100327.25	64761	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	62569.89	62570	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Iron	XRF	96159.02	62071	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Iron	XRF	94989.14	61315	
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	61153.48	61153	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Iron	Lab		60200	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	59132.21	59132	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	58631.36	58631	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Iron	XRF	58400.83	58401	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	57759.93	57760	
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Iron	XRF	57661.5	57662	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Iron	XRF	89032.63	57471	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	57267.21	57267	
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	56862.43	56862	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	54864.84	54865	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Iron	Lab		54800	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Iron	XRF	83948.73	54189	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	54152.09	54152	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	53125.52	53126	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	52902.05	52902	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	52812.38	52812	
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	52710.64	52711	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	51837.71	51838	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	51333.98	51334	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	49771.83	49772	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	49231.89	49232	
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	48905.18	48905	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	48751.21	48751	
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	47984.83	47985	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	47735.83	47736	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	47514.91	47515	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	47455.69	47456	
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	47338.83	47339	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Iron	XRF	47012.07	47012	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Iron	XRF	72423.01	46749	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	45950.93	45951	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	45642.52	45643	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	43375.42	43375	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	43360.46	43360	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	42790.96	42791	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	42639.45	42639	
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Iron	XRF	42394.62	42395	
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	42132.7	42133	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	41439.54	41440	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	40810.6	40811	
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Iron	XRF	63030.8	40686	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Iron	XRF	62854.52	40573	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	39316.82	39317	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	38070.58	38071	
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	37678.27	37678	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	37562.78	37563	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Iron	XRF	37434.11	37434	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	36792.84	36793	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	35962.86	35963	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Iron	XRF	55519.15	35838	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	34847.13	34847	
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	34364.66	34365	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	32973.79	32974	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	31869.19	31869	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	31829.09	31829	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	31651.29	31651	
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Iron	XRF	48992.13	31624	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Iron	XRF	48952.73	31599	
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	31409.43	31409	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	31312.04	31312	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30944.81	30945	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	30836.86	30837	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30831.41	30831	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30774.54	30775	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30678.96	30679	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30421.48	30421	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	30320.33	30320	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	29951.51	29952	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Iron	XRF	46177.31	29807	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	29726.96	29727	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	28889.3	28889	
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Iron	XRF	44219.61	28544	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	27817.7	27818	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	27638.09	27638	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	27582.33	27582	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	27579.9	27580	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	27379.43	27379	
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	27289.46	27289	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	27137.82	27138	
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	27021.65	27022	
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Iron	XRF	26905.13	26905	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	26529.48	26529	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	26492.17	26492	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Iron	XRF	26349.43	26349	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	26094.18	26094	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	26069.71	26070	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	25955.24	25955	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Iron	XRF	39861.16	25730	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	25656.97	25657	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	25247.27	25247	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	25134.29	25134	
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	25110.83	25111	
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	25104.77	25105	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	24942.28	24942	
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	24709.39	24709	
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Iron	XRF	24621.22	24621	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	24485.89	24486	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	24215.44	24215	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	24136.99	24137	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Iron	XRF	37307.71	24082	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Iron	Lab		23800	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Iron	XRF	23765.67	23766	
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	23333.28	23333	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Iron	XRF	23203.53	23204	
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	22883.27	22883	
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	22877.41	22877	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	22847.17	22847	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	22288.56	22289	
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	21929.84	21930	
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	21507.43	21507	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	21473.86	21474	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Iron	XRF	33154.59	21401	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Iron	XRF	21380.38	21380	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	21333.01	21333	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	21149.1	21149	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20915.66	20916	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	20831.33	20831	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20761.57	20762	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20749.73	20750	
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	20492.28	20492	
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20377	20377	
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20325.29	20325	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	20220.56	20221	
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	19428.75	19429	
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	19412.76	19413	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	19334.04	19334	
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	19159.74	19160	
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	18341.62	18342	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Iron	XRF	18006.07	18006	
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	17163.22	17163	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	16952.04	16952	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	16411.5	16412	
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	15852.35	15852	
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Iron	XRF	15544.6	15545	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Iron	XRF	13689.03	13689	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Iron	XRF	10216.34	10216	
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	17431.72	21699	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Lead	XRF	15717.3	19565	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Lead	XRF	8427.36	8552	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Lead	XRF	7139.48	7245	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Lead	XRF	6911.22	7014	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Lead	Lab		6470	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Lead	XRF	6129.86	6221	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Lead	Lab		5560	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Lead	XRF	4405.25	4470	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Lead	XRF	4371.13	4436	
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	3352.9	4174	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Lead	XRF	3940.68	3999	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Lead	XRF	3859.33	3916	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Lead	XRF	3650.31	3704	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Lead	XRF	3605.71	3659	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Lead	XRF	3317.83	3367	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Lead	XRF	3259.35	3308	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Lead	XRF	3249.24	3297	
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Lead	XRF	3018.47	3063	
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2363.8	2942	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Lead	XRF	2862.83	2905	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Lead	XRF	2845.65	2888	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2309.56	2875	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2308.39	2873	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Lead	XRF	2821.27	2863	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Lead	XRF	2772.11	2813	
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Lead	XRF	2593.71	2632	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2111.73	2629	
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2067.82	2574	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	2044.37	2545	
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Lead	XRF	2451.49	2488	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Lead	XRF	2285.08	2319	
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Lead	XRF	2266.22	2300	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Lead	XRF	2163.22	2195	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Lead	XRF	2151.16	2183	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Lead	Lab		2160	J
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1719.88	2141	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Lead	XRF	1644.8	2047	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1615.5	2011	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Lead	XRF	1979.06	2008	
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1576.27	1962	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Lead	XRF	1916.06	1944	
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Lead	XRF	1771.55	1798	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1442.36	1795	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Lead	XRF	1757.24	1783	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Lead	XRF	1721.48	1747	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Lead	Lab		1730	J
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Lead	Lab		1730	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Lead	XRF	1685.53	1710	
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	1354.53	1686	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Lead	Lab		1620	J
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1261.63	1570	
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1260.14	1569	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Lead	XRF	1501.23	1523	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1222.4	1522	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1111	1383	
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1033.36	1286	
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	1010.95	1258	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Lead	XRF	1159.18	1176	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Lead	Lab		1160	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	914.37	1138	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	842.65	1049	
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Lead	XRF	968.57	983	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	738.2	919	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	715.5	891	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	713.77	889	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	705.03	878	
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	660.73	822	
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Lead	XRF	657.8	819	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	630.75	785	
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Lead	XRF	619.63	771	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	619.34	771	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	615.22	766	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	572.41	713	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	558.21	695	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Lead	XRF	554.77	691	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	550.68	685	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	546.65	680	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	525.76	654	
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	524.5	653	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	517.71	644	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Lead	XRF	615.18	624	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	487.49	607	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	467.5	582	
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Lead	XRF	448.48	558	
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Lead	XRF	536.07	544	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	428.74	534	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	423.63	527	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	395.72	493	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	390.91	487	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	370.19	461	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	369.12	459	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	366.65	456	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Lead	XRF	350.82	437	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	349.39	435	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	349.09	435	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	339.83	423	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Lead	Lab		414	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Lead	Lab		380	J
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	300.11	374	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	297.22	370	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Lead	Lab		369	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	294.85	367	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Lead	XRF	287.47	358	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	286.92	357	
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	279.75	348	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	278.16	346	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	253.65	316	
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Lead	XRF	249.95	311	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	241.86	301	
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	237.81	296	
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	232.82	290	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	231.15	288	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	230.79	287	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	221.13	275	
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	221.06	275	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	220.29	274	
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	200.06	249	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	191.56	238	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	188.5	235	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	186.09	232	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	183.33	228	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	178.04	222	
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	177.18	221	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		219	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Lead	XRF	211.03	214	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	170.32	212	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	164.16	204	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	158.01	197	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	157.33	196	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	156.44	195	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	144.43	180	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	142.6	178	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	136.07	169	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	135.2	168	
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	134.14	167	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	132.38	165	
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Lead	XRF	131.57	164	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	129.7	161	
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Lead	XRF	156.69	159	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	127.24	158	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	125.41	156	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	124.64	155	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		153	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	120.56	150	
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	119.46	149	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Lead	XRF	113.16	141	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	112.09	140	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	109.84	137	
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	108.36	135	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	105.29	131	
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	102.34	127	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		126	
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	101.18	126	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	100.58	125	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	96.38	120	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	96.37	120	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Lead	XRF	92.01	115	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Lead	XRF	112.04	114	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	91.16	113	
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	87.65	109	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	83.77	104	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	82.57	103	
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	78.68	98	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Lead	XRF	96.03	97	
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	77.15	96	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	76.01	95	
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	76	95	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	75.53	94	
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	73.53	92	
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	71.29	89	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	70.55	88	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		84	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Lead	Lab		76	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Lead	XRF	74.26	75	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Lead	XRF	70.84	72	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	55.59	69	
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Lead	XRF	54.35	68	
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Lead	XRF	53.68	67	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Lead	Lab		62	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	49.41	62	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	49.1	61	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	45.42	57	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Lead	XRF	41.08	51	
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	40.68	51	
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	40.21	50	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Lead	XRF	38.97	49	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		48	
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Lead	XRF	34.78	43	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Lead	XRF	37.34	38	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Lead	XRF	29.24	36	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Lead	Lab		36	
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	28.35	35	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Lead	Lab		32	
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	23.8	30	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Lead	XRF	21.18	26	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Manganese	Lab		23700	JM21
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Manganese	XRF	22358.11	10189	
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Manganese	XRF	21998.6	10025	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Manganese	Lab		9080	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Manganese	XRF	18764.45	8551	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Manganese	XRF	16594.61	7562	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Manganese	XRF	14620.34	6662	
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	10365.25	6480	
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	10297.96	6438	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Manganese	XRF	13591.28	6194	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Manganese	XRF	13187.5	6010	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Manganese	XRF	12780.95	5824	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	9137.23	5713	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Manganese	XRF	12431.2	5665	
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	8381.56	5240	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Manganese	XRF	11369.59	5181	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Manganese	Lab		5090	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	7999.06	5001	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	7882.2	4928	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	7488.88	4682	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	5843.56	3653	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Manganese	Lab		3370	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Manganese	XRF	7369.02	3358	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	5038.19	3150	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	4559.02	2850	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Manganese	Lab		2820	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	3746.14	2342	
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	3723.44	2328	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Manganese	Lab		2260	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	3541.57	2214	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Manganese	Lab		2190	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	3387.32	2118	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Manganese	Lab		2000	
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	3156.97	1974	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	3056.56	1911	
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2860.96	1789	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	2825.82	1767	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2742.72	1715	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2737.45	1711	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2685.31	1679	
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2650.92	1657	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2640.12	1651	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	2636.95	1649	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		1630	JM21
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2456.98	1536	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2436	1523	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Manganese	Lab		1460	
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2318.06	1449	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2285.62	1429	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Manganese	XRF	3122.43	1423	
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2274.27	1422	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Manganese	XRF	3094.72	1410	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	2245.72	1404	
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Manganese	XRF	2953.23	1346	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		1340	JM21
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	2122.58	1327	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1967.01	1230	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1931.81	1208	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		1180	JM21
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1754.65	1097	
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1750.41	1094	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1717.24	1074	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1691.84	1058	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Manganese	XRF	2205.93	1005	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Manganese	Lab		984	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1545.64	966	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Manganese	XRF	2105.51	959	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1523.05	952	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Manganese	XRF	2067.29	942	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1472.17	920	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1444.2	903	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Manganese	XRF	1952.93	890	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1420.23	888	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	1416.96	886	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Manganese	XRF	1932.49	881	
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1395.96	873	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1375.86	860	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Manganese	Lab		832	JM21
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1310.76	819	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Manganese	XRF	1777.53	810	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	1283.02	802	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1265.96	791	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1260.65	788	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1245.4	779	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1245.11	778	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1236.93	773	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1235.68	773	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1224.39	765	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1219.22	762	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1215.76	760	
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1205.75	754	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1187.2	742	
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1173.13	733	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	1172.24	733	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1164.97	728	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		722	JM21
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1149.22	718	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1140.68	713	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1130.53	707	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1122.67	702	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1120.3	700	
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1108.69	693	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1108.58	693	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1108.51	693	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Manganese	XRF	1491.05	679	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Manganese	Lab		679	JM21
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	1047.23	655	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1046.31	654	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1037.84	649	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1032.89	646	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Manganese	XRF	1411.97	643	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		634	JM21
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	1004.09	628	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	986.15	617	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	964.23	603	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	947.43	592	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	926.77	579	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Manganese	XRF	889.72	556	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	877.13	548	
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	852.89	533	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Manganese	XRF	1165.34	531	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	846.08	529	
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	832.67	521	
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	825.62	516	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Manganese	XRF	1132.69	516	
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	814.76	509	
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	795.99	498	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Manganese	XRF	791.95	495	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Manganese	XRF	1086.51	495	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	761.24	476	
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Manganese	XRF	1039.48	474	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Manganese	XRF	1001.84	457	
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	716.34	448	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	714.13	446	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	713.99	446	
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	712.48	445	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	711.29	445	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Manganese	XRF	698.25	437	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Manganese	Lab		421	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	672.51	420	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Manganese	XRF	895.09	408	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	636.87	398	
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	633.61	396	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Manganese	Lab		392	JM21
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	610.89	382	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	610.4	382	
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	608.51	380	
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Manganese	XRF	600.57	375	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	600.09	375	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	582.99	364	
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	582.51	364	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Manganese	XRF	795.48	363	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	574.12	359	
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	572.07	358	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Manganese	XRF	556.43	348	
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	553.77	346	
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	550.48	344	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	537.89	336	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	526.09	329	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	517.56	324	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	505.85	316	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	470.07	294	
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	467.13	292	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Manganese	XRF	640.55	292	
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Manganese	XRF	620.77	283	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Manganese	XRF	440.87	276	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Manganese	XRF	434.46	272	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	426.3	267	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	423.25	265	
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	423.17	265	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	364.76	228	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Manganese	XRF	363.37	227	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	352.72	221	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Manganese	XRF	483.84	220	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Manganese	XRF	476.99	217	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	346.78	217	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Manganese	XRF	451.62	206	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Manganese	XRF	451.49	206	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	323.42	202	
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	312.99	196	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	302.6	189	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	297.22	186	
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	279.86	175	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Manganese	XRF	375.85	171	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Manganese	XRF	347.09	158	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	247.79	155	U
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	244.09	153	U
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Manganese	XRF	241.18	151	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	230.16	144	U
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Manganese	XRF	303.31	138	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Manganese	XRF	274.82	125	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	167.2	105	U
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Manganese	XRF	167.06	104	U
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Manganese	XRF	210.36	96	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Manganese	XRF	192.3	88	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Manganese	XRF	165.52	75	
11	BCEOT-E17-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	16182.16	18108	
11	BCEOT-E18+12.5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	13646.53	15270	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Zinc	Lab		13700	
11	TP-FP-27(0.9-1.2)	9/18/2012	0.9	1.2	Zinc	XRF	6577.81	6200	
11	TP-FP-06(1.3-2.0)	8/16/2012	1.3	2	Zinc	XRF	5293.26	4989	
11	TP-FP-20(0.3-0.5)	9/12/2012	0.3	0.5	Zinc	XRF	5033.85	4745	
11	TP-FP-27(0.0-0.4)	9/18/2012	0	0.4	Zinc	XRF	4946.57	4663	
11	TP-FP-07(1.0-1.5)	8/17/2012	1	1.5	Zinc	XRF	4754.79	4482	
11	BCEOT-E16-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	3861.7	4321	
11	BCEOT-W23-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	3665.7	4102	
11	BCEOT-W20-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	3627.62	4059	
11	TP-FP-08(1.3-2.0)	8/17/2012	1.3	2	Zinc	XRF	4134.81	3897	
11	TP-FP-19(0.5-0.9)	9/11/2012	0.5	0.9	Zinc	XRF	3506.12	3305	
11	TP-FP-15(0.0-0.4)	8/31/2012	0	0.4	Zinc	XRF	3443.96	3246	
11	BCEOT-W24-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	2809.17	3143	
11	TP-FP-22(0.7-1.2)	9/17/2012	0.7	1.2	Zinc	XRF	3334.75	3143	
11	BCEOT-W9-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	2800.76	3134	
11	TP-FP-25(1.1-1.2)	9/17/2012	1.1	1.2	Zinc	XRF	3226.14	3041	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Zinc	Lab		3040	
11	TP-FP-12(0.9-1.3)	8/23/2012	0.9	1.3	Zinc	XRF	3154.12	2973	
11	TP-FP-21(1.0-1.3)	9/13/2012	1	1.3	Zinc	XRF	3005.92	2833	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	0.8	Zinc	Lab		2690	
11	TP-FP-25A(1.3-1.8)	9/17/2012	1.3	1.8	Zinc	XRF	2644.2	2492	
11	TP-FP-12(1.6-2.0)	8/29/2012	1.6	2	Zinc	XRF	2637.76	2486	
11	TP-FP-07(0.5-1.0)	8/17/2012	0.5	1	Zinc	XRF	2569.87	2422	
11	TP-FP-26(1.8-2.0)	9/17/2012	1.8	2	Zinc	XRF	2218.38	2091	
11	BCEOT-W11-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1811.31	2027	
11	BCEOT-W27-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1735.69	1942	
11	TP-FP-05(1.0-3.0)	8/13/2012	1	3	Zinc	XRF	1923.11	1813	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-26(0.7-1.0)	9/17/2012	0.7	1	Zinc	XRF	1799.31	1696	
11	TP-FP-10A(0.7-1.5)	8/23/2012	0.7	1.5	Zinc	XRF	1724.63	1626	
11	TP-FP-13(1.5-1.8)	8/29/2012	1.5	1.8	Zinc	XRF	1682.12	1586	
11	TP-FP-16(1.1-1.5)	8/31/2012	1.1	1.5	Zinc	XRF	1537.59	1449	
11	BCEOT-E22-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1238.19	1386	
11	TP-FP-11(1.5-2.0)	8/23/2012	1.5	2	Zinc	XRF	1456.32	1373	
11	TP-FP-18(0.0-0.3)	9/10/2012	0	0.3	Zinc	XRF	1390.17	1310	
11	BCEOT-W5-12.5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	1160.83	1299	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Zinc	Lab		1270	
11	BCEOT-W12-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1080.42	1209	
11	BCEOT-W16-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	1067.98	1195	
11	TP-FP-04(1.5-2.0)	8/16/2012	1.5	2	Zinc	XRF	1145.83	1080	
11	TP-FP-22(0.1-0.3)	9/17/2012	0.1	0.3	Zinc	XRF	1127.01	1062	
11	TP-FP-13(1.0-1.3)	8/29/2012	1	1.3	Zinc	XRF	1060.39	1000	
11	TP-FP-11(0.1-0.3)	8/23/2012	0.1	0.3	Zinc	XRF	928.45	875	
11	TP-FP-09(1.5-2.0)	8/23/2012	1.5	2	Zinc	XRF	920.25	867	
11	BCEOT-W15-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	771.56	863	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	0.9	Zinc	Lab		860	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2.4	Zinc	Lab		849	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0.2	Zinc	Lab		835	
11	BCEOT-W14-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	735.46	823	
11	TP-FP-15A(0.5-1.0)	8/31/2012	0.5	1	Zinc	XRF	871.39	821	
11	BCEOT-E17-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	644.42	721	
11	TP-FP-28(1.5-2.0)	9/19/2012	1.5	2	Zinc	XRF	762.98	719	
11	BCEOT-W13-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	576.55	645	
11	BCEOT-E20-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	571.98	640	
11	BCEOT-E25-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	567.2	635	
11	TP-FP-11(1.0-1.2)	8/23/2012	1	1.2	Zinc	XRF	665.56	627	
11	TP-FP-12(1.6-1.8)	8/29/2012	1.6	1.8	Zinc	XRF	664.87	627	
11	TP-FP-17(1.0-1.5)	9/7/2012	1	1.5	Zinc	XRF	647.92	611	
11	BCEOT-E2-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	509.31	570	
11	BCEOT-W17-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	504.59	565	
11	TP-FP-15(0.0-0.3)	8/31/2012	0	0.3	Zinc	XRF	572.31	539	
11	BCEOT-E1+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	428.46	479	
11	BCEOT-W23-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	404.11	452	
11	TP-FP-27(0.5-0.8)	9/18/2012	0.5	0.8	Zinc	XRF	467.3	440	
11	BCEOT-W15-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	391.75	438	
11	BCEOT-W14-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	387.97	434	
11	BCEOT-W18-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	387.94	434	
11	BCEOT-E18-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	379.82	425	
11	BCEOT-W8-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	379.64	425	
11	BCEOT-E17+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	377.79	423	
11	TP-FP-14(1.4-1.9)	8/29/2012	1.4	1.9	Zinc	XRF	434.22	409	
11	BCEOT-W21-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	345.9	387	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Zinc	Lab		383	
11	BCEOT-W19-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	339.96	380	
11	BCEOT-E26-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	329.61	369	
11	BCEOT-W11-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	322.53	361	
11	BCEOT-E10-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	322.14	360	
11	TP-FP-15(1.7-1.9)	8/31/2012	1.7	1.9	Zinc	XRF	368.44	347	
11	BCEOT-W24+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	309.9	347	
11	BCEOT-W26-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	309.06	346	
11	BCEOT-W21-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	308.57	345	
11	BCEOT-E22+70 (0-6")	7/8/2008	0	0.5	Zinc	XRF	307.45	344	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Zinc	Lab		340	
11	BCEOT-W19-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	298.3	334	
11	BCEOT-W25-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	283.58	317	
11	BCEOT-W26+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	281.45	315	
11	TP-FP-10A(1.1-1.3)	8/23/2012	1.1	1.3	Zinc	XRF	333.69	315	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		314	
11	BCEOT-E1-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	275.4	308	
11	BCEOT-W18-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	273.22	306	
11	BCEOT-E0-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	272.94	305	
11	BCEOT-E23-15 (0-6")	10/17/2007	0	0.5	Zinc	XRF	272.74	305	
11	BCEOT-W20-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	271.21	303	
11	BCEOT-W25+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	269.71	302	
11	BCEOT-W27-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	269.48	302	
11	BCEOT-E21-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	267.27	299	
11	BCEOT-W15+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	266.1	298	
11	BCEOT-E19-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	265.16	297	
11	BCEOT-E15-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	262.78	294	
11	BCEOT-W27+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	262.77	294	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Zinc	Lab		294	
11	BCEOT-E9-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	260.64	292	
11	BCEOT-E15+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	258.99	290	
11	BCEOT-E9+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	255.9	286	
11	BCEOT-E10-12.5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	253.9	284	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		281	
11	BCEOT-E19+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	250.49	280	
11	BCEOT-W24-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	247.41	277	
11	TP-FP-25(1.7-2.1)	9/17/2012	1.7	2.1	Zinc	XRF	288.18	272	
11	BCEOT-W22-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	240.94	270	
11	BCEOT-W10-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	240.7	269	
11	BCEOT-E5-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	237.08	265	
11	BCEOT-W4-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	236.16	264	
11	BCEOT-W9+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	234.88	263	
11	BCEOT-W17-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	230.91	258	
11	BCEOT-E15-8 (0-6")	10/17/2007	0	0.5	Zinc	XRF	227.59	255	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E9-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	226.64	254	
11	BCEOT-E13-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	220.05	246	
11	BCEOT-W16-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	219.51	246	
11	BCEOT-W18+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	205.98	230	
11	BCEOT-E11+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	205.29	230	
11	BCEOT-E0+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	204.68	229	
11	BCEOT-E22+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	201.37	225	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		223	
11	TP-FP-14(1.0-1.3)	8/29/2012	1	1.3	Zinc	XRF	236.24	223	
11	BCEOT-E26-12.5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	198.62	222	
11	BCEOT-E16+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	198.52	222	
11	BCEOT-W20+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	197.69	221	
11	BCEOT-E6-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	192.82	216	
11	BCEOT-W5-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	192.81	216	
11	BCEOT-E21+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	188.45	211	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Zinc	Lab		210	
11	BCEOT-E1-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	185.27	207	
11	BCEOT-E0-12.5 (0-6")	10/16/2007	0	0.5	Zinc	XRF	182.73	204	
11	BCEOT-E16-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	182.62	204	
11	BCEOT-E4-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	176.15	197	
11	BCEOT-E2+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	174.98	196	
11	BCEOT-W21+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	174.68	195	
11	BCEOT-W14+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	171.91	192	
11	BCEOT-E25-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	171.8	192	
11	BCEOT-W5+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	171.18	192	
11	BCEOT-W12+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	170.69	191	
11	BCEOT-E6-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	169.47	190	
11	BCEOT-E7-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	169.39	190	
11	TP-FP-22(0.4-1.2)	9/17/2012	0.4	1.2	Zinc	XRF	200.2	189	
11	BCEOT-E11-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	165.36	185	
11	BCEOT-E12-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	161.4	181	
11	BCEOT-W8+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	160.57	180	
11	BCEOT-W22+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	160.14	179	
11	BCEOT-E4+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	159.8	179	
11	BCEOT-E10+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	158.18	177	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		175	
11	BCEOT-E13+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	155.88	174	
11	BCEOT-E6+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	152.49	171	
11	BCEOT-W16+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	152.05	170	
11	BCEOT-E12+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	147.55	165	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		164	
11	BCEOT-E24-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	146.3	164	
11	BCEOT-W4+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	145.73	163	
11	BCEOT-E7+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	145.7	163	

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	BCEOT-E11-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	144.15	161	
11	BCEOT-W7-12.5 (0-6")	10/18/2007	0	0.5	Zinc	XRF	142.6	160	
11	BCEOT-E2-8 (0-6")	10/16/2007	0	0.5	Zinc	XRF	136.3	153	
11	BCEOT-E13-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	134.9	151	
11	TP-FP-28(1.0-1.5)	9/19/2012	1	1.5	Zinc	XRF	159.41	150	
11	BCEOT-E20-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	132.38	148	
11	BCEOT-E12-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	125.89	141	
11	BCEOT-E22-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	124.65	139	
11	BCEOT-W19+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	124.35	139	
11	BCEOT-E26+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	124.29	139	
11	BCEOT-E3-0 (0-6")	10/16/2007	0	0.5	Zinc	XRF	124.13	139	
11	BCEOT-E14-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	123.38	138	
11	BCEOT-W7+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	123.05	138	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Zinc	Lab		134	
11	BCEOT-E7-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	111.46	125	
11	BCEOT-E3+25 (0-6")	10/16/2007	0	0.5	Zinc	XRF	110.34	123	
11	BCEOT-W6-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	108.82	122	
11	BCEOT-E25+20 (0-6")	10/17/2007	0	0.5	Zinc	XRF	108.57	121	
11	BCEOT-E24-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	106.86	120	
11	BCEOT-E23+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	102.17	114	
11	BCEOT-E5-25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	95.61	107	
11	BCEOT-E14+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	94.45	106	
11	BCEOT-E23-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	90.17	101	
11	BCEOT-W4-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	88.45	99	
11	BCEOT-W11+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	86.4	97	
11	BCEOT-W6+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	85.46	96	
11	BCEOT-W13-25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	82	92	
11	BCEOT-W6-12.5 (0-6")	10/17/2007	0	0.5	Zinc	XRF	81.91	92	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Zinc	Lab		92	
11	BCEOT-W12-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	76.66	86	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Zinc	Lab		82	
11	BCEOT-W10-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	71.02	79	
11	BCEOT-W9-0 (0-6")	10/17/2007	0	0.5	Zinc	XRF	68.12	76	
11	BCEOT-E24+25 (0-6")	10/17/2007	0	0.5	Zinc	XRF	58.77	66	
11	BCEOT-W7-0 (0-6")	10/18/2007	0	0.5	Zinc	XRF	24.67	28	U

Notes:

All concentrations are in units of milligrams per kilogram.

(a) XRF results were converted to laboratory-equivalent results using correlations developed for XRF and laboratory results. See Tables F-10, F-11, and F-12 for data used to develop conversion factors, and figures F-1, F-2, and F-3 for correlation plots.

-- Not applicable - no conversions were performed for laboratory data. The final result is the original result.

B Method blank shows evidence of contamination

bgs Below ground surface

EU Exposure Unit

TABLE F-1: ANALYTICAL DATA FOR SURFACE SOIL (0 TO 2 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier

HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
J	Estimated concentration
U	Nondetected concentration
XRF 10	X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Aluminum	Lab		21000	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Aluminum	Lab		19600	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Aluminum	Lab		14400	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Aluminum	Lab		13700	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Aluminum	Lab		13300	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Aluminum	Lab		11900	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Aluminum	Lab		11600	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Aluminum	Lab		11400	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Aluminum	Lab		10700	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Aluminum	Lab		10200	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Arsenic	XRF	1092.14	730	
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Arsenic	XRF	361.64	242	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Arsenic	XRF	244.49	163	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Arsenic	XRF	205.53	137	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Arsenic	XRF	181.58	121	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Arsenic	XRF	163.15	109	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Arsenic	Lab		83	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Arsenic	Lab		82	JM20
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Arsenic	XRF	113.2	76	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Arsenic	XRF	100.65	67	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Arsenic	XRF	87.99	59	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Arsenic	Lab		58	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Arsenic	XRF	85.13	57	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Arsenic	Lab		56	JM20
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Arsenic	XRF	83.88	56	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Arsenic	XRF	82.57	55	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Arsenic	XRF	80.16	54	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Arsenic	XRF	68.12	46	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Arsenic	XRF	61.28	41	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Arsenic	XRF	58.99	39	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Arsenic	XRF	58.47	39	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Arsenic	XRF	57.84	39	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Arsenic	XRF	56.05	37	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Arsenic	Lab		36	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Arsenic	XRF	53.31	36	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Arsenic	XRF	50.16	34	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Arsenic	XRF	50.1	33	
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Arsenic	XRF	45.1	30	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Arsenic	XRF	44.92	30	
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Arsenic	XRF	44.14	29	
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Arsenic	XRF	43.81	29	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Arsenic	XRF	43.69	29	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Arsenic	Lab		28	JM20
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Arsenic	XRF	40.89	27	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Arsenic	XRF	40.76	27	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Arsenic	Lab		27	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Arsenic	Lab		26	JM20
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Arsenic	XRF	38.46	26	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Arsenic	XRF	38.29	26	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Arsenic	XRF	37.48	25	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Arsenic	XRF	37.03	25	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Arsenic	XRF	36.87	25	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Arsenic	Lab		24	JM20
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Arsenic	Lab		24	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Arsenic	Lab		24	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Arsenic	Lab		24	JM20
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Arsenic	XRF	34.99	23	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Arsenic	Lab		23	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Arsenic	Lab		22	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Arsenic	XRF	32.7	22	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Arsenic	XRF	32.49	22	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Arsenic	XRF	32.07	21	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Arsenic	XRF	31.91	21	
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Arsenic	XRF	31.85	21	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Arsenic	XRF	31.04	21	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Arsenic	XRF	30.82	21	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Arsenic	XRF	29.66	20	
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Arsenic	XRF	29.34	20	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Arsenic	XRF	29.29	20	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Arsenic	XRF	29.24	20	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Arsenic	XRF	29.08	19	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Arsenic	XRF	28.17	19	
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Arsenic	XRF	27.71	19	
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Arsenic	XRF	27.67	18	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Arsenic	XRF	27.45	18	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Arsenic	XRF	27.32	18	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Arsenic	Lab		18	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Arsenic	XRF	26.85	18	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Arsenic	XRF	26.71	18	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Arsenic	XRF	26.66	18	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Arsenic	XRF	26.56	18	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Arsenic	XRF	26.48	18	
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Arsenic	XRF	26.44	18	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Arsenic	XRF	26.28	18	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Arsenic	XRF	25.83	17	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Arsenic	Lab		17	
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Arsenic	XRF	25.31	17	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Arsenic	XRF	25.2	17	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Arsenic	XRF	24.91	17	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Arsenic	XRF	24.82	17	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Arsenic	Lab		17	JM20
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Arsenic	XRF	24.48	16	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Arsenic	XRF	24.36	16	
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Arsenic	XRF	24.32	16	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Arsenic	XRF	24.12	16	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Arsenic	Lab		16	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Arsenic	XRF	23.35	16	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Arsenic	XRF	23.27	16	
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Arsenic	XRF	23.24	16	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Arsenic	XRF	23.16	15	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Arsenic	XRF	23.09	15	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Arsenic	XRF	22.97	15	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Arsenic	XRF	22.6	15	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Arsenic	Lab		15	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Arsenic	XRF	22.37	15	
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Arsenic	XRF	22.34	15	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Arsenic	XRF	22	15	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Arsenic	XRF	21.91	15	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Arsenic	XRF	21.75	15	
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Arsenic	XRF	21.19	14	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Arsenic	XRF	20.75	14	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Arsenic	XRF	20.41	14	
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Arsenic	XRF	20.31	14	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Arsenic	XRF	20.06	13	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Arsenic	Lab		13	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Arsenic	XRF	19.69	13	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Arsenic	XRF	19.66	13	
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Arsenic	XRF	19.18	13	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Arsenic	XRF	19.11	13	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Arsenic	XRF	18.21	12	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Arsenic	XRF	18	12	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Arsenic	Lab		12	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Arsenic	XRF	17.77	12	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Arsenic	XRF	17.68	12	
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Arsenic	XRF	17.47	12	
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Arsenic	XRF	16.72	11	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Arsenic	XRF	16.62	11	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Arsenic	XRF	16.46	11	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Arsenic	XRF	16.34	11	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Arsenic	XRF	16.13	11	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Arsenic	XRF	16.06	11	
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Arsenic	XRF	15.93	11	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Arsenic	XRF	15.85	11	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Arsenic	XRF	15.73	11	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Arsenic	XRF	15.38	10	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Arsenic	XRF	15.37	10	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Arsenic	XRF	14.99	10	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Arsenic	XRF	14.76	10	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Arsenic	XRF	14.59	10	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Arsenic	XRF	14.21	9	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Arsenic	XRF	13.97	9	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Arsenic	XRF	13.58	9	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Arsenic	XRF	13.36	9	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Arsenic	XRF	13.01	9	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Arsenic	Lab		9	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Arsenic	XRF	12.68	8	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Arsenic	XRF	12.51	8	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Arsenic	XRF	12.45	8	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Arsenic	XRF	11.88	8	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Arsenic	XRF	10.31	7	
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Arsenic	XRF	10.01	7	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Arsenic	XRF	9.67	6	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Arsenic	XRF	9.1	6	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Arsenic	XRF	8.86	6	
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Arsenic	XRF	7.94	5	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Arsenic	XRF	7.2	5	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Arsenic	XRF	7.14	5	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Arsenic	XRF	6.67	4	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Arsenic	XRF	6.33	4	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Arsenic	XRF	5.84	4	U
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Arsenic	XRF	5.49	4	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Arsenic	XRF	3.96	3	U
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Arsenic	XRF	3.26	2	U
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Cadmium	Lab		27.5	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Cadmium	Lab		13.7	JM270, 30
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Cadmium	Lab		12.8	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Cadmium	Lab		10.5	JM270, 30
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Cadmium	Lab		10.4	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Cadmium	Lab		9.8	JM270, 30
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Cadmium	Lab		6.1	JM270, 30
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Cadmium	Lab		5.8	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Cadmium	Lab		5.5	JM270, 30
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Cadmium	Lab		5.4	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Cadmium	Lab		5.3	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Cadmium	Lab		5.0	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Cadmium	Lab		4.8	JM270, 30

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Cadmium	Lab		2.7	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Cadmium	Lab		2.5	JM270, 30
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Cadmium	Lab		2.1	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Cadmium	Lab		1.8	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Cadmium	Lab		1.4	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Cadmium	Lab		1.3	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Cadmium	Lab		1.1	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Cadmium	Lab		0.6	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Cadmium	Lab		0.2	U
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Copper	XRF	2810.42	2076	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Copper	XRF	2338.65	1728	
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Copper	XRF	2000.56	1478	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Copper	XRF	1988.7	1469	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Copper	XRF	1852.55	1369	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Copper	XRF	1789.48	1322	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Copper	XRF	1295.1	957	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Copper	XRF	1147.47	848	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Copper	XRF	1125.74	832	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Copper	Lab		831	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Copper	Lab		776	JM31
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Copper	XRF	966.68	714	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Copper	XRF	956.1	706	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Copper	XRF	925.02	683	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Copper	XRF	918.6	679	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Copper	XRF	897.23	663	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Copper	XRF	888.44	656	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Copper	Lab		652	JM31
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Copper	XRF	877.76	648	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Copper	XRF	863.24	638	
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Copper	XRF	860.22	636	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Copper	Lab		624	JM31
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Copper	XRF	824.48	609	
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Copper	XRF	810.31	599	
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Copper	XRF	804.23	594	
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Copper	XRF	794.22	587	
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Copper	XRF	767.1	567	
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Copper	XRF	755.05	558	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Copper	XRF	754.48	557	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Copper	XRF	693.54	512	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Copper	Lab		510	JM31
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Copper	XRF	668.91	494	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Copper	XRF	659.38	487	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Copper	Lab		474	JM31
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Copper	XRF	602.77	445	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Copper	XRF	597.08	441	
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Copper	XRF	593.79	439	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Copper	XRF	586.22	433	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Copper	XRF	584.78	432	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Copper	XRF	583.52	431	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Copper	XRF	569.43	421	
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Copper	XRF	563.53	416	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Copper	Lab		414	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Copper	XRF	544.58	402	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Copper	XRF	529.33	391	
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Copper	XRF	518.54	383	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Copper	XRF	510.94	377	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Copper	XRF	506.83	374	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Copper	XRF	498.19	368	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Copper	XRF	497.78	368	
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Copper	XRF	492.23	364	
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Copper	XRF	491.86	363	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Copper	XRF	471.51	348	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Copper	XRF	471.48	348	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Copper	XRF	463.74	343	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Copper	XRF	460	340	
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Copper	XRF	430.47	318	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Copper	XRF	428.5	317	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Copper	XRF	421.12	311	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Copper	XRF	420.04	310	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Copper	XRF	401.25	296	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Copper	XRF	400.41	296	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Copper	XRF	389.83	288	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Copper	Lab		284	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Copper	Lab		281	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Copper	XRF	366.64	271	
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Copper	XRF	363.48	269	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Copper	XRF	360.05	266	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Copper	XRF	359.94	266	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Copper	XRF	356.7	264	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Copper	XRF	353.45	261	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Copper	XRF	352.05	260	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Copper	XRF	339.93	251	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Copper	XRF	338.89	250	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Copper	XRF	338.46	250	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Copper	XRF	331.97	245	
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Copper	XRF	325.33	240	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Copper	Lab		233	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Copper	Lab		233	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Copper	Lab		232	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Copper	XRF	313.29	231	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Copper	XRF	312.25	231	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Copper	XRF	311.98	230	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Copper	XRF	306.51	226	
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Copper	XRF	296.39	219	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Copper	XRF	295.43	218	
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Copper	XRF	287.07	212	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Copper	XRF	286.32	212	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Copper	Lab		210	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Copper	XRF	281.8	208	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Copper	XRF	260.4	192	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Copper	XRF	260.25	192	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Copper	XRF	259.66	192	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Copper	XRF	256	189	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Copper	XRF	250.78	185	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Copper	Lab		184	JM31
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Copper	XRF	244.15	180	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Copper	Lab		177	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Copper	XRF	238.22	176	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Copper	XRF	237.57	176	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Copper	XRF	237.36	175	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Copper	XRF	234.78	173	
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Copper	XRF	228.62	169	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Copper	Lab		167	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Copper	XRF	219.44	162	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Copper	XRF	218.07	161	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Copper	Lab		155	JM31
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Copper	XRF	206.82	153	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Copper	XRF	206.19	152	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Copper	Lab		151	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Copper	XRF	202.53	150	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Copper	XRF	200.58	148	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Copper	Lab		148	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Copper	XRF	199.67	148	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Copper	XRF	196.88	145	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Copper	Lab		145	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Copper	XRF	190.02	140	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Copper	XRF	189.98	140	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Copper	XRF	185.94	137	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Copper	XRF	185.8	137	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Copper	XRF	185.64	137	
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Copper	XRF	185.42	137	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Copper	Lab		136	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Copper	XRF	182.52	135	
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Copper	XRF	177.69	131	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Copper	XRF	176.16	130	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Copper	XRF	174.5	129	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Copper	XRF	173.07	128	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Copper	XRF	170.64	126	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Copper	Lab		125	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Copper	XRF	161.64	119	
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Copper	XRF	156.47	116	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Copper	XRF	153.6	113	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Copper	XRF	151.28	112	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Copper	XRF	147.17	109	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Copper	XRF	143.02	106	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Copper	XRF	139.39	103	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Copper	XRF	122.1	90	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Copper	XRF	122	90	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Copper	XRF	121.58	90	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Copper	XRF	108.5	80	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Copper	XRF	97.2	72	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Copper	XRF	95.67	71	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Copper	XRF	92.49	68	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Copper	XRF	90.59	67	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Copper	XRF	88.03	65	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Copper	XRF	81.32	60	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Copper	XRF	79.98	59	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Copper	XRF	76.57	57	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Copper	XRF	57.61	43	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Copper	XRF	43.93	32	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Copper	XRF	15.51	11	
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Copper	XRF	10.47	8	U
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Iron	XRF	152998.66	98761	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Iron	XRF	146157.33	94345	
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Iron	XRF	133788.52	86360	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Iron	XRF	124974.86	80671	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Iron	XRF	122887.78	79324	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Iron	XRF	115156.88	74334	
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Iron	XRF	105038.98	67803	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Iron	XRF	104217.93	67273	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Iron	XRF	104193.91	67257	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Iron	XRF	101944.14	65805	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Iron	XRF	99049.9	63937	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Iron	XRF	97568	62980	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Iron	Lab		62510	
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Iron	XRF	95758.45	61812	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Iron	XRF	95735.77	61797	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Iron	XRF	93691.39	60478	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Iron	XRF	92902.88	59969	
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Iron	XRF	91894.78	59318	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Iron	XRF	90346.88	58319	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Iron	XRF	89493.56	57768	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Iron	XRF	86929.2	56113	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Iron	XRF	86044.17	55542	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Iron	XRF	84532.67	54566	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Iron	XRF	84284.35	54406	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Iron	XRF	84038.52	54247	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Iron	XRF	83579.49	53951	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Iron	XRF	83136.87	53665	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Iron	XRF	82869.03	53492	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Iron	XRF	82685.08	53373	
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Iron	XRF	82539.09	53279	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Iron	XRF	79766.65	51489	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Iron	XRF	78877.94	50916	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Iron	Lab		49741	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Iron	XRF	75716.13	48875	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Iron	Lab		47929	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Iron	XRF	72320.74	46683	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Iron	XRF	71860.98	46386	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Iron	XRF	69127.88	44622	
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Iron	XRF	68964.41	44517	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Iron	Lab		44200	
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Iron	XRF	68249.94	44055	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Iron	XRF	68029.51	43913	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Iron	XRF	67910.85	43836	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Iron	XRF	67730.11	43720	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Iron	XRF	67460.17	43546	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Iron	Lab		43300	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Iron	XRF	66367.78	42840	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Iron	XRF	66170.92	42713	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Iron	XRF	66150.81	42700	
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Iron	XRF	66129.41	42687	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Iron	XRF	65864.38	42515	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Iron	XRF	65777.84	42460	
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Iron	XRF	65667.92	42389	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Iron	XRF	65482.82	42269	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Iron	XRF	64794.7	41825	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Iron	XRF	64587.04	41691	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Iron	XRF	64293.84	41502	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Iron	XRF	63794.53	41179	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Iron	XRF	63431.17	40945	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Iron	XRF	63315.06	40870	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Iron	Lab		40800	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Iron	XRF	62799.2	40537	
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Iron	XRF	62202.54	40152	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Iron	XRF	62199.94	40150	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Iron	XRF	62065.42	40063	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Iron	XRF	61874.4	39940	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Iron	Lab		39400	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Iron	XRF	60695.25	39179	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Iron	XRF	60153.45	38829	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Iron	XRF	60136.8	38818	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Iron	XRF	59820.45	38614	
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Iron	XRF	59669.76	38517	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Iron	XRF	59252.58	38248	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Iron	XRF	59074.63	38133	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Iron	XRF	59014.92	38094	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Iron	XRF	57970.8	37420	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Iron	XRF	57965.45	37417	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Iron	XRF	57959.24	37413	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Iron	XRF	57683.89	37235	
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Iron	XRF	57612.04	37189	
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Iron	XRF	57365.1	37029	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Iron	XRF	57097.02	36856	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Iron	Lab		36600	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Iron	XRF	56532.05	36491	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Iron	XRF	56122.79	36227	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Iron	XRF	56025.15	36164	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Iron	XRF	55962.36	36124	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Iron	XRF	55472.12	35807	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Iron	Lab		35800	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Iron	XRF	55221.13	35645	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Iron	XRF	54919.52	35451	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Iron	XRF	54901.18	35439	
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Iron	XRF	54830.23	35393	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Iron	XRF	54795.77	35371	
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Iron	XRF	54549.79	35212	
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Iron	XRF	54307.73	35056	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Iron	Lab		34214	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Iron	XRF	52874.93	34131	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Iron	XRF	52559.55	33927	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Iron	XRF	51853.45	33471	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Iron	XRF	51694.45	33369	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Iron	XRF	51354.57	33149	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Iron	Lab		32535	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Iron	XRF	49637.25	32041	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Iron	XRF	49295.45	31820	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Iron	XRF	49273.55	31806	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Iron	XRF	49038.14	31654	
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Iron	XRF	49010.29	31636	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Iron	XRF	48624.67	31387	
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Iron	XRF	48490.26	31300	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Iron	XRF	48251.22	31146	
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Iron	XRF	48211.66	31121	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Iron	XRF	47931.11	30940	
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Iron	XRF	47588.04	30718	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Iron	Lab		30610	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Iron	Lab		30566	
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Iron	XRF	46187.02	29814	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Iron	XRF	46159.78	29796	
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Iron	XRF	45946.85	29659	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Iron	Lab		29473	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Iron	Lab		29200	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Iron	XRF	44947.74	29014	
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Iron	XRF	44909.71	28989	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Iron	Lab		28500	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Iron	XRF	44105.39	28470	
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Iron	XRF	43914.57	28347	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Iron	XRF	43540.11	28105	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Iron	Lab		27900	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Iron	Lab		27610	
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Iron	XRF	42765.2	27605	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Iron	XRF	42400.38	27369	
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Iron	XRF	42024.64	27127	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Iron	XRF	41084.28	26520	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Iron	XRF	40857.84	26374	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Iron	XRF	40813.27	26345	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Iron	XRF	40085.41	25875	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Iron	XRF	39467.64	25476	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Iron	XRF	39153.41	25274	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Iron	XRF	38692.34	24976	
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Iron	XRF	38564	24893	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Iron	XRF	38200.89	24659	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Iron	XRF	38200.48	24658	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Iron	XRF	37748.35	24367	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Iron	XRF	36268.5	23411	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Iron	Lab		23106	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Iron	Lab		23100	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Iron	XRF	35062.44	22633	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Iron	Lab		21509	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Iron	Lab		20887	
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Iron	XRF	30923.51	19961	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Iron	XRF	30534.46	19710	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Iron	XRF	29444.77	19007	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Iron	XRF	28100.39	18139	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Lead	XRF	28499.39	28921	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Lead	XRF	4957.41	5031	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Lead	Lab		4220	
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Lead	XRF	3588.86	3642	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Lead	XRF	3352.37	3402	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Lead	XRF	3303.01	3352	
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Lead	XRF	2934.47	2978	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Lead	Lab		2490	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Lead	XRF	2355.3	2390	
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Lead	XRF	1949	1978	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Lead	Lab		1900	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Lead	XRF	1853.55	1881	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Lead	XRF	1661.66	1686	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Lead	XRF	1506.24	1529	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Lead	Lab		1400	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Lead	XRF	1351.11	1371	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Lead	XRF	1333.37	1353	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Lead	XRF	1215.02	1233	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Lead	Lab		1110	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Lead	XRF	1075.52	1091	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Lead	XRF	979.63	994	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Lead	Lab		975	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Lead	XRF	941.58	956	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Lead	XRF	933.55	947	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Lead	XRF	900.5	914	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Lead	Lab		900	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Lead	Lab		890	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Lead	Lab		862	
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Lead	XRF	781.56	793	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Lead	XRF	754.87	766	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Lead	XRF	715.74	726	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Lead	XRF	704.98	715	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Lead	XRF	621.6	631	
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Lead	XRF	615.81	625	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Lead	XRF	613.57	623	
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Lead	XRF	600.57	609	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Lead	XRF	593.21	602	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Lead	XRF	583.02	592	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Lead	Lab		584	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Lead	XRF	575.43	584	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Lead	XRF	554.65	563	
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Lead	XRF	549.22	557	
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Lead	XRF	531.5	539	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Lead	Lab		531	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Lead	XRF	459.49	466	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Lead	XRF	438.75	445	
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Lead	XRF	437.28	444	
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Lead	XRF	424.17	430	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Lead	XRF	421.75	428	
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Lead	XRF	404.53	411	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Lead	XRF	381.26	387	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Lead	Lab		381	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Lead	Lab		371	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Lead	XRF	360.19	366	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Lead	XRF	357.77	363	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Lead	XRF	347.79	353	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Lead	XRF	346.13	351	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Lead	Lab		338	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Lead	Lab		331	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Lead	XRF	310.27	315	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Lead	XRF	307.03	312	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Lead	XRF	287.91	292	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Lead	XRF	283.92	288	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Lead	XRF	273.59	278	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Lead	XRF	272.36	276	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Lead	XRF	267.66	272	
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Lead	XRF	265.59	270	
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Lead	XRF	264.82	269	
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Lead	XRF	253.29	257	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Lead	XRF	251.43	255	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Lead	XRF	246.24	250	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Lead	XRF	237.14	241	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Lead	XRF	233.84	237	
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Lead	XRF	219.29	223	
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Lead	XRF	218.89	222	
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Lead	XRF	212.6	216	
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Lead	XRF	209.11	212	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Lead	XRF	208.46	212	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Lead	XRF	199.5	202	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Lead	XRF	194.75	198	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Lead	XRF	189.6	192	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Lead	XRF	188.49	191	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Lead	XRF	185.79	189	
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Lead	XRF	185.56	188	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Lead	XRF	183.93	187	
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Lead	XRF	183.61	186	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Lead	XRF	183.03	186	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Lead	XRF	181.26	184	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Lead	XRF	178.91	182	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Lead	Lab		178	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Lead	XRF	172.97	176	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Lead	XRF	172.77	175	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Lead	XRF	171.65	174	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Lead	XRF	164.51	167	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Lead	XRF	164.09	167	
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Lead	XRF	162.74	165	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Lead	XRF	161.04	163	
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Lead	XRF	155.43	158	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Lead	XRF	153.82	156	
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Lead	XRF	153.56	156	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Lead	XRF	150.9	153	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Lead	XRF	147.73	150	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Lead	XRF	146.75	149	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Lead	XRF	145.29	147	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Lead	Lab		147	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Lead	XRF	144.5	147	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Lead	Lab		145	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Lead	XRF	142.61	145	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Lead	XRF	141.14	143	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Lead	XRF	139.84	142	
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Lead	XRF	138.55	141	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Lead	XRF	138.02	140	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Lead	XRF	136.62	139	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Lead	XRF	136.43	138	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Lead	XRF	130.53	132	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Lead	XRF	129.73	132	
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Lead	XRF	129.62	132	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Lead	XRF	127.47	129	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Lead	XRF	126.17	128	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Lead	XRF	125.96	128	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Lead	XRF	125.39	127	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Lead	Lab		126	
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Lead	XRF	120.62	122	
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Lead	XRF	119.03	121	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Lead	XRF	117.56	119	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Lead	XRF	117.5	119	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Lead	XRF	112.83	114	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Lead	XRF	109.82	111	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Lead	XRF	105.86	107	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Lead	XRF	104.59	106	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Lead	XRF	104	106	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Lead	XRF	102.91	104	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Lead	Lab		104	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Lead	XRF	100.33	102	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Lead	XRF	100.27	102	
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Lead	XRF	99.71	101	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Lead	Lab		99	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Lead	XRF	86.93	88	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Lead	XRF	86.6	88	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Lead	XRF	85.13	86	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Lead	XRF	82.12	83	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Lead	XRF	81.44	83	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Lead	XRF	78.86	80	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Lead	XRF	78.72	80	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Lead	XRF	78.37	80	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Lead	XRF	75.8	77	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Lead	XRF	69.28	70	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Lead	XRF	66.15	67	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Lead	XRF	58.48	59	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Lead	XRF	56.06	57	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Lead	Lab		52	
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Lead	XRF	30.36	31	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Lead	XRF	26.11	26	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Manganese	XRF	32366.45	14749	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Manganese	XRF	21952.99	10004	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Manganese	XRF	16680.31	7601	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Manganese	XRF	11064.13	5042	
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Manganese	XRF	10200.62	4648	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Manganese	XRF	9882.44	4503	
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Manganese	XRF	9789.1	4461	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Manganese	XRF	9646.04	4396	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Manganese	XRF	9471.82	4316	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Manganese	XRF	8858.26	4037	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Manganese	XRF	8391.53	3824	
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Manganese	XRF	8244.73	3757	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Manganese	XRF	8099.13	3691	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Manganese	XRF	8028.87	3659	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Manganese	Lab		3390	
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Manganese	XRF	7296.58	3325	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Manganese	XRF	7037.34	3207	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Manganese	Lab		3200	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Manganese	Lab		3200	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Manganese	XRF	6864.59	3128	
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Manganese	XRF	6364.41	2900	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Manganese	XRF	6167.04	2810	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Manganese	XRF	6164.22	2809	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Manganese	XRF	6133.81	2795	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Manganese	XRF	5353.99	2440	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Manganese	XRF	5257.93	2396	
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Manganese	Lab		2380	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Manganese	XRF	5120.48	2333	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Manganese	Lab		2320	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Manganese	XRF	4778.51	2178	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Manganese	XRF	4368.39	1991	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Manganese	Lab		1990	
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Manganese	XRF	4200.96	1914	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Manganese	XRF	4087.92	1863	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Manganese	Lab		1830	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Manganese	XRF	3660.39	1668	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Manganese	Lab		1620	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Manganese	XRF	3456.56	1575	
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Manganese	XRF	3369.5	1535	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Manganese	XRF	3296.04	1502	
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Manganese	XRF	3291.29	1500	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Manganese	XRF	3266.61	1489	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Manganese	XRF	3069.26	1399	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Manganese	XRF	3037.06	1384	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Manganese	XRF	3026.99	1379	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Manganese	Lab		1350	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Manganese	Lab		1340	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Manganese	XRF	2918.34	1330	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Manganese	XRF	2891.41	1318	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Manganese	XRF	2822.04	1286	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Manganese	Lab		1270	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Manganese	XRF	2764.84	1260	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Manganese	Lab		1240	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Manganese	XRF	2680.55	1222	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Manganese	XRF	2629.29	1198	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Manganese	XRF	2616.41	1192	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Manganese	XRF	2614.9	1192	
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Manganese	XRF	2588.14	1179	
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Manganese	XRF	2575.03	1173	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Manganese	Lab		1160	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Manganese	XRF	2521.8	1149	
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Manganese	XRF	2503.4	1141	
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Manganese	XRF	2419.1	1102	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Manganese	Lab		1100	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Manganese	XRF	2400.36	1094	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Manganese	XRF	2377.3	1083	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Manganese	XRF	2214.48	1009	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Manganese	XRF	2163.31	986	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Manganese	XRF	2132.06	972	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Manganese	XRF	2067.53	942	
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Manganese	XRF	1940.36	884	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Manganese	Lab		884	
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Manganese	XRF	1937.79	883	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Manganese	Lab		838	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Manganese	XRF	1803.5	822	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Manganese	XRF	1763.63	804	
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Manganese	XRF	1756.7	801	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Manganese	XRF	1744.03	795	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Manganese	XRF	1723.93	786	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Manganese	XRF	1667.43	760	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Manganese	XRF	1661.53	757	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Manganese	Lab		752	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Manganese	XRF	1616.57	737	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Manganese	XRF	1577.64	719	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Manganese	XRF	1566.47	714	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Manganese	XRF	1539.78	702	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Manganese	XRF	1508.36	687	
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Manganese	XRF	1451.6	661	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Manganese	XRF	1446.3	659	
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Manganese	XRF	1437.62	655	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Manganese	XRF	1425.09	649	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Manganese	Lab		642	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Manganese	XRF	1404.25	640	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Manganese	XRF	1373.69	626	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Manganese	XRF	1372.45	625	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Manganese	XRF	1323.19	603	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Manganese	XRF	1306.72	595	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Manganese	XRF	1299.05	592	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Manganese	XRF	1249.2	569	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Manganese	XRF	1205.15	549	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Manganese	XRF	1191.58	543	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Manganese	XRF	1167.94	532	
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Manganese	XRF	1137.85	519	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Manganese	XRF	1114.74	508	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Manganese	XRF	1102.89	503	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Manganese	XRF	1083.46	494	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Manganese	XRF	1067.8	487	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Manganese	XRF	1053.83	480	
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Manganese	XRF	1049.78	478	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Manganese	XRF	1037.84	473	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Manganese	XRF	1015.29	463	
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Manganese	XRF	991.6	452	
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Manganese	XRF	982.96	448	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Manganese	XRF	967.69	441	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Manganese	XRF	919.32	419	
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Manganese	XRF	910.34	415	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Manganese	XRF	905.88	413	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Manganese	XRF	875.49	399	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Manganese	XRF	853.88	389	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Manganese	XRF	837.65	382	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Manganese	Lab		380	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Manganese	XRF	811.45	370	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Manganese	XRF	807.4	368	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Manganese	XRF	778.77	355	
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Manganese	XRF	729.6	332	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Manganese	XRF	685.76	313	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Manganese	Lab		307	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Manganese	XRF	666.07	304	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Manganese	XRF	648.12	295	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Manganese	XRF	627.37	286	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Manganese	XRF	622.17	284	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Manganese	XRF	578.61	264	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Manganese	Lab		241	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Manganese	Lab		235	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Manganese	XRF	469.19	214	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Manganese	XRF	459.78	210	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Manganese	XRF	382.49	174	
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Manganese	XRF	367.95	168	
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Manganese	XRF	366.74	167	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Manganese	XRF	361.85	165	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Manganese	XRF	347	158	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Manganese	XRF	340.41	155	
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Manganese	XRF	305.08	139	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Manganese	XRF	295.9	135	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Manganese	XRF	248.22	113	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Manganese	XRF	225.49	103	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Manganese	XRF	216.75	99	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Manganese	XRF	206.82	94	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Manganese	XRF	169.18	77	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Manganese	XRF	143.02	65	U
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Manganese	XRF	125.9	57	
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Manganese	XRF	82.01	37	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Manganese	XRF	76.57	35	U
2	TP-FP-45(2.0-2.3)	10/1/2012	2	2.3	Zinc	XRF	10357.12	9763	
2	TP-FP-49(5.0-5.5)	10/2/2012	5	5.5	Zinc	XRF	6363.75	5998	
2	TP-FP-45(3.5-4.0)	10/1/2012	3.5	4	Zinc	XRF	5586.51	5266	
2	TP-FP-44(2.0-2.5)	10/1/2012	2	2.5	Zinc	XRF	4406.55	4154	
2	UBDT-TP-1 (24-36")	10/17/2007	2	3	Zinc	Lab		3620	
2	TP-FP-45A(5.0-6.0)	10/1/2012	5	6	Zinc	XRF	3458.63	3260	
2	TP-FP-54(3.4-3.8)	10/10/2012	3.4	3.8	Zinc	XRF	3320.56	3130	
2	TP-FP-38A(2.5-3.0)	9/27/2012	2.5	3	Zinc	XRF	3255.44	3069	
2	TP-FP-44(4.0-4.5)	10/1/2012	4	4.5	Zinc	XRF	3060.77	2885	
2	TP-FP-33(3.5-4.0)	9/24/2012	3.5	4	Zinc	XRF	2991.06	2819	
2	TP-FP-43(4.0-4.3)	10/1/2012	4	4.3	Zinc	XRF	2989.52	2818	
2	TP-FP-45(7.5-8.0)	10/1/2012	7.5	8	Zinc	XRF	2873.89	2709	
2	TP-FP-30(2.3-3.3)	9/19/2012	2.3	3.3	Zinc	XRF	2852.35	2689	
2	TP-FP-38(7.5-8.0)	9/25/2012	7.5	8	Zinc	XRF	2812.65	2651	
2	TP-FP-47(5.5-6.0)	10/1/2012	5.5	6	Zinc	XRF	2665.44	2512	
2	TP-FP-33(5.9-6.2)	9/24/2012	5.9	6.2	Zinc	XRF	2622.56	2472	
2	TP-FP-47(3.5-4.0)	10/1/2012	3.5	4	Zinc	XRF	2605.34	2456	
2	TP-FP-55(2.0-2.3)	10/15/2012	2	2.3	Zinc	XRF	2579.35	2431	
2	TP-FP-44(6.0-6.5)	10/1/2012	6	6.5	Zinc	XRF	2539.35	2394	
2	TP-FP-37(9.5-10.0)	9/25/2012	9.5	10	Zinc	XRF	2527.12	2382	
2	TP-FP-55(5.0-5.5)	10/15/2012	5	5.5	Zinc	XRF	2495.74	2352	
2	TP-FP-48(8.0-8.5)	10/2/2012	8	8.5	Zinc	XRF	2379.94	2243	
2	TP-FP-37(7.5-8.0)	9/25/2012	7.5	8	Zinc	XRF	2224.43	2097	
2	TP-FP-48(6.0-6.5)	10/2/2012	6	6.5	Zinc	XRF	2215.32	2088	
2	TP-FP-31(4.5-5.0)	9/24/2012	4.5	5	Zinc	XRF	2197.5	2071	
2	TP-FP-38(5.0-5.4)	9/25/2012	5	5.4	Zinc	XRF	2195.63	2070	
2	TP-FP-44A(8.0-8.5)	10/1/2012	8	8.5	Zinc	XRF	2062.66	1944	
2	TP-FP-30(7.5-8.0)	9/19/2012	7.5	8	Zinc	XRF	2027.62	1911	
2	TP-FP-55(3.8-4.2)	10/15/2012	3.8	4.2	Zinc	XRF	2021.7	1906	
2	TP-FP-47(2.0-2.5)	10/1/2012	2	2.5	Zinc	XRF	2003.85	1889	
2	TP-FP-38A(4.5-5.0)	9/27/2012	4.5	5	Zinc	XRF	1977.51	1864	
2	TP-FP-35(9.0-9.8)	9/24/2012	9	9.8	Zinc	XRF	1822.61	1718	
2	TP-FP-49(8.5-9.0)	10/2/2012	8.5	9	Zinc	XRF	1740.49	1641	
2	TP-FP-31(6.5-7.0)	9/24/2012	6.5	7	Zinc	XRF	1738.68	1639	
2	TP-FP-38(9.5-10.0)	9/25/2012	9.5	10	Zinc	XRF	1677.55	1581	
2	TP-FP-43(6.0-6.5)	10/1/2012	6	6.5	Zinc	XRF	1652.89	1558	
2	TP-FP-47(6.5-7.0)	10/1/2012	6.5	7	Zinc	XRF	1612.92	1520	
2	UBDT-TP-1 (36-48")	10/17/2007	3	4	Zinc	Lab		1490	
2	UBDT-TP-6 (36-48")	10/16/2007	3	4	Zinc	Lab		1490	JM31

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-55(2.5-3.0)	10/15/2012	2.5	3	Zinc	XRF	1569.88	1480	
2	TP-FP-49(6.5-7.0)	10/2/2012	6.5	7	Zinc	XRF	1562.6	1473	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Zinc	Lab		1460	
2	TP-FP-43(9.0-9.5)	10/1/2012	9	9.5	Zinc	XRF	1520.15	1433	
2	TP-FP-48(2.5-3.0)	10/2/2012	2.5	3	Zinc	XRF	1432.85	1351	
2	TP-FP-45A(5.5-6.0)	10/1/2012	5.5	6	Zinc	XRF	1398.05	1318	
2	TP-FP-32(7.0-7.5)	9/24/2012	7	7.5	Zinc	XRF	1376.75	1298	
2	TP-FP-46(6.0-6.5)	10/1/2012	6	6.5	Zinc	XRF	1371.97	1293	
2	UBDT-TP-6 (24-36")	10/16/2007	2	3	Zinc	Lab		1290	JM31
2	TP-FP-38(2.0-2.5)	9/25/2012	2	2.5	Zinc	XRF	1310.54	1235	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Zinc	Lab		1190	
2	UBDT-TP-6 (48-60")	10/16/2007	4	5	Zinc	Lab		1190	JM31
2	TP-FP-42(2.0-2.6)	9/27/2012	2	2.6	Zinc	XRF	1257.84	1186	
2	TP-FP-30(4.8-5.0)	9/19/2012	4.8	5	Zinc	XRF	1247.88	1176	
2	TP-FP-42(4.8-5.2)	9/27/2012	4.8	5.2	Zinc	XRF	1229.38	1159	
2	UBDT-TP-2 (24-36")	10/17/2007	2	3	Zinc	Lab		1150	JM31
2	UBDT-TP-3 (36-48")	10/17/2007	3	4	Zinc	Lab		1120	JM31
2	TP-FP-59(6.5-7.0)	10/15/2012	6.5	7	Zinc	XRF	1179.69	1112	
2	TP-FP-52(2.7-3.0)	10/10/2012	2.7	3	Zinc	XRF	1153.7	1087	
2	UBDT-TP-2 (36-48")	10/17/2007	3	4	Zinc	Lab		1060	
2	TP-FP-45A(3.0-3.5)	10/1/2012	3	3.5	Zinc	XRF	1106.65	1043	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	8.5	Zinc	Lab		1020	
2	UBDT-TP-4 (24-36")	10/16/2007	2	3	Zinc	Lab		1020	JM31
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Zinc	Lab		1010	
2	TP-FP-35(8.5-9.0)	9/24/2012	8.5	9	Zinc	XRF	1066.63	1005	
2	TP-FP-45A(9.0-9.5)	10/1/2012	9	9.5	Zinc	XRF	987.72	931	
2	TP-FP-58(9.5-10.0)	10/15/2012	9.5	10	Zinc	XRF	981.76	925	
2	TP-FP-58(3.6-4.0)	10/15/2012	3.6	4	Zinc	XRF	971.34	916	
2	TP-FP-37(4.5-5.0)	9/25/2012	4.5	5	Zinc	XRF	957.87	903	
2	TP-FP-31(7.0-7.5)	9/24/2012	7	7.5	Zinc	XRF	957.84	903	
2	TP-FP-46(3.0-3.5)	10/1/2012	3	3.5	Zinc	XRF	953.09	898	
2	TP-FP-42(6.0-6.1)	9/27/2012	6	6.1	Zinc	XRF	943.6	889	
2	TP-FP-50(5.5-6.0)	10/2/2012	5.5	6	Zinc	XRF	942.9	889	
2	TP-FP-54(5.0-5.5)	10/10/2012	5	5.5	Zinc	XRF	936.46	883	
2	TP-FP-31(9.0-9.5)	9/24/2012	9	9.5	Zinc	XRF	933.07	880	
2	TP-FP-36(6.5-7.0)	9/24/2012	6.5	7	Zinc	XRF	909.51	857	
2	TP-FP-48(3.0-3.5)	10/2/2012	3	3.5	Zinc	XRF	899.04	847	
2	TP-FP-53(3.0-3.6)	10/10/2012	3	3.6	Zinc	XRF	897.82	846	
2	TP-FP-32(8.5-9.0)	9/24/2012	8.5	9	Zinc	XRF	896.35	845	
2	TP-FP-49(3.0-3.4)	10/2/2012	3	3.4	Zinc	XRF	858.29	809	
2	TP-FP-42(4.2-4.8)	9/27/2012	4.2	4.8	Zinc	XRF	856.71	808	
2	TP-FP-50(3.5-4.0)	10/2/2012	3.5	4	Zinc	XRF	772.02	728	
2	TP-FP-58(8.5-9.0)	10/15/2012	8.5	9	Zinc	XRF	751.01	708	
2	UBDT-TP-3 (48-60")	10/17/2007	4	5	Zinc	Lab		701	JM31

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-54(9.0-9.5)	10/10/2012	9	9.5	Zinc	XRF	707	666	
2	TP-FP-36(9.5-10.0)	9/25/2012	9.5	10	Zinc	XRF	667.73	629	
2	TP-FP-60(8.0-8.0)	10/15/2012	8	8	Zinc	XRF	659.6	622	
2	TP-FP-30(3.5-4.0)	9/19/2012	3.5	4	Zinc	XRF	639.63	603	
2	TP-FP-35(4.0-4.3)	9/24/2012	4	4.3	Zinc	XRF	625.93	590	
2	TP-FP-44(2.5-3.0)	10/1/2012	2.5	3	Zinc	XRF	604.69	570	
2	TP-FP-60(9.5-10.0)	10/15/2012	9.5	10	Zinc	XRF	587.5	554	
2	TP-FP-59(8.5-9.0)	10/15/2012	8.5	9	Zinc	XRF	587.4	554	
2	TP-FP-53(7.5-8.0)	10/10/2012	7.5	8	Zinc	XRF	568.37	536	
2	UBDT-TP-1 (48-60")	10/17/2007	4	5	Zinc	Lab		524	
2	UBDT-TP-3 (24-36")	10/17/2007	2	3	Zinc	Lab		518	
2	TP-FP-59(2.5-3.0)	10/15/2012	2.5	3	Zinc	XRF	541.67	511	
2	TP-FP-60(8.0-8.5)	10/15/2012	8	8.5	Zinc	XRF	522.48	492	
2	TP-FP-50(7.5-8.0)	10/2/2012	7.5	8	Zinc	XRF	520.59	491	
2	TP-FP-41(4.0-4.5)	9/27/2012	4	4.5	Zinc	XRF	487.1	459	
2	TP-FP-58(2.3-2.8)	10/15/2012	2.3	2.8	Zinc	XRF	485.8	458	
2	TP-FP-54(7.0-7.5)	10/10/2012	7	7.5	Zinc	XRF	462.61	436	
2	TP-FP-53(5.0-5.5)	10/10/2012	5	5.5	Zinc	XRF	441.5	416	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3.2	Zinc	Lab		412	
2	TP-FP-41(5.5-6.0)	9/27/2012	5.5	6	Zinc	XRF	434.5	410	
2	TP-FP-52(7.5-8.0)	10/10/2012	7.5	8	Zinc	XRF	430.14	405	
2	TP-FP-40(6.5-6.8)	9/27/2012	6.5	6.8	Zinc	XRF	422.71	398	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Zinc	Lab		396	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	6.5	Zinc	Lab		387	
2	TP-FP-37(2.5-3.0)	9/25/2012	2.5	3	Zinc	XRF	409.91	386	
2	TP-FP-51A(2.5-3.0)	10/4/2012	2.5	3	Zinc	XRF	409.84	386	
2	TP-FP-39(3.5-4.2)	9/27/2012	3.5	4.2	Zinc	XRF	395	372	
2	TP-FP-34(6.0-6.3)	9/24/2012	6	6.3	Zinc	XRF	384.56	362	
2	TP-FP-59(3.5-4.0)	10/15/2012	3.5	4	Zinc	XRF	377.06	355	
2	TP-FP-33(2.3-2.6)	9/24/2012	2.3	2.6	Zinc	XRF	367.91	347	
2	TP-FP-41(8.5-9.0)	9/27/2012	8.5	9	Zinc	XRF	366.5	345	
2	TP-FP-58(4.1-4.7)	10/15/2012	4.1	4.7	Zinc	XRF	366.23	345	
2	TP-FP-34(3.5-4.0)	9/24/2012	3.5	4	Zinc	XRF	365.3	344	
2	TP-FP-39A(6.0-6.5)	9/27/2012	6	6.5	Zinc	XRF	359.1	338	
2	TP-FP-34(7.5-8.0)	9/24/2012	7.5	8	Zinc	XRF	351.8	332	
2	TP-FP-40(6.0-6.2)	9/27/2012	6	6.2	Zinc	XRF	340.53	321	
2	TP-FP-40(3.5-3.8)	9/27/2012	3.5	3.8	Zinc	XRF	340.12	321	
2	TP-FP-52(9.5-10.0)	10/10/2012	9.5	10	Zinc	XRF	331.93	313	
2	TP-FP-50A(2.2-2.5)	10/3/2012	2.2	2.5	Zinc	XRF	331.38	312	
2	TP-FP-58B(4.1-4.7)	10/15/2012	4.1	4.7	Zinc	XRF	308.22	291	
2	TP-FP-50A(2.3-2.5)	10/3/2012	2.3	2.5	Zinc	XRF	306.16	289	
2	TP-FP-56(4.5-4.9)	10/15/2012	4.5	4.9	Zinc	XRF	304.1	287	
2	TP-FP-34(8.5-9.0)	9/24/2012	8.5	9	Zinc	XRF	299.62	282	
2	TP-FP-52(5.0-5.5)	10/10/2012	5	5.5	Zinc	XRF	281.27	265	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Zinc	Lab		263	
2	TP-FP-60(5.8-6.0)	10/15/2012	5.8	6	Zinc	XRF	274.15	258	
2	TP-FP-31(2.0-2.8)	9/24/2012	2	2.8	Zinc	XRF	265.33	250	
2	TP-FP-56(6.5-7.0)	10/15/2012	6.5	7	Zinc	XRF	254.35	240	
2	TP-FP-56(2.6-3.0)	10/15/2012	2.6	3	Zinc	XRF	252.49	238	
2	TP-FP-51A(4.5-5.0)	10/4/2012	4.5	5	Zinc	XRF	249.89	236	
2	TP-FP-60(3.6-4.0)	10/15/2012	3.6	4	Zinc	XRF	247.13	233	
2	TP-FP-51A(6.0-6.2)	10/4/2012	6	6.2	Zinc	XRF	242.9	229	
2	TP-FP-50A(3.5-4.0)	10/3/2012	3.5	4	Zinc	XRF	238.38	225	
2	TP-FP-60(2.0-2.2)	10/15/2012	2	2.2	Zinc	XRF	237.49	224	
2	TP-FP-35(6.0-6.4)	9/24/2012	6	6.4	Zinc	XRF	235.62	222	
2	TP-FP-39A(9.5-10.0)	9/27/2012	9.5	10	Zinc	XRF	228.75	216	
2	TP-FP-32(2.4-2.7)	9/24/2012	2.4	2.7	Zinc	XRF	216	204	
2	TP-FP-35(2.3-2.8)	9/24/2012	2.3	2.8	Zinc	XRF	211.77	200	
2	TP-FP-30(3.0-3.5)	9/19/2012	3	3.5	Zinc	XRF	195.5	184	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	2.5	Zinc	Lab		183	
2	TP-FP-6A(2.0-3.0)	11/13/2012	2	3	Zinc	XRF	174.5	164	
2	TP-FP-40A(8.5-9.0)	9/27/2012	8.5	9	Zinc	XRF	152.18	143	
2	TP-FP-50A(5.0-5.5)	10/3/2012	5	5.5	Zinc	XRF	149.82	141	
2	TP-FP-51(5.5-6.0)	10/3/2012	5.5	6	Zinc	XRF	143.52	135	
2	TP-FP-40(8.5-9.0)	9/27/2012	8.5	9	Zinc	XRF	142.41	134	
2	TP-FP-51(3.5-4.0)	10/3/2012	3.5	4	Zinc	XRF	139.98	132	
2	TP-FP-6B(2.5-3.5)	10/24/2012	2.5	3.5	Zinc	XRF	131.8	124	
2	TP-FP-51(7.5-8.0)	10/3/2012	7.5	8	Zinc	XRF	127.73	120	
2	TP-FP-6A(5.5-6.5)	11/13/2012	5.5	6.5	Zinc	XRF	116.64	110	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Zinc	Lab		35	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Aluminum	Lab		10100	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Aluminum	Lab		7370	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Aluminum	Lab		7250	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Aluminum	Lab		7040	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Aluminum	Lab		6920	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Aluminum	Lab		6820	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Aluminum	Lab		5640	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Aluminum	Lab		5470	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Aluminum	Lab		5080	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Aluminum	Lab		4700	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Aluminum	Lab		4380	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Aluminum	Lab		4020	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Aluminum	Lab		3550	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Arsenic	Lab		1370	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Arsenic	Lab		1130	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Arsenic	Lab		1030	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Arsenic	Lab		735	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Arsenic	Lab		620	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Arsenic	Lab		491	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Arsenic	Lab		468	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Arsenic	Lab		319	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Arsenic	Lab		240	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Arsenic	Lab		228	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Arsenic	Lab		193	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Arsenic	Lab		181	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Arsenic	Lab		19	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Cadmium	Lab		0.22	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Cadmium	Lab		0.17	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Cadmium	Lab		0.15	U
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Cadmium	Lab		0.15	U
9	PAYCW-2 (12-24")	6/2/2008	1	2	Cadmium	Lab		0.15	U
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Cadmium	Lab		0.15	U
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Cadmium	Lab		0.15	U
9	PAYCW-3 (12-24")	6/2/2008	1	2	Cadmium	Lab		0.15	U
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Cadmium	Lab		0.15	U
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Cadmium	Lab		0.15	U
9	PAYCW-4 (12-24")	6/2/2008	1	2	Cadmium	Lab		0.15	U
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Cadmium	Lab		0.15	U
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Cadmium	Lab		0.15	U
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Copper	Lab		264	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Copper	Lab		212	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Copper	Lab		211	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Copper	Lab		202	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Copper	Lab		201	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Copper	Lab		190	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Copper	Lab		184	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Copper	Lab		172	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Copper	Lab		162	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Copper	Lab		151	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Copper	Lab		122	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Copper	Lab		115	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Copper	Lab		114	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Iron	Lab		218000	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Iron	Lab		208000	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Iron	Lab		192000	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Iron	Lab		184000	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Iron	Lab		146000	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Iron	Lab		145000	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Iron	Lab		140000	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Iron	Lab		114000	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Iron	Lab		65200	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Iron	Lab		58100	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
9	PAYCW-3 (12-24")	6/2/2008	1	2	Iron	Lab		57400	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Iron	Lab		51700	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Iron	Lab		45900	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Lead	Lab		422	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Lead	Lab		286	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Lead	Lab		212	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Lead	Lab		138	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Lead	Lab		132	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Lead	Lab		122	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Lead	Lab		118	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Lead	Lab		95	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Lead	Lab		94	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Lead	Lab		90	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Lead	Lab		77	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Lead	Lab		50	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Lead	Lab		43	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Manganese	Lab		216	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Manganese	Lab		154	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Manganese	Lab		148	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Manganese	Lab		126	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Manganese	Lab		91	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Manganese	Lab		88	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Manganese	Lab		83	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Manganese	Lab		78	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Manganese	Lab		70	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Manganese	Lab		51	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Manganese	Lab		51	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Manganese	Lab		33	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Manganese	Lab		27	
9	PAYCW-1 (0-6")	6/2/2008	0	0.5	Zinc	Lab		53	
9	PAYCW-2 (0-6")	6/2/2008	0	0.5	Zinc	Lab		48	
9	PAYRD-1 (0-6")	6/2/2008	0	0.5	Zinc	Lab		48	
9	PAYCW-4 (0-6")	6/2/2008	0	0.5	Zinc	Lab		40	
9	PAYCW-3 (6-12")	6/2/2008	0.5	1	Zinc	Lab		37	
9	PAYCW-1 (6-12")	6/2/2008	0.5	1	Zinc	Lab		32	
9	PAYCW-3 (12-24")	6/2/2008	1	2	Zinc	Lab		29	
9	PAYCW-1 (12-24")	6/2/2008	1	2	Zinc	Lab		28	
9	PAYCW-4 (6-12")	6/2/2008	0.5	1	Zinc	Lab		26	
9	PAYCW-2 (6-12")	6/2/2008	0.5	1	Zinc	Lab		26	
9	PAYCW-3 (0-6")	6/2/2008	0	0.5	Zinc	Lab		25	
9	PAYCW-4 (12-24")	6/2/2008	1	2	Zinc	Lab		25	
9	PAYCW-2 (12-24")	6/2/2008	1	2	Zinc	Lab		24	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Aluminum	Lab		14400	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Aluminum	Lab		13100	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Aluminum	Lab		13000	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Aluminum	Lab		12100	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Aluminum	Lab		11200	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Aluminum	Lab		11100	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Aluminum	Lab		10100	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Aluminum	Lab		9100	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Aluminum	Lab		8310	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Aluminum	Lab		8220	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Aluminum	Lab		5780	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Arsenic	XRF	943.34	630	U
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Arsenic	XRF	774.98	518	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Arsenic	XRF	654.93	438	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Arsenic	XRF	546.02	365	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Arsenic	XRF	511.35	342	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Arsenic	XRF	490.62	328	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Arsenic	Lab		283	
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Arsenic	XRF	417.68	279	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Arsenic	XRF	371.09	248	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Arsenic	Lab		223	
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Arsenic	XRF	331.35	221	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Arsenic	XRF	324.71	217	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Arsenic	Lab		215	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Arsenic	XRF	320.94	214	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Arsenic	XRF	264.79	177	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Arsenic	XRF	242.51	162	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Arsenic	XRF	228.03	152	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Arsenic	XRF	210.7	141	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Arsenic	Lab		138	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Arsenic	XRF	183.18	122	U
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Arsenic	XRF	178.2	119	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Arsenic	Lab		117	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Arsenic	XRF	163.83	109	
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Arsenic	XRF	151.57	101	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Arsenic	XRF	143.62	96	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Arsenic	XRF	139.61	93	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Arsenic	XRF	139.37	93	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Arsenic	XRF	137	92	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Arsenic	XRF	134.11	90	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Arsenic	Lab		88	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Arsenic	XRF	131.23	88	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Arsenic	XRF	127.56	85	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Arsenic	XRF	116.67	78	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Arsenic	XRF	106.74	71	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Arsenic	XRF	98.18	66	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Arsenic	XRF	92.91	62	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Arsenic	XRF	92.05	61	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Arsenic	XRF	90.84	61	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Arsenic	XRF	89.66	60	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Arsenic	Lab		59	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Arsenic	XRF	88.2	59	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Arsenic	XRF	83.06	55	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Arsenic	XRF	77.04	51	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Arsenic	XRF	66.83	45	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Arsenic	XRF	65.83	44	
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Arsenic	XRF	63.18	42	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Arsenic	XRF	60.03	40	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Arsenic	XRF	59.23	40	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Arsenic	XRF	58.43	39	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Arsenic	Lab		39	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Arsenic	Lab		39	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Arsenic	XRF	53.25	36	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Arsenic	XRF	53.22	36	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Arsenic	XRF	52.72	35	
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Arsenic	XRF	52.64	35	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Arsenic	XRF	51.7	35	
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Arsenic	XRF	51.55	34	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Arsenic	XRF	50.68	34	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Arsenic	XRF	50.21	34	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Arsenic	XRF	49.7	33	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Arsenic	XRF	48.98	33	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Arsenic	XRF	46.85	31	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Arsenic	XRF	46.31	31	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Arsenic	XRF	44.16	30	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Arsenic	XRF	43.89	29	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Arsenic	XRF	42.57	28	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Arsenic	XRF	42.07	28	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Arsenic	XRF	41.3	28	
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Arsenic	XRF	40.83	27	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Arsenic	XRF	39.85	27	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Arsenic	XRF	38.54	26	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Arsenic	XRF	38.42	26	U
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Arsenic	XRF	38.14	25	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Arsenic	XRF	37.39	25	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Arsenic	XRF	37.37	25	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Arsenic	XRF	36.69	25	
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Arsenic	XRF	36.68	25	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Arsenic	XRF	36.63	24	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Arsenic	XRF	36.56	24	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Arsenic	XRF	36.3	24	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Arsenic	XRF	35.7	24	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Arsenic	XRF	35.56	24	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Arsenic	XRF	34.31	23	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Arsenic	XRF	34.16	23	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Arsenic	XRF	34.11	23	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Arsenic	XRF	31.8	21	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Arsenic	XRF	31.76	21	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Arsenic	XRF	31.53	21	U
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Arsenic	XRF	31.41	21	
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Arsenic	XRF	30.78	21	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Arsenic	XRF	30.49	20	
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Arsenic	XRF	29.64	20	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Arsenic	XRF	29.33	20	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Arsenic	Lab		19	
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Arsenic	XRF	27.99	19	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Arsenic	XRF	25.89	17	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Arsenic	XRF	25.65	17	
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Arsenic	XRF	25.53	17	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Arsenic	Lab		17	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Arsenic	XRF	25.31	17	
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Arsenic	XRF	23.86	16	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Arsenic	XRF	22.82	15	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Arsenic	XRF	22.1	15	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Arsenic	XRF	21.91	15	
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Arsenic	XRF	21.46	14	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Arsenic	XRF	19.78	13	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Arsenic	XRF	19.64	13	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Arsenic	XRF	19.43	13	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Arsenic	XRF	17.91	12	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Arsenic	XRF	16.46	11	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Arsenic	XRF	14.51	10	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Arsenic	XRF	14.02	9	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Arsenic	XRF	10.03	7	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Arsenic	XRF	9.8	7	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Cadmium	Lab		120.0	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Cadmium	Lab		56.0	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Cadmium	Lab		35.6	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Cadmium	Lab		34.5	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Cadmium	Lab		26.9	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Cadmium	Lab		11.0	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Cadmium	Lab		3.0	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Cadmium	Lab		2.9	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Cadmium	Lab		1.9	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Cadmium	Lab		1.3	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Cadmium	Lab		1.0	U
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Copper	XRF	7862.53	5809	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Copper	XRF	4421.47	3267	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Copper	XRF	3169.88	2342	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Copper	XRF	3169.41	2342	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Copper	Lab		2170	
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Copper	XRF	2551.65	1885	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Copper	XRF	2460.81	1818	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Copper	XRF	2230.87	1648	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Copper	Lab		1600	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Copper	XRF	1775.33	1312	
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Copper	XRF	1688.05	1247	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Copper	XRF	1600.8	1183	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Copper	XRF	1575.37	1164	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Copper	XRF	1525	1127	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Copper	Lab		860	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Copper	XRF	1131.98	836	U
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Copper	Lab		786	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Copper	XRF	1054.47	779	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Copper	XRF	1041.59	770	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Copper	XRF	972.98	719	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Copper	XRF	922.78	682	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Copper	XRF	908.04	671	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Copper	XRF	860.57	636	
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Copper	XRF	844.66	624	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Copper	XRF	844.07	624	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Copper	XRF	832.56	615	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Copper	XRF	828.12	612	
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Copper	XRF	777.64	575	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Copper	XRF	767.09	567	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Copper	XRF	756.62	559	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Copper	XRF	735	543	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Copper	XRF	697.67	515	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Copper	Lab		505	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Copper	XRF	667.54	493	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Copper	XRF	637.48	471	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Copper	XRF	628.79	465	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Copper	XRF	565.19	418	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Copper	XRF	530.01	392	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Copper	XRF	504.39	373	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Copper	XRF	496.8	367	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Copper	XRF	486.95	360	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Copper	Lab		344	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Copper	XRF	454.85	336	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Copper	XRF	453.67	335	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Copper	XRF	439.94	325	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Copper	XRF	436.25	322	
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Copper	XRF	424.61	314	
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Copper	XRF	416.85	308	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Copper	XRF	415.36	307	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Copper	XRF	414.56	306	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Copper	XRF	397.55	294	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Copper	XRF	396.85	293	
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Copper	XRF	369.81	273	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Copper	XRF	369.45	273	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Copper	XRF	346.3	256	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Copper	XRF	343.02	253	
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Copper	XRF	342.2	253	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Copper	XRF	311.13	230	
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Copper	XRF	309.88	229	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Copper	XRF	253.28	187	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Copper	XRF	248.39	184	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Copper	XRF	245.44	181	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Copper	Lab		179	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Copper	XRF	239.37	177	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Copper	XRF	236.89	175	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Copper	XRF	233.04	172	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Copper	Lab		169	
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Copper	XRF	228.41	169	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Copper	XRF	221.43	164	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Copper	XRF	216.13	160	
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Copper	XRF	209.34	155	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Copper	XRF	184.64	136	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Copper	XRF	183.4	135	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Copper	XRF	181.22	134	
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Copper	XRF	179.72	133	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Copper	XRF	176.89	131	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Copper	XRF	172.59	128	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Copper	XRF	170.29	126	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Copper	XRF	164.76	122	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Copper	XRF	164.38	121	
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Copper	XRF	163.72	121	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Copper	XRF	158.98	117	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Copper	Lab		114	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Copper	XRF	150.69	111	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Copper	XRF	143.26	106	
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Copper	XRF	136.98	101	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Copper	XRF	134.56	99	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Copper	XRF	131.76	97	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Copper	XRF	129.64	96	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Copper	XRF	129.61	96	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Copper	XRF	126.38	93	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Copper	Lab		89	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Copper	XRF	115.57	85	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Copper	XRF	104.64	77	
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Copper	XRF	100.43	74	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Copper	XRF	98.88	73	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Copper	XRF	95.22	70	
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Copper	XRF	85.53	63	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Copper	XRF	84.71	63	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Copper	XRF	83.29	62	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Copper	XRF	82.1	61	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Copper	XRF	76.48	57	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Copper	XRF	70.83	52	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Copper	XRF	67.52	50	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Copper	XRF	66.27	49	
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Copper	XRF	65.56	48	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Copper	XRF	64.37	48	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Copper	XRF	59.13	44	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Copper	XRF	56.41	42	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Copper	XRF	54.16	40	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Copper	XRF	48.81	36	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Copper	Lab		35	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Copper	XRF	23.07	17	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Copper	XRF	17.17	13	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Iron	XRF	221507.36	142983	
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Iron	XRF	208405.88	134526	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Iron	XRF	193316.94	124786	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Iron	Lab		110000	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Iron	Lab		106000	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Iron	XRF	128915.9	83215	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Iron	XRF	126781.09	81837	
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Iron	XRF	122906.91	79336	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Iron	XRF	121749.88	78590	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Iron	XRF	121521.74	78442	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Iron	Lab		76200	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Iron	XRF	115410.04	74497	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Iron	XRF	114569.76	73955	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Iron	XRF	112419.16	72567	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Iron	XRF	111765.95	72145	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Iron	XRF	111396.05	71906	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Iron	XRF	101968.86	65821	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Iron	XRF	99151.23	64002	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Iron	XRF	98046.66	63289	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Iron	XRF	95951.08	61936	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Iron	XRF	94751.37	61162	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Iron	XRF	94585.43	61055	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Iron	XRF	91878.06	59307	
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Iron	XRF	87929.3	56758	
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Iron	XRF	85991.69	55508	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Iron	Lab		55000	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Iron	XRF	77278.47	49883	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Iron	XRF	77143.88	49796	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Iron	Lab		48400	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Iron	XRF	74377.2	48010	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Iron	XRF	73944.15	47731	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Iron	Lab		46900	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Iron	XRF	70637.19	45596	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Iron	XRF	68868.66	44455	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Iron	XRF	67906.14	43833	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Iron	XRF	66794.52	43116	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Iron	XRF	65262.92	42127	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Iron	XRF	64817.46	41840	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Iron	XRF	64525.66	41651	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Iron	XRF	64326.09	41522	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Iron	XRF	61967.71	40000	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Iron	XRF	60531.92	39073	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Iron	XRF	60088.16	38787	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Iron	XRF	58035.23	37462	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Iron	XRF	55968.61	36128	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Iron	XRF	55291.9	35691	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Iron	XRF	54646.81	35275	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Iron	XRF	54440.18	35141	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Iron	XRF	53844.28	34756	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Iron	XRF	53447.26	34500	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Iron	XRF	53171.99	34323	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Iron	XRF	52479.43	33875	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Iron	XRF	52366.59	33803	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Iron	XRF	52153.68	33665	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Iron	XRF	51723	33387	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Iron	XRF	51528.94	33262	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Iron	XRF	51457.82	33216	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Iron	XRF	51256.39	33086	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Iron	XRF	50808.98	32797	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Iron	XRF	50465.15	32575	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Iron	XRF	49897.73	32209	
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Iron	XRF	49797.68	32144	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Iron	XRF	49472.49	31934	
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Iron	XRF	49347.8	31854	
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Iron	XRF	49262.42	31799	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Iron	XRF	48988.83	31622	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Iron	XRF	48720.05	31449	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Iron	XRF	48323.69	31193	
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Iron	XRF	48311.5	31185	
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Iron	XRF	48147.4	31079	
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Iron	XRF	47856.31	30891	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Iron	XRF	47854.26	30890	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Iron	XRF	47499.9	30661	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Iron	XRF	47225.4	30484	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Iron	XRF	47109.57	30409	
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Iron	XRF	46986.55	30330	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Iron	XRF	46957.52	30311	
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Iron	XRF	46794.63	30206	
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Iron	XRF	46669.61	30125	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Iron	XRF	45984.26	29683	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Iron	XRF	45973.39	29676	
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Iron	XRF	45818.91	29576	
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Iron	XRF	45544.24	29399	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Iron	XRF	45425.32	29322	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Iron	XRF	45086.06	29103	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Iron	XRF	45044.65	29076	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Iron	XRF	45012.66	29056	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Iron	Lab		29000	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Iron	XRF	44918.47	28995	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Iron	XRF	44681.34	28842	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Iron	XRF	43995.8	28399	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Iron	XRF	43717.57	28220	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Iron	Lab		28200	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Iron	Lab		28100	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Iron	XRF	43522.3	28094	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Iron	XRF	43452.66	28049	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Iron	XRF	42625.16	27515	
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Iron	XRF	42566.46	27477	
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Iron	XRF	42341.77	27332	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Iron	XRF	42123.58	27191	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Iron	XRF	41269.47	26639	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Iron	XRF	40778.82	26323	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Iron	XRF	40606.88	26212	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Iron	XRF	40497.36	26141	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Iron	XRF	39709.6	25633	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Iron	XRF	38607.19	24921	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Iron	XRF	37801.64	24401	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Iron	XRF	37482.72	24195	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Iron	XRF	34800.14	22463	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Iron	XRF	33193.05	21426	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Iron	XRF	32768.81	21152	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Iron	Lab		19800	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Iron	Lab		19200	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Iron	XRF	8773.46	5663	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Lead	XRF	24528.78	24892	
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Lead	XRF	17658.18	17920	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Lead	XRF	16293.55	16535	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Lead	XRF	15653.21	15885	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Lead	XRF	11095.57	11260	
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Lead	XRF	8768.13	8898	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Lead	XRF	8028.57	8147	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Lead	XRF	6771.16	6871	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Lead	Lab		6750	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Lead	XRF	6522.97	6620	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Lead	XRF	5581.72	5664	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Lead	Lab		5520	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Lead	Lab		5330	
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Lead	XRF	4801.81	4873	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Lead	XRF	4758.79	4829	
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Lead	XRF	4742.95	4813	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Lead	XRF	4222.54	4285	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Lead	XRF	3980.04	4039	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Lead	XRF	3884.19	3942	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Lead	XRF	3701.66	3756	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Lead	XRF	3699.42	3754	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Lead	XRF	3654.38	3708	
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Lead	XRF	3507.77	3560	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Lead	XRF	3432.55	3483	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Lead	XRF	3384.63	3435	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Lead	XRF	3274.88	3323	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Lead	XRF	3189.59	3237	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Lead	XRF	3167.34	3214	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Lead	XRF	2985.61	3030	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Lead	Lab		2940	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Lead	XRF	2797.45	2839	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Lead	XRF	2703.85	2744	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Lead	XRF	2623.54	2662	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Lead	XRF	2573.18	2611	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Lead	XRF	2435.87	2472	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Lead	Lab		2220	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Lead	XRF	2149.4	2181	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Lead	Lab		2030	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Lead	XRF	1961.81	1991	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Lead	XRF	1770.33	1797	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Lead	XRF	1699.43	1725	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Lead	XRF	1618.46	1642	
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Lead	XRF	1616.74	1641	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Lead	XRF	1596.33	1620	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Lead	XRF	1182.69	1200	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Lead	XRF	1114.79	1131	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Lead	XRF	1018.97	1034	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Lead	XRF	926.17	940	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Lead	XRF	811.62	824	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Lead	XRF	793.09	805	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Lead	XRF	789.9	802	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Lead	XRF	773.19	785	
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Lead	XRF	734.11	745	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Lead	XRF	721.44	732	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Lead	XRF	612.88	622	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Lead	XRF	609.79	619	
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Lead	XRF	604.67	614	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Lead	XRF	531.07	539	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Lead	XRF	512.51	520	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Lead	XRF	499.57	507	U
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Lead	XRF	447.84	454	
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Lead	XRF	433.03	439	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Lead	XRF	374.58	380	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Lead	XRF	367.48	373	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Lead	XRF	365.04	370	
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Lead	XRF	356.72	362	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Lead	XRF	348.74	354	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Lead	XRF	343.81	349	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Lead	XRF	330.25	335	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Lead	XRF	329.84	335	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Lead	XRF	329.63	335	
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Lead	XRF	311.14	316	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Lead	XRF	310.95	316	
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Lead	XRF	282.95	287	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Lead	Lab		287	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Lead	XRF	281.3	285	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Lead	XRF	277.9	282	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Lead	XRF	260.98	265	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Lead	XRF	255.54	259	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Lead	XRF	254.6	258	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Lead	XRF	240.48	244	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Lead	XRF	235.22	239	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Lead	XRF	227.88	231	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Lead	XRF	225.54	229	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Lead	XRF	224.09	227	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Lead	XRF	212.67	216	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Lead	Lab		205	
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Lead	XRF	191	194	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Lead	XRF	185.31	188	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Lead	Lab		184	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Lead	Lab		182	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Lead	XRF	165	167	
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Lead	XRF	164.58	167	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Lead	XRF	162.35	165	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Lead	XRF	151.9	154	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Lead	XRF	144.45	147	
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Lead	XRF	134.67	137	
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Lead	XRF	131.77	134	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Lead	XRF	127.5	129	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Lead	XRF	101.05	103	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Lead	XRF	96.87	98	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Lead	XRF	93.83	95	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Lead	XRF	92.52	94	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Lead	XRF	92.1	93	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Lead	XRF	86.08	87	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Lead	XRF	69.15	70	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Lead	XRF	68.46	69	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Lead	XRF	64.13	65	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Lead	Lab		63	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Lead	XRF	58.28	59	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Lead	XRF	48.92	50	
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Lead	XRF	42.18	43	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Lead	XRF	39.98	41	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Lead	XRF	28.58	29	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Manganese	XRF	32291.9	14715	
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Manganese	XRF	29143.14	13281	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Manganese	XRF	27256.8	12421	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Manganese	XRF	22671.66	10331	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Manganese	Lab		9980	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Manganese	XRF	20756.81	9459	
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Manganese	XRF	17687.26	8060	
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Manganese	XRF	16064	7320	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Manganese	XRF	12856.05	5859	
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Manganese	XRF	12461.71	5679	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Manganese	XRF	12446.39	5672	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Manganese	XRF	12327.08	5617	
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Manganese	XRF	12237.44	5577	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Manganese	XRF	12233.38	5575	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Manganese	XRF	12202.84	5561	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Manganese	XRF	10099.27	4602	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Manganese	Lab		4570	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Manganese	XRF	9929.08	4525	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Manganese	XRF	9825.11	4477	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Manganese	XRF	9671.93	4407	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Manganese	XRF	9641.53	4394	
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Manganese	XRF	9389.89	4279	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Manganese	XRF	8867.99	4041	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Manganese	XRF	7538.73	3435	
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Manganese	XRF	7480.7	3409	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Manganese	XRF	7339.15	3344	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Manganese	Lab		3260	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Manganese	XRF	6591.07	3004	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Manganese	XRF	6306.9	2874	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Manganese	XRF	6289.98	2866	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Manganese	XRF	6232.16	2840	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Manganese	XRF	6223.1	2836	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Manganese	XRF	6146.46	2801	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Manganese	XRF	6124.68	2791	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Manganese	XRF	5871.06	2675	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Manganese	XRF	5828.59	2656	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Manganese	XRF	5634.11	2567	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Manganese	Lab		2560	
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Manganese	XRF	5594.47	2549	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Manganese	Lab		2540	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Manganese	XRF	5518.79	2515	
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Manganese	XRF	5338.59	2433	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Manganese	XRF	5237.54	2387	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Manganese	XRF	5181.52	2361	
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Manganese	XRF	4251.73	1938	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Manganese	XRF	4188.75	1909	
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Manganese	XRF	4116.65	1876	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Manganese	Lab		1850	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Manganese	XRF	3955.85	1803	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Manganese	XRF	3878.69	1768	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Manganese	XRF	3836.63	1748	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Manganese	XRF	3695.63	1684	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Manganese	XRF	3693.55	1683	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Manganese	XRF	3555.99	1620	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Manganese	XRF	3508.25	1599	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Manganese	Lab		1590	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Manganese	XRF	3464.06	1579	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Manganese	XRF	3406.93	1553	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Manganese	XRF	3406.75	1552	U
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Manganese	XRF	3391.33	1545	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Manganese	XRF	3377.41	1539	
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Manganese	XRF	3360.73	1531	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Manganese	XRF	3354.9	1529	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Manganese	XRF	3079.36	1403	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Manganese	XRF	3044.49	1387	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Manganese	XRF	2868.39	1307	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Manganese	Lab		1240	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Manganese	XRF	2683.43	1223	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Manganese	XRF	2650.17	1208	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Manganese	XRF	2585.47	1178	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Manganese	XRF	2565.71	1169	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Manganese	XRF	2447.92	1116	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Manganese	XRF	2332.87	1063	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Manganese	Lab		1060	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Manganese	XRF	2185.71	996	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Manganese	XRF	2175.69	991	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Manganese	XRF	2115.76	964	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Manganese	XRF	2084.62	950	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Manganese	XRF	2026.48	923	
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Manganese	XRF	1893.37	863	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Manganese	XRF	1761.32	803	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Manganese	XRF	1659.49	756	
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Manganese	XRF	1651.29	752	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Manganese	XRF	1566.97	714	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Manganese	Lab		701	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Manganese	XRF	1535.03	700	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Manganese	XRF	1517.58	692	
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Manganese	XRF	1500.63	684	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Manganese	XRF	1428.03	651	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Manganese	XRF	1370.95	625	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Manganese	XRF	1365.24	622	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Manganese	XRF	1359.71	620	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Manganese	XRF	1340.02	611	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Manganese	XRF	1326.61	605	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Manganese	XRF	1287.15	587	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Manganese	XRF	1259.86	574	

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Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Manganese	XRF	1244.04	567	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Manganese	XRF	1218.5	555	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Manganese	XRF	1206.56	550	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Manganese	XRF	1171.74	534	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Manganese	XRF	1046.41	477	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Manganese	XRF	1018.13	464	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Manganese	XRF	908.5	414	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Manganese	Lab		411	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Manganese	XRF	881.43	402	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Manganese	XRF	874.42	398	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Manganese	XRF	842.18	384	
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Manganese	XRF	753.8	344	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Manganese	XRF	734.78	335	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Manganese	XRF	696.4	317	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Manganese	XRF	535.56	244	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Manganese	XRF	402.05	183	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Manganese	XRF	279.63	127	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Manganese	XRF	191.76	87	
11	TP-FP-04(9.0-10.0)	8/16/2012	9	10	Zinc	XRF	10125.37	9544	
11	TP-FP-16(4.2-4.3)	8/31/2012	4.2	4.3	Zinc	XRF	9420.67	8880	
11	TP-FP-08(4.0-4.5)	8/23/2012	4	4.5	Zinc	XRF	8426.13	7942	
11	TP-FP-26(9.0-9.5)	9/18/2012	9	9.5	Zinc	XRF	8151.57	7684	
11	TP-FP-08(3.0-3.8)	8/23/2012	3	3.8	Zinc	XRF	7340.46	6919	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	2.9	Zinc	Lab		6870	
11	TP-FP-16(4.8-5.0)	9/7/2012	4.8	5	Zinc	XRF	7160.14	6749	
11	TP-FP-18(2.0-2.3)	9/10/2012	2	2.3	Zinc	XRF	7023.79	6621	
11	TP-FP-21A(2.8-3.0)	9/13/2012	2.8	3	Zinc	XRF	6891.95	6496	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	4.5	Zinc	Lab		6190	
11	TP-FP-06(4.5-5.5)	8/16/2012	4.5	5.5	Zinc	XRF	6023.27	5678	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Zinc	Lab		5630	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3.3	Zinc	Lab		5610	
11	TP-FP-07(7.0-8.0)	8/17/2012	7	8	Zinc	XRF	5921.56	5582	
11	TP-FP-17(3.0-3.2)	9/10/2012	3	3.2	Zinc	XRF	5763.06	5432	
11	TP-FP-04(5.5-6.5)	8/16/2012	5.5	6.5	Zinc	XRF	5044.54	4755	
11	TP-FP-26(6.0-6.5)	9/18/2012	6	6.5	Zinc	XRF	4992.99	4706	
11	TP-FP-20(2.1-2.4)	9/13/2012	2.1	2.4	Zinc	XRF	4973.06	4688	
11	TP-FP-19(4.9-5.0)	9/11/2012	4.9	5	Zinc	XRF	4908.1	4626	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Zinc	Lab		4500	
11	TP-FP-08b(2.4-2.9)	8/17/2012	2.4	2.9	Zinc	XRF	4508.17	4249	
11	TP-FP-18A(4.0-4.5)	9/10/2012	4	4.5	Zinc	XRF	4271.23	4026	
11	TP-FP-04(3.0-4.0)	8/16/2012	3	4	Zinc	XRF	4267.05	4022	
11	TP-FP-16(5.5-6.3)	9/7/2012	5.5	6.3	Zinc	XRF	4187.52	3947	
11	TP-FP-14(4.0-4.6)	8/31/2012	4	4.6	Zinc	XRF	3882.68	3660	
11	TP-FP-13(3.1-3.4)	8/29/2012	3.1	3.4	Zinc	XRF	3473.81	3274	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-18(4.0-4.5)	9/10/2012	4	4.5	Zinc	XRF	3314.18	3124	
11	TP-FP-12(3.0-3.5)	8/29/2012	3	3.5	Zinc	XRF	3214.11	3030	
11	TP-FP-17(4.6-5.0)	9/10/2012	4.6	5	Zinc	XRF	3169.09	2987	
11	TP-FP-15A(2.7-3.0)	8/31/2012	2.7	3	Zinc	XRF	3132.09	2952	
11	TP-FP-08(6.0-6.5)	8/23/2012	6	6.5	Zinc	XRF	3047.03	2872	
11	TP-FP-12(3.0-3.3)	8/29/2012	3	3.3	Zinc	XRF	3009.15	2836	
11	TP-FP-21A(3.4-3.7)	9/13/2012	3.4	3.7	Zinc	XRF	2986.91	2815	
11	TP-FP-18A(9.0-9.5)	9/10/2012	9	9.5	Zinc	XRF	2963.65	2794	
11	TP-FP-25(6.0-6.2)	9/18/2012	6	6.2	Zinc	XRF	2848.63	2685	
11	TP-FP-04(7.0-8.0)	8/16/2012	7	8	Zinc	XRF	2836.35	2674	
11	TP-FP-03(7.6-8.6)	8/13/2012	7.6	8.6	Zinc	XRF	2824.11	2662	
11	TP-FP-13(3.5-3.7)	8/29/2012	3.5	3.7	Zinc	XRF	2804.89	2644	
11	TP-FP-19(5.0-5.5)	9/11/2012	5	5.5	Zinc	XRF	2685.03	2531	
11	TP-FP-06(8.5-9.0)	8/16/2012	8.5	9	Zinc	XRF	2584.12	2436	
11	TP-FP-12(2.0-2.3)	8/29/2012	2	2.3	Zinc	XRF	2500.85	2357	
11	TP-FP-12(6.0-6.5)	8/29/2012	6	6.5	Zinc	XRF	2416.38	2278	
11	TP-FP-14(3.2-3.5)	8/29/2012	3.2	3.5	Zinc	XRF	2352.98	2218	
11	TP-FP-17(5.0-6.0)	9/10/2012	5	6	Zinc	XRF	2337.42	2203	
11	TP-FP-03(9.0-9.5)	8/13/2012	9	9.5	Zinc	XRF	2289.9	2158	
11	TP-FP-05(3.8-4.8)	8/16/2012	3.8	4.8	Zinc	XRF	2220	2093	
11	TP-FP-21(3.0-3.2)	9/13/2012	3	3.2	Zinc	XRF	2205.13	2079	
11	TP-FP-11(3.7-4.0)	8/23/2012	3.7	4	Zinc	XRF	2176.88	2052	
11	TP-FP-20(9.5-10.0)	9/13/2012	9.5	10	Zinc	XRF	2054.26	1936	
11	TP-FP-17(6.3-6.5)	9/10/2012	6.3	6.5	Zinc	XRF	2048.71	1931	
11	TP-FP-09(2.7-3.0)	8/23/2012	2.7	3	Zinc	XRF	2032.33	1916	
11	TP-FP-08(4.5-6.0)	8/23/2012	4.5	6	Zinc	XRF	2022.7	1907	
11	TP-FP-21A(4.7-4.8)	9/13/2012	4.7	4.8	Zinc	XRF	2009.05	1894	
11	TP-FP-07(5.0-5.5)	8/17/2012	5	5.5	Zinc	XRF	2005.36	1890	
11	TP-FP-17(2.6-3.0)	9/7/2012	2.6	3	Zinc	XRF	1956.95	1845	
11	TP-FP-20(3.1-3.6)	9/13/2012	3.1	3.6	Zinc	XRF	1844.85	1739	
11	TP-FP-19(3.9-4.6)	9/11/2012	3.9	4.6	Zinc	XRF	1834.03	1729	
11	TP-FP-21(6.5-7.0)	9/13/2012	6.5	7	Zinc	XRF	1754.78	1654	
11	TP-FP-10(5.5-6.0)	8/23/2012	5.5	6	Zinc	XRF	1733.08	1634	
11	TP-FP-27(3.8-4.2)	9/18/2012	3.8	4.2	Zinc	XRF	1713.21	1615	
11	TP-FP-05(7.5-8.0)	8/16/2012	7.5	8	Zinc	XRF	1580.14	1489	
11	TP-FP-16(9.0-9.4)	9/7/2012	9	9.4	Zinc	XRF	1562.04	1472	
11	TP-FP-17(9.0-9.5)	9/10/2012	9	9.5	Zinc	XRF	1530.96	1443	
11	TP-FP-14(6.0-6.5)	8/31/2012	6	6.5	Zinc	XRF	1523.02	1436	
11	TP-FP-20(6.0-6.5)	9/13/2012	6	6.5	Zinc	XRF	1496.1	1410	
11	TP-FP-16(6.2-7.4)	9/7/2012	6.2	7.4	Zinc	XRF	1495.09	1409	
11	TP-FP-13(4.0-4.3)	8/29/2012	4	4.3	Zinc	XRF	1477.29	1392	
11	TP-FP-10A(3.5-4.0)	8/23/2012	3.5	4	Zinc	XRF	1461.57	1378	
11	TP-FP-08(8.0-8.6)	8/23/2012	8	8.6	Zinc	XRF	1435.64	1353	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	8.5	Zinc	Lab		1340	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
11	TP-FP-12(8.0-8.5)	8/29/2012	8	8.5	Zinc	XRF	1358.31	1280	
11	TP-FP-05(8.5-9.5)	8/16/2012	8.5	9.5	Zinc	XRF	1339.52	1263	
11	TP-FP-10(8.0-8.5)	8/23/2012	8	8.5	Zinc	XRF	1324.16	1248	
11	TP-FP-27(2.0-2.4)	9/18/2012	2	2.4	Zinc	XRF	1198.22	1129	
11	TP-FP-10(4.0-4.5)	8/23/2012	4	4.5	Zinc	XRF	1185.39	1117	
11	TP-FP-25(7.5-8.0)	9/18/2012	7.5	8	Zinc	XRF	1173.22	1106	
11	TP-FP-11(2.7-3.0)	8/23/2012	2.7	3	Zinc	XRF	1158.32	1092	
11	TP-FP-19(8.0-8.5)	9/11/2012	8	8.5	Zinc	XRF	1146.87	1081	
11	TP-FP-27(9.5-10.0)	9/18/2012	9.5	10	Zinc	XRF	1101.96	1039	
11	TP-FP-09(4.5-5.0)	8/23/2012	4.5	5	Zinc	XRF	1068.37	1007	
11	TP-FP-28(5.5-7.0)	9/19/2012	5.5	7	Zinc	XRF	1047.84	988	
11	TP-FP-03(4.0-4.5)	8/10/2012	4	4.5	Zinc	XRF	1035.79	976	
11	TP-FP-16(3.0-3.4)	8/31/2012	3	3.4	Zinc	XRF	1020.08	962	
11	TP-FP-09(7.5-8.0)	8/23/2012	7.5	8	Zinc	XRF	936.57	883	
11	TP-FP-15A(6.0-6.5)	8/31/2012	6	6.5	Zinc	XRF	928.07	875	
11	TP-FP-25(10.0-10.0)	9/18/2012	10	10	Zinc	XRF	898.09	847	
11	TP-FP-15A(5.0-5.2)	8/31/2012	5	5.2	Zinc	XRF	688.14	649	
11	TP-FP-12(9.5-10.0)	8/29/2012	9.5	10	Zinc	XRF	678.58	640	
11	TP-FP-15A(3.1-3.6)	8/31/2012	3.1	3.6	Zinc	XRF	672.43	634	U
11	TP-FP-25(4.3-4.5)	9/18/2012	4.3	4.5	Zinc	XRF	669.91	631	
11	TP-FP-15(6.5-7.0)	8/31/2012	6.5	7	Zinc	XRF	618.65	583	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Zinc	Lab		561	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	2.6	Zinc	Lab		504	
11	TP-FP-27(4.0-5.2)	10/8/2012	4	5.2	Zinc	XRF	528.63	498	
11	TP-FP-15A(5.0-5.7)	8/31/2012	5	5.7	Zinc	XRF	517.97	488	
11	TP-FP-10(2.0-2.4)	8/23/2012	2	2.4	Zinc	XRF	511.86	482	
11	TP-FP-27(5.0-5.5)	9/18/2012	5	5.5	Zinc	XRF	482.21	455	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	2.7	Zinc	Lab		403	
11	TP-FP-28(3.0-3.5)	9/19/2012	3	3.5	Zinc	XRF	405.99	383	
11	TP-FP-11(8.5-9.0)	8/23/2012	8.5	9	Zinc	XRF	405.75	382	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Zinc	Lab		357	
11	TP-FP-11(6.5-7.0)	8/23/2012	6.5	7	Zinc	XRF	363.22	342	
11	TP-FP-11A(6.5-7.0)	8/23/2012	6.5	7	Zinc	XRF	322.95	304	
11	TP-FP-22(3.7-3.9)	9/17/2012	3.7	3.9	Zinc	XRF	308.63	291	
11	TP-FP-28(8.0-8.5)	9/19/2012	8	8.5	Zinc	XRF	258.78	244	
11	TP-FP-22(2.0-2.3)	9/17/2012	2	2.3	Zinc	XRF	258.17	243	
11	TP-FP-28(4.6-5.0)	9/19/2012	4.6	5	Zinc	XRF	255.45	241	
11	TP-FP-07(2.5-3.0)	8/17/2012	2.5	3	Zinc	XRF	242.08	228	
11	TP-FP-22(9.0-9.5)	9/17/2012	9	9.5	Zinc	XRF	224.42	212	
11	TP-FP-03(2.5-3.0)	8/10/2012	2.5	3	Zinc	XRF	188.13	177	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	9.5	Zinc	Lab		174	
11	TP-FP-22(5.5-6.0)	9/17/2012	5.5	6	Zinc	XRF	181.82	171	
11	TP-FP-22(7.5-8.0)	9/17/2012	7.5	8	Zinc	XRF	170.7	161	
11	TP-FP-03(6.0-7.0)	8/13/2012	6	7	Zinc	XRF	157.23	148	

TABLE F-2: ANALYTICAL DATA FOR SUBSURFACE SOIL (2 TO 5 FEET BGS) USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) (a)		Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
			Top	Bottom					

Notes:

All concentrations are in units of milligrams per kilogram.

(a) For EU 9 samples, depths listed are from the bottom of the constructed wetland., which is 2 to 4 feet below ground surface. Because of this, these samples are considered subsurface soil samples even though the listed depths are 2 feet or less below ground surface.

(b) XRF results were converted to laboratory-equivalent results using correlations developed for XRF and laboratory results. See Tables F-10, F-11, and F-12 for data used to develop conversion factors, and figures F-1, F-2, and F-3 for correlation plots.

-- Not applicable - no conversions were performed for laboratory data. The final result is the original result.

bgs Below ground surface

EU Exposure Unit

HHRA Human Health Risk Assessment

ID Identification Number

Lab Laboratory analysis

J Estimated concentration

U Nondetected concentration

XRF 10 X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Aluminum	Lab		33600	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		23500	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Aluminum	Lab		23300	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Aluminum	Lab		22700	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Aluminum	Lab		21700	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Aluminum	Lab		21500	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Aluminum	Lab		20900	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Aluminum	Lab		18500	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Aluminum	Lab		18500	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Aluminum	Lab		17600	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Aluminum	Lab		17600	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Aluminum	Lab		17200	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Aluminum	Lab		17200	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Aluminum	Lab		17100	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Aluminum	Lab		17100	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Aluminum	Lab		16800	
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Aluminum	Lab		16700	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Aluminum	Lab		16400	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Aluminum	Lab		16300	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Aluminum	Lab		15700	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		15300	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Aluminum	Lab		14300	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Aluminum	Lab		13200	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Aluminum	Lab		12400	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Aluminum	Lab		12100	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Aluminum	Lab		11800	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Aluminum	Lab		11600	
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Aluminum	Lab		11000	
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Aluminum	Lab		10800	
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		10600	
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Aluminum	Lab		10300	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Aluminum	Lab		9520	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Aluminum	Lab		9340	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Aluminum	Lab		9320	
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		9230	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Aluminum	Lab		8570	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		8400	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		8220	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Aluminum	Lab		8170	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		8080	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Aluminum	Lab		8080	
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		7820	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Aluminum	Lab		7740	
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		7360	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Aluminum	Lab		7320	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Aluminum	Lab		7300	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		6940	
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Aluminum	Lab		6020	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Aluminum	Lab		5980	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Aluminum	Lab		5880	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Aluminum	Lab		5650	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Aluminum	Lab		5440	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Aluminum	Lab		4340	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		4260	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Aluminum	Lab		3880	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Aluminum	Lab		3800	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Aluminum	Lab		3660	
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Aluminum	Lab		3400	
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Aluminum	Lab		3220	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Aluminum	Lab		2860	
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Aluminum	Lab		2670	
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		1660	
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Aluminum	Lab		1090	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		507	
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		238	J
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Arsenic	Lab		214	
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Arsenic	XRF	298.59	199	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		193	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Arsenic	Lab		193	
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		183	J
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Arsenic	Lab		179	
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Arsenic	Lab		177	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Arsenic	Lab		177	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	261.42	175	
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Arsenic	XRF	257.93	172	
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		165	J
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		164	J
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		162	J
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		157	J
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		156	J
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		150	J
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Arsenic	Lab		149	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Arsenic	XRF	222.08	148	
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Arsenic	XRF	218.57	146	
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		143	J
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		142	J
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		141	J
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		138	J
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		138	J
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Arsenic	XRF	206.5	138	
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Arsenic	XRF	205.63	137	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Arsenic	Lab		132	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Arsenic	XRF	197.03	132	
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Arsenic	XRF	194.76	130	
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Arsenic	XRF	187.54	125	
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Arsenic	XRF	185	124	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Arsenic	XRF	179.87	120	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Arsenic	Lab		119	
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Arsenic	XRF	176.91	118	
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Arsenic	Lab		117	J
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Arsenic	Lab		116	J
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		116	J
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Arsenic	XRF	172.87	115	
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Arsenic	XRF	171.92	115	
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Arsenic	XRF	171.68	115	
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Arsenic	XRF	171.3	114	
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Arsenic	XRF	170.65	114	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	165.51	111	
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Arsenic	XRF	164.54	110	
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Arsenic	XRF	164.35	110	
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Arsenic	XRF	164.34	110	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Arsenic	XRF	161.35	108	
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Arsenic	XRF	160.34	107	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		107	J
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Arsenic	XRF	159.31	106	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Arsenic	XRF	159.06	106	
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Arsenic	Lab		103	J
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Arsenic	XRF	152.91	102	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	152.12	102	
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Arsenic	XRF	151.62	101	
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Arsenic	XRF	150.61	101	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		100	J
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Arsenic	XRF	149.63	100	
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Arsenic	XRF	148.77	99	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Arsenic	XRF	148.7	99	
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Arsenic	XRF	147.94	99	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Arsenic	XRF	147.16	98	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Arsenic	XRF	147.03	98	
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Arsenic	XRF	146.91	98	
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Arsenic	Lab		97	J
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Arsenic	XRF	144.56	97	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Arsenic	XRF	143.24	96	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Arsenic	XRF	140.96	94	
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Arsenic	XRF	139.84	93	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Arsenic	Lab		93	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Arsenic	XRF	138.81	93	
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Arsenic	XRF	137.97	92	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	136.84	91	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Arsenic	Lab		91	J
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Arsenic	XRF	135.08	90	
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Arsenic	XRF	134.66	90	
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Arsenic	XRF	132.01	88	
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		87	J
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	129.8	87	
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Arsenic	XRF	128.48	86	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Arsenic	XRF	125.88	84	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Arsenic	XRF	123.66	83	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Arsenic	XRF	122.14	82	
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Arsenic	XRF	121.28	81	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Arsenic	XRF	120.22	80	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Arsenic	XRF	119.21	80	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Arsenic	XRF	118.57	79	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	117.92	79	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Arsenic	XRF	117.9	79	
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Arsenic	XRF	117.56	79	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Arsenic	XRF	116	77	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Arsenic	XRF	115.28	77	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Arsenic	XRF	114.8	77	
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Arsenic	XRF	114.63	77	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	114.35	76	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Arsenic	Lab		76	
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		74	J
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Arsenic	Lab		73	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Arsenic	XRF	103.95	69	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	103.61	69	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Arsenic	Lab		69	
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Arsenic	XRF	102.96	69	
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Arsenic	XRF	102.52	68	
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		68	J
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	100.83	67	
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Arsenic	XRF	99.21	66	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Arsenic	Lab		66	
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		66	J
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Arsenic	XRF	96.59	65	
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Arsenic	Lab		63	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Arsenic	XRF	93.53	62	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Arsenic	Lab		60	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Arsenic	XRF	89.67	60	
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	89.39	60	
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		59	J
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Arsenic	XRF	84.2	56	
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	81.9	55	
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Arsenic	XRF	81.29	54	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		54	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Arsenic	XRF	78.93	53	
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Arsenic	XRF	78.03	52	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Arsenic	XRF	76.22	51	
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Arsenic	XRF	75.53	50	
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		49	J
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Arsenic	XRF	71.1	48	
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		47	J
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Arsenic	XRF	68.91	46	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	68.67	46	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Arsenic	XRF	67.76	45	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Arsenic	XRF	65.28	44	U
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Arsenic	XRF	64.84	43	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Arsenic	XRF	62.23	42	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Arsenic	XRF	61.97	41	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	61.46	41	
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Arsenic	XRF	60.58	40	
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	58.08	39	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Arsenic	Lab		38	
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		38	J
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Arsenic	XRF	57	38	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		38	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Arsenic	XRF	55.36	37	
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Arsenic	XRF	54.57	36	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		36	
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Arsenic	XRF	52.41	35	
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		33	J
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Arsenic	XRF	49.73	33	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Arsenic	Lab		33	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Arsenic	XRF	48.44	32	
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	46.05	31	
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		31	J
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		30	
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Arsenic	XRF	44.88	30	
12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Arsenic	XRF	44.25	30	
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Arsenic	XRF	43.99	29	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Arsenic	Lab		29	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Arsenic	XRF	41.49	28	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Arsenic	XRF	39.69	27	
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Arsenic	XRF	39.59	26	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Arsenic	XRF	38.35	26	
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Arsenic	XRF	37.49	25	
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		25	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Arsenic	XRF	35.66	24	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Arsenic	Lab		23	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		23	J
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	33.41	22	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	32.88	22	
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Arsenic	XRF	31.95	21	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Arsenic	XRF	31.46	21	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Arsenic	Lab		21	
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		21	J
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Arsenic	Lab		20	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Arsenic	Lab		20	
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Arsenic	XRF	29.41	20	
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		20	J
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Arsenic	XRF	29.07	19	
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Arsenic	XRF	28.95	19	
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Arsenic	XRF	28.92	19	
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Arsenic	XRF	28.64	19	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Arsenic	Lab		19	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Arsenic	Lab		19	
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Arsenic	Lab		19	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Arsenic	XRF	28.2	19	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	27.85	19	
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Arsenic	XRF	27.41	18	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	27.15	18	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Arsenic	Lab		18	
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		18	J
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Arsenic	XRF	26.5	18	
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		18	J
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Arsenic	XRF	26.39	18	
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		18	J
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Arsenic	Lab		17	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Arsenic	XRF	25.84	17	
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Arsenic	XRF	25.62	17	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Arsenic	XRF	25.23	17	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Arsenic	Lab		17	
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		17	J
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Arsenic	XRF	24.62	16	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Arsenic	XRF	24.26	16	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Arsenic	Lab		16	
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Arsenic	XRF	24.23	16	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Arsenic	XRF	24.21	16	U
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Arsenic	XRF	23.48	16	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Arsenic	Lab		16	
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Arsenic	XRF	23.34	16	
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Arsenic	XRF	22.96	15	
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		15	J
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		15	J
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Arsenic	XRF	22.57	15	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Arsenic	XRF	22.53	15	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Arsenic	Lab		15	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Arsenic	Lab		15	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Arsenic	Lab		15	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Arsenic	Lab		15	
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Arsenic	XRF	22.05	15	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		15	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		15	J
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Arsenic	XRF	21.97	15	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Arsenic	XRF	21.96	15	
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		15	J
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Arsenic	XRF	21.68	14	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Arsenic	XRF	21.23	14	
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Arsenic	XRF	21.12	14	
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Arsenic	XRF	20.76	14	
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Arsenic	XRF	20.75	14	
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Arsenic	XRF	20.56	14	
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Arsenic	XRF	20.51	14	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Arsenic	XRF	19.78	13	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Arsenic	XRF	19.67	13	
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		13	J
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Arsenic	XRF	19.28	13	
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Arsenic	XRF	19.09	13	
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Arsenic	XRF	18.92	13	
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		13	J
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Arsenic	Lab		13	
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		12	J
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Arsenic	XRF	18.51	12	
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Arsenic	Lab		12	J
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Arsenic	XRF	18.38	12	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Arsenic	Lab		12	
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Arsenic	Lab		12	J
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Arsenic	XRF	18.18	12	
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Arsenic	XRF	18.05	12	
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		12	
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Arsenic	XRF	17.69	12	
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		12	J
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Arsenic	Lab		12	
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Arsenic	Lab		12	J
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Arsenic	XRF	17.06	11	
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Arsenic	XRF	17	11	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Arsenic	XRF	16.98	11	
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Arsenic	Lab		11	J
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Arsenic	XRF	16.8	11	
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Arsenic	XRF	16.6	11	
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Arsenic	XRF	16.5	11	
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Arsenic	Lab		11	J
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Arsenic	XRF	16.45	11	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		11	
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Arsenic	XRF	16.08	11	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Arsenic	XRF	16.05	11	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Arsenic	XRF	15.98	11	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Arsenic	XRF	15.79	11	
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		11	J
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Arsenic	XRF	15.62	10	
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Arsenic	XRF	15.48	10	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	15.47	10	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Arsenic	Lab		10	
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Arsenic	XRF	15.2	10	
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Arsenic	XRF	15.15	10	
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		10	J
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Arsenic	XRF	14.88	10	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Arsenic	XRF	14.88	10	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Arsenic	Lab		10	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Arsenic	Lab		10	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Arsenic	XRF	14.8	10	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Arsenic	Lab		10	
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Arsenic	XRF	14.69	10	
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Arsenic	XRF	14.55	10	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Arsenic	XRF	14.53	10	
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Arsenic	XRF	14.47	10	
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		10	J
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Arsenic	XRF	14.28	10	
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Arsenic	XRF	14.05	9	
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		9	J
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Arsenic	XRF	13.54	9	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Arsenic	Lab		9	
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Arsenic	XRF	13.34	9	
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		9	J
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Arsenic	Lab		9	J
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Arsenic	Lab		9	J
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Arsenic	XRF	13.08	9	
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Arsenic	XRF	12.88	9	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Arsenic	Lab		9	
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Arsenic	Lab		9	J
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		9	J
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Arsenic	XRF	12.69	8	
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Arsenic	XRF	12.62	8	
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Arsenic	XRF	12.56	8	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Arsenic	XRF	12.53	8	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Arsenic	XRF	12.38	8	
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Arsenic	XRF	12.3	8	
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		8	J
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		8	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Arsenic	XRF	12.06	8	
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		8	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Arsenic	Lab		8	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Arsenic	XRF	11.7	8	
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		8	J
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Arsenic	XRF	11.62	8	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Arsenic	XRF	11.6	8	
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		8	J
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Arsenic	XRF	11.02	7	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Arsenic	Lab		7	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Arsenic	XRF	11	7	
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Arsenic	XRF	10.96	7	
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		7	J
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Arsenic	XRF	10.9	7	
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Arsenic	XRF	10.87	7	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Arsenic	Lab		7	
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Arsenic	Lab		7	J
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Arsenic	XRF	10.62	7	
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Arsenic	Lab		7	
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		7	J
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Arsenic	XRF	10.26	7	
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Arsenic	Lab		7	J
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Arsenic	Lab		7	
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Arsenic	XRF	9.77	7	U
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		6	
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Arsenic	Lab		6	
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Arsenic	XRF	9.6	6	U
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Arsenic	Lab		6	J
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Arsenic	XRF	9.15	6	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Arsenic	Lab		6	
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Arsenic	XRF	8.79	6	
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Arsenic	XRF	8.75	6	
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Arsenic	XRF	8.53	6	
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Arsenic	XRF	8.38	6	
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Arsenic	XRF	8.16	5	
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Arsenic	XRF	7.41	5	
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Arsenic	XRF	5.88	4	
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Arsenic	XRF	5.86	4	
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Arsenic	XRF	5.48	4	
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Arsenic	Lab		4	J
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Arsenic	XRF	5.33	4	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Arsenic	XRF	5.17	3	
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Arsenic	XRF	4.54	3	U
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Arsenic	Lab		3	J
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Arsenic	XRF	3.75	3	U
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Arsenic	XRF	3.04	2	U

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		2	J
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Arsenic	Lab		1	J
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Arsenic	Lab		1	
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		78.0	J
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		34.7	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Cadmium	Lab		33.4	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Cadmium	Lab		28.0	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Cadmium	Lab		27.2	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Cadmium	Lab		24.0	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Cadmium	Lab		23.5	
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Cadmium	Lab		23.1	J
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		20.7	J
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		19.6	J
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		19.2	J
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		18.3	J
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		18.0	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Cadmium	Lab		18.0	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		17.9	J
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Cadmium	Lab		16.9	
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		16.4	J
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		15.8	
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		15.3	J
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		15.0	J
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		14.6	J
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Cadmium	Lab		14.4	J
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Cadmium	Lab		14.3	
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Cadmium	Lab		14.3	J
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		14.3	J
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Cadmium	Lab		13.7	
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		13.6	J
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		13.3	J
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		13.2	J
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		12.8	J
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		12.5	J
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Cadmium	Lab		12.4	J
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Cadmium	Lab		12.2	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Cadmium	Lab		12.0	
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		11.0	J
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		10.7	J
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Cadmium	Lab		10.3	
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Cadmium	Lab		9.7	J
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		9.1	J
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		9.1	J
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		9.1	J
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Cadmium	Lab		8.8	
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		8.8	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Cadmium	Lab		8.6	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Cadmium	Lab		8.2	
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		8.0	J
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Cadmium	Lab		7.7	
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		7.1	J
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		7.1	J
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Cadmium	Lab		6.3	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Cadmium	Lab		6.3	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		6.0	J
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Cadmium	Lab		5.6	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		5.6	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		5.2	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Cadmium	Lab		5.0	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Cadmium	Lab		4.9	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		4.8	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		3.6	
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		3.5	J
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		3.5	J
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Cadmium	Lab		3.4	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Cadmium	Lab		3.4	
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		3.3	J
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		3.1	J
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Cadmium	Lab		3.0	J
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		2.8	J
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		2.7	J
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		2.5	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Cadmium	Lab		2.5	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Cadmium	Lab		2.4	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Cadmium	Lab		2.3	
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		2.2	J
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		2.1	J
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Cadmium	Lab		2.0	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Cadmium	Lab		2.0	
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		1.8	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		1.8	J
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Cadmium	Lab		1.8	J
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Cadmium	Lab		1.8	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Cadmium	Lab		1.7	
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		1.7	J
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Cadmium	Lab		1.6	J
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Cadmium	Lab		1.5	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Cadmium	Lab		1.5	
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		1.4	J
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Cadmium	Lab		1.3	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Cadmium	Lab		1.3	
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Cadmium	Lab		1.3	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Cadmium	Lab		1.2	J
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Cadmium	Lab		1.2	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		1.2	J
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		1.1	J
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Cadmium	Lab		1.1	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Cadmium	Lab		1.1	
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		1.1	J
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		1.0	J
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		1.0	
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Cadmium	Lab		1.0	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Cadmium	Lab		1.0	
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		0.9	J
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		0.9	
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		0.9	J
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Cadmium	Lab		0.9	J
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		0.8	J
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		0.8	J
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Cadmium	Lab		0.8	J
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.8	J
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Cadmium	Lab		0.8	
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Cadmium	Lab		0.7	J
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Cadmium	Lab		0.7	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Cadmium	Lab		0.7	
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.6	J
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		0.6	J
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Cadmium	Lab		0.6	
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Cadmium	Lab		0.6	
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		0.6	J
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		0.5	J
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Cadmium	Lab		0.4	
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Cadmium	Lab		0.4	J
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Cadmium	Lab		0.3	J
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Cadmium	Lab		0.2	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Cadmium	Lab		0.2	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Cadmium	Lab		0.2	U
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Cadmium	Lab		0.2	
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		0.2	
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		0.2	J
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Cadmium	Lab		0.2	
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		0.2	UJ
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.2	UJ
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		0.2	UJ
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Cadmium	Lab		0.2	UJ
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.2	UJ
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Cadmium	Lab		0.2	UJ
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Cadmium	Lab		0.2	U

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Cadmium	Lab		0.2	UJ
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		2760	J
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Copper	XRF	3301.96	2439	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	3219.2	2378	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Copper	XRF	3043.73	2249	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Copper	XRF	2866.43	2118	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Copper	XRF	2818.54	2082	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Copper	XRF	2724.65	2013	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Copper	XRF	2685.19	1984	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Copper	XRF	2671.98	1974	
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Copper	XRF	2581.13	1907	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Copper	XRF	2457.31	1815	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	2383.28	1761	
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Copper	XRF	2353.34	1739	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Copper	XRF	2329.69	1721	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Copper	XRF	2275.44	1681	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Copper	XRF	2236.38	1652	
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	2194.29	1621	
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Copper	XRF	2179.43	1610	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Copper	XRF	2174.29	1606	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Copper	XRF	2147.46	1587	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Copper	XRF	2123.34	1569	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Copper	XRF	2120.51	1567	
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Copper	XRF	2103.16	1554	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	2051.82	1516	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Copper	Lab		1500	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	1996.95	1475	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	1988.86	1469	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Copper	XRF	1969.9	1455	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Copper	XRF	1959.87	1448	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		1420	
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Copper	XRF	1911.84	1412	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Copper	XRF	1818.37	1343	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Copper	XRF	1749.76	1293	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Copper	Lab		1240	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Copper	XRF	1667.14	1232	
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Copper	XRF	1633.92	1207	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Copper	XRF	1608.38	1188	
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Copper	XRF	1519.5	1123	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		1120	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		1120	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Copper	XRF	1496.68	1106	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Copper	XRF	1476.62	1091	
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Copper	Lab		1080	J
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Copper	XRF	1443.81	1067	
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	1410.75	1042	

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Copper	XRF	1337.85	988	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Copper	Lab		971	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		971	J
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	1311.48	969	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Copper	XRF	1282.43	947	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Copper	Lab		918	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Copper	XRF	1241.92	918	
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		894	J
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Copper	XRF	1182.32	873	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Copper	XRF	1176.79	869	
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Copper	XRF	1163.27	859	
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		849	J
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Copper	XRF	1146.91	847	
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Copper	XRF	1138.43	841	
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Copper	XRF	1114.02	823	
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Copper	XRF	1103.27	815	
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Copper	XRF	1093.67	808	
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Copper	XRF	1089.34	805	
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		801	J
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Copper	XRF	1082.16	799	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	1081.94	799	
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Copper	XRF	1077.77	796	
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		788	J
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Copper	XRF	1048.18	774	
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Copper	XRF	1045.74	773	
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Copper	XRF	1033.78	764	
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Copper	XRF	1004.98	742	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Copper	Lab		740	
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Copper	XRF	998.1	737	
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Copper	Lab		730	J
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Copper	Lab		729	J
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Copper	XRF	963.15	712	
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		711	J
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Copper	XRF	961.31	710	
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Copper	XRF	959.77	709	
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Copper	XRF	957.83	708	
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Copper	XRF	954.11	705	
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Copper	XRF	943.49	697	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		690	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Copper	Lab		690	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	906.78	670	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Copper	XRF	904.1	668	
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		651	
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Copper	XRF	869.35	642	
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Copper	XRF	867.5	641	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Copper	XRF	847.78	626	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Copper	XRF	847.3	626	
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Copper	XRF	837.25	619	
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Copper	XRF	828.92	612	
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Copper	XRF	794.66	587	
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		585	J
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		571	J
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Copper	XRF	772.09	570	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Copper	Lab		568	
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Copper	XRF	766.09	566	
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Copper	XRF	756.28	559	
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Copper	XRF	751.99	556	
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Copper	Lab		555	J
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Copper	Lab		553	
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Copper	XRF	728.36	538	
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		528	J
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Copper	XRF	709.17	524	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	707.62	523	
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Copper	Lab		514	J
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Copper	Lab		513	J
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Copper	Lab		512	J
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Copper	Lab		510	J
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Copper	XRF	686.5	507	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Copper	XRF	684.35	506	
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		504	J
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Copper	XRF	675.22	499	
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Copper	XRF	671.68	496	
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Copper	XRF	667.11	493	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Copper	XRF	663.85	490	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Copper	XRF	655.86	485	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Copper	XRF	630.53	466	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Copper	XRF	625.99	462	
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Copper	XRF	624.76	462	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Copper	Lab		458	
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	615.84	455	
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		450	J
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Copper	XRF	605.19	447	
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Copper	XRF	602.2	445	
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		442	J
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		438	J
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Copper	XRF	562.3	415	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Copper	Lab		409	
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Copper	Lab		409	J
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		405	J
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Copper	XRF	544.6	402	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Copper	Lab		402	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Copper	XRF	541.82	400	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Copper	XRF	532.76	394	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Copper	Lab		392	
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Copper	XRF	529.46	391	
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Copper	XRF	525.17	388	
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Copper	XRF	522.35	386	
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Copper	XRF	517.31	382	
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Copper	XRF	516.46	382	
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	515.54	381	
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Copper	XRF	512.62	379	
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Copper	XRF	511.6	378	
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Copper	XRF	511.5	378	
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Copper	Lab		374	J
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Copper	Lab		373	
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Copper	Lab		373	J
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		371	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Copper	XRF	498.93	369	
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	497.29	367	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Copper	Lab		367	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Copper	Lab		364	
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Copper	Lab		364	J
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Copper	XRF	488.71	361	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Copper	XRF	485.96	359	
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Copper	Lab		355	J
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Copper	XRF	479.26	354	
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		354	J
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Copper	XRF	479.1	354	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Copper	XRF	475.32	351	
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Copper	XRF	470.45	348	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Copper	Lab		344	J
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Copper	Lab		343	
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Copper	Lab		343	J
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		342	J
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Copper	XRF	461.25	341	
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Copper	XRF	459.45	339	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Copper	XRF	454.85	336	
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Copper	XRF	452.02	334	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Copper	Lab		327	
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Copper	XRF	435.07	321	
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		318	J
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Copper	XRF	427.42	316	
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		315	J
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Copper	XRF	426.18	315	
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Copper	XRF	422.77	312	
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Copper	XRF	415.64	307	
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Copper	XRF	414.24	306	
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		302	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Copper	XRF	408.58	302	
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Copper	XRF	405.82	300	
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Copper	XRF	402.66	297	
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Copper	XRF	397.5	294	
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Copper	Lab		290	J
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		286	J
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Copper	XRF	384.22	284	
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Copper	XRF	375.11	277	
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Copper	XRF	371.13	274	
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Copper	XRF	370.25	274	
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		273	J
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Copper	XRF	367.3	271	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Copper	XRF	362.5	268	
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Copper	XRF	359.72	266	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Copper	Lab		265	
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Copper	XRF	356.16	263	
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Copper	XRF	354.96	262	
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Copper	Lab		262	J
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Copper	XRF	354.12	262	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Copper	XRF	354.09	262	
12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Copper	XRF	352.4	260	
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Copper	XRF	347.68	257	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Copper	Lab		253	
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Copper	XRF	339.98	251	
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Copper	XRF	338.37	250	
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Copper	XRF	329.76	244	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Copper	XRF	327.16	242	
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		240	J
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Copper	XRF	323.33	239	
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		237	J
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Copper	XRF	317.84	235	
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Copper	Lab		232	J
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Copper	XRF	312.88	231	
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Copper	XRF	311.09	230	
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Copper	XRF	310.56	229	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Copper	Lab		229	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Copper	XRF	300.49	222	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Copper	XRF	299.98	222	
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		221	J
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Copper	XRF	292.89	216	
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Copper	XRF	290.74	215	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Copper	Lab		214	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Copper	Lab		214	J
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Copper	XRF	289.23	214	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Copper	XRF	287.13	212	
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Copper	XRF	286.5	212	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Copper	XRF	286.28	212	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Copper	Lab		208	
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		208	J
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Copper	XRF	281.16	208	
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Copper	XRF	278.37	206	
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Copper	XRF	276.15	204	
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Copper	Lab		204	J
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Copper	XRF	272.58	201	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Copper	Lab		200	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Copper	XRF	270.25	200	
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Copper	XRF	267.9	198	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Copper	XRF	263.97	195	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Copper	Lab		194	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Copper	Lab		191	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Copper	XRF	255.81	189	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Copper	XRF	255.47	189	
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Copper	XRF	254.72	188	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Copper	Lab		188	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Copper	XRF	254.15	188	
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Copper	XRF	254.14	188	
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Copper	XRF	254.12	188	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Copper	Lab		186	
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Copper	XRF	251.05	185	
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Copper	Lab		184	J
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		183	J
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Copper	XRF	246.39	182	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Copper	XRF	244.51	181	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Copper	Lab		180	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Copper	XRF	243.06	180	
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Copper	XRF	241.8	179	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Copper	XRF	240.71	178	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Copper	XRF	238.82	176	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Copper	XRF	237.63	176	
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Copper	XRF	237.59	176	
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	237.58	176	
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Copper	XRF	237.27	175	
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Copper	XRF	232.45	172	
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Copper	XRF	228.33	169	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Copper	Lab		167	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Copper	XRF	221.26	163	
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Copper	XRF	216.15	160	
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Copper	XRF	215.53	159	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Copper	XRF	215.46	159	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Copper	XRF	215.07	159	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Copper	Lab		155	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		154	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Copper	Lab		153	
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Copper	XRF	206.92	153	
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Copper	XRF	205.59	152	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Copper	XRF	201.88	149	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Copper	XRF	200.39	148	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Copper	Lab		148	
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Copper	Lab		147	J
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Copper	Lab		143	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Copper	Lab		143	
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Copper	XRF	192.66	142	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Copper	XRF	190.04	140	
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Copper	XRF	189.04	140	
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		135	J
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Copper	XRF	181.84	134	
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Copper	XRF	180.73	134	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		133	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Copper	XRF	178.14	132	
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Copper	XRF	174.69	129	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Copper	Lab		129	
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Copper	Lab		128	J
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Copper	XRF	170.62	126	
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Copper	XRF	167.33	124	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Copper	XRF	157.35	116	
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Copper	XRF	155.57	115	
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Copper	Lab		114	J
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Copper	XRF	153.71	114	
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Copper	XRF	147.62	109	
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Copper	XRF	146.19	108	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Copper	Lab		108	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Copper	Lab		108	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Copper	XRF	145.58	108	
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		106	J
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Copper	Lab		98	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Copper	Lab		98	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Copper	Lab		97	
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		96	J
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Copper	Lab		93	
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Copper	Lab		91	
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Copper	Lab		91	J
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		90	J
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Copper	XRF	121.94	90	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Copper	Lab		89	
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Copper	Lab		89	J
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		88	J
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Copper	Lab		87	J
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Copper	Lab		87	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Copper	XRF	116.82	86	
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Copper	XRF	115.16	85	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Copper	Lab		84	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Copper	Lab		84	
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Copper	XRF	113.27	84	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		82	J
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Copper	Lab		82	J
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Copper	XRF	110.87	82	
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Copper	Lab		82	J
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		81	J
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		79	
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Copper	Lab		78	
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Copper	Lab		74	J
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Copper	Lab		62	
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Copper	XRF	83.77	62	
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Copper	XRF	83.63	62	
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Copper	Lab		59	J
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		57	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Copper	Lab		53	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Copper	Lab		49	
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Copper	XRF	59.49	44	
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Copper	Lab		33	J
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		18	
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Copper	Lab		16	
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Copper	XRF	12.57	9	
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Copper	Lab		8	J
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		8	J
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Copper	Lab		8	
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Copper	Lab		5	J
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Copper	Lab		5	J
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		3	J
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Copper	Lab		2	
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Copper	Lab		2	J
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		199000	
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	282354.06	182260	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Iron	XRF	169337.95	109308	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Iron	Lab		106000	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Iron	XRF	138459.92	89376	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Iron	Lab		87500	
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	135322.63	87351	
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Iron	XRF	128255.81	82789	
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Iron	XRF	126968.33	81958	
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Iron	XRF	121612.45	78501	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Iron	Lab		78100	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Iron	XRF	119736.76	77290	
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Iron	XRF	118453.61	76462	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Iron	XRF	118041.07	76196	
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Iron	XRF	117171.78	75634	
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Iron	XRF	115617.86	74631	
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Iron	XRF	114400.55	73846	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Iron	XRF	109192.64	70484	
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Iron	XRF	108362.19	69948	
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Iron	XRF	108208.88	69849	
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Iron	XRF	106463.82	68722	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Iron	Lab		68100	
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Iron	XRF	104449.16	67422	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Iron	XRF	104004.99	67135	
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Iron	Lab		66600	
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Iron	XRF	103153.91	66586	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Iron	Lab		65600	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	100815.08	65076	
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Iron	XRF	100454.33	64843	
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Iron	XRF	100268.2	64723	
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Iron	XRF	99978.62	64536	
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Iron	XRF	99798.09	64420	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		64400	
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Iron	XRF	99639.7	64317	
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Iron	XRF	98958.42	63878	
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Iron	XRF	98756.82	63748	
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Iron	XRF	98493.63	63578	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Iron	Lab		63000	
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Iron	XRF	97219.16	62755	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Iron	XRF	96593.78	62351	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Iron	XRF	96586.96	62347	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	96558.61	62329	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Iron	XRF	95990.69	61962	
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Iron	XRF	95718.34	61786	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Iron	XRF	95339.81	61542	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Iron	XRF	93718.92	60496	
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Iron	XRF	92317.6	59591	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Iron	XRF	91966.95	59365	
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Iron	XRF	91794.07	59253	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Iron	XRF	91406.06	59003	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Iron	XRF	91171.14	58851	
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Iron	XRF	91120.67	58818	
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Iron	XRF	91074.22	58788	
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	90951.8	58709	
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Iron	XRF	89909.48	58037	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Iron	XRF	89885.87	58021	
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Iron	XRF	89806.91	57970	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Iron	XRF	89084.95	57504	
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Iron	XRF	88990.6	57443	

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Iron	XRF	88401.58	57063	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	88344.82	57027	
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Iron	XRF	87812.27	56683	
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Iron	XRF	87541.73	56508	
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Iron	XRF	87255.33	56323	
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Iron	XRF	86707.03	55969	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Iron	XRF	86541.13	55862	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Iron	XRF	86099.16	55577	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Iron	XRF	85958.26	55486	
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Iron	XRF	85084.73	54922	
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Iron	XRF	85046.78	54898	
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	84891.68	54798	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	84504.34	54548	
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Iron	XRF	84211.71	54359	
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Iron	XRF	84153.37	54321	
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Iron	XRF	83855.13	54128	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Iron	XRF	83134.97	53664	
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Iron	XRF	82945.54	53541	
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Iron	XRF	80774.55	52140	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Iron	XRF	80561.14	52002	
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Iron	XRF	80386.13	51889	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Iron	XRF	79956.55	51612	
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Iron	XRF	79148.48	51090	
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Iron	XRF	77905.74	50288	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Iron	XRF	77003.58	49706	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Iron	XRF	76556.39	49417	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	76466.19	49359	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	75966.35	49036	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Iron	Lab		48900	
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Iron	XRF	75140.73	48503	
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Iron	XRF	74165.59	47874	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Iron	Lab		47800	
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Iron	XRF	71045.53	45860	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Iron	XRF	70092.57	45245	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Iron	XRF	70058	45222	
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Iron	XRF	69717.84	45003	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Iron	XRF	69077.62	44590	
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Iron	XRF	68875.92	44459	
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Iron	XRF	67971.76	43876	
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	66380.25	42848	
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Iron	XRF	66328.88	42815	
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Iron	XRF	65379.49	42202	
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Iron	XRF	63631.59	41074	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Iron	XRF	63390.77	40919	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Iron	XRF	62932.82	40623	
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Iron	XRF	62884.54	40592	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Iron	XRF	62817.19	40548	
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Iron	XRF	62780.98	40525	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Iron	Lab		40500	
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Iron	XRF	61874.05	39940	
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Iron	XRF	61506.15	39702	
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Iron	XRF	61172.96	39487	
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Iron	XRF	60495.69	39050	
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Iron	XRF	60467.05	39031	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Iron	Lab		39000	
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Iron	XRF	59903.85	38668	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Iron	Lab		38500	
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	59568.69	38452	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Iron	XRF	59159.72	38188	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Iron	XRF	58838.3	37980	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Iron	XRF	58656.47	37863	
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Iron	XRF	58431.2	37717	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Iron	XRF	58309.47	37639	
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Iron	XRF	58134.63	37526	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Iron	Lab		37300	
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Iron	XRF	57757.5	37282	
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Iron	XRF	57353.05	37021	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Iron	XRF	56508.49	36476	
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Iron	XRF	56204.58	36280	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Iron	XRF	55600.3	35890	
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Iron	XRF	54900.5	35438	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Iron	XRF	54758.11	35346	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Iron	XRF	54304.15	35053	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Iron	XRF	54117.14	34933	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Iron	XRF	54041.18	34884	
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Iron	XRF	53531.66	34555	
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	53456.73	34506	
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Iron	XRF	53260.38	34380	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Iron	XRF	52703.07	34020	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Iron	XRF	52515.48	33899	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Iron	XRF	52406.57	33828	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Iron	Lab		33400	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Iron	Lab		33400	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	51702.07	33374	
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Iron	XRF	51413.05	33187	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Iron	Lab		33100	
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Iron	XRF	51236.96	33073	
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Iron	XRF	51021.58	32934	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Iron	Lab		32900	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Iron	XRF	50817.23	32803	
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Iron	XRF	50729.78	32746	
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Iron	XRF	50575.79	32647	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Iron	XRF	50509.76	32604	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Iron	XRF	50041.29	32302	
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		32200	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Iron	XRF	49625.54	32033	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	49590.64	32011	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Iron	XRF	49373.57	31871	
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Iron	XRF	49371.28	31869	
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Iron	XRF	49067.62	31673	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Iron	XRF	48734.57	31458	
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Iron	XRF	48320.14	31191	
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Iron	XRF	47433.76	30618	
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Iron	XRF	46786.36	30201	
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Iron	XRF	46572.83	30063	
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Iron	XRF	46389.22	29944	
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Iron	XRF	46225.54	29839	
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Iron	XRF	46215.41	29832	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Iron	XRF	45938	29653	
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Iron	XRF	45411.47	29313	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Iron	Lab		29200	
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Iron	XRF	45229.43	29196	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Iron	XRF	44996.08	29045	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Iron	XRF	44982.65	29036	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Iron	XRF	44950.11	29015	
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Iron	XRF	44443.96	28689	
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Iron	XRF	44394.68	28657	
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		28300	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Iron	Lab		28300	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Iron	XRF	43841.54	28300	
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Iron	XRF	43492.25	28074	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Iron	XRF	43253.88	27920	
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Iron	XRF	43223.03	27900	
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Iron	XRF	43216.41	27896	
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Iron	XRF	42773.69	27610	
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Iron	XRF	42682.44	27552	
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Iron	XRF	42193.46	27236	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Iron	XRF	42180.32	27227	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Iron	Lab		27200	
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Iron	XRF	41938.55	27071	
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Iron	XRF	41927.16	27064	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Iron	XRF	41730.87	26937	
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Iron	XRF	41537	26812	
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Iron	XRF	41488.06	26781	
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Iron	XRF	41056.08	26502	
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Iron	XRF	40923.35	26416	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Iron	XRF	40794.62	26333	
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Iron	XRF	40522.48	26157	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Iron	XRF	39587.35	25554	
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Iron	XRF	39568.11	25541	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Iron	Lab		25400	
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Iron	XRF	39317.48	25379	
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Iron	XRF	39152.94	25273	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Iron	XRF	38614.11	24925	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Iron	Lab		24800	
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Iron	XRF	37228.16	24031	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Iron	XRF	36974.17	23867	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Iron	XRF	36913.67	23828	
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Iron	XRF	36801.46	23755	
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		23500	
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Iron	XRF	36303.74	23434	
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Iron	XRF	36183.14	23356	
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Iron	Lab		23100	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Iron	Lab		23100	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Iron	XRF	35672.63	23027	
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Iron	XRF	35665.46	23022	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		23000	
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Iron	Lab		22900	
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Iron	XRF	35465.4	22893	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Iron	XRF	35463.92	22892	
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Iron	XRF	35428.87	22869	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Iron	Lab		22800	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Iron	Lab		22700	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Iron	Lab		22600	
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		22600	
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Iron	Lab		22600	
12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Iron	XRF	34820.39	22477	
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Iron	XRF	34790.89	22458	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		22400	
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Iron	XRF	34473.91	22253	
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Iron	XRF	34325.89	22157	
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Iron	XRF	34160.86	22051	
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Iron	XRF	34123.57	22027	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Iron	Lab		21800	
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Iron	XRF	32837.7	21197	
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Iron	XRF	32816.89	21183	
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Iron	XRF	32604.46	21046	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Iron	Lab		21000	
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		20800	
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Iron	XRF	32173.92	20768	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Iron	XRF	32116.21	20731	
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Iron	XRF	32081.18	20708	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Iron	Lab		20700	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		20400	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Iron	XRF	31585.05	20388	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Iron	XRF	31042.68	20038	
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Iron	XRF	30498.44	19687	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Iron	Lab		19600	
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Iron	XRF	30013.74	19374	
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Iron	XRF	29270.33	18894	
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Iron	XRF	29260.85	18888	
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Iron	XRF	28974.06	18703	
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Iron	XRF	28494.76	18393	
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Iron	Lab		17800	
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Iron	XRF	27277.41	17608	
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Iron	XRF	26351.6	17010	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Iron	Lab		16800	
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Iron	XRF	25857.44	16691	
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		16600	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Iron	Lab		16600	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Iron	Lab		16500	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Iron	Lab		16200	
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Iron	XRF	23895.03	15424	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Iron	Lab		15200	
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Iron	Lab		15200	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Iron	Lab		15100	
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Iron	XRF	22930.35	14802	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Iron	Lab		14800	
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Iron	Lab		14800	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Iron	Lab		14200	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Iron	Lab		14100	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Iron	Lab		13200	
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Iron	Lab		13000	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Iron	Lab		12900	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Iron	Lab		12500	
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Iron	XRF	18681.34	12059	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Iron	Lab		11700	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Iron	Lab		9840	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Iron	Lab		8760	
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Iron	XRF	10569.67	6823	
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Iron	XRF	8647.38	5582	
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Iron	XRF	7792.75	5030	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Lead	XRF	30417.13	30867	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Lead	XRF	12557.85	12744	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	10960.43	11123	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Lead	XRF	9946.9	10094	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Lead	XRF	9526.21	9667	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Lead	XRF	9472.15	9612	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Lead	XRF	8098.1	8218	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	7636.74	7750	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Lead	XRF	6741.85	6842	
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Lead	XRF	6403.43	6498	
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Lead	XRF	6074.74	6165	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	6040.94	6130	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	5918.69	6006	
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Lead	XRF	5678.52	5763	
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Lead	XRF	5097.57	5173	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Lead	XRF	5018.26	5093	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Lead	XRF	4983.7	5057	
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	4560.7	4628	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Lead	Lab		4220	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Lead	XRF	4122.51	4184	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Lead	Lab		4160	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Lead	XRF	3806.52	3863	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Lead	XRF	3794.29	3850	
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Lead	XRF	3538.03	3590	
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Lead	XRF	3473.6	3525	
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Lead	XRF	3467.94	3519	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Lead	XRF	3383.76	3434	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	3356.33	3406	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Lead	XRF	3348.96	3399	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	3343.09	3393	
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Lead	XRF	3318.81	3368	
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Lead	XRF	3317.63	3367	
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Lead	XRF	3280.49	3329	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Lead	XRF	3275.73	3324	
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Lead	XRF	3240.57	3289	
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Lead	Lab		3280	J
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Lead	XRF	3219.02	3267	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Lead	Lab		3220	
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Lead	XRF	3108.27	3154	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		3130	
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Lead	XRF	3076.04	3122	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Lead	XRF	3052.92	3098	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Lead	XRF	3002.35	3047	
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Lead	XRF	2977.37	3021	
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Lead	XRF	2974.49	3019	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Lead	XRF	2886.35	2929	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Lead	XRF	2860.97	2903	
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Lead	XRF	2826.87	2869	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	2806.27	2848	
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Lead	XRF	2805.75	2847	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Lead	XRF	2748.47	2789	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Lead	Lab		2660	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Lead	XRF	2602.26	2641	
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Lead	XRF	2575.55	2614	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Lead	XRF	2574.61	2613	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Lead	XRF	2548.92	2587	
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Lead	XRF	2546.32	2584	
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Lead	XRF	2543.62	2581	
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Lead	XRF	2528.37	2566	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	2497.41	2534	
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Lead	XRF	2491.79	2529	
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		2480	J
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		2460	J
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Lead	Lab		2410	J
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Lead	XRF	2338.91	2374	
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Lead	XRF	2326.31	2361	
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	2319.85	2354	
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Lead	XRF	2317.78	2352	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Lead	Lab		2310	
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Lead	XRF	2271.75	2305	
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Lead	Lab		2290	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	2250.04	2283	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Lead	XRF	2226.26	2259	
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		2240	J
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Lead	XRF	2177.82	2210	
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		2210	J
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		2160	
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		2120	J
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Lead	XRF	2087.51	2118	
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Lead	XRF	2081.41	2112	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		2100	
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		2080	J
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Lead	XRF	2048.63	2079	
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Lead	XRF	2030.92	2061	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Lead	XRF	1974.93	2004	
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Lead	Lab		2000	J
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Lead	XRF	1961.41	1990	
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Lead	XRF	1923.03	1951	
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		1950	J
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Lead	XRF	1904.28	1932	
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Lead	XRF	1877.96	1906	
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Lead	XRF	1862.93	1891	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Lead	XRF	1849.19	1877	
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Lead	XRF	1815.7	1843	
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	1806.86	1834	
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Lead	XRF	1749.19	1775	
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Lead	XRF	1746.32	1772	
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		1770	J
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Lead	XRF	1705.86	1731	
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		1730	J

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Lead	XRF	1700.79	1726	
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Lead	XRF	1688.59	1714	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Lead	XRF	1668.64	1693	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		1680	J
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		1660	J
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Lead	XRF	1616.15	1640	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Lead	XRF	1614.59	1638	
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Lead	XRF	1611.75	1636	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Lead	Lab		1590	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Lead	XRF	1540.68	1563	
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	1511.15	1534	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Lead	XRF	1503.72	1526	
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Lead	Lab		1520	J
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Lead	Lab		1460	
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		1460	J
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Lead	XRF	1417.2	1438	
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Lead	XRF	1412.38	1433	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Lead	XRF	1352.21	1372	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Lead	Lab		1370	
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Lead	XRF	1342.99	1363	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Lead	Lab		1340	
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Lead	Lab		1290	
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Lead	XRF	1265.37	1284	
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Lead	Lab		1280	J
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Lead	XRF	1250.72	1269	
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Lead	Lab		1260	J
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Lead	XRF	1213.67	1232	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Lead	Lab		1230	
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		1210	J
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Lead	Lab		1210	J
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		1200	J
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Lead	XRF	1166.78	1184	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Lead	XRF	1159.2	1176	
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Lead	XRF	1140.42	1157	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Lead	Lab		1120	
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Lead	Lab		1120	J
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Lead	XRF	1091.49	1108	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		1090	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Lead	Lab		1080	
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Lead	Lab		1070	J
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		1070	J
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Lead	Lab		1050	
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		996	J
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Lead	Lab		975	J
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		968	J
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Lead	Lab		931	J

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12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Lead	XRF	912.21	926	
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Lead	XRF	910.91	924	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Lead	Lab		836	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Lead	XRF	807.87	820	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		804	
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		794	J
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Lead	Lab		773	
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Lead	Lab		678	J
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		632	
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Lead	XRF	610.56	620	
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Lead	XRF	600.76	610	
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	599.77	609	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Lead	Lab		608	J
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Lead	XRF	565.42	574	
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Lead	XRF	547.89	556	
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		522	J
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Lead	XRF	512.99	521	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Lead	XRF	481.2	488	
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Lead	XRF	461.75	469	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Lead	XRF	444.22	451	
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Lead	XRF	428.53	435	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Lead	XRF	389.86	396	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Lead	XRF	387.98	394	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Lead	XRF	364.42	370	
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Lead	XRF	347.54	353	
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Lead	XRF	343.01	348	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Lead	Lab		348	
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Lead	XRF	328.11	333	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Lead	Lab		332	
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Lead	XRF	325.29	330	
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Lead	XRF	317.67	322	
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		320	J
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Lead	XRF	311.96	317	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Lead	Lab		305	
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		305	J
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Lead	Lab		300	
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Lead	XRF	292.81	297	
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Lead	XRF	284.24	288	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Lead	Lab		288	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Lead	Lab		285	
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	280.61	285	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Lead	XRF	278.15	282	
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		282	J
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Lead	XRF	276.64	281	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Lead	Lab		278	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Lead	XRF	272.15	276	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Lead	XRF	267	271	
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Lead	XRF	265.11	269	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Lead	Lab		269	J
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Lead	XRF	264.03	268	
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Lead	XRF	257.27	261	
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Lead	XRF	239.81	243	
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Lead	XRF	236.18	240	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Lead	XRF	233.11	237	
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Lead	XRF	231.96	235	
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Lead	XRF	226.36	230	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Lead	XRF	225.74	229	
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Lead	XRF	224.78	228	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Lead	Lab		226	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Lead	XRF	221.42	225	
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Lead	XRF	220.63	224	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Lead	XRF	219.74	223	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Lead	XRF	217.71	221	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Lead	XRF	211.54	215	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Lead	XRF	210.97	214	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Lead	Lab		212	
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Lead	XRF	208.32	211	
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Lead	XRF	208.3	211	
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Lead	XRF	203.29	206	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Lead	XRF	202.27	205	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Lead	XRF	201.44	204	
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Lead	XRF	199.24	202	
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Lead	XRF	198.57	202	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Lead	XRF	195.14	198	
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Lead	XRF	194.37	197	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Lead	XRF	193.86	197	
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Lead	XRF	193.2	196	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Lead	Lab		194	
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Lead	XRF	191.12	194	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Lead	XRF	190.37	193	
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Lead	XRF	190	193	
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Lead	Lab		192	
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Lead	XRF	187.85	191	
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Lead	XRF	185.94	189	
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Lead	XRF	185.75	188	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Lead	XRF	183.97	187	
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Lead	XRF	183.11	186	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Lead	XRF	180.25	183	
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Lead	XRF	177.53	180	
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Lead	XRF	175.11	178	
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Lead	XRF	174.72	177	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Lead	Lab		177	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Lead	XRF	172.82	175	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Lead	XRF	169.44	172	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Lead	XRF	168.91	171	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Lead	XRF	168.9	171	
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Lead	XRF	168.7	171	
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Lead	XRF	168.51	171	
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		168	J
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Lead	XRF	162.42	165	
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Lead	XRF	161.58	164	
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Lead	XRF	161.14	164	
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		163	J
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Lead	Lab		161	
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Lead	XRF	155.48	158	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Lead	XRF	154.27	157	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Lead	XRF	153.94	156	
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Lead	XRF	153.9	156	
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Lead	XRF	152.47	155	
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Lead	XRF	152.44	155	
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Lead	XRF	151.83	154	
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Lead	Lab		154	J
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Lead	XRF	150.31	153	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Lead	XRF	146.41	149	
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Lead	XRF	144.63	147	
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Lead	XRF	143.87	146	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Lead	Lab		145	
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Lead	XRF	142.07	144	
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Lead	XRF	140.82	143	
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Lead	XRF	140.12	142	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Lead	XRF	139.34	141	
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Lead	XRF	138.13	140	
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Lead	XRF	138.02	140	
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Lead	XRF	136.93	139	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Lead	XRF	136.24	138	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		138	J
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Lead	XRF	135.59	138	
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Lead	XRF	135.34	137	
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Lead	XRF	135.2	137	
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Lead	XRF	135.15	137	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Lead	Lab		134	
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Lead	XRF	131.95	134	
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Lead	XRF	130.01	132	
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		131	J
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Lead	XRF	124.57	126	
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Lead	XRF	123.88	126	
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Lead	Lab		122	J
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Lead	XRF	119.94	122	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		121	J
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Lead	XRF	115.03	117	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Lead	Lab		115	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Lead	Lab		115	
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Lead	Lab		115	J
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Lead	XRF	112.98	115	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Lead	Lab		114	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Lead	Lab		112	
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Lead	Lab		112	J
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Lead	Lab		111	
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		111	J
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Lead	Lab		111	J
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Lead	XRF	109.16	111	
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Lead	Lab		107	J
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Lead	XRF	105.32	107	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Lead	Lab		104	
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		102	J
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Lead	Lab		102	
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Lead	Lab		99	
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Lead	Lab		98	J
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Lead	XRF	95.58	97	
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Lead	Lab		96	
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		95	J
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Lead	Lab		95	J
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Lead	Lab		95	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Lead	Lab		94	
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Lead	Lab		94	J
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Lead	Lab		94	
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		94	J
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		93	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		93	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		92	
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Lead	Lab		92	J
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Lead	Lab		91	J
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Lead	Lab		89	J
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Lead	XRF	87.15	88	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Lead	Lab		87	
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Lead	Lab		85	J
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Lead	Lab		85	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Lead	Lab		85	
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Lead	XRF	81.07	82	
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Lead	XRF	80.53	82	
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Lead	Lab		82	J
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Lead	XRF	79.68	81	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Lead	XRF	78.77	80	
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Lead	Lab		76	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		76	J
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Lead	Lab		73	J
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		70	J
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Lead	Lab		67	
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		66	J
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		62	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Lead	Lab		59	
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Lead	XRF	51.5	52	
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Lead	XRF	45.48	46	
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Lead	Lab		44	J
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Lead	XRF	42.8	43	
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Lead	Lab		40	J
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Lead	Lab		34	J
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Lead	XRF	28.39	29	
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		24	
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		7	J
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Lead	Lab		7	
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Lead	Lab		6	J
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Lead	Lab		6	J
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Lead	Lab		5	J
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Lead	Lab		4	
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		3	J
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Lead	Lab		2	
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Lead	Lab		2	J
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Manganese	XRF	164819.17	75108	
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Manganese	XRF	115786.94	52764	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Manganese	XRF	93687.25	42693	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Manganese	XRF	79855.47	36390	
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Manganese	XRF	67613.55	30811	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Manganese	XRF	48536.75	22118	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	44057.34	20077	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Manganese	XRF	43339.5	19750	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Manganese	XRF	30470.59	13885	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Manganese	XRF	26116.81	11901	
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Manganese	XRF	26050.12	11871	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Manganese	XRF	25932.35	11817	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Manganese	Lab		11100	
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Manganese	XRF	22717.14	10352	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		10100	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Manganese	XRF	21281.06	9698	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Manganese	Lab		9240	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	19502.72	8887	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Manganese	XRF	19390.66	8836	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Manganese	XRF	18513.04	8436	
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		8360	J
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Manganese	Lab		8160	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Manganese	Lab		7990	
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Manganese	Lab		7980	J
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		7810	J
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Manganese	Lab		7690	
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Manganese	Lab		7670	J
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Manganese	Lab		7620	
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		7440	J
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		7430	J
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Manganese	XRF	16144.02	7357	
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Manganese	Lab		7280	J
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Manganese	XRF	15734.31	7170	
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Manganese	XRF	15733.16	7170	
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		7160	J
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Manganese	XRF	15707.91	7158	
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		7110	J
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		7090	J
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Manganese	XRF	15302.94	6974	
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Manganese	XRF	14857.43	6771	
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Manganese	Lab		6740	J
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Manganese	XRF	14686.29	6693	
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Manganese	XRF	14485.99	6601	
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Manganese	XRF	14280.69	6508	
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Manganese	XRF	14069.89	6412	
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Manganese	XRF	14055.08	6405	
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Manganese	XRF	13995.02	6378	
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Manganese	Lab		6350	J
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Manganese	XRF	13860.17	6316	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Manganese	XRF	13796.95	6287	
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Manganese	XRF	13583.71	6190	
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Manganese	XRF	13469.65	6138	
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Manganese	Lab		6090	
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Manganese	XRF	13253.44	6040	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Manganese	XRF	13250.81	6038	
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Manganese	XRF	13239.07	6033	
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Manganese	XRF	13236.7	6032	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Manganese	XRF	12956.43	5904	
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Manganese	XRF	12914.39	5885	
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		5850	J
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Manganese	XRF	12837.06	5850	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Manganese	XRF	12784.58	5826	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Manganese	Lab		5550	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Manganese	Lab		5480	
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Manganese	XRF	11559.64	5268	
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Manganese	Lab		5000	J
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Manganese	Lab		4920	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Manganese	XRF	10592.01	4827	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Manganese	XRF	10543.25	4805	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	10144.38	4623	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Manganese	XRF	10034.98	4573	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Manganese	XRF	9993.43	4554	
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	9850.54	4489	
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Manganese	XRF	9742.69	4440	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Manganese	XRF	9709.08	4424	
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Manganese	XRF	9692.06	4417	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		4400	J
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		4320	J
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Manganese	XRF	9470.81	4316	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Manganese	XRF	9381.17	4275	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Manganese	XRF	9046	4122	
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Manganese	XRF	8676.26	3954	
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Manganese	XRF	8572.49	3906	
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		3820	J
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Manganese	Lab		3800	J
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Manganese	XRF	8304.44	3784	
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	7768.05	3540	
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		3410	
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Manganese	XRF	7330.07	3340	
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		3330	
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Manganese	Lab		3220	J
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Manganese	XRF	6978.68	3180	
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Manganese	XRF	6912.06	3150	
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Manganese	XRF	6808.8	3103	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Manganese	XRF	6535.24	2978	
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Manganese	XRF	6445.89	2937	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Manganese	Lab		2860	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Manganese	XRF	5888.33	2683	
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		2590	J
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		2570	J
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Manganese	XRF	5368.77	2447	
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	5326.25	2427	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Manganese	Lab		2380	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Manganese	XRF	5140.92	2343	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Manganese	XRF	5120.08	2333	
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Manganese	XRF	5071.42	2311	
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	5050.44	2301	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Manganese	Lab		2110	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	4630.18	2110	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Manganese	XRF	4500.48	2051	
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Manganese	Lab		2050	J
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Manganese	Lab		1890	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Manganese	XRF	4080.12	1859	
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	3919.94	1786	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Manganese	XRF	3880.38	1768	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Manganese	Lab		1760	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Manganese	XRF	3765.83	1716	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		1690	
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Manganese	XRF	3679.17	1677	
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Manganese	Lab		1640	J
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Manganese	XRF	3481.52	1587	
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Manganese	XRF	3422.79	1560	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Manganese	Lab		1500	
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Manganese	XRF	3253.74	1483	
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		1470	J
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Manganese	XRF	3205.13	1461	
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		1460	J
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Manganese	Lab		1410	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Manganese	XRF	3093.78	1410	
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Manganese	XRF	3043.93	1387	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		1360	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Manganese	XRF	2943.5	1341	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Manganese	Lab		1310	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	2760.83	1258	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Manganese	XRF	2725.69	1242	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		1240	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Manganese	Lab		1230	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Manganese	Lab		1230	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Manganese	XRF	2648.23	1207	
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Manganese	Lab		1200	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Manganese	XRF	2617.84	1193	
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		1180	J
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		1170	J
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Manganese	XRF	2543.45	1159	
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Manganese	XRF	2542.39	1159	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Manganese	Lab		1130	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Manganese	Lab		1060	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		1040	
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Manganese	Lab		1000	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	2086.17	951	
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Manganese	XRF	2080.97	948	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Manganese	XRF	2049.94	934	
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Manganese	XRF	2040.34	930	
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Manganese	XRF	1979.98	902	
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Manganese	XRF	1888.01	860	
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Manganese	XRF	1667.76	760	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Manganese	XRF	1659.23	756	
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	1649.74	752	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	1605.2	731	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Manganese	XRF	1531.81	698	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Manganese	Lab		648	
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Manganese	XRF	1416.7	646	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Manganese	XRF	1402.76	639	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Manganese	Lab		635	
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Manganese	XRF	1381.38	629	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Manganese	XRF	1332.24	607	
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Manganese	XRF	1301.66	593	
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Manganese	XRF	1236.33	563	
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Manganese	XRF	1227.41	559	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	1219.34	556	
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Manganese	XRF	1200.83	547	
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Manganese	XRF	1132.89	516	
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Manganese	XRF	1102.55	502	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Manganese	XRF	1101.91	502	
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Manganese	XRF	1101.7	502	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Manganese	Lab		493	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Manganese	Lab		473	
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Manganese	XRF	1037.16	473	
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Manganese	XRF	1036.19	472	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Manganese	XRF	1016.53	463	
12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Manganese	XRF	984.69	449	
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Manganese	Lab		446	J
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Manganese	XRF	969.14	442	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Manganese	Lab		441	
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Manganese	XRF	966.03	440	
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Manganese	XRF	965.33	440	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Manganese	XRF	946.67	431	
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		430	J
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		428	J
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Manganese	XRF	918.42	419	
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Manganese	XRF	890.68	406	
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Manganese	Lab		389	J
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Manganese	XRF	832.26	379	
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Manganese	XRF	823.17	375	
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Manganese	XRF	799.88	365	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Manganese	XRF	779.03	355	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Manganese	Lab		347	
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Manganese	XRF	730.48	333	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	699.94	319	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		317	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		317	J
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Manganese	Lab		292	
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		283	J
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Manganese	Lab		281	J
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Manganese	Lab		279	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Manganese	Lab		276	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Manganese	XRF	583.23	266	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Manganese	Lab		252	
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Manganese	XRF	549.47	250	
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Manganese	XRF	544.53	248	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Manganese	XRF	539.34	246	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Manganese	XRF	535.16	244	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Manganese	XRF	530.02	242	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Manganese	Lab		238	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	517.22	236	
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Manganese	Lab		235	J
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Manganese	XRF	511.69	233	
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Manganese	XRF	511.29	233	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Manganese	Lab		226	
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Manganese	XRF	488.82	223	
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Manganese	Lab		220	J
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	466.36	213	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Manganese	Lab		212	
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Manganese	Lab		210	
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Manganese	Lab		206	J
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Manganese	XRF	438.87	200	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Manganese	XRF	437.4	199	
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Manganese	Lab		186	J
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Manganese	XRF	391.06	178	
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Manganese	Lab		178	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Manganese	XRF	388.42	177	
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Manganese	XRF	386.43	176	
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Manganese	XRF	383.49	175	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Manganese	Lab		174	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Manganese	XRF	373.5	170	
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Manganese	XRF	371.84	169	
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Manganese	XRF	371.67	169	
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Manganese	XRF	364.39	166	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Manganese	XRF	363.45	166	
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Manganese	XRF	359.45	164	
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Manganese	Lab		163	J
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Manganese	XRF	356.22	162	
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Manganese	Lab		162	J
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Manganese	XRF	354.63	162	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Manganese	XRF	353.32	161	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Manganese	XRF	346.51	158	
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Manganese	Lab		153	J
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Manganese	Lab		152	J
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Manganese	Lab		150	J
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Manganese	XRF	322.57	147	
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Manganese	XRF	316.75	144	
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	311.88	142	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Manganese	XRF	297.92	136	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Manganese	XRF	294	134	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Manganese	Lab		133	
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		133	J
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		131	J
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Manganese	Lab		129	
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		129	J
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Manganese	XRF	278.53	127	
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Manganese	Lab		126	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Manganese	Lab		125	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	270.28	123	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Manganese	Lab		119	
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Manganese	XRF	259.16	118	
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Manganese	XRF	259.06	118	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Manganese	XRF	254.67	116	
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Manganese	XRF	253.46	116	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Manganese	XRF	253.17	115	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Manganese	Lab		107	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Manganese	XRF	232.71	106	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	223.54	102	
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		101	J
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Manganese	Lab		101	J
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Manganese	Lab		100	
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Manganese	XRF	217.64	99	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Manganese	Lab		97	J
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Manganese	XRF	213.27	97	
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		97	J
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Manganese	Lab		95	
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Manganese	Lab		94	
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Manganese	XRF	195.88	89	
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		89	J
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Manganese	XRF	192	87	
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Manganese	XRF	191.93	87	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Manganese	XRF	190.93	87	
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Manganese	XRF	189.45	86	
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		85	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Manganese	XRF	185.79	85	
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Manganese	Lab		84	J
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Manganese	XRF	179.68	82	
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		81	J
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		80	
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Manganese	XRF	171.83	78	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Manganese	Lab		77	
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		76	J
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Manganese	XRF	164.22	75	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Manganese	XRF	158.99	72	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Manganese	XRF	156.12	71	
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		70	J
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		69	
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		67	J
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		66	J
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Manganese	Lab		66	J
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Manganese	Lab		65	J
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Manganese	Lab		64	J
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		63	J
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Manganese	XRF	128.23	58	
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		55	J
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Manganese	Lab		52	J
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Manganese	Lab		52	J
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Manganese	XRF	111.55	51	
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Manganese	Lab		51	J
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Manganese	XRF	108.94	50	
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Manganese	XRF	107.69	49	
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		47	J
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Manganese	XRF	101.4	46	
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Manganese	XRF	96.13	44	
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Manganese	XRF	89.8	41	
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Manganese	XRF	88.39	40	
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		37	J
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Manganese	XRF	77	35	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Manganese	XRF	76.28	35	
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Manganese	XRF	72.8	33	
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		33	
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Manganese	Lab		29	J
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Manganese	Lab		27	J
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Manganese	Lab		27	J
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Manganese	Lab		26	
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Manganese	Lab		24	J
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Manganese	XRF	50.89	23	
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Manganese	XRF	48.73	22	U
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Manganese	XRF	48.31	22	U
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Manganese	XRF	47	21	U
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Manganese	XRF	46.55	21	U
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Manganese	XRF	46.35	21	U
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Manganese	XRF	46.16	21	U
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Manganese	XRF	45.07	21	U
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Manganese	XRF	44.6	20	U
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Manganese	XRF	43.68	20	U
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Manganese	XRF	43.21	20	U
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Manganese	XRF	42.74	19	U
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Manganese	XRF	42.07	19	U
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Manganese	XRF	40.41	18	U

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Manganese	XRF	38.78	18	U
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Manganese	XRF	35.35	16	U
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Manganese	XRF	34.42	16	U
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Manganese	XRF	34.27	16	U
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Manganese	XRF	31.03	14	U
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Manganese	XRF	29.25	13	U
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Manganese	Lab		12	
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Manganese	XRF	26.5	12	U
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Manganese	XRF	23.79	11	U
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Manganese	Lab		10	U
12	TP-MS-11B(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	38799.05	36572	
12	TP-MS-120(0.0-0.5)	11/2/2012	0	0.5	Zinc	XRF	37230.9	35094	
12	TP-MS-11C(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	25652.42	24180	
12	TP-MS-108(0.0-0.5)	10/29/2012	0	0.5	Zinc	XRF	25190.82	23745	
12	TP-MS-10B(0.0-0.5)	10/8/2012	0	0.5	Zinc	XRF	25141.88	23699	
12	Tp-Ms-105(0.0-0.7)	11/5/2012	0	0.7	Zinc	XRF	17638.47	16626	
12	TP-MS-10A(0.0-0.5)	10/8/2012	0	0.5	Zinc	XRF	17591.44	16582	
12	TP-MS-115(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	16040.68	15120	
12	TP-MS-116(1.0-1.5)	10/30/2012	1	1.5	Zinc	XRF	15643.96	14746	
12	TP-MS-10D(0.0-0.5)	10/4/2012	0	0.5	Zinc	XRF	14192.75	13378	
12	Tp-Ms-106(0.0-0.5)	11/5/2012	0	0.5	Zinc	XRF	14043.79	13238	
12	Tp-Ms-123(1.1-2.1)	11/5/2012	1.1	2.1	Zinc	XRF	13653.92	12870	
12	TP-MS-122(1.0-1.5)	10/24/2012	1	1.5	Zinc	XRF	13634.63	12852	
12	Tp-Ms-123(0.0-1.0)	11/5/2012	0	1	Zinc	XRF	13004.44	12258	
12	TP-MS-120(0.5-1.0)	11/2/2012	0.5	1	Zinc	XRF	12728.34	11998	
12	Tp-Ms-106(0.5-0.8)	11/5/2012	0.5	0.8	Zinc	XRF	12333.09	11625	
12	TP-MS-112(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	12225.92	11524	
12	TP-MS-10C(0.0-1.0)	10/4/2012	0	1	Zinc	XRF	11707.37	11035	
12	TP-MS-122(0.0-0.5)	10/24/2012	0	0.5	Zinc	XRF	9555.74	9007	
12	Tp-Ms-123(0.5-1.0)	11/5/2012	0.5	1	Zinc	XRF	9307.78	8774	
12	TP-MS-10A(0.5-1.0)	10/8/2012	0.5	1	Zinc	XRF	8835.93	8329	
12	TP-MS-115(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	8684.36	8186	
12	TP-MS-109(1.0-1.5)	10/30/2012	1	1.5	Zinc	XRF	8189.08	7719	
12	TP-MS-15(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	8163.25	7695	
12	TP-MS-09(1.0-2.0)	10/4/2012	1	2	Zinc	XRF	7556.79	7123	
12	TP-MS-102(1.0-1.5)	10/29/2012	1	1.5	Zinc	XRF	7549.62	7116	
12	TP-MS-11C(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	7063.03	6658	
12	TP-MS-108(0.5-1.0)	10/29/2012	0.5	1	Zinc	XRF	7061.55	6656	
12	TP-MS-111(0.0-0.5)	10/24/2012	0	0.5	Zinc	XRF	7002.92	6601	
12	TP-MS-122(0.5-1.0)	10/24/2012	0.5	1	Zinc	XRF	6911.46	6515	
12	TP-MS-09(0.0-0.5)	10/4/2012	0	0.5	Zinc	XRF	6752.83	6365	
12	TP-MS-104(0.0-0.5)	10/29/2012	0	0.5	Zinc	XRF	6730.56	6344	
12	Tp-Ms-123(0.0-0.5)	11/5/2012	0	0.5	Zinc	XRF	6649.45	6268	
12	TP-MS-109(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	6541.92	6166	
12	TP-MS-119(1.0-1.5)	11/2/2012	1	1.5	Zinc	XRF	6536.89	6162	
12	TP-MS-11A(0.0-0.4)	10/9/2012	0	0.4	Zinc	XRF	6492.58	6120	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs)		Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
			Top	Bottom					
12	TP-MS-121(1.5-1.8)	10/24/2012	1.5	1.8	Zinc	XRF	6162.89	5809	
12	TP-MS-109(1.5-2.0)	10/30/2012	1.5	2	Zinc	XRF	6120.83	5769	
12	Tp-Ms-105(1.0-1.5)	11/5/2012	1	1.5	Zinc	XRF	5783.41	5451	
12	TP-MS-116(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	5711.42	5384	
12	TP-MS-11B(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	5691.03	5364	
12	TP-MS-121(0.0-0.5)	10/24/2012	0	0.5	Zinc	XRF	5586.18	5266	
12	Tp-Ms-105(0.7-1.0)	11/5/2012	0.7	1	Zinc	XRF	5492.49	5177	
12	TP-MS-03(0.0-0.3)	10/8/2012	0	0.3	Zinc	XRF	5485.49	5171	
12	TP-MS-120(1.0-1.5)	11/2/2012	1	1.5	Zinc	XRF	5462.34	5149	
12	Tp-Ms-123(1.1-1.8)	11/5/2012	1.1	1.8	Zinc	XRF	5417.17	5106	
12	Tp-Ms-106(2.0-2.5)	11/5/2012	2	2.5	Zinc	XRF	5392.03	5083	
12	TP-MS-109(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	5267.52	4965	
12	TP-MS-104(1.5-2.5)	10/29/2012	1.5	2.5	Zinc	XRF	5212.28	4913	
12	Tp-Ms-106(0.7-1.5)	11/5/2012	0.7	1.5	Zinc	XRF	5176.63	4879	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Zinc	Lab		4840	
12	TP-MS-08(0.0-0.5)	10/8/2012	0	0.5	Zinc	XRF	4898.26	4617	
12	TP-MS-101(0.0-0.5)	10/29/2012	0	0.5	Zinc	XRF	4798.41	4523	
12	TP-MS-25(0.0-0.3)	10/4/2012	0	0.3	Zinc	XRF	4686.52	4418	
12	Tp-Ms-106(1.5-2.0)	11/5/2012	1.5	2	Zinc	XRF	4500.67	4242	
12	TP-MS-102(1.5-2.0)	10/29/2012	1.5	2	Zinc	XRF	4487.33	4230	
12	BRSD-2 (6-12)	7/17/2008	0.5	1	Zinc	Lab		4220	
12	TP-MS-111(0.5-0.8)	10/24/2012	0.5	0.8	Zinc	XRF	4414.84	4161	
12	UM-250S-3000E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		4080	J
12	TP-MS-119(0.0-0.5)	11/2/2012	0	0.5	Zinc	XRF	4261.18	4017	
12	Tp-Ms-106(1.0-1.5)	11/5/2012	1	1.5	Zinc	XRF	4233.76	3991	
12	TP-MS-10D(2.0-3.5)	10/4/2012	2	3.5	Zinc	XRF	4143.27	3905	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Zinc	Lab		3900	
12	BRSD-16 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		3890	
12	TP-MS-10D(0.5-1.5)	10/4/2012	0.5	1.5	Zinc	XRF	4124.76	3888	
12	TP-MS-10A(1.0-2.0)	10/8/2012	1	2	Zinc	XRF	4104.87	3869	
12	TP-MS-118(0.0-0.5)	11/2/2012	0	0.5	Zinc	XRF	4078.69	3845	
12	TP-MS-04(0.0-0.5)	10/4/2012	0	0.5	Zinc	XRF	4072.6	3839	
12	TP-MS-116(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	3984.9	3756	
12	TP-MS-108(1.0-1.5)	10/30/2012	1	1.5	Zinc	XRF	3984.63	3756	
12	TP-MS-13(0.5-1.0)	10/9/2012	0.5	1	Zinc	XRF	3965.29	3738	
12	BRSD-10 (6-12")	7/17/2008	0.5	1	Zinc	Lab		3620	
12	UM-250S-3000E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		3550	J
12	TP-MS-10C(1.0-2.0)	10/4/2012	1	2	Zinc	XRF	3691.17	3479	
12	BRSD-24 (2-6)	7/17/2008	0.16666667	0.5	Zinc	Lab		3450	
12	TP-MS-09(0.5-1.0)	10/4/2012	0.5	1	Zinc	XRF	3657.42	3447	
12	TP-MS-08(0.5-1.0)	10/8/2012	0.5	1	Zinc	XRF	3588.58	3383	
12	TP-MS-102(0.5-1.0)	10/29/2012	0.5	1	Zinc	XRF	3587.43	3382	
12	TP-MS-121(0.5-0.8)	10/24/2012	0.5	0.8	Zinc	XRF	3544.76	3341	
12	UM-0N-2500E (0-2")	10/3/2007	0	0.16666667	Zinc	Lab		3340	J
12	TP-MS-120(1.5-2.5)	11/2/2012	1.5	2.5	Zinc	XRF	3340.99	3149	
12	UM-0N-2000E (6-12")	10/4/2007	0.5	1	Zinc	Lab		3110	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-10cRETEST(1.0-2.0)	10/5/2012	1	2	Zinc	XRF	3282.7	3094	
12	TP-MS-117(0.0-0.5)	11/1/2012	0	0.5	Zinc	XRF	3205.24	3021	
12	UM-750S-3500E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		3010	J
12	UM-250N-2500E (0-2")	10/3/2007	0	0.16666667	Zinc	Lab		2990	J
12	UM-250S-3000E (6-12")	10/4/2007	0.5	1	Zinc	Lab		2950	J
12	BRSD-10 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		2870	
12	UM-750S-3500E (6-12")	10/4/2007	0.5	1	Zinc	Lab		2820	J
12	TP-MS-13(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	2979.41	2808	
12	TP-MS-116(1.5-2.0)	11/1/2012	1.5	2	Zinc	XRF	2950.7	2781	
12	UM-0N-2000E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		2760	J
12	UM-0N-2000E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		2760	J
12	UM-250S-1500E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		2760	J
12	TP-MS-118(0.5-1.0)	11/2/2012	0.5	1	Zinc	XRF	2815.21	2654	
12	TP-MS-119(0.5-1.0)	11/2/2012	0.5	1	Zinc	XRF	2749.48	2592	
12	TP-MS-10CRETEST(2.0-3.0)	10/5/2012	2	3	Zinc	XRF	2698.86	2544	
12	TP-MS-10DRETEST(1.5-2.0)	10/5/2012	1.5	2	Zinc	XRF	2631.46	2480	
12	UM-250N-2500E (2-6")	10/3/2007	0.16666667	0.5	Zinc	Lab		2480	J
12	UM-0N-500E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		2420	J
12	BRSD-10 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		2340	
12	BRSD-16 (6-12)	7/17/2008	0.5	1	Zinc	Lab		2310	
12	TP-MS-104(1.0-1.5)	10/29/2012	1	1.5	Zinc	XRF	2434.68	2295	
12	TP-MS-10c(2.0-3.0)	10/5/2012	2	3	Zinc	XRF	2421.54	2283	
12	TP-MS-08(1.0-2.0)	10/8/2012	1	2	Zinc	XRF	2402.49	2265	
12	TP-MS-112(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	2397.96	2260	
12	TP-MS-110(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	2333.1	2199	
12	TP-MS-01(0.0-0.5)	10/8/2012	0	0.5	Zinc	XRF	2331.24	2197	
12	UM-500S-2750E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		2190	J
12	TP-MS-03(0.5-1.0)	10/8/2012	0.5	1	Zinc	XRF	2317.2	2184	
12	TP-MS-10c(3.0-3.8)	10/5/2012	3	3.8	Zinc	XRF	2309.1	2177	
12	TP-MS-104(0.5-1.0)	10/29/2012	0.5	1	Zinc	XRF	2276.46	2146	
12	UM-750S-3000E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		2130	J
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Zinc	Lab		2100	
12	TP-MS-4A(1.0-2.0)	10/10/2012	1	2	Zinc	XRF	2211.81	2085	
12	TP-MS-122(1.7-3.5)	10/24/2012	1.7	3.5	Zinc	XRF	2197.88	2072	
12	UM-250N-2250E (0-2)	7/18/2008	0	0.16666667	Zinc	Lab		2060	
12	BRSD-24 (0-2)	7/17/2008	0	0.16666667	Zinc	Lab		2040	
12	UM-250S-1500E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		2010	J
12	UM-250S-2750E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		2010	J
12	BRSD-2 (2-6)	7/17/2008	0.16666667	0.5	Zinc	Lab		1990	
12	TP-MS-25(0.3-0.5)	10/4/2012	0.3	0.5	Zinc	XRF	2082.94	1963	
12	TP-MS-25(1.0-2.0)	10/4/2012	1	2	Zinc	XRF	2079.72	1960	
12	UM-250S-2750E (6-12")	10/4/2007	0.5	1	Zinc	Lab		1930	J
12	UM-250N-2500E (6-12")	10/3/2007	0.5	1	Zinc	Lab		1870	J
12	TP-MS-03(0.3-0.5)	10/8/2012	0.3	0.5	Zinc	XRF	1882.23	1774	
12	UM-750S-3000E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		1770	J
12	BRSD-2 (0-2)	7/17/2008	0	0.16666667	Zinc	Lab		1750	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	BRSD-24 (6-12)	7/17/2008	0.5	1	Zinc	Lab		1740	
12	UM-0N-500E (6-12")	10/5/2007	0.5	1	Zinc	Lab		1740	J
12	UM-1000S-3500E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		1720	J
12	UM-750S-3000E (6-12")	10/4/2007	0.5	1	Zinc	Lab		1710	J
12	UM-0N-250E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		1670	J
12	TP-MS-15(0.5-1.0)	10/9/2012	0.5	1	Zinc	XRF	1755.04	1654	
12	TP-MS-04(0.5-1.0)	10/4/2012	0.5	1	Zinc	XRF	1709.91	1612	
12	TP-MS-110(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	1635.7	1542	
12	TP-MS-21(0.0-0.8)	10/10/2012	0	0.8	Zinc	XRF	1614.72	1522	
12	UM-250S-2750E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		1510	J
12	UM-500S-2750E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		1510	J
12	UM-0N-250E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		1500	J
12	UM-0N-2500E (2-6")	10/3/2007	0.16666667	0.5	Zinc	Lab		1460	J
12	TP-MS-10B(2.0-2.8)	10/8/2012	2	2.8	Zinc	XRF	1536.33	1448	
12	UM-500S-3000E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		1410	J
12	TP-MS-103(0.0-0.5)	10/24/2012	0	0.5	Zinc	XRF	1475.77	1391	
12	UM-500S-2750E (6-12")	10/4/2007	0.5	1	Zinc	Lab		1340	J
12	TP-MS-113(1.0-1.8)	10/30/2012	1	1.8	Zinc	XRF	1380.08	1301	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Zinc	Lab		1300	
12	UM-750S-3500E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		1250	J
12	TP-MS-09(2.0-3.0)	10/4/2012	2	3	Zinc	XRF	1301.85	1227	
12	TP-MS-19(0.0-1.0)	10/3/2012	0	1	Zinc	XRF	1275.71	1202	
12	TP-MS-102(0.0-0.5)	10/29/2012	0	0.5	Zinc	XRF	1213.64	1144	
12	BRSD-3 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		1140	
12	BRSD-25 (2-6)	7/17/2008	0.16666667	0.5	Zinc	Lab		1120	
12	TP-MS-113(0.5-1.0)	10/30/2012	0.5	1	Zinc	XRF	1154.96	1089	
12	TP-MS-117(2.0-2.5)	11/1/2012	2	2.5	Zinc	XRF	1146.41	1081	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Zinc	Lab		1060	
12	TP-MS-101(0.5-1.0)	10/29/2012	0.5	1	Zinc	XRF	1123.04	1059	
12	UM-0N-250E (6-12")	10/5/2007	0.5	1	Zinc	Lab		1050	J
12	TP-MS-25(2.0-3.0)	10/4/2012	2	3	Zinc	XRF	1099.84	1037	
12	BRSD-25 (6-12)	7/17/2008	0.5	1	Zinc	Lab		1030	
12	BRSD-3 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		1020	
12	TP-MS-08(2.0-3.0)	10/8/2012	2	3	Zinc	XRF	1060	999	
12	TP-MS-11D(0.0-0.1)	10/9/2012	0	0.1	Zinc	XRF	1052.25	992	
12	UM-250S-3250E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		948	J
12	UM-500S-3250E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		940	J
12	TP-MS-26(0.0-0.5)	10/10/2012	0	0.5	Zinc	XRF	984.86	928	
12	TP-MS-09(3.0-4.0)	10/4/2012	3	4	Zinc	XRF	947.72	893	
12	TP-MS-102(2.5-2.8)	10/29/2012	2.5	2.8	Zinc	XRF	941.21	887	
12	UM-250S-1500E (6-12")	10/4/2007	0.5	1	Zinc	Lab		882	J
12	TP-MS-117(0.5-1.0)	11/1/2012	0.5	1	Zinc	XRF	926.19	873	
12	TP-MS-113(0.0-0.5)	10/30/2012	0	0.5	Zinc	XRF	910.17	858	
12	BRSD-25 (0-2)	7/17/2008	0	0.16666667	Zinc	Lab		836	
12	TP-MS-13(1.0-1.9)	10/9/2012	1	1.9	Zinc	XRF	877.25	827	
12	BRSD-16 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		822	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Depth Sampled (feet bgs) Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-24(0.1-0.2)	10/9/2012	0.1	0.2	Zinc	XRF	863.95	814	
12	TP-MS-14(0.5-1.0)	10/9/2012	0.5	1	Zinc	XRF	822.09	775	
12	UM-250S-3250E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		760	J
12	TP-MS-24(4.5-5.3)	10/9/2012	4.5	5.3	Zinc	XRF	796.56	751	
12	TP-MS-03(2.0-2.8)	10/8/2012	2	2.8	Zinc	XRF	770.88	727	
12	TP-MS-27(3.5-4.0)	10/5/2012	3.5	4	Zinc	XRF	757.66	714	
12	TP-MS-12(3.0-3.4)	10/9/2012	3	3.4	Zinc	XRF	757.26	714	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Zinc	Lab		687	
12	TP-MS-4A(0.0-1.0)	10/10/2012	0	1	Zinc	XRF	720.8	679	
12	TP-MS-20(1.0-2.0)	10/4/2012	1	2	Zinc	XRF	710.76	670	
12	UM-500S-3250E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		668	J
12	BRSD-7 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		663	
12	TP-MS-20(0.0-0.5)	10/4/2012	0	0.5	Zinc	XRF	702.34	662	
12	TP-MS-21(1.3-2.5)	10/10/2012	1.3	2.5	Zinc	XRF	699.17	659	
12	BRSD-9 (0-2")	7/16/2008	0	0.16666667	Zinc	Lab		652	
12	UM-250S-3250E (6-12")	10/4/2007	0.5	1	Zinc	Lab		652	J
12	UM-250N-2250E (2-6)	7/18/2008	0.16666667	0.5	Zinc	Lab		640	
12	TP-MS-26(2.0-2.5)	10/10/2012	2	2.5	Zinc	XRF	657.83	620	
12	TP-MS-21(2.5-3.3)	10/10/2012	2.5	3.3	Zinc	XRF	657.66	620	
12	TP-MS-27(3.0-3.5)	10/5/2012	3	3.5	Zinc	XRF	639.97	603	
12	TP-MS-14(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	632.01	596	
12	Tp-Ms-105(1.5-2.0)	11/5/2012	1.5	2	Zinc	XRF	632	596	
12	BRSD-8 (6-12")	7/16/2008	0.5	1	Zinc	Lab		590	
12	TP-MS-117(1.0-1.5)	11/1/2012	1	1.5	Zinc	XRF	620.3	585	
12	TP-MS-27(1.0-1.5)	10/5/2012	1	1.5	Zinc	XRF	617.95	582	
12	BRSD-8 (2-6")	7/16/2008	0.16666667	0.5	Zinc	Lab		579	
12	UM-250S-2500E (0-2")	10/3/2007	0	0.16666667	Zinc	Lab		576	J
12	TP-MS-13(0.0-0.1)	10/9/2012	0	0.1	Zinc	XRF	609.98	575	
12	TP-MS-26(0.5-1.0)	10/10/2012	0.5	1	Zinc	XRF	608.82	574	
12	TP-MS-117(1.5-2.0)	11/1/2012	1.5	2	Zinc	XRF	608.05	573	
12	UM-500S-3250E (6-12")	10/4/2007	0.5	1	Zinc	Lab		573	J
12	UM-0N-1500E (6-12")	10/4/2007	0.5	1	Zinc	Lab		572	J
12	TP-TS-01(0.5-1.0)	10/15/2012	0.5	1	Zinc	XRF	602.38	568	
12	TP-MS-24(0.0-1.0)	10/9/2012	0	1	Zinc	XRF	589.74	556	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Zinc	Lab		550	
12	TP-MS-24(3.0-4.0)	10/9/2012	3	4	Zinc	XRF	575.31	542	
12	BRSD-3 (6-12")	7/17/2008	0.5	1	Zinc	Lab		538	
12	TP-MS-22(0.0-1.0)	10/9/2012	0	1	Zinc	XRF	552.83	521	
12	BRSD-8 (0-2")	7/16/2008	0	0.16666667	Zinc	Lab		521	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	5.75	Zinc	Lab		507	
12	TP-MS-26(1.0-2.0)	10/10/2012	1	2	Zinc	XRF	533.28	503	
12	TP-MS-27(0.0-0.5)	10/5/2012	0	0.5	Zinc	XRF	531.75	501	
12	TP-MS-27(0.5-1.0)	10/5/2012	0.5	1	Zinc	XRF	528.19	498	
12	TP-MS-27(2.5-3.0)	10/5/2012	2.5	3	Zinc	XRF	512.16	483	
12	TP-MS-24(2.0-3.0)	10/9/2012	2	3	Zinc	XRF	509.11	480	
12	TP-MS-14(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	504.2	475	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-20(0.7-1.0)	10/4/2012	0.7	1	Zinc	XRF	490.38	462	
12	TP-MS-01(0.5-1.0)	10/8/2012	0.5	1	Zinc	XRF	484.23	456	
12	BRSD-11 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		456	
12	TP-MS-103(0.5-1.0)	10/24/2012	0.5	1	Zinc	XRF	473.3	446	
12	TP-MS-04(2.0-2.5)	10/4/2012	2	2.5	Zinc	XRF	467.02	440	
12	TP-MS-110(1.0-1.5)	10/30/2012	1	1.5	Zinc	XRF	465.56	439	
12	TP-TS-02(0.6-0.9)	10/15/2012	0.6	0.9	Zinc	XRF	464.39	438	
12	TP-MS-27(1.5-2.0)	10/5/2012	1.5	2	Zinc	XRF	463.43	437	
12	TP-TS-03(0.1-0.2)	10/15/2012	0.1	0.2	Zinc	XRF	459.63	433	
12	TP-MS-12(0.0-0.5)	10/9/2012	0	0.5	Zinc	XRF	440.24	415	
12	TP-MS-08(6.0-6.8)	10/8/2012	6	6.8	Zinc	XRF	433.74	409	
12	TP-MS-110(1.5-2.0)	10/30/2012	1.5	2	Zinc	XRF	428.36	404	
12	UM-1000S-3500E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		396	J
12	TP-MS-08(4.0-5.0)	10/8/2012	4	5	Zinc	XRF	419.67	396	
12	TP-MS-11B(3.0-4.0)	10/9/2012	3	4	Zinc	XRF	419.09	395	
12	TP-MS-12(2.0-3.0)	10/9/2012	2	3	Zinc	XRF	414.49	391	
12	UM-250N-2250E (6-12)	7/18/2008	0.5	1	Zinc	Lab		390	
12	TP-MS-24(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	410.48	387	
12	TP-MS-05(1.2-1.5)	10/3/2012	1.2	1.5	Zinc	XRF	405.75	382	
12	TP-MS-14(0.0-0.2)	10/9/2012	0	0.2	Zinc	XRF	404.1	381	
12	TP-MS-14(2.0-3.5)	10/9/2012	2	3.5	Zinc	XRF	404.09	381	
12	TP-MS-05A(1.2-1.5)	10/3/2012	1.2	1.5	Zinc	XRF	394.57	372	
12	TP-MS-112(1.7-2.5)	10/30/2012	1.7	2.5	Zinc	XRF	383.04	361	
12	TP-MS-06(0.5-1.0)	10/3/2012	0.5	1	Zinc	XRF	381.48	360	
12	TP-MS-05(9.0-9.5)	10/3/2012	9	9.5	Zinc	XRF	374.23	353	
12	BRSD-9 (6-12")	7/16/2008	0.5	1	Zinc	Lab		352	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	2.5	Zinc	Lab		345	
12	TP-MS-06(1.0-1.5)	10/3/2012	1	1.5	Zinc	XRF	352.72	332	
12	TP-MS-17(0.0-0.1)	10/10/2012	0	0.1	Zinc	XRF	339.94	320	
12	UM-500S-3000E (6-12")	10/4/2007	0.5	1	Zinc	Lab		320	J
12	TP-MS-115(1.3-1.5)	10/30/2012	1.3	1.5	Zinc	XRF	338.21	319	
12	BRSD-4 (6-12")	7/16/2008	0.5	1	Zinc	Lab		318	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0.2	Zinc	Lab		312	
12	TP-MS-103(1.0-1.5)	10/24/2012	1	1.5	Zinc	XRF	329.07	310	
12	TP-MS-05(6.0-6.5)	10/3/2012	6	6.5	Zinc	XRF	325.12	306	
12	TP-MS-05(3.3-3.5)	10/3/2012	3.3	3.5	Zinc	XRF	324.43	306	
12	TP-MS-11C(3.0-4.0)	10/9/2012	3	4	Zinc	XRF	323.73	305	
12	BRSD-11 (6-12")	7/17/2008	0.5	1	Zinc	Lab		301	
12	BRSD-9 (2-6")	7/16/2008	0.16666667	0.5	Zinc	Lab		300	
12	TP-MS-09(5.0-6.0)	10/4/2012	5	6	Zinc	XRF	315.51	297	
12	BRSD-11 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		297	
12	UM-0N-1500E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		286	J
12	UM-250N-1750E (2-6)	7/18/2008	0.16666667	0.5	Zinc	Lab		286	
12	TP-MS-14(2.0-3.0)	10/9/2012	2	3	Zinc	XRF	303.26	286	
12	BRSD-15 (6-12")	7/16/2008	0.5	1	Zinc	Lab		282	
12	TP-MS-11B(5.0-5.8)	10/9/2012	5	5.8	Zinc	XRF	297.62	281	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	TP-MS-05(4.0-4.5)	10/3/2012	4	4.5	Zinc	XRF	293.21	276	
12	TP-MS-22(1.0-1.8)	10/9/2012	1	1.8	Zinc	XRF	291.53	275	
12	TP-MS-06(1.6-2.3)	10/3/2012	1.6	2.3	Zinc	XRF	289.79	273	
12	UM-500N-2500E (2-6")	10/3/2007	0.16666667	0.5	Zinc	Lab		272	J
12	UM-500N-2500E (0-2")	10/3/2007	0	0.16666667	Zinc	Lab		270	J
12	TP-MS-11B(4.0-5.0)	10/9/2012	4	5	Zinc	XRF	283.94	268	
12	UM-500S-3000E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		265	J
12	TP-MS-12(1.0-1.5)	10/9/2012	1	1.5	Zinc	XRF	278.75	263	
12	TP-MS-23(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	277.13	261	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Zinc	Lab		261	
12	TP-MS-06(2.5-2.7)	10/3/2012	2.5	2.7	Zinc	XRF	275.78	260	
12	UM-0N-1500E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		255	J
12	TP-MS-16(4.5-5.0)	10/10/2012	4.5	5	Zinc	XRF	268.6	253	
12	UM-250S-2500E (6-12")	10/3/2007	0.5	1	Zinc	Lab		253	J
12	TP-MS-115(1.5-2.0)	10/30/2012	1.5	2	Zinc	XRF	265.33	250	
12	UM-250S-250E (6-12")	10/5/2007	0.5	1	Zinc	Lab		245	J
12	BRSD-15 (2-6")	7/16/2008	0.16666667	0.5	Zinc	Lab		243	
12	TP-MS-15(1.0-2.0)	10/9/2012	1	2	Zinc	XRF	257.39	243	
12	TP-MS-12(1.5-2.0)	10/9/2012	1.5	2	Zinc	XRF	252.79	238	
12	TP-MS-15(2.0-3.0)	10/9/2012	2	3	Zinc	XRF	250.5	236	
12	TP-MS-12(0.5-1.0)	10/9/2012	0.5	1	Zinc	XRF	243.02	229	
12	Tp-Ms-105(2.0-3.0)	11/5/2012	2	3	Zinc	XRF	242.28	228	
12	TP-MS-17(0.0-0.5)	10/10/2012	0	0.5	Zinc	XRF	242.19	228	
12	Tp-Ms-123(2.5-3.0)	11/5/2012	2.5	3	Zinc	XRF	237.78	224	
12	UM-500S-2500E (0-2")	10/3/2007	0	0.16666667	Zinc	Lab		222	J
12	UM-500S-2500E (2-6")	10/3/2007	0.16666667	0.5	Zinc	Lab		220	J
12	UM-0N-500E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		218	J
12	TP-TS-03A(1.8-2.0)	10/15/2012	1.8	2	Zinc	XRF	228.86	216	
12	BRSD-4 (2-6")	7/16/2008	0.16666667	0.5	Zinc	Lab		214	
12	TP-MS-114(0.0-0.3)	10/30/2012	0	0.3	Zinc	XRF	224.57	212	
12	TP-TS-03(1.8-2.0)	10/15/2012	1.8	2	Zinc	XRF	217.42	205	
12	TP-MS-07(7.5-8.5)	10/10/2012	7.5	8.5	Zinc	XRF	215.71	203	
12	TP-MS-114(1.0-1.5)	10/30/2012	1	1.5	Zinc	XRF	214.73	202	
12	TP-MS-17(1.0-2.0)	10/10/2012	1	2	Zinc	XRF	209.2	197	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	3.7	Zinc	Lab		192	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Zinc	Lab		191	
12	UM-500S-2500E (6-12")	10/3/2007	0.5	1	Zinc	Lab		188	J
12	UM-500S-500E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		188	J
12	TP-MS-19(3.0-3.4)	10/4/2012	3	3.4	Zinc	XRF	193.32	182	
12	UM-1000S-3500E (6-12")	10/4/2007	0.5	1	Zinc	Lab		182	J
12	TP-MS-16(3.5-4.5)	10/10/2012	3.5	4.5	Zinc	XRF	192.04	181	
12	BRSD-4 (0-2")	7/16/2008	0	0.16666667	Zinc	Lab		181	
12	TP-MS-108(2.0-2.5)	10/30/2012	2	2.5	Zinc	XRF	191.2	180	
12	TP-MS-07(3.5-4.5)	10/10/2012	3.5	4.5	Zinc	XRF	189.42	179	
12	TP-MS-07(5.5-6.5)	10/10/2012	5.5	6.5	Zinc	XRF	188.85	178	
12	UM-500S-500E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		177	J

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
12	UM-500N-2500E (6-12")	10/3/2007	0.5	1	Zinc	Lab		176	J
12	TP-MS-07(8.5-9.5)	10/10/2012	8.5	9.5	Zinc	XRF	185.87	175	
12	UM-500S-500E (6-12")	10/5/2007	0.5	1	Zinc	Lab		175	J
12	UM-250S-250E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		172	J
12	TP-MS-06(4.5-5.0)	10/3/2012	4.5	5	Zinc	XRF	181.48	171	
12	BRSD-15 (0-2")	7/16/2008	0	0.16666667	Zinc	Lab		167	
12	TP-MS-19(3.4-3.5)	10/4/2012	3.4	3.5	Zinc	XRF	175.98	166	
12	TP-MS-114(0.2-5.5)	10/30/2012	0.2	5.5	Zinc	XRF	170.18	160	
12	TP-MS-17(0.5-1.0)	10/10/2012	0.5	1	Zinc	XRF	164.7	155	
12	TP-MS-07(4.5-5.5)	10/10/2012	4.5	5.5	Zinc	XRF	162.72	153	
12	TP-MS-19(2.0-3.0)	10/3/2012	2	3	Zinc	XRF	162.28	153	
12	BRSD-7 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		148	
12	UM-250S-500E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		148	J
12	UM-250S-1250E (6-12")	7/17/2008	0.5	1	Zinc	Lab		146	
12	UM-250S-1250E (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		140	
12	TP-MS-16(0.5-1.0)	10/10/2012	0.5	1	Zinc	XRF	139.49	131	
12	UM-250S-250E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		131	J
12	UM-250N-1750E (0-2)	7/18/2008	0	0.16666667	Zinc	Lab		126	
12	TP-MS-16(3.0-3.5)	10/10/2012	3	3.5	Zinc	XRF	132.43	125	
12	TP-MS-16(1.7-2.5)	10/10/2012	1.7	2.5	Zinc	XRF	124.98	118	
12	BRSD-7 (6-12")	7/17/2008	0.5	1	Zinc	Lab		116	
12	UM-250S-500E (6-12")	10/5/2007	0.5	1	Zinc	Lab		112	J
12	UM-500S-2000E (2-6")	10/4/2007	0.16666667	0.5	Zinc	Lab		111	J
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	3.5	Zinc	Lab		104	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Zinc	Lab		103	
12	UM-250N-1750E (6-12)	7/18/2008	0.5	1	Zinc	Lab		100	
12	UM-250S-1250E (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		99	
12	UM-250S-500E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		99	J
12	UM-500S-2000E (6-12")	10/4/2007	0.5	1	Zinc	Lab		86	J
12	UM-0N-750E (6-12")	10/5/2007	0.5	1	Zinc	Lab		42	J
12	UM-0N-750E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		41	J
12	UM-500S-2000E (0-2")	10/4/2007	0	0.16666667	Zinc	Lab		41	J
12	TP-MS-07(1.0-2.0)	10/10/2012	1	2	Zinc	XRF	39.07	37	
12	BRSD-6 (6-12")	7/17/2008	0.5	1	Zinc	Lab		35	
12	BRSD-6 (2-6")	7/17/2008	0.16666667	0.5	Zinc	Lab		22	
12	TP-MS-07(0.0-0.5)	10/10/2012	0	0.5	Zinc	XRF	18.73	18	
12	TP-MS-07(0.5-1.0)	10/10/2012	0.5	1	Zinc	XRF	14.19	13	
12	UM-0N-1000E (6-12")	10/5/2007	0.5	1	Zinc	Lab		10	J
12	BRSD-6 (0-2")	7/17/2008	0	0.16666667	Zinc	Lab		8	
12	UM-0N-1000E (2-6")	10/5/2007	0.16666667	0.5	Zinc	Lab		6	J
12	UM-0N-1000E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		4	J
12	UM-0N-750E (0-2")	10/5/2007	0	0.16666667	Zinc	Lab		2	UJ
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Aluminum	Lab		23000	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		22800	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		10200	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		8740	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Aluminum	Lab		8440	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Aluminum	Lab		8400	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		7850	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		7810	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Aluminum	Lab		7690	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		6780	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		5360	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		5130	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		5070	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		4840	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		4710	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		4570	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Aluminum	Lab		4550	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Aluminum	Lab		4230	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Aluminum	Lab		3920	
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Arsenic	Lab		87	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Arsenic	Lab		59	J
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Arsenic	Lab		47	
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Arsenic	Lab		34	
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Arsenic	Lab		31	J
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Arsenic	Lab		27	J
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Arsenic	Lab		26	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Arsenic	Lab		25	J
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Arsenic	Lab		25	J
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Arsenic	Lab		22	
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		21	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		20	
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Arsenic	Lab		19	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Arsenic	Lab		18	
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Arsenic	Lab		18	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		17	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Arsenic	Lab		15	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		15	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		15	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		14	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Arsenic	Lab		14	
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Arsenic	Lab		14	
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		13	
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Arsenic	Lab		13	
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Arsenic	Lab		12	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Arsenic	Lab		11	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Arsenic	Lab		11	
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		10	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		10	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		9	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Arsenic	Lab		9	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Arsenic	Lab		9	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		8	
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		8	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Arsenic	Lab		6	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Arsenic	Lab		6	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		6	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		5	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		5	
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Arsenic	Lab		5	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Arsenic	Lab		4	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		4	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Arsenic	Lab		4	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		4	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Arsenic	Lab		4	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Arsenic	Lab		4	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Arsenic	Lab		3	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Cadmium	Lab		20.3	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		18.2	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Cadmium	Lab		18.1	J
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Cadmium	Lab		16.4	J
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Cadmium	Lab		13.3	
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		10.5	
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Cadmium	Lab		10.5	J
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Cadmium	Lab		10.4	
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Cadmium	Lab		10.0	
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Cadmium	Lab		9.4	
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		8.8	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		8.5	
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Cadmium	Lab		8.3	J
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		8.1	
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Cadmium	Lab		8.0	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		7.5	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Cadmium	Lab		7.0	
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Cadmium	Lab		5.5	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		5.3	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		5.2	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Cadmium	Lab		4.9	
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Cadmium	Lab		4.6	
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Cadmium	Lab		4.4	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Cadmium	Lab		3.9	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		3.5	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Cadmium	Lab		3.1	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Cadmium	Lab		2.8	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Cadmium	Lab		2.0	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		1.9	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Cadmium	Lab		1.9	

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Cadmium	Lab		1.4	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		1.3	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		1.2	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Cadmium	Lab		0.9	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		0.8	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Cadmium	Lab		0.8	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Cadmium	Lab		0.6	J
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.6	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Cadmium	Lab		0.5	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Cadmium	Lab		0.5	U
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Cadmium	Lab		0.5	U
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Copper	Lab		3030	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		2630	
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		620	
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Copper	Lab		404	J
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		372	
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Copper	Lab		334	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Copper	Lab		322	J
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Copper	Lab		320	J
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		319	
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Copper	Lab		298	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Copper	Lab		283	J
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Copper	Lab		268	
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Copper	Lab		262	J
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		262	
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Copper	Lab		253	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		251	
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Copper	Lab		247	
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Copper	Lab		244	
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		234	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Copper	Lab		231	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		214	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		193	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Copper	Lab		192	
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Copper	Lab		181	
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Copper	Lab		178	
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Copper	Lab		158	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		145	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Copper	Lab		140	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Copper	Lab		130	

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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Copper	Lab		127	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Copper	Lab		103	
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Copper	Lab		84	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		79	
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Copper	Lab		71	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Copper	Lab		51	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		47	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Copper	Lab		41	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Copper	Lab		41	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Copper	Lab		40	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Copper	Lab		39	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Copper	Lab		36	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Copper	Lab		35	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Copper	Lab		34	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Copper	Lab		30	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Copper	Lab		30	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Copper	Lab		28	
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Copper	Lab		27	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Iron	Lab		35800	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		35400	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		29600	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		28500	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Iron	Lab		27000	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		25800	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		24600	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Iron	Lab		23600	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		22200	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Iron	Lab		20000	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Iron	Lab		16300	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Iron	Lab		14600	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Iron	Lab		14400	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		13300	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Iron	Lab		13100	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Iron	Lab		12500	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Iron	Lab		11800	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Iron	Lab		11400	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Iron	Lab		9650	
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Lead	Lab		1500	J
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Lead	Lab		1330	J
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		716	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Lead	Lab		578	J
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Lead	Lab		542	J
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Lead	Lab		530	
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Lead	Lab		502	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		502	
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Lead	Lab		474	

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Baseline Human Health Risk Assessment
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EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		409	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Lead	Lab		395	J
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Lead	Lab		395	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Lead	Lab		352	
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		351	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Lead	Lab		293	
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		244	
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Lead	Lab		235	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		198	
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Lead	Lab		187	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Lead	Lab		184	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		177	
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		161	
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Lead	Lab		154	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Lead	Lab		138	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Lead	Lab		135	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		131	
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Lead	Lab		120	
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Lead	Lab		101	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Lead	Lab		69	
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Lead	Lab		69	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Lead	Lab		67	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		60	
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Lead	Lab		56	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Lead	Lab		32	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		31	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		29	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Lead	Lab		29	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Lead	Lab		28	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Lead	Lab		21	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Lead	Lab		20	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Lead	Lab		18	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Lead	Lab		17	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Lead	Lab		14	
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Lead	Lab		13	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Lead	Lab		11	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Lead	Lab		11	
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Lead	Lab		8	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Manganese	Lab		11300	
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		10100	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Manganese	Lab		4380	J
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Manganese	Lab		3900	J
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Manganese	Lab		3760	
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Manganese	Lab		3450	J
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Manganese	Lab		3140	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		3080	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Manganese	Lab		2770	
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		2580	
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Manganese	Lab		2540	
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		2540	
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		2360	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Manganese	Lab		2280	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Manganese	Lab		2250	
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		2060	
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Manganese	Lab		1960	J
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Manganese	Lab		1830	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		1500	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		1390	
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Manganese	Lab		1300	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		1270	
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Manganese	Lab		1200	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Manganese	Lab		1190	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Manganese	Lab		1160	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Manganese	Lab		992	
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Manganese	Lab		979	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Manganese	Lab		934	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Manganese	Lab		767	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		750	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		749	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		589	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		555	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Manganese	Lab		511	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		396	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Manganese	Lab		336	J
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		311	
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Manganese	Lab		293	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		259	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		247	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Manganese	Lab		218	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Manganese	Lab		203	
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Manganese	Lab		55	
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Manganese	Lab		55	
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Manganese	Lab		43	
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Manganese	Lab		31	
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Manganese	Lab		8	
13	BRSW-9 SE (2007) (0-2)	10/9/2007	0	0.16666667	Zinc	Lab		4810	J
13	BRSW-36 SE (2007) (0-2)	10/9/2007	0	0.16666667	Zinc	Lab		3540	J
13	BRSW-109 SE (2007) (0-2)	10/9/2007	0	0.16666667	Zinc	Lab		3240	J
13	BRSW-104 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		2370	
13	BRSW-104 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Zinc	Lab		2350	
13	BRSW-107 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		2350	
13	BRSW-12 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Zinc	Lab		2350	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-105 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		2010	
13	BRSW-12 SE (2007) (0-2)	10/5/2007	0	0.16666667	Zinc	Lab		2000	
13	BRSW-12 SE (2007) (6-12)	10/5/2007	0.5	1	Zinc	Lab		1890	
13	BRSW-105 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Zinc	Lab		1880	
13	BRSW-104 SE (2007) (0-2)	10/3/2007	0	0.16666667	Zinc	Lab		1850	
13	BRSW-31 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		1710	
13	BRSW-33 SE (2007) (0-2)	10/9/2007	0	0.16666667	Zinc	Lab		1670	J
13	BRSW-105 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		1660	
13	BRSW-31 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		1650	
13	BRSW-105 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Zinc	Lab		1560	
13	BRSW-16 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		1230	
13	BRSW-106 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		1180	
13	BRSW-106 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Zinc	Lab		1120	
13	BRSW-110 SE (2007) (2-6)	10/4/2007	0.16666667	0.5	Zinc	Lab		994	
13	BRSW-17 SE (2007) (0-2)	10/3/2007	0	0.16666667	Zinc	Lab		936	
13	BRSW-110 SE (2007) (6-12)	10/4/2007	0.5	1	Zinc	Lab		908	
13	BRSW-106 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		878	
13	BRSW-110 SE (2007) (0-2)	10/4/2007	0	0.16666667	Zinc	Lab		865	
13	BRSW-106 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Zinc	Lab		852	
13	BRSW-107 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		782	
13	BRSW-102 SE (2007) (0-2)	10/3/2007	0	0.16666667	Zinc	Lab		660	
13	BRSW-101 SE (2007) (0-2)	10/3/2007	0	0.16666667	Zinc	Lab		612	
13	BRSW-206 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		534	
13	BRSW-16 SE (2008) (0-2)	6/17/2008	0	0.16666667	Zinc	Lab		516	
13	BRSW-102 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		481	
13	BRSW-101 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		396	
13	BRSW-102 SE (2008) (2-6)	6/16/2008	0.16666667	0.5	Zinc	Lab		361	
13	BRSW-13 SE (2007) (6-12)	10/5/2007	0.5	1	Zinc	Lab		275	
13	BRSW-103 SE (2007) (0-2)	10/3/2007	0	0.16666667	Zinc	Lab		225	
13	BRSW-205 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		202	
13	BRSW-108 SE (2007) (0-2)	10/10/2007	0	0.16666667	Zinc	Lab		194	J
13	BRSW-201 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		150	
13	BRSW-202 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		146	
13	BRSW-203 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		126	
13	BRSW-204 (2011)	11/9/2011	0	0.16666667	Zinc	Lab		125	
13	BRSW-13 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Zinc	Lab		122	

TABLE F-3: ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Original Result (a)	Final Result (a)	Qualifier
13	BRSW-103 SE (2008) (0-2)	6/16/2008	0	0.16666667	Zinc	Lab		119	
13	BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Zinc	Lab		49	
13	BRSW-13 SE (2007) (0-2)	10/5/2007	0	0.16666667	Zinc	Lab		15	
13	BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Zinc	Lab		9	

Notes:

All concentrations are in units of milligrams per kilogram.

(a) XRF results were converted to laboratory-equivalent results using correlations developed for XRF and laboratory results. See Tables F-10, F-11, and F-12 for data used to develop conversion factors, and figures F-1, F-2, and F-3 for correlation plots.

-- Not applicable - no conversions were performed for laboratory data. The final result is the original result.

bgs Below ground surface

EU Exposure Unit

HHRA Human Health Risk Assessment

ID Identification Number

Lab Laboratory analysis

J Estimated concentration

U Nondetected concentration

UJ Estimated nondetected concentration

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
ANMW-7 (2007)	10/12/2007	Aluminum	Lab	0.04	BJ
ANMW-7 (2008)	7/9/2008	Aluminum	Lab	0.03	U
ANWS-1 (2007)	10/12/2007	Aluminum	Lab	0.03	U
ANWS-1 (2008)	7/8/2008	Aluminum	Lab	0.03	U
BCGW-115 (2007)	10/26/2007	Aluminum	Lab	0.04	
BCGW-115 (2008)	7/9/2008	Aluminum	Lab	0.03	U
BCGW-116 (2008)	7/31/2008	Aluminum	Lab	0.03	U
BCMW-10 (2007)	10/17/2007	Aluminum	Lab	0.65	
BCMW-10 (2008)	7/7/2008	Aluminum	Lab	0.66	
BRGW-101 (2007)	10/16/2007	Aluminum	Lab	0.03	U
BRGW-101 (2008)	7/11/2008	Aluminum	Lab	0.03	U
BRGW-110 (2007)	10/18/2007	Aluminum	Lab	0.04	
BRGW-110 (2008)	7/9/2008	Aluminum	Lab	0.03	U
EDGW-105 (2007)	10/17/2007	Aluminum	Lab	1.91	
EDGW-105 (2008)	7/10/2008	Aluminum	Lab	3.58	
EDMW-2 (2007)	10/17/2007	Aluminum	Lab	0.03	U
EDMW-2 (2008)	7/10/2008	Aluminum	Lab	0.03	U
EDP-2 (2007)	10/17/2007	Aluminum	Lab	3.73	
EDP-2 (2008)	7/10/2008	Aluminum	Lab	4.2	
LCMW-1 (2007)	10/16/2007	Aluminum	Lab	0.03	U
LCMW-1 (2008)	7/11/2008	Aluminum	Lab	0.03	U
LCMW-12D (2007)	10/16/2007	Aluminum	Lab	0.03	U
LCMW-12D (2008)	7/11/2008	Aluminum	Lab	0.03	U
LCMW-12S (2007)	10/16/2007	Aluminum	Lab	0.03	U
LCMW-12S (2008)	7/15/2008	Aluminum	Lab	0.03	U
LCMW-5 (2007)	10/16/2007	Aluminum	Lab	1.83	
LCMW-5 (2008)	7/10/2008	Aluminum	Lab	3.22	
MHGW-109 (2007)	10/12/2007	Aluminum	Lab	0.03	U
MHGW-109 (2008)	7/8/2008	Aluminum	Lab	0.13	
MHGW-112 (2007)	10/26/2007	Aluminum	Lab	0.03	U
MHGW-112 (2008)	7/8/2008	Aluminum	Lab	0.03	U
MHGW-113 (2007)	10/26/2007	Aluminum	Lab	0.18	
MHGW-113 (2008)	7/8/2008	Aluminum	Lab	0.03	U
MHMW-8 (2007)	10/12/2007	Aluminum	Lab	0.03	U
MHMW-8 (2008)	7/8/2008	Aluminum	Lab	0.03	U
MPP-4 (2007)	10/18/2007	Aluminum	Lab	0.29	
MPP-4 (2008A)	7/9/2008	Aluminum	Lab	1.21	
MPP-4 (2008B)	7/29/2008	Aluminum	Lab	1.15	
MW-1 (2007)	10/11/2007	Aluminum	Lab	0.03	U
MW-1 (2008)	7/7/2008	Aluminum	Lab	0.03	U
PDGW101 (2008)	7/31/2008	Aluminum	Lab	3.47	
PDGW102 (2008)	7/31/2008	Aluminum	Lab	6.63	
PGPZ-1 (2008)	7/16/2008	Aluminum	Lab	0.03	U
PMGW-116 (2007)	10/25/2007	Aluminum	Lab	0.03	U
PMGW-116 (2008)	7/14/2008	Aluminum	Lab	0.03	U
PMGW-117 (2007)	10/25/2007	Aluminum	Lab	2.74	
PMGW-117 (2008)	7/14/2008	Aluminum	Lab	5.31	
PMGW-118 (2007)	10/18/2007	Aluminum	Lab	0.29	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
PMGW-118 (2008)	7/14/2008	Aluminum	Lab	0.03	U
PMGW-119 (2007)	10/18/2007	Aluminum	Lab	0.53	
PMGW-119 (2008)	7/14/2008	Aluminum	Lab	4	
PMGW-120 (2007)	10/15/2007	Aluminum	Lab	11.64	
PMGW-120 (2008)	7/15/2008	Aluminum	Lab	15.24	
PMMW-13 (2007)	10/16/2007	Aluminum	Lab	3.05	
PMMW-13 (2008)	7/14/2008	Aluminum	Lab	3.55	
PMMW-14 (2007)	10/15/2007	Aluminum	Lab	0.22	
PMMW-14 (2008)	7/14/2008	Aluminum	Lab	0.25	
PMMW-15 (2007)	10/15/2007	Aluminum	Lab	0.03	
PMMW-15 (2008)	7/15/2008	Aluminum	Lab	0.03	U
PMPZ-3 (2008)	7/7/2008	Aluminum	Lab	3.93	
SGGW-101 (2007)	10/15/2007	Aluminum	Lab	1.72	
SGGW-101 (2008)	7/10/2008	Aluminum	Lab	1.73	
SGGW-102 (2007)	10/15/2007	Aluminum	Lab	0.21	
SGGW-102 (2008)	7/9/2008	Aluminum	Lab	0.19	
UCMW-11 (2007)	10/17/2007	Aluminum	Lab	0.14	
UCMW-11 (2008)	7/7/2008	Aluminum	Lab	21.06	
UMHMW-1D (2007)	10/11/2007	Aluminum	Lab	0.03	U
UMHMW-1D (2008)	7/9/2008	Aluminum	Lab	0.03	U
UMHMW-1S (2008)	7/9/2008	Aluminum	Lab	58.52	
UMHMW-2D (2007)	10/11/2007	Aluminum	Lab	0.03	U
UMHMW-2D (2008)	7/9/2008	Aluminum	Lab	0.03	U
UMHMW-2S (2007)	10/11/2007	Aluminum	Lab	54.55	
UMHMW-2S (2008)	7/9/2008	Aluminum	Lab	21.58	
UMHMW-3 (2007)	10/12/2007	Aluminum	Lab	0.03	U
UMHMW-3 (2008)	7/8/2008	Aluminum	Lab	0	U
UMPZ-1 (2008)	7/15/2008	Aluminum	Lab	0	U
UMPZ-2 (2008)	7/15/2008	Aluminum	Lab	0.03	U
UMPZ-3 (2008)	7/15/2008	Aluminum	Lab	0.03	
UMPZ-4 (2008)	7/15/2008	Aluminum	Lab	0.03	U
UMPZ-5 (2008)	7/15/2008	Aluminum	Lab	0.85	
ANMW-7 (2007)	10/12/2007	Arsenic	Lab	0.002	U
ANMW-7 (2008)	7/9/2008	Arsenic	Lab	0.002	U
ANWS-1 (2007)	10/12/2007	Arsenic	Lab	0.002	U
ANWS-1 (2008)	7/8/2008	Arsenic	Lab	0.002	U
BCGW-115 (2007)	10/26/2007	Arsenic	Lab	0.002	U
BCGW-115 (2008)	7/9/2008	Arsenic	Lab	0.002	U
BCGW-116 (2008)	7/31/2008	Arsenic	Lab	0.002	U
BCMW-10 (2007)	10/17/2007	Arsenic	Lab	0.002	U
BCMW-10 (2008)	7/7/2008	Arsenic	Lab	0.002	U
BRGW-101 (2007)	10/16/2007	Arsenic	Lab	0.002	U
BRGW-101 (2008)	7/11/2008	Arsenic	Lab	0.002	U
BRGW-110 (2007)	10/18/2007	Arsenic	Lab	0.002	U
BRGW-110 (2008)	7/9/2008	Arsenic	Lab	0.002	U
EDGW-105 (2007)	10/17/2007	Arsenic	Lab	0.002	U
EDGW-105 (2008)	7/10/2008	Arsenic	Lab	0.002	U
EDMW-2 (2007)	10/17/2007	Arsenic	Lab	0.002	U

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
EDMW-2 (2008)	7/10/2008	Arsenic	Lab	0.002	U
EDP-2 (2007)	10/17/2007	Arsenic	Lab	0.002	U
EDP-2 (2008)	7/10/2008	Arsenic	Lab	0.002	U
LCMW-1 (2007)	10/16/2007	Arsenic	Lab	0.002	U
LCMW-1 (2008)	7/11/2008	Arsenic	Lab	0.002	U
LCMW-12D (2007)	10/16/2007	Arsenic	Lab	0.002	U
LCMW-12D (2008)	7/11/2008	Arsenic	Lab	0.002	U
LCMW-12S (2007)	10/16/2007	Arsenic	Lab	0.004	
LCMW-12S (2008)	7/15/2008	Arsenic	Lab	0.004	
LCMW-5 (2007)	10/16/2007	Arsenic	Lab	0.002	U
LCMW-5 (2008)	7/10/2008	Arsenic	Lab	0.002	U
MHGW-109 (2007)	10/12/2007	Arsenic	Lab	0.002	U
MHGW-109 (2008)	7/8/2008	Arsenic	Lab	0.002	U
MHGW-112 (2007)	10/26/2007	Arsenic	Lab	0	U
MHGW-112 (2008)	7/8/2008	Arsenic	Lab	0.002	U
MHGW-113 (2007)	10/26/2007	Arsenic	Lab	0.002	U
MHGW-113 (2008)	7/8/2008	Arsenic	Lab	0.002	U
MHMW-8 (2007)	10/12/2007	Arsenic	Lab	0.002	U
MHMW-8 (2008)	7/8/2008	Arsenic	Lab	0.002	U
MPP-4 (2007)	10/18/2007	Arsenic	Lab	0	U
MPP-4 (2008A)	7/9/2008	Arsenic	Lab	0	U
MPP-4 (2008B)	7/29/2008	Arsenic	Lab	0	U
MW-1 (2007)	10/11/2007	Arsenic	Lab	0.002	U
MW-1 (2008)	7/7/2008	Arsenic	Lab	0.004	
PDGW101 (2008)	7/31/2008	Arsenic	Lab	0.002	U
PDGW102 (2008)	7/31/2008	Arsenic	Lab	0.003	
PGPZ-1 (2008)	7/16/2008	Arsenic	Lab	0.04	
PMGW-116 (2007)	10/25/2007	Arsenic	Lab	0.002	U
PMGW-116 (2008)	7/14/2008	Arsenic	Lab	0.002	U
PMGW-117 (2007)	10/25/2007	Arsenic	Lab	0.002	U
PMGW-117 (2008)	7/14/2008	Arsenic	Lab	0.0002	U
PMGW-118 (2007)	10/18/2007	Arsenic	Lab	0.002	U
PMGW-118 (2008)	7/14/2008	Arsenic	Lab	0.002	U
PMGW-119 (2007)	10/18/2007	Arsenic	Lab	0.002	U
PMGW-119 (2008)	7/14/2008	Arsenic	Lab	0.002	U
PMGW-120 (2007)	10/15/2007	Arsenic	Lab	0.002	U
PMGW-120 (2008)	7/15/2008	Arsenic	Lab	0.002	U
PMMW-13 (2007)	10/16/2007	Arsenic	Lab	0.002	U
PMMW-13 (2008)	7/14/2008	Arsenic	Lab	0.002	U
PMMW-14 (2007)	10/15/2007	Arsenic	Lab	0.002	U
PMMW-14 (2008)	7/14/2008	Arsenic	Lab	0.002	U
PMMW-15 (2007)	10/15/2007	Arsenic	Lab	0.002	U
PMMW-15 (2008)	7/15/2008	Arsenic	Lab	0	U
PMPZ-3 (2008)	7/7/2008	Arsenic	Lab	0	U
SGGW-101 (2007)	10/15/2007	Arsenic	Lab	0.002	U
SGGW-101 (2008)	7/10/2008	Arsenic	Lab	0.002	U
SGGW-102 (2007)	10/15/2007	Arsenic	Lab	0.002	U
SGGW-102 (2008)	7/9/2008	Arsenic	Lab	0.002	U

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
UCMW-11 (2007)	10/17/2007	Arsenic	Lab	0	U
UCMW-11 (2008)	7/7/2008	Arsenic	Lab	0.002	U
UMHMW-1D (2007)	10/11/2007	Arsenic	Lab	0.01	
UMHMW-1D (2008)	7/9/2008	Arsenic	Lab	0.002	U
UMHMW-1S (2008)	7/9/2008	Arsenic	Lab	0.01	
UMHMW-2D (2007)	10/11/2007	Arsenic	Lab	0.008	
UMHMW-2D (2008)	7/9/2008	Arsenic	Lab	0	
UMHMW-2S (2007)	10/11/2007	Arsenic	Lab	0.003	
UMHMW-2S (2008)	7/9/2008	Arsenic	Lab	0.005	
UMHMW-3 (2007)	10/12/2007	Arsenic	Lab	0.002	U
UMHMW-3 (2008)	7/8/2008	Arsenic	Lab	0.002	U
UMPZ-1 (2008)	7/15/2008	Arsenic	Lab	0.002	U
UMPZ-2 (2008)	7/15/2008	Arsenic	Lab	0.002	U
UMPZ-3 (2008)	7/15/2008	Arsenic	Lab	0.011	
UMPZ-4 (2008)	7/15/2008	Arsenic	Lab	0.002	U
UMPZ-5 (2008)	7/15/2008	Arsenic	Lab	0.002	U
ANMW-7 (2007)	10/12/2007	Cadmium	Lab	0.00241	
ANMW-7 (2008)	7/9/2008	Cadmium	Lab	0.00095	
ANWS-1 (2007)	10/12/2007	Cadmium	Lab	0.00009	
ANWS-1 (2008)	7/8/2008	Cadmium	Lab	0.00008	U
BCGW-115 (2007)	10/26/2007	Cadmium	Lab	0.00018	
BCGW-115 (2008)	7/9/2008	Cadmium	Lab	0.00018	
BCGW-116 (2008)	7/31/2008	Cadmium	Lab	0.00008	U
BCMW-10 (2007)	10/17/2007	Cadmium	Lab	0.08425	
BCMW-10 (2008)	7/7/2008	Cadmium	Lab	0.08954	
BRGW-101 (2007)	10/16/2007	Cadmium	Lab	0.00008	U
BRGW-101 (2008)	7/11/2008	Cadmium	Lab	0.00008	U
BRGW-110 (2007)	10/18/2007	Cadmium	Lab	0.0003	
BRGW-110 (2008)	7/9/2008	Cadmium	Lab	0.00028	
EDGW-105 (2007)	10/17/2007	Cadmium	Lab	0.00071	
EDGW-105 (2008)	7/10/2008	Cadmium	Lab	0.00065	
EDMW-2 (2007)	10/17/2007	Cadmium	Lab	0.00039	
EDMW-2 (2008)	7/10/2008	Cadmium	Lab	0.00046	
EDP-2 (2007)	10/17/2007	Cadmium	Lab	0.00115	
EDP-2 (2008)	7/10/2008	Cadmium	Lab	0.00122	
LCMW-1 (2007)	10/16/2007	Cadmium	Lab	0.00965	
LCMW-1 (2008)	7/11/2008	Cadmium	Lab	0.00325	
LCMW-12D (2007)	10/16/2007	Cadmium	Lab	0.01923	
LCMW-12D (2008)	7/11/2008	Cadmium	Lab	0.00576	
LCMW-12S (2007)	10/16/2007	Cadmium	Lab	0.00009	
LCMW-12S (2008)	7/15/2008	Cadmium	Lab	0.00008	U
LCMW-5 (2007)	10/16/2007	Cadmium	Lab	0.1562	
LCMW-5 (2008)	7/10/2008	Cadmium	Lab	0.1775	
MHGW-109 (2007)	10/12/2007	Cadmium	Lab	0.03074	
MHGW-109 (2008)	7/8/2008	Cadmium	Lab	0.05209	
MHGW-112 (2007)	10/26/2007	Cadmium	Lab	0.00957	
MHGW-112 (2008)	7/8/2008	Cadmium	Lab	0.0073	
MHGW-113 (2007)	10/26/2007	Cadmium	Lab	0.00008	U

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
MHGW-113 (2008)	7/8/2008	Cadmium	Lab	0.00008	U
MHMW-8 (2007)	10/12/2007	Cadmium	Lab	0.06788	
MHMW-8 (2008)	7/8/2008	Cadmium	Lab	0.0669	
MPP-4 (2007)	10/18/2007	Cadmium	Lab	0.00254	
MPP-4 (2008A)	7/9/2008	Cadmium	Lab	0.00338	
MPP-4 (2008B)	7/29/2008	Cadmium	Lab	0.00298	
MW-1 (2007)	10/11/2007	Cadmium	Lab	0.0002	
MW-1 (2008)	7/7/2008	Cadmium	Lab	0.00041	
PDGW101 (2008)	7/31/2008	Cadmium	Lab	0.0014	
PDGW102 (2008)	7/31/2008	Cadmium	Lab	0.00008	U
PGPZ-1 (2008)	7/16/2008	Cadmium	Lab	0.00008	U
PMGW-116 (2007)	10/25/2007	Cadmium	Lab	0.00263	
PMGW-116 (2008)	7/14/2008	Cadmium	Lab	0.00222	
PMGW-117 (2007)	10/25/2007	Cadmium	Lab	0.00562	
PMGW-117 (2008)	7/14/2008	Cadmium	Lab	0.00431	
PMGW-118 (2007)	10/18/2007	Cadmium	Lab	0.0022	
PMGW-118 (2008)	7/14/2008	Cadmium	Lab	0.00008	U
PMGW-119 (2007)	10/18/2007	Cadmium	Lab	0.00175	
PMGW-119 (2008)	7/14/2008	Cadmium	Lab	0.00372	
PMGW-120 (2007)	10/15/2007	Cadmium	Lab	0.00102	J
PMGW-120 (2008)	7/15/2008	Cadmium	Lab	0.00103	
PMMW-13 (2007)	10/16/2007	Cadmium	Lab	0.00512	
PMMW-13 (2008)	7/14/2008	Cadmium	Lab	0.00482	
PMMW-14 (2007)	10/15/2007	Cadmium	Lab	0.00104	J
PMMW-14 (2008)	7/14/2008	Cadmium	Lab	0.00134	
PMMW-15 (2007)	10/15/2007	Cadmium	Lab	0.00008	J
PMMW-15 (2008)	7/15/2008	Cadmium	Lab	0.00008	U
PMPZ-3 (2008)	7/7/2008	Cadmium	Lab	0.00053	
SGGW-101 (2007)	10/15/2007	Cadmium	Lab	0	J
SGGW-101 (2008)	7/10/2008	Cadmium	Lab	0.00053	
SGGW-102 (2007)	10/15/2007	Cadmium	Lab	0.00174	J
SGGW-102 (2008)	7/9/2008	Cadmium	Lab	0.00132	
UCMW-11 (2007)	10/17/2007	Cadmium	Lab	0.00008	U
UCMW-11 (2008)	7/7/2008	Cadmium	Lab	0.04187	
UMHMW-1D (2007)	10/11/2007	Cadmium	Lab	0.01535	
UMHMW-1D (2008)	7/9/2008	Cadmium	Lab	0.01552	
UMHMW-1S (2008)	7/9/2008	Cadmium	Lab	1.061	
UMHMW-2D (2007)	10/11/2007	Cadmium	Lab	0.2139	
UMHMW-2D (2008)	7/9/2008	Cadmium	Lab	0.2491	
UMHMW-2S (2007)	10/11/2007	Cadmium	Lab	1.209	
UMHMW-2S (2008)	7/9/2008	Cadmium	Lab	0.6406	
UMHMW-3 (2007)	10/12/2007	Cadmium	Lab	0.00043	
UMHMW-3 (2008)	7/8/2008	Cadmium	Lab	0.00036	
UMPZ-1 (2008)	7/15/2008	Cadmium	Lab	0.00955	
UMPZ-2 (2008)	7/15/2008	Cadmium	Lab	0.00008	U
UMPZ-3 (2008)	7/15/2008	Cadmium	Lab	0.00008	U
UMPZ-4 (2008)	7/15/2008	Cadmium	Lab	0.00191	
UMPZ-5 (2008)	7/15/2008	Cadmium	Lab	0.00009	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
ANMW-7 (2007)	10/12/2007	Copper	Lab	0.069	
ANMW-7 (2008)	7/9/2008	Copper	Lab	0.021	
ANWS-1 (2007)	10/12/2007	Copper	Lab	0.001	U
ANWS-1 (2008)	7/8/2008	Copper	Lab	0.001	U
BCGW-115 (2007)	10/26/2007	Copper	Lab	0.001	U
BCGW-115 (2008)	7/9/2008	Copper	Lab	0.001	U
BCGW-116 (2008)	7/31/2008	Copper	Lab	0.001	U
BCMW-10 (2007)	10/17/2007	Copper	Lab	0.176	
BCMW-10 (2008)	7/7/2008	Copper	Lab	0	
BRGW-101 (2007)	10/16/2007	Copper	Lab	0	U
BRGW-101 (2008)	7/11/2008	Copper	Lab	0.001	U
BRGW-110 (2007)	10/18/2007	Copper	Lab	0.003	
BRGW-110 (2008)	7/9/2008	Copper	Lab	0.052	
EDGW-105 (2007)	10/17/2007	Copper	Lab	0.463	
EDGW-105 (2008)	7/10/2008	Copper	Lab	0.555	
EDMW-2 (2007)	10/17/2007	Copper	Lab	0.002	
EDMW-2 (2008)	7/10/2008	Copper	Lab	0.002	
EDP-2 (2007)	10/17/2007	Copper	Lab	0.117	
EDP-2 (2008)	7/10/2008	Copper	Lab	0.118	
LCMW-1 (2007)	10/16/2007	Copper	Lab	0.019	
LCMW-1 (2008)	7/11/2008	Copper	Lab	0.02	
LCMW-12D (2007)	10/16/2007	Copper	Lab	0.029	
LCMW-12D (2008)	7/11/2008	Copper	Lab	0.004	
LCMW-12S (2007)	10/16/2007	Copper	Lab	0.001	U
LCMW-12S (2008)	7/15/2008	Copper	Lab	0.001	U
LCMW-5 (2007)	10/16/2007	Copper	Lab	0.761	
LCMW-5 (2008)	7/10/2008	Copper	Lab	1.375	
MHGW-109 (2007)	10/12/2007	Copper	Lab	0.042	
MHGW-109 (2008)	7/8/2008	Copper	Lab	0.136	
MHGW-112 (2007)	10/26/2007	Copper	Lab	0.002	
MHGW-112 (2008)	7/8/2008	Copper	Lab	0.002	
MHGW-113 (2007)	10/26/2007	Copper	Lab	0.001	U
MHGW-113 (2008)	7/8/2008	Copper	Lab	0	U
MHMW-8 (2007)	10/12/2007	Copper	Lab	0.05	
MHMW-8 (2008)	7/8/2008	Copper	Lab	0.046	
MPP-4 (2007)	10/18/2007	Copper	Lab	0.07	
MPP-4 (2008A)	7/9/2008	Copper	Lab	0.104	
MPP-4 (2008B)	7/29/2008	Copper	Lab	0.108	
MW-1 (2007)	10/11/2007	Copper	Lab	0.001	
MW-1 (2008)	7/7/2008	Copper	Lab	0.001	
PDGW101 (2008)	7/31/2008	Copper	Lab	0.08	
PDGW102 (2008)	7/31/2008	Copper	Lab	0.275	
PGPZ-1 (2008)	7/16/2008	Copper	Lab	0.001	U
PMGW-116 (2007)	10/25/2007	Copper	Lab	0.004	
PMGW-116 (2008)	7/14/2008	Copper	Lab	0.003	
PMGW-117 (2007)	10/25/2007	Copper	Lab	0.895	
PMGW-117 (2008)	7/14/2008	Copper	Lab	1.029	
PMGW-118 (2007)	10/18/2007	Copper	Lab	0.127	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
PMGW-118 (2008)	7/14/2008	Copper	Lab	0.001	U
PMGW-119 (2007)	10/18/2007	Copper	Lab	2.866	
PMGW-119 (2008)	7/14/2008	Copper	Lab	0.64	
PMGW-120 (2007)	10/15/2007	Copper	Lab	1.666	
PMGW-120 (2008)	7/15/2008	Copper	Lab	1.222	
PMMW-13 (2007)	10/16/2007	Copper	Lab	0	
PMMW-13 (2008)	7/14/2008	Copper	Lab	0.397	
PMMW-14 (2007)	10/15/2007	Copper	Lab	0.1	
PMMW-14 (2008)	7/14/2008	Copper	Lab	0.186	
PMMW-15 (2007)	10/15/2007	Copper	Lab	0.034	
PMMW-15 (2008)	7/15/2008	Copper	Lab	0.001	
PMPZ-3 (2008)	7/7/2008	Copper	Lab	0.002	
SGGW-101 (2007)	10/15/2007	Copper	Lab	0	
SGGW-101 (2008)	7/10/2008	Copper	Lab	0	
SGGW-102 (2007)	10/15/2007	Copper	Lab	0	
SGGW-102 (2008)	7/9/2008	Copper	Lab	0.104	
UCMW-11 (2007)	10/17/2007	Copper	Lab	0.002	
UCMW-11 (2008)	7/7/2008	Copper	Lab	0.004	
UMHMW-1D (2007)	10/11/2007	Copper	Lab	0.006	
UMHMW-1D (2008)	7/9/2008	Copper	Lab	0.02	
UMHMW-1S (2008)	7/9/2008	Copper	Lab	46.5	
UMHMW-2D (2007)	10/11/2007	Copper	Lab	0.037	
UMHMW-2D (2008)	7/9/2008	Copper	Lab	0.023	
UMHMW-2S (2007)	10/11/2007	Copper	Lab	50.4	
UMHMW-2S (2008)	7/9/2008	Copper	Lab	27.38	
UMHMW-3 (2007)	10/12/2007	Copper	Lab	0.005	
UMHMW-3 (2008)	7/8/2008	Copper	Lab	0.002	
UMPZ-1 (2008)	7/15/2008	Copper	Lab	0.003	
UMPZ-2 (2008)	7/15/2008	Copper	Lab	0.001	U
UMPZ-3 (2008)	7/15/2008	Copper	Lab	0.002	
UMPZ-4 (2008)	7/15/2008	Copper	Lab	0.001	
UMPZ-5 (2008)	7/15/2008	Copper	Lab	0.002	
ANMW-7 (2007)	10/12/2007	Iron	Lab	0.03	U
ANMW-7 (2008)	7/9/2008	Iron	Lab	0.03	U
ANWS-1 (2007)	10/12/2007	Iron	Lab	0.07	
ANWS-1 (2008)	7/8/2008	Iron	Lab	0	
BCGW-115 (2007)	10/26/2007	Iron	Lab	0	U
BCGW-115 (2008)	7/9/2008	Iron	Lab	0.03	U
BCGW-116 (2008)	7/31/2008	Iron	Lab	0.03	U
BCMW-10 (2007)	10/17/2007	Iron	Lab	0.03	U
BCMW-10 (2008)	7/7/2008	Iron	Lab	0.03	U
BRGW-101 (2007)	10/16/2007	Iron	Lab	0.25	
BRGW-101 (2008)	7/11/2008	Iron	Lab	1	
BRGW-110 (2007)	10/18/2007	Iron	Lab	0	
BRGW-110 (2008)	7/9/2008	Iron	Lab	0.03	U
EDGW-105 (2007)	10/17/2007	Iron	Lab	10.83	
EDGW-105 (2008)	7/10/2008	Iron	Lab	9.41	
EDMW-2 (2007)	10/17/2007	Iron	Lab	1.84	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
EDMW-2 (2008)	7/10/2008	Iron	Lab	1.24	
EDP-2 (2007)	10/17/2007	Iron	Lab	23.98	
EDP-2 (2008)	7/10/2008	Iron	Lab	24.15	
LCMW-1 (2007)	10/16/2007	Iron	Lab	0.04	BJ
LCMW-1 (2008)	7/11/2008	Iron	Lab	0	
LCMW-12D (2007)	10/16/2007	Iron	Lab	43.8	
LCMW-12D (2008)	7/11/2008	Iron	Lab	10.16	
LCMW-12S (2007)	10/16/2007	Iron	Lab	45.23	
LCMW-12S (2008)	7/15/2008	Iron	Lab	46.99	
LCMW-5 (2007)	10/16/2007	Iron	Lab	15.79	
LCMW-5 (2008)	7/10/2008	Iron	Lab	6.52	
MHGW-109 (2007)	10/12/2007	Iron	Lab	0.03	
MHGW-109 (2008)	7/8/2008	Iron	Lab	0.03	U
MHGW-112 (2007)	10/26/2007	Iron	Lab	0.03	U
MHGW-112 (2008)	7/8/2008	Iron	Lab	0.03	U
MHGW-113 (2007)	10/26/2007	Iron	Lab	0.03	U
MHGW-113 (2008)	7/8/2008	Iron	Lab	0.03	U
MHMW-8 (2007)	10/12/2007	Iron	Lab	0.03	
MHMW-8 (2008)	7/8/2008	Iron	Lab	0.03	U
MPP-4 (2007)	10/18/2007	Iron	Lab	0.12	
MPP-4 (2008A)	7/9/2008	Iron	Lab	0.03	
MPP-4 (2008B)	7/29/2008	Iron	Lab	0.03	U
MW-1 (2007)	10/11/2007	Iron	Lab	0.03	U
MW-1 (2008)	7/7/2008	Iron	Lab	0.03	U
PDGW101 (2008)	7/31/2008	Iron	Lab	8.7	
PDGW102 (2008)	7/31/2008	Iron	Lab	12.73	
PGPZ-1 (2008)	7/16/2008	Iron	Lab	18.56	
PMGW-116 (2007)	10/25/2007	Iron	Lab	0.03	U
PMGW-116 (2008)	7/14/2008	Iron	Lab	0.03	U
PMGW-117 (2007)	10/25/2007	Iron	Lab	0.05	
PMGW-117 (2008)	7/14/2008	Iron	Lab	0.03	U
PMGW-118 (2007)	10/18/2007	Iron	Lab	0.03	U
PMGW-118 (2008)	7/14/2008	Iron	Lab	0.03	U
PMGW-119 (2007)	10/18/2007	Iron	Lab	1.37	
PMGW-119 (2008)	7/14/2008	Iron	Lab	4.66	
PMGW-120 (2007)	10/15/2007	Iron	Lab	21.25	
PMGW-120 (2008)	7/15/2008	Iron	Lab	18.87	
PMMW-13 (2007)	10/16/2007	Iron	Lab	26.28	
PMMW-13 (2008)	7/14/2008	Iron	Lab	24.6	
PMMW-14 (2007)	10/15/2007	Iron	Lab	14.91	
PMMW-14 (2008)	7/14/2008	Iron	Lab	11.3	
PMMW-15 (2007)	10/15/2007	Iron	Lab	0.67	
PMMW-15 (2008)	7/15/2008	Iron	Lab	0.03	U
PMPZ-3 (2008)	7/7/2008	Iron	Lab	15.12	
SGGW-101 (2007)	10/15/2007	Iron	Lab	0.1	
SGGW-101 (2008)	7/10/2008	Iron	Lab	0.29	
SGGW-102 (2007)	10/15/2007	Iron	Lab	0.06	
SGGW-102 (2008)	7/9/2008	Iron	Lab	0.03	U

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
UCMW-11 (2007)	10/17/2007	Iron	Lab	20.72	
UCMW-11 (2008)	7/7/2008	Iron	Lab	9.5	
UMHMW-1D (2007)	10/11/2007	Iron	Lab	12.54	
UMHMW-1D (2008)	7/9/2008	Iron	Lab	1.46	
UMHMW-1S (2008)	7/9/2008	Iron	Lab	0.05	
UMHMW-2D (2007)	10/11/2007	Iron	Lab	10.12	
UMHMW-2D (2008)	7/9/2008	Iron	Lab	12.7	
UMHMW-2S (2007)	10/11/2007	Iron	Lab	0.12	
UMHMW-2S (2008)	7/9/2008	Iron	Lab	0.12	
UMHMW-3 (2007)	10/12/2007	Iron	Lab	0.03	U
UMHMW-3 (2008)	7/8/2008	Iron	Lab	0.03	U
UMPZ-1 (2008)	7/15/2008	Iron	Lab	0.03	U
UMPZ-2 (2008)	7/15/2008	Iron	Lab	27.8	
UMPZ-3 (2008)	7/15/2008	Iron	Lab	28.84	
UMPZ-4 (2008)	7/15/2008	Iron	Lab	1.67	
UMPZ-5 (2008)	7/15/2008	Iron	Lab	24.63	
ANMW-7 (2007)	10/12/2007	Lead	Lab	0.0005	U
ANMW-7 (2008)	7/9/2008	Lead	Lab	0.0005	U
ANWS-1 (2007)	10/12/2007	Lead	Lab	0	U
ANWS-1 (2008)	7/8/2008	Lead	Lab	0.0005	U
BCGW-115 (2007)	10/26/2007	Lead	Lab	0.0005	U
BCGW-115 (2008)	7/9/2008	Lead	Lab	0.0005	U
BCGW-116 (2008)	7/31/2008	Lead	Lab	0.0005	U
BCMW-10 (2007)	10/17/2007	Lead	Lab	0.0352	
BCMW-10 (2008)	7/7/2008	Lead	Lab	0.0492	
BRGW-101 (2007)	10/16/2007	Lead	Lab	0.0005	U
BRGW-101 (2008)	7/11/2008	Lead	Lab	0	U
BRGW-110 (2007)	10/18/2007	Lead	Lab	0.0005	U
BRGW-110 (2008)	7/9/2008	Lead	Lab	0.0005	U
EDGW-105 (2007)	10/17/2007	Lead	Lab	0.0005	U
EDGW-105 (2008)	7/10/2008	Lead	Lab	0.0012	
EDMW-2 (2007)	10/17/2007	Lead	Lab	0.0005	U
EDMW-2 (2008)	7/10/2008	Lead	Lab	0.0005	U
EDP-2 (2007)	10/17/2007	Lead	Lab	0.0005	U
EDP-2 (2008)	7/10/2008	Lead	Lab	0.0005	U
LCMW-1 (2007)	10/16/2007	Lead	Lab	0.0005	U
LCMW-1 (2008)	7/11/2008	Lead	Lab	0.0005	U
LCMW-12D (2007)	10/16/2007	Lead	Lab	0.0005	U
LCMW-12D (2008)	7/11/2008	Lead	Lab	0.0006	
LCMW-12S (2007)	10/16/2007	Lead	Lab	0.0005	U
LCMW-12S (2008)	7/15/2008	Lead	Lab	0.0005	U
LCMW-5 (2007)	10/16/2007	Lead	Lab	0.0342	
LCMW-5 (2008)	7/10/2008	Lead	Lab	0.0602	
MHGW-109 (2007)	10/12/2007	Lead	Lab	0.0012	
MHGW-109 (2008)	7/8/2008	Lead	Lab	0	
MHGW-112 (2007)	10/26/2007	Lead	Lab	0	
MHGW-112 (2008)	7/8/2008	Lead	Lab	0.0005	U
MHGW-113 (2007)	10/26/2007	Lead	Lab	0.0005	U

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
MHGW-113 (2008)	7/8/2008	Lead	Lab	0.0005	U
MHMW-8 (2007)	10/12/2007	Lead	Lab	0.0006	
MHMW-8 (2008)	7/8/2008	Lead	Lab	0.0009	
MPP-4 (2007)	10/18/2007	Lead	Lab	0.0005	U
MPP-4 (2008A)	7/9/2008	Lead	Lab	0.0012	
MPP-4 (2008B)	7/29/2008	Lead	Lab	0.019	
MW-1 (2007)	10/11/2007	Lead	Lab	0.0005	U
MW-1 (2008)	7/7/2008	Lead	Lab	0.0005	U
PDGW101 (2008)	7/31/2008	Lead	Lab	0.0027	
PDGW102 (2008)	7/31/2008	Lead	Lab	0.0007	
PGPZ-1 (2008)	7/16/2008	Lead	Lab	0.0005	U
PMGW-116 (2007)	10/25/2007	Lead	Lab	0.0005	U
PMGW-116 (2008)	7/14/2008	Lead	Lab	0.0005	U
PMGW-117 (2007)	10/25/2007	Lead	Lab	0.0021	
PMGW-117 (2008)	7/14/2008	Lead	Lab	0.0032	
PMGW-118 (2007)	10/18/2007	Lead	Lab	0.001	
PMGW-118 (2008)	7/14/2008	Lead	Lab	0.0005	U
PMGW-119 (2007)	10/18/2007	Lead	Lab	0.0005	U
PMGW-119 (2008)	7/14/2008	Lead	Lab	0.0007	
PMGW-120 (2007)	10/15/2007	Lead	Lab	0.001	J
PMGW-120 (2008)	7/15/2008	Lead	Lab	0.0018	
PMMW-13 (2007)	10/16/2007	Lead	Lab	0.0007	
PMMW-13 (2008)	7/14/2008	Lead	Lab	0.0006	
PMMW-14 (2007)	10/15/2007	Lead	Lab	0.0011	J
PMMW-14 (2008)	7/14/2008	Lead	Lab	0.001	
PMMW-15 (2007)	10/15/2007	Lead	Lab	0.0005	U
PMMW-15 (2008)	7/15/2008	Lead	Lab	0.0005	U
PMPZ-3 (2008)	7/7/2008	Lead	Lab	0.0005	U
SGGW-101 (2007)	10/15/2007	Lead	Lab	0.0007	J
SGGW-101 (2008)	7/10/2008	Lead	Lab	0.0019	
SGGW-102 (2007)	10/15/2007	Lead	Lab	0.0005	U
SGGW-102 (2008)	7/9/2008	Lead	Lab	0	
UCMW-11 (2007)	10/17/2007	Lead	Lab	0.0005	U
UCMW-11 (2008)	7/7/2008	Lead	Lab	0.0006	
UMHMW-1D (2007)	10/11/2007	Lead	Lab	0.0032	
UMHMW-1D (2008)	7/9/2008	Lead	Lab	0	
UMHMW-1S (2008)	7/9/2008	Lead	Lab	1	
UMHMW-2D (2007)	10/11/2007	Lead	Lab	0.0231	
UMHMW-2D (2008)	7/9/2008	Lead	Lab	0	
UMHMW-2S (2007)	10/11/2007	Lead	Lab	1.191	
UMHMW-2S (2008)	7/9/2008	Lead	Lab	0.7229	
UMHMW-3 (2007)	10/12/2007	Lead	Lab	0.0005	U
UMHMW-3 (2008)	7/8/2008	Lead	Lab	0.0005	U
UMPZ-1 (2008)	7/15/2008	Lead	Lab	0.0005	U
UMPZ-2 (2008)	7/15/2008	Lead	Lab	0.0006	
UMPZ-3 (2008)	7/15/2008	Lead	Lab	0.0019	
UMPZ-4 (2008)	7/15/2008	Lead	Lab	0.0005	
UMPZ-5 (2008)	7/15/2008	Lead	Lab	0.0006	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
ANMW-7 (2007)	10/12/2007	Manganese	Lab	0.245	
ANMW-7 (2008)	7/9/2008	Manganese	Lab	0.051	
ANWS-1 (2007)	10/12/2007	Manganese	Lab	0.008	
ANWS-1 (2008)	7/8/2008	Manganese	Lab	0.007	
BCGW-115 (2007)	10/26/2007	Manganese	Lab	0.015	
BCGW-115 (2008)	7/9/2008	Manganese	Lab	0.005	U
BCGW-116 (2008)	7/31/2008	Manganese	Lab	0.239	
BCMW-10 (2007)	10/17/2007	Manganese	Lab	6.74	
BCMW-10 (2008)	7/7/2008	Manganese	Lab	5.24	
BRGW-101 (2007)	10/16/2007	Manganese	Lab	0.184	
BRGW-101 (2008)	7/11/2008	Manganese	Lab	0	
BRGW-110 (2007)	10/18/2007	Manganese	Lab	0	
BRGW-110 (2008)	7/9/2008	Manganese	Lab	0.059	
EDGW-105 (2007)	10/17/2007	Manganese	Lab	0.786	
EDGW-105 (2008)	7/10/2008	Manganese	Lab	0.495	
EDMW-2 (2007)	10/17/2007	Manganese	Lab	1.039	
EDMW-2 (2008)	7/10/2008	Manganese	Lab	0.56	
EDP-2 (2007)	10/17/2007	Manganese	Lab	1	
EDP-2 (2008)	7/10/2008	Manganese	Lab	2	
LCMW-1 (2007)	10/16/2007	Manganese	Lab	0.119	
LCMW-1 (2008)	7/11/2008	Manganese	Lab	0.122	
LCMW-12D (2007)	10/16/2007	Manganese	Lab	39.16	
LCMW-12D (2008)	7/11/2008	Manganese	Lab	13.52	
LCMW-12S (2007)	10/16/2007	Manganese	Lab	28.88	
LCMW-12S (2008)	7/15/2008	Manganese	Lab	34	
LCMW-5 (2007)	10/16/2007	Manganese	Lab	20.01	
LCMW-5 (2008)	7/10/2008	Manganese	Lab	13.14	
MHGW-109 (2007)	10/12/2007	Manganese	Lab	0.098	
MHGW-109 (2008)	7/8/2008	Manganese	Lab	0.567	
MHGW-112 (2007)	10/26/2007	Manganese	Lab	1.12	
MHGW-112 (2008)	7/8/2008	Manganese	Lab	0.005	U
MHGW-113 (2007)	10/26/2007	Manganese	Lab	0.177	
MHGW-113 (2008)	7/8/2008	Manganese	Lab	0.174	
MHMW-8 (2007)	10/12/2007	Manganese	Lab	0.059	
MHMW-8 (2008)	7/8/2008	Manganese	Lab	0.033	
MPP-4 (2007)	10/18/2007	Manganese	Lab	0.166	
MPP-4 (2008A)	7/9/2008	Manganese	Lab	0.174	
MPP-4 (2008B)	7/29/2008	Manganese	Lab	0.13	
MW-1 (2007)	10/11/2007	Manganese	Lab	0.005	U
MW-1 (2008)	7/7/2008	Manganese	Lab	0.377	
PDGW101 (2008)	7/31/2008	Manganese	Lab	0.668	
PDGW102 (2008)	7/31/2008	Manganese	Lab	0.376	
PGPZ-1 (2008)	7/16/2008	Manganese	Lab	2.149	
PMGW-116 (2007)	10/25/2007	Manganese	Lab	0.023	
PMGW-116 (2008)	7/14/2008	Manganese	Lab	0.005	
PMGW-117 (2007)	10/25/2007	Manganese	Lab	0.938	
PMGW-117 (2008)	7/14/2008	Manganese	Lab	0.783	
PMGW-118 (2007)	10/18/2007	Manganese	Lab	1.739	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
PMGW-118 (2008)	7/14/2008	Manganese	Lab	0.163	
PMGW-119 (2007)	10/18/2007	Manganese	Lab	1.215	
PMGW-119 (2008)	7/14/2008	Manganese	Lab	1.308	
PMGW-120 (2007)	10/15/2007	Manganese	Lab	0.972	
PMGW-120 (2008)	7/15/2008	Manganese	Lab	0.689	
PMMW-13 (2007)	10/16/2007	Manganese	Lab	3.277	
PMMW-13 (2008)	7/14/2008	Manganese	Lab	3.296	
PMMW-14 (2007)	10/15/2007	Manganese	Lab	1.546	
PMMW-14 (2008)	7/14/2008	Manganese	Lab	2.286	
PMMW-15 (2007)	10/15/2007	Manganese	Lab	0.038	
PMMW-15 (2008)	7/15/2008	Manganese	Lab	0.005	U
PMPZ-3 (2008)	7/7/2008	Manganese	Lab	0.495	
SGGW-101 (2007)	10/15/2007	Manganese	Lab	0.164	
SGGW-101 (2008)	7/10/2008	Manganese	Lab	0.158	
SGGW-102 (2007)	10/15/2007	Manganese	Lab	0.206	
SGGW-102 (2008)	7/9/2008	Manganese	Lab	0.115	
UCMW-11 (2007)	10/17/2007	Manganese	Lab	62.9	
UCMW-11 (2008)	7/7/2008	Manganese	Lab	39.94	
UMHMW-1D (2007)	10/11/2007	Manganese	Lab	16.46	
UMHMW-1D (2008)	7/9/2008	Manganese	Lab	15	
UMHMW-1S (2008)	7/9/2008	Manganese	Lab	148.8	
UMHMW-2D (2007)	10/11/2007	Manganese	Lab	26.64	
UMHMW-2D (2008)	7/9/2008	Manganese	Lab	33.58	
UMHMW-2S (2007)	10/11/2007	Manganese	Lab	66.05	
UMHMW-2S (2008)	7/9/2008	Manganese	Lab	37.36	
UMHMW-3 (2007)	10/12/2007	Manganese	Lab	0.007	
UMHMW-3 (2008)	7/8/2008	Manganese	Lab	0.005	U
UMPZ-1 (2008)	7/15/2008	Manganese	Lab	0.055	
UMPZ-2 (2008)	7/15/2008	Manganese	Lab	1.503	
UMPZ-3 (2008)	7/15/2008	Manganese	Lab	3.074	
UMPZ-4 (2008)	7/15/2008	Manganese	Lab	3.027	
UMPZ-5 (2008)	7/15/2008	Manganese	Lab	0.756	
ANMW-7 (2007)	10/12/2007	Zinc	Lab	0.54	
ANMW-7 (2008)	7/9/2008	Zinc	Lab	0.37	
ANWS-1 (2007)	10/12/2007	Zinc	Lab	0.01	U
ANWS-1 (2008)	7/8/2008	Zinc	Lab	0.01	
BCGW-115 (2007)	10/26/2007	Zinc	Lab	0.03	
BCGW-115 (2008)	7/9/2008	Zinc	Lab	0.02	
BCGW-116 (2008)	7/31/2008	Zinc	Lab	0.01	U
BCMW-10 (2007)	10/17/2007	Zinc	Lab	13.97	
BCMW-10 (2008)	7/7/2008	Zinc	Lab	17.35	
BRGW-101 (2007)	10/16/2007	Zinc	Lab	0.01	U
BRGW-101 (2008)	7/11/2008	Zinc	Lab	0.01	U
BRGW-110 (2007)	10/18/2007	Zinc	Lab	0.04	
BRGW-110 (2008)	7/9/2008	Zinc	Lab	0.04	
EDGW-105 (2007)	10/17/2007	Zinc	Lab	0.26	
EDGW-105 (2008)	7/10/2008	Zinc	Lab	0.26	
EDMW-2 (2007)	10/17/2007	Zinc	Lab	0.07	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
EDMW-2 (2008)	7/10/2008	Zinc	Lab	0.02	
EDP-2 (2007)	10/17/2007	Zinc	Lab	0.58	
EDP-2 (2008)	7/10/2008	Zinc	Lab	0.64	
LCMW-1 (2007)	10/16/2007	Zinc	Lab	0.2	
LCMW-1 (2008)	7/11/2008	Zinc	Lab	0.2	
LCMW-12D (2007)	10/16/2007	Zinc	Lab	1.26	
LCMW-12D (2008)	7/11/2008	Zinc	Lab	0.48	
LCMW-12S (2007)	10/16/2007	Zinc	Lab	0.57	
LCMW-12S (2008)	7/15/2008	Zinc	Lab	0.56	
LCMW-5 (2007)	10/16/2007	Zinc	Lab	6.78	
LCMW-5 (2008)	7/10/2008	Zinc	Lab	7.53	
MHGW-109 (2007)	10/12/2007	Zinc	Lab	7.24	
MHGW-109 (2008)	7/8/2008	Zinc	Lab	11.08	
MHGW-112 (2007)	10/26/2007	Zinc	Lab	1.79	
MHGW-112 (2008)	7/8/2008	Zinc	Lab	1.79	
MHGW-113 (2007)	10/26/2007	Zinc	Lab	0.01	
MHGW-113 (2008)	7/8/2008	Zinc	Lab	0.01	U
MHMW-8 (2007)	10/12/2007	Zinc	Lab	14.9	
MHMW-8 (2008)	7/8/2008	Zinc	Lab	18.21	
MPP-4 (2007)	10/18/2007	Zinc	Lab	0.46	
MPP-4 (2008A)	7/9/2008	Zinc	Lab	0.71	
MPP-4 (2008B)	7/29/2008	Zinc	Lab	0.67	
MW-1 (2007)	10/11/2007	Zinc	Lab	0.04	
MW-1 (2008)	7/7/2008	Zinc	Lab	0.07	
PDGW101 (2008)	7/31/2008	Zinc	Lab	0.3	
PDGW102 (2008)	7/31/2008	Zinc	Lab	0.26	
PGPZ-1 (2008)	7/16/2008	Zinc	Lab	0.02	
PMGW-116 (2007)	10/25/2007	Zinc	Lab	0.3	
PMGW-116 (2008)	7/14/2008	Zinc	Lab	0.29	
PMGW-117 (2007)	10/25/2007	Zinc	Lab	0.82	
PMGW-117 (2008)	7/14/2008	Zinc	Lab	0.69	
PMGW-118 (2007)	10/18/2007	Zinc	Lab	0.2	
PMGW-118 (2008)	7/14/2008	Zinc	Lab	0.01	U
PMGW-119 (2007)	10/18/2007	Zinc	Lab	0.41	
PMGW-119 (2008)	7/14/2008	Zinc	Lab	0.5	
PMGW-120 (2007)	10/15/2007	Zinc	Lab	0.3	
PMGW-120 (2008)	7/15/2008	Zinc	Lab	0.2	
PMMW-13 (2007)	10/16/2007	Zinc	Lab	0.86	
PMMW-13 (2008)	7/14/2008	Zinc	Lab	0.86	
PMMW-14 (2007)	10/15/2007	Zinc	Lab	0.34	
PMMW-14 (2008)	7/14/2008	Zinc	Lab	0.35	
PMMW-15 (2007)	10/15/2007	Zinc	Lab	0.07	
PMMW-15 (2008)	7/15/2008	Zinc	Lab	0.01	U
PMPZ-3 (2008)	7/7/2008	Zinc	Lab	0.19	
SGGW-101 (2007)	10/15/2007	Zinc	Lab	0.23	
SGGW-101 (2008)	7/10/2008	Zinc	Lab	0.2	
SGGW-102 (2007)	10/15/2007	Zinc	Lab	0.33	
SGGW-102 (2008)	7/9/2008	Zinc	Lab	0.21	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
UCMW-11 (2007)	10/17/2007	Zinc	Lab	0.01	U
UCMW-11 (2008)	7/7/2008	Zinc	Lab	16.54	
UMHMW-1D (2007)	10/11/2007	Zinc	Lab	3.98	
UMHMW-1D (2008)	7/9/2008	Zinc	Lab	4.42	
UMHMW-1S (2008)	7/9/2008	Zinc	Lab	194.8	
UMHMW-2D (2007)	10/11/2007	Zinc	Lab	50.84	
UMHMW-2D (2008)	7/9/2008	Zinc	Lab	62.14	
UMHMW-2S (2007)	10/11/2007	Zinc	Lab	149	
UMHMW-2S (2008)	7/9/2008	Zinc	Lab	83.7	
UMHMW-3 (2007)	10/12/2007	Zinc	Lab	0.04	
UMHMW-3 (2008)	7/8/2008	Zinc	Lab	0.01	
UMPZ-1 (2008)	7/15/2008	Zinc	Lab	4.08	
UMPZ-2 (2008)	7/15/2008	Zinc	Lab	0.01	
UMPZ-3 (2008)	7/15/2008	Zinc	Lab	0.08	
UMPZ-4 (2008)	7/15/2008	Zinc	Lab	0.3	
UMPZ-5 (2008)	7/15/2008	Zinc	Lab	0.25	

TABLE F-4: ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier

Notes:

All concentrations are in units of micrograms per liter.

B	Method blank shows evidence of contamination
ID	Identification
J	Estimated concentration
U	Nondetected concentration
UJ	Estimated nondetected concentration

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-101 (2007)	10/3/2007	Aluminum	Lab	0.03	U
BRSW-101 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-102 (2007)	10/3/2007	Aluminum	Lab	0.03	U
BRSW-102 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-103 (2007)	10/3/2007	Aluminum	Lab	0.03	U
BRSW-103 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-104 (2007)	10/3/2007	Aluminum	Lab	0.03	U
BRSW-104 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-105 (2007)	10/4/2007	Aluminum	Lab	0.03	U
BRSW-105 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-106 (2007)	10/4/2007	Aluminum	Lab	0.03	U
BRSW-106 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-107 (2007)	10/4/2007	Aluminum	Lab	0.03	U
BRSW-107 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-108 (2008)	6/17/2008	Aluminum	Lab	0.03	U
BRSW-109 (2007)	10/9/2007	Aluminum	Lab	0.03	U
BRSW-110 (2007)	10/4/2007	Aluminum	Lab	0.03	U
BRSW-12 (2007)	10/5/2007	Aluminum	Lab	0.03	U
BRSW-16 (2008)	6/17/2008	Aluminum	Lab	0.03	U
BRSW-17 (2007)	10/3/2007	Aluminum	Lab	0.03	U
BRSW-17 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-202	11/3/2011	Aluminum	Lab	0.03	U
BRSW-203	11/3/2011	Aluminum	Lab	0.03	U
BRSW-204	11/3/2011	Aluminum	Lab	0.03	U
BRSW-205	11/3/2011	Aluminum	Lab	0.03	U
BRSW-206	11/3/2011	Aluminum	Lab	0.03	U
BRSW-23 (2007)	10/10/2007	Aluminum	Lab	0.03	U
BRSW-29 (2007)	10/9/2007	Aluminum	Lab	0.03	U
BRSW-31 (2007)	10/4/2007	Aluminum	Lab	0.03	U
BRSW-31 (2008)	6/16/2008	Aluminum	Lab	0.03	U
BRSW-33 (2007)	10/9/2007	Aluminum	Lab	0.03	U
BRSW-36 (2007)	10/9/2007	Aluminum	Lab	0.03	U
BRSW-39A (2007)	10/10/2007	Aluminum	Lab	0.03	U
BRSW-4 (2007)	10/10/2007	Aluminum	Lab	0.05	
BRSW-44 (2007)	10/10/2007	Aluminum	Lab	0.03	U
BRSW-44 (2008)	6/17/2008	Aluminum	Lab	0.03	U
BRSW-4A (2008)	6/17/2008	Aluminum	Lab	0.08	
BRSW-9 (2007)	10/9/2007	Aluminum	Lab	0.03	U
BRSW-101 (2007)	10/3/2007	Arsenic	Lab	0.002	U
BRSW-101 (2008)	6/16/2008	Arsenic	Lab	0	U
BRSW-102 (2007)	10/3/2007	Arsenic	Lab	0.002	U
BRSW-102 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-103 (2007)	10/3/2007	Arsenic	Lab	0.002	U
BRSW-103 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-104 (2007)	10/3/2007	Arsenic	Lab	0.002	U
BRSW-104 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-105 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-105 (2008)	6/16/2008	Arsenic	Lab	0.003	U

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-106 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-106 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-107 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-107 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-108 (2007)	10/10/2007	Arsenic	Lab	0.002	U
BRSW-108 (2008)	6/17/2008	Arsenic	Lab	0.003	U
BRSW-109 (2007)	10/9/2007	Arsenic	Lab	0.002	U
BRSW-110 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-12 (2007)	10/5/2007	Arsenic	Lab	0.002	U
BRSW-13 (2007)	10/5/2007	Arsenic	Lab	0.002	U
BRSW-16 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-16 (2008)	6/17/2008	Arsenic	Lab	0.003	U
BRSW-17 (2007)	10/3/2007	Arsenic	Lab	0.002	U
BRSW-17 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-201	11/3/2011	Arsenic	Lab	0	U
BRSW-202	11/3/2011	Arsenic	Lab	0	U
BRSW-203	11/3/2011	Arsenic	Lab	0.003	U
BRSW-204	11/3/2011	Arsenic	Lab	0.003	U
BRSW-205	11/3/2011	Arsenic	Lab	0.003	U
BRSW-206	11/3/2011	Arsenic	Lab	0.003	U
BRSW-21 (2007)	10/5/2007	Arsenic	Lab	0.002	U
BRSW-23 (2007)	10/10/2007	Arsenic	Lab	0.002	U
BRSW-29 (2007)	10/9/2007	Arsenic	Lab	0.002	U
BRSW-31 (2007)	10/4/2007	Arsenic	Lab	0.002	U
BRSW-31 (2008)	6/16/2008	Arsenic	Lab	0.003	U
BRSW-33 (2007)	10/9/2007	Arsenic	Lab	0.002	U
BRSW-36 (2007)	10/9/2007	Arsenic	Lab	0.002	U
BRSW-39A (2007)	10/10/2007	Arsenic	Lab	0.002	U
BRSW-4 (2007)	10/10/2007	Arsenic	Lab	0.002	U
BRSW-44 (2007)	10/10/2007	Arsenic	Lab	0.002	U
BRSW-44 (2008)	6/17/2008	Arsenic	Lab	0.003	U
BRSW-4A (2008)	6/17/2008	Arsenic	Lab	0.003	U
BRSW-9 (2007)	10/9/2007	Arsenic	Lab	0.002	U
MHSW-101	7/16/2008	Arsenic	Lab	0.003	U
MHSW-102	7/16/2008	Arsenic	Lab	0.003	U
BRSW-101 (2007)	10/3/2007	Cadmium	Lab	0.00015	
BRSW-101 (2008)	6/16/2008	Cadmium	Lab	0.0005	
BRSW-102 (2007)	10/3/2007	Cadmium	Lab	0.00107	
BRSW-102 (2008)	6/16/2008	Cadmium	Lab	0.00051	
BRSW-103 (2007)	10/3/2007	Cadmium	Lab	0.00008	U
BRSW-103 (2008)	6/16/2008	Cadmium	Lab	0.00011	
BRSW-104 (2007)	10/3/2007	Cadmium	Lab	0.0012	
BRSW-104 (2008)	6/16/2008	Cadmium	Lab	0.00129	
BRSW-105 (2007)	10/4/2007	Cadmium	Lab	0.00164	
BRSW-105 (2008)	6/16/2008	Cadmium	Lab	0.00139	
BRSW-106 (2007)	10/4/2007	Cadmium	Lab	0.00193	
BRSW-106 (2008)	6/16/2008	Cadmium	Lab	0	
BRSW-107 (2007)	10/4/2007	Cadmium	Lab	0.00228	

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-107 (2008)	6/16/2008	Cadmium	Lab	0.00163	
BRSW-108 (2007)	10/10/2007	Cadmium	Lab	0.0011	
BRSW-108 (2008)	6/17/2008	Cadmium	Lab	0.00042	
BRSW-109 (2007)	10/9/2007	Cadmium	Lab	0.00632	
BRSW-110 (2007)	10/4/2007	Cadmium	Lab	0	
BRSW-12 (2007)	10/5/2007	Cadmium	Lab	0	
BRSW-13 (2007)	10/5/2007	Cadmium	Lab	0	
BRSW-16 (2007)	10/4/2007	Cadmium	Lab	0.00136	
BRSW-16 (2008)	6/17/2008	Cadmium	Lab	0.00141	
BRSW-17 (2007)	10/3/2007	Cadmium	Lab	0.00008	U
BRSW-17 (2008)	6/16/2008	Cadmium	Lab	0.00053	
BRSW-201	11/3/2011	Cadmium	Lab	0.00008	U
BRSW-202	11/3/2011	Cadmium	Lab	0.00008	U
BRSW-203	11/3/2011	Cadmium	Lab	0.00008	U
BRSW-204	11/3/2011	Cadmium	Lab	0.00008	U
BRSW-205	11/3/2011	Cadmium	Lab	0.00008	U
BRSW-206	11/3/2011	Cadmium	Lab	0.00017	
BRSW-21 (2007)	10/5/2007	Cadmium	Lab	0.00012	
BRSW-23 (2007)	10/10/2007	Cadmium	Lab	0.00328	
BRSW-29 (2007)	10/9/2007	Cadmium	Lab	0.00426	
BRSW-31 (2007)	10/4/2007	Cadmium	Lab	0.00225	
BRSW-31 (2008)	6/16/2008	Cadmium	Lab	0.00149	
BRSW-33 (2007)	10/9/2007	Cadmium	Lab	0.00575	
BRSW-36 (2007)	10/9/2007	Cadmium	Lab	0.00922	
BRSW-39A (2007)	10/10/2007	Cadmium	Lab	0	
BRSW-4 (2007)	10/10/2007	Cadmium	Lab	0	
BRSW-44 (2007)	10/10/2007	Cadmium	Lab	0.0199	
BRSW-44 (2008)	6/17/2008	Cadmium	Lab	0.00622	
BRSW-4A (2008)	6/17/2008	Cadmium	Lab	0.0204	
BRSW-9 (2007)	10/9/2007	Cadmium	Lab	0.00711	
MHSW-101	7/16/2008	Cadmium	Lab	0.00814	
MHSW-102	7/16/2008	Cadmium	Lab	0	
BRSW-101 (2007)	10/3/2007	Copper	Lab	0	U
BRSW-101 (2008)	6/16/2008	Copper	Lab	0.003	
BRSW-102 (2007)	10/3/2007	Copper	Lab	0.003	
BRSW-102 (2008)	6/16/2008	Copper	Lab	0.003	
BRSW-103 (2007)	10/3/2007	Copper	Lab	0.00	
BRSW-103 (2008)	6/16/2008	Copper	Lab	0.004	
BRSW-104 (2007)	10/3/2007	Copper	Lab	0	
BRSW-104 (2008)	6/16/2008	Copper	Lab	0.01	
BRSW-105 (2007)	10/4/2007	Copper	Lab	0.006	
BRSW-105 (2008)	6/16/2008	Copper	Lab	0.013	
BRSW-106 (2007)	10/4/2007	Copper	Lab	0.015	
BRSW-106 (2008)	6/16/2008	Copper	Lab	0.012	
BRSW-107 (2007)	10/4/2007	Copper	Lab	0.027	
BRSW-107 (2008)	6/16/2008	Copper	Lab	0.013	
BRSW-108 (2007)	10/10/2007	Copper	Lab	0.159	
BRSW-108 (2008)	6/17/2008	Copper	Lab	0.055	

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-109 (2007)	10/9/2007	Copper	Lab	0.015	
BRSW-110 (2007)	10/4/2007	Copper	Lab	0.015	
BRSW-12 (2007)	10/5/2007	Copper	Lab	0.012	
BRSW-13 (2007)	10/5/2007	Copper	Lab	0.136	
BRSW-16 (2007)	10/4/2007	Copper	Lab	0.005	
BRSW-16 (2008)	6/17/2008	Copper	Lab	0.01	
BRSW-17 (2007)	10/3/2007	Copper	Lab	0.001	
BRSW-17 (2008)	6/16/2008	Copper	Lab	0.003	
BRSW-201	11/3/2011	Copper	Lab	0.001	U
BRSW-202	11/3/2011	Copper	Lab	0.001	U
BRSW-203	11/3/2011	Copper	Lab	0.001	
BRSW-204	11/3/2011	Copper	Lab	0.001	U
BRSW-205	11/3/2011	Copper	Lab	0.001	U
BRSW-206	11/3/2011	Copper	Lab	0.001	U
BRSW-21 (2007)	10/5/2007	Copper	Lab	0.007	
BRSW-23 (2007)	10/10/2007	Copper	Lab	0.014	
BRSW-29 (2007)	10/9/2007	Copper	Lab	0.006	
BRSW-31 (2007)	10/4/2007	Copper	Lab	0.022	
BRSW-31 (2008)	6/16/2008	Copper	Lab	0.012	
BRSW-33 (2007)	10/9/2007	Copper	Lab	0.012	
BRSW-36 (2007)	10/9/2007	Copper	Lab	0.014	
BRSW-39A (2007)	10/10/2007	Copper	Lab	0.009	
BRSW-4 (2007)	10/10/2007	Copper	Lab	0.682	
BRSW-44 (2007)	10/10/2007	Copper	Lab	0.093	
BRSW-44 (2008)	6/17/2008	Copper	Lab	0.085	
BRSW-4A (2008)	6/17/2008	Copper	Lab	0.886	
BRSW-9 (2007)	10/9/2007	Copper	Lab	0.018	
MHSW-101	7/16/2008	Copper	Lab	0.077	
MHSW-102	7/16/2008	Copper	Lab	0.001	
BRSW-101 (2007)	10/3/2007	Iron	Lab	0.05	
BRSW-101 (2008)	6/16/2008	Iron	Lab	0.07	
BRSW-102 (2007)	10/3/2007	Iron	Lab	0.07	
BRSW-102 (2008)	6/16/2008	Iron	Lab	0.06	
BRSW-103 (2007)	10/3/2007	Iron	Lab	0.88	
BRSW-103 (2008)	6/16/2008	Iron	Lab	0.78	
BRSW-104 (2007)	10/3/2007	Iron	Lab	0.08	
BRSW-104 (2008)	6/16/2008	Iron	Lab	0.14	
BRSW-105 (2007)	10/4/2007	Iron	Lab	0.17	
BRSW-105 (2008)	6/16/2008	Iron	Lab	0.13	
BRSW-106 (2007)	10/4/2007	Iron	Lab	0.82	
BRSW-106 (2008)	6/16/2008	Iron	Lab	0.11	
BRSW-107 (2007)	10/4/2007	Iron	Lab	0.81	
BRSW-107 (2008)	6/16/2008	Iron	Lab	0.12	
BRSW-108 (2007)	10/10/2007	Iron	Lab	0.01	BJ
BRSW-108 (2008)	6/17/2008	Iron	Lab	0.23	
BRSW-109 (2007)	10/9/2007	Iron	Lab	0.11	
BRSW-110 (2007)	10/4/2007	Iron	Lab	3.18	
BRSW-12 (2007)	10/5/2007	Iron	Lab	0.09	

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-13 (2007)	10/5/2007	Iron	Lab	6.72	
BRSW-16 (2007)	10/4/2007	Iron	Lab	0.19	
BRSW-16 (2008)	6/17/2008	Iron	Lab	0.12	
BRSW-17 (2007)	10/3/2007	Iron	Lab	0.17	
BRSW-17 (2008)	6/16/2008	Iron	Lab	0.06	
BRSW-201	11/3/2011	Iron	Lab	0	U
BRSW-202	11/3/2011	Iron	Lab	0.05	U
BRSW-203	11/3/2011	Iron	Lab	0.05	U
BRSW-204	11/3/2011	Iron	Lab	0.05	U
BRSW-205	11/3/2011	Iron	Lab	0.06	
BRSW-206	11/3/2011	Iron	Lab	0.05	U
BRSW-21 (2007)	10/5/2007	Iron	Lab	6.1	
BRSW-23 (2007)	10/10/2007	Iron	Lab	0.7	
BRSW-29 (2007)	10/9/2007	Iron	Lab	0.13	
BRSW-31 (2007)	10/4/2007	Iron	Lab	1.03	
BRSW-31 (2008)	6/16/2008	Iron	Lab	0.13	
BRSW-33 (2007)	10/9/2007	Iron	Lab	0.07	BJ
BRSW-36 (2007)	10/9/2007	Iron	Lab	0.08	
BRSW-39A (2007)	10/10/2007	Iron	Lab	0.41	
BRSW-4 (2007)	10/10/2007	Iron	Lab	0.06	
BRSW-44 (2007)	10/10/2007	Iron	Lab	0.05	
BRSW-44 (2008)	6/17/2008	Iron	Lab	0.09	
BRSW-4A (2008)	6/17/2008	Iron	Lab	0.2	
BRSW-9 (2007)	10/9/2007	Iron	Lab	0.11	
MHSW-101	7/16/2008	Iron	Lab	0.15	
MHSW-102	7/16/2008	Iron	Lab	0.05	U
BRSW-101 (2007)	10/3/2007	Lead	Lab	0.0005	U
BRSW-101 (2008)	6/16/2008	Lead	Lab	0.0006	BJ
BRSW-102 (2007)	10/3/2007	Lead	Lab	0.0016	BJ
BRSW-102 (2008)	6/16/2008	Lead	Lab	0.0006	
BRSW-103 (2007)	10/3/2007	Lead	Lab	0.0016	BJ
BRSW-103 (2008)	6/16/2008	Lead	Lab	0.0025	
BRSW-104 (2007)	10/3/2007	Lead	Lab	0	U
BRSW-104 (2008)	6/16/2008	Lead	Lab	0	
BRSW-105 (2007)	10/4/2007	Lead	Lab	0.0005	U
BRSW-105 (2008)	6/16/2008	Lead	Lab	0.004	
BRSW-106 (2007)	10/4/2007	Lead	Lab	0.0035	
BRSW-106 (2008)	6/16/2008	Lead	Lab	0.0034	BJ
BRSW-107 (2007)	10/4/2007	Lead	Lab	0.0048	
BRSW-107 (2008)	6/16/2008	Lead	Lab	0.0045	
BRSW-108 (2007)	10/10/2007	Lead	Lab	0.0012	
BRSW-108 (2008)	6/17/2008	Lead	Lab	0.001	
BRSW-109 (2007)	10/9/2007	Lead	Lab	0.0019	
BRSW-110 (2007)	10/4/2007	Lead	Lab	0.0156	
BRSW-12 (2007)	10/5/2007	Lead	Lab	0.0019	BJ
BRSW-13 (2007)	10/5/2007	Lead	Lab	0.0062	
BRSW-16 (2007)	10/4/2007	Lead	Lab	0.0009	BJ
BRSW-16 (2008)	6/17/2008	Lead	Lab	0.0034	

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-17 (2007)	10/3/2007	Lead	Lab	0.0005	U
BRSW-17 (2008)	6/16/2008	Lead	Lab	0.0006	
BRSW-201	11/3/2011	Lead	Lab	0.0005	U
BRSW-202	11/3/2011	Lead	Lab	0.0005	U
BRSW-203	11/3/2011	Lead	Lab	0.0005	U
BRSW-204	11/3/2011	Lead	Lab	0.0005	U
BRSW-205	11/3/2011	Lead	Lab	0	U
BRSW-206	11/3/2011	Lead	Lab	0.0005	U
BRSW-21 (2007)	10/5/2007	Lead	Lab	0.0005	U
BRSW-23 (2007)	10/10/2007	Lead	Lab	0.0063	
BRSW-29 (2007)	10/9/2007	Lead	Lab	0.0024	
BRSW-31 (2007)	10/4/2007	Lead	Lab	0.0055	
BRSW-31 (2008)	6/16/2008	Lead	Lab	0.0042	
BRSW-33 (2007)	10/9/2007	Lead	Lab	0.0031	
BRSW-36 (2007)	10/9/2007	Lead	Lab	0.0013	
BRSW-39A (2007)	10/10/2007	Lead	Lab	0.0063	
BRSW-4 (2007)	10/10/2007	Lead	Lab	0.0481	
BRSW-44 (2007)	10/10/2007	Lead	Lab	0.0257	
BRSW-44 (2008)	6/17/2008	Lead	Lab	0.0189	
BRSW-4A (2008)	6/17/2008	Lead	Lab	0.0798	
BRSW-9 (2007)	10/9/2007	Lead	Lab	0.0019	
MHSW-101	7/16/2008	Lead	Lab	0.0252	
MHSW-102	7/16/2008	Lead	Lab	0.0058	
BRSW-101 (2007)	10/3/2007	Manganese	Lab	0.004	
BRSW-101 (2008)	6/16/2008	Manganese	Lab	0.015	
BRSW-102 (2007)	10/3/2007	Manganese	Lab	0.012	
BRSW-102 (2008)	6/16/2008	Manganese	Lab	0.016	
BRSW-103 (2007)	10/3/2007	Manganese	Lab	0.226	
BRSW-103 (2008)	6/16/2008	Manganese	Lab	0.103	
BRSW-104 (2007)	10/3/2007	Manganese	Lab	0.039	
BRSW-104 (2008)	6/16/2008	Manganese	Lab	0.05	
BRSW-105 (2007)	10/4/2007	Manganese	Lab	0.139	
BRSW-105 (2008)	6/16/2008	Manganese	Lab	0.051	
BRSW-106 (2007)	10/4/2007	Manganese	Lab	0.216	
BRSW-106 (2008)	6/16/2008	Manganese	Lab	0.059	
BRSW-107 (2007)	10/4/2007	Manganese	Lab	0.256	
BRSW-107 (2008)	6/16/2008	Manganese	Lab	0.063	
BRSW-108 (2007)	10/10/2007	Manganese	Lab	0.374	
BRSW-108 (2008)	6/17/2008	Manganese	Lab	0.137	
BRSW-109 (2007)	10/9/2007	Manganese	Lab	1.13	
BRSW-110 (2007)	10/4/2007	Manganese	Lab	0.278	
BRSW-12 (2007)	10/5/2007	Manganese	Lab	0.33	
BRSW-13 (2007)	10/5/2007	Manganese	Lab	0.354	
BRSW-16 (2007)	10/4/2007	Manganese	Lab	0.076	
BRSW-16 (2008)	6/17/2008	Manganese	Lab	0.051	
BRSW-17 (2007)	10/3/2007	Manganese	Lab	0.111	
BRSW-17 (2008)	6/16/2008	Manganese	Lab	0.019	
BRSW-201	11/3/2011	Manganese	Lab	0.005	U

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-202	11/3/2011	Manganese	Lab	0.005	U
BRSW-203	11/3/2011	Manganese	Lab	0.008	
BRSW-204	11/3/2011	Manganese	Lab	0.008	
BRSW-205	11/3/2011	Manganese	Lab	0.007	
BRSW-206	11/3/2011	Manganese	Lab	0.013	
BRSW-21 (2007)	10/5/2007	Manganese	Lab	0.303	
BRSW-23 (2007)	10/10/2007	Manganese	Lab	1.21	
BRSW-29 (2007)	10/9/2007	Manganese	Lab	0.761	
BRSW-31 (2007)	10/4/2007	Manganese	Lab	0.273	
BRSW-31 (2008)	6/16/2008	Manganese	Lab	0.055	
BRSW-33 (2007)	10/9/2007	Manganese	Lab	0.341	
BRSW-36 (2007)	10/9/2007	Manganese	Lab	1.31	
BRSW-39A (2007)	10/10/2007	Manganese	Lab	2.12	
BRSW-4 (2007)	10/10/2007	Manganese	Lab	1.39	
BRSW-44 (2007)	10/10/2007	Manganese	Lab	0.596	
BRSW-44 (2008)	6/17/2008	Manganese	Lab	1.019	
BRSW-4A (2008)	6/17/2008	Manganese	Lab	1.19	
BRSW-9 (2007)	10/9/2007	Manganese	Lab	1.47	
MHSW-101	7/16/2008	Manganese	Lab	0.091	
MHSW-102	7/16/2008	Manganese	Lab	0.005	U
BRSW-101 (2007)	10/3/2007	Zinc	Lab	0.09	
BRSW-101 (2008)	6/16/2008	Zinc	Lab	0.24	
BRSW-102 (2007)	10/3/2007	Zinc	Lab	0.1	
BRSW-102 (2008)	6/16/2008	Zinc	Lab	0.22	
BRSW-103 (2007)	10/3/2007	Zinc	Lab	0.01	U
BRSW-103 (2008)	6/16/2008	Zinc	Lab	0.03	
BRSW-104 (2007)	10/3/2007	Zinc	Lab	0.52	
BRSW-104 (2008)	6/16/2008	Zinc	Lab	0.38	
BRSW-105 (2007)	10/4/2007	Zinc	Lab	0.72	
BRSW-105 (2008)	6/16/2008	Zinc	Lab	0.36	
BRSW-106 (2007)	10/4/2007	Zinc	Lab	0.76	
BRSW-106 (2008)	6/16/2008	Zinc	Lab	0.39	
BRSW-107 (2007)	10/4/2007	Zinc	Lab	0.93	
BRSW-107 (2008)	6/16/2008	Zinc	Lab	0.42	
BRSW-108 (2007)	10/10/2007	Zinc	Lab	0.22	
BRSW-108 (2008)	6/17/2008	Zinc	Lab	0.1	
BRSW-109 (2007)	10/9/2007	Zinc	Lab	2.6	
BRSW-110 (2007)	10/4/2007	Zinc	Lab	1.04	
BRSW-12 (2007)	10/5/2007	Zinc	Lab	1.75	
BRSW-13 (2007)	10/5/2007	Zinc	Lab	0.07	
BRSW-16 (2007)	10/4/2007	Zinc	Lab	0.55	
BRSW-16 (2008)	6/17/2008	Zinc	Lab	0.42	
BRSW-17 (2007)	10/3/2007	Zinc	Lab	0.12	
BRSW-17 (2008)	6/16/2008	Zinc	Lab	0.23	
BRSW-201	11/3/2011	Zinc	Lab	0.01	
BRSW-202	11/3/2011	Zinc	Lab	0.02	
BRSW-203	11/3/2011	Zinc	Lab	0.01	
BRSW-204	11/3/2011	Zinc	Lab	0.01	

TABLE F-5: ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-205	11/3/2011	Zinc	Lab	0.03	
BRSW-206	11/3/2011	Zinc	Lab	0.12	
BRSW-21 (2007)	10/5/2007	Zinc	Lab	0.06	
BRSW-23 (2007)	10/10/2007	Zinc	Lab	0.69	
BRSW-29 (2007)	10/9/2007	Zinc	Lab	0.84	
BRSW-31 (2007)	10/4/2007	Zinc	Lab	0.81	
BRSW-31 (2008)	6/16/2008	Zinc	Lab	0.39	
BRSW-33 (2007)	10/9/2007	Zinc	Lab	1.67	
BRSW-36 (2007)	10/9/2007	Zinc	Lab	3.61	
BRSW-39A (2007)	10/10/2007	Zinc	Lab	1.06	
BRSW-4 (2007)	10/10/2007	Zinc	Lab	4.01	
BRSW-44 (2007)	10/10/2007	Zinc	Lab	3.08	
BRSW-44 (2008)	6/17/2008	Zinc	Lab	1.11	
BRSW-4A (2008)	6/17/2008	Zinc	Lab	2.54	
BRSW-9 (2007)	10/9/2007	Zinc	Lab	3.42	
MHSW-101	7/16/2008	Zinc	Lab	1.04	
MHSW-102	7/16/2008	Zinc	Lab	0.12	

Notes:

All concentrations are in units of milligrams per liter.

B	Method blank shows evidence of contamination
ID	Identification
J	Estimated concentration
U	Nondetected concentration

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
ACBG-1	10/16/2007	0	0.5	Aluminum	Lab	16000	
ACBG-2	10/16/2007	0	0.5	Aluminum	Lab	16600	
BCBG 202	10/31/2011	0	0.5	Aluminum	Lab	28400	
BCBG 203	10/31/2011	0	0.5	Aluminum	Lab	8730	
BCBG-1	10/15/2007	0	0.5	Aluminum	Lab	24500	
BCBG-201	11/1/2011	0	0.5	Aluminum	Lab	16600	
MGBG-1	10/15/2007	0	0.5	Aluminum	Lab	16600	
MGBG-2	10/15/2007	0	0.5	Aluminum	Lab	19400	
MHBG 201	10/31/2011	0	0.5	Aluminum	Lab	13800	
MHBG 202	10/31/2011	0	0.5	Aluminum	Lab	19800	
PCBG 201	10/31/2011	0	0.5	Aluminum	Lab	22600	
PCBG 202	10/31/2011	0	0.5	Aluminum	Lab	20300	
PCBG 203	10/31/2011	0	0.5	Aluminum	Lab	10300	
PCBG-1	10/15/2007	0	0.5	Aluminum	Lab	21200	
PSCBG-201	11/1/2011	0	0.5	Aluminum	Lab	21600	
PSCBG-202	11/1/2011	0	0.5	Aluminum	Lab	16000	
PSCBG-203	11/1/2011	0	0.5	Aluminum	Lab	43000	
SGBG-1	10/15/2007	0	0.5	Aluminum	Lab	18700	
SGBG201	10/31/2011	0	0.5	Aluminum	Lab	22500	
SHGBG-1	10/16/2007	0	0.5	Aluminum	Lab	15400	
SHGBG-2	10/16/2007	0	0.5	Aluminum	Lab	12700	
SHGBG-201	11/1/2011	0	0.5	Aluminum	Lab	17400	
SHGBG-202	11/1/2011	0	0.5	Aluminum	Lab	19100	
SHGBG-203	11/1/2011	0	0.5	Aluminum	Lab	22300	
SWGBG-1	10/15/2007	0	0.5	Aluminum	Lab	16100	
SWGBG-2	10/15/2007	0	0.5	Aluminum	Lab	13500	
UBRBG 201	10/31/2011	0	0.5	Aluminum	Lab	23400	
UBRBG 202	10/31/2011	0	0.5	Aluminum	Lab	18300	
UBRBG 204	10/31/2011	0	0.5	Aluminum	Lab	25100	
UBRBG-203	11/1/2011	0	0.5	Aluminum	Lab	18300	
ACBG-1	10/16/2007	0	0.5	Arsenic	Lab	26.6	
ACBG-2	10/16/2007	0	0.5	Arsenic	Lab	17.4	
BCBG 202	10/31/2011	0	0.5	Arsenic	Lab	19	
BCBG 203	10/31/2011	0	0.5	Arsenic	Lab	2	
BCBG-1	10/15/2007	0	0.5	Arsenic	Lab	23.5	
BCBG-201	11/1/2011	0	0.5	Arsenic	Lab	18	
MGBG-1	10/15/2007	0	0.5	Arsenic	Lab	23.2	
MGBG-2	10/15/2007	0	0.5	Arsenic	Lab	13.3	
MHBG 201	10/31/2011	0	0.5	Arsenic	Lab	9	
MHBG 202	10/31/2011	0	0.5	Arsenic	Lab	11	
PCBG 201	10/31/2011	0	0.5	Arsenic	Lab	11	
PCBG 202	10/31/2011	0	0.5	Arsenic	Lab	22	
PCBG 203	10/31/2011	0	0.5	Arsenic	Lab	24	
PCBG-1	10/15/2007	0	0.5	Arsenic	Lab	7.68	
PSCBG-201	11/1/2011	0	0.5	Arsenic	Lab	18	

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
PSCBG-202	11/1/2011	0	0.5	Arsenic	Lab	39	
PSCBG-203	11/1/2011	0	0.5	Arsenic	Lab	39	
SGBG-1	10/15/2007	0	0.5	Arsenic	Lab	44.9	
SGBG201	10/31/2011	0	0.5	Arsenic	Lab	19	
SHGBG-1	10/16/2007	0	0.5	Arsenic	Lab	29.7	
SHGBG-2	10/16/2007	0	0.5	Arsenic	Lab	24.6	
SHGBG-201	11/1/2011	0	0.5	Arsenic	Lab	16	
SHGBG-202	11/1/2011	0	0.5	Arsenic	Lab	14	
SHGBG-203	11/1/2011	0	0.5	Arsenic	Lab	16	
SWGBG-1	10/15/2007	0	0.5	Arsenic	Lab	16.1	
SWGBG-2	10/15/2007	0	0.5	Arsenic	Lab	10.6	
UBRBG 201	10/31/2011	0	0.5	Arsenic	Lab	20	
UBRBG 202	10/31/2011	0	0.5	Arsenic	Lab	14	
UBRBG 204	10/31/2011	0	0.5	Arsenic	Lab	16	
UBRBG-203	11/1/2011	0	0.5	Arsenic	Lab	18	
ACBG-1	10/16/2007	0	0.5	Cadmium	Lab	0.486	
ACBG-2	10/16/2007	0	0.5	Cadmium	Lab	0.52	
BCBG 202	10/31/2011	0	0.5	Cadmium	Lab	3.9	
BCBG 203	10/31/2011	0	0.5	Cadmium	Lab	4.7	
BCBG-1	10/15/2007	0	0.5	Cadmium	Lab	1.57	
BCBG-201	11/1/2011	0	0.5	Cadmium	Lab	2.6	
MGBG-1	10/15/2007	0	0.5	Cadmium	Lab	4.44	
MGBG-2	10/15/2007	0	0.5	Cadmium	Lab	3.59	
MHBG 201	10/31/2011	0	0.5	Cadmium	Lab	4.5	
MHBG 202	10/31/2011	0	0.5	Cadmium	Lab	4.6	
PCBG 201	10/31/2011	0	0.5	Cadmium	Lab	2.2	
PCBG 202	10/31/2011	0	0.5	Cadmium	Lab	2.2	
PCBG 203	10/31/2011	0	0.5	Cadmium	Lab	3.7	
PCBG-1	10/15/2007	0	0.5	Cadmium	Lab	0.543	
PSCBG-201	11/1/2011	0	0.5	Cadmium	Lab	2.2	
PSCBG-202	11/1/2011	0	0.5	Cadmium	Lab	3.2	
PSCBG-203	11/1/2011	0	0.5	Cadmium	Lab	3	
SGBG-1	10/15/2007	0	0.5	Cadmium	Lab	0.284	
SGBG201	10/31/2011	0	0.5	Cadmium	Lab	2.2	
SHGBG-1	10/16/2007	0	0.5	Cadmium	Lab	3.32	
SHGBG-2	10/16/2007	0	0.5	Cadmium	Lab	2.46	
SHGBG-201	11/1/2011	0	0.5	Cadmium	Lab	2.5	
SHGBG-202	11/1/2011	0	0.5	Cadmium	Lab	2.4	
SHGBG-203	11/1/2011	0	0.5	Cadmium	Lab	4.8	
SWGBG-1	10/15/2007	0	0.5	Cadmium	Lab	0.83	
SWGBG-2	10/15/2007	0	0.5	Cadmium	Lab	1.79	
UBRBG 201	10/31/2011	0	0.5	Cadmium	Lab	2.1	
UBRBG 202	10/31/2011	0	0.5	Cadmium	Lab	2.9	
UBRBG 204	10/31/2011	0	0.5	Cadmium	Lab	2.7	
UBRBG-203	11/1/2011	0	0.5	Cadmium	Lab	4.1	

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
ACBG-1	10/16/2007	0	0.5	Copper	Lab	144	
ACBG-2	10/16/2007	0	0.5	Copper	Lab	242	
BCBG 202	10/31/2011	0	0.5	Copper	Lab	36.2	
BCBG 203	10/31/2011	0	0.5	Copper	Lab	31.3	
BCBG-1	10/15/2007	0	0.5	Copper	Lab	43.8	
BCBG-201	11/1/2011	0	0.5	Copper	Lab	57.1	
MGBG-1	10/15/2007	0	0.5	Copper	Lab	87.8	
MGBG-2	10/15/2007	0	0.5	Copper	Lab	299	
MHBG 201	10/31/2011	0	0.5	Copper	Lab	35.8	
MHBG 202	10/31/2011	0	0.5	Copper	Lab	17.6	
PCBG 201	10/31/2011	0	0.5	Copper	Lab	339	
PCBG 202	10/31/2011	0	0.5	Copper	Lab	82.5	
PCBG 203	10/31/2011	0	0.5	Copper	Lab	33	
PCBG-1	10/15/2007	0	0.5	Copper	Lab	12.1	
PSCBG-201	11/1/2011	0	0.5	Copper	Lab	151	
PSCBG-202	11/1/2011	0	0.5	Copper	Lab	97	
PSCBG-203	11/1/2011	0	0.5	Copper	Lab	208	
SGBG-1	10/15/2007	0	0.5	Copper	Lab	97	
SGBG201	10/31/2011	0	0.5	Copper	Lab	52.2	
SHGBG-1	10/16/2007	0	0.5	Copper	Lab	50.8	
SHGBG-2	10/16/2007	0	0.5	Copper	Lab	53	
SHGBG-201	11/1/2011	0	0.5	Copper	Lab	108	
SHGBG-202	11/1/2011	0	0.5	Copper	Lab	82.3	
SHGBG-203	11/1/2011	0	0.5	Copper	Lab	24.6	
SWGBG-1	10/15/2007	0	0.5	Copper	Lab	43.3	
SWGBG-2	10/15/2007	0	0.5	Copper	Lab	48.4	
UBRBG 201	10/31/2011	0	0.5	Copper	Lab	157	
UBRBG 202	10/31/2011	0	0.5	Copper	Lab	198	
UBRBG 204	10/31/2011	0	0.5	Copper	Lab	160	
UBRBG-203	11/1/2011	0	0.5	Copper	Lab	36.3	
ACBG-1	10/16/2007	0	0.5	Iron	Lab	40700	
ACBG-2	10/16/2007	0	0.5	Iron	Lab	36800	
BCBG 202	10/31/2011	0	0.5	Iron	Lab	18500	
BCBG 203	10/31/2011	0	0.5	Iron	Lab	17500	
BCBG-1	10/15/2007	0	0.5	Iron	Lab	21400	
BCBG-201	11/1/2011	0	0.5	Iron	Lab	23300	
MGBG-1	10/15/2007	0	0.5	Iron	Lab	23700	
MGBG-2	10/15/2007	0	0.5	Iron	Lab	63900	
MHBG 201	10/31/2011	0	0.5	Iron	Lab	17200	
MHBG 202	10/31/2011	0	0.5	Iron	Lab	17300	
PCBG 201	10/31/2011	0	0.5	Iron	Lab	64200	
PCBG 202	10/31/2011	0	0.5	Iron	Lab	51800	
PCBG 203	10/31/2011	0	0.5	Iron	Lab	31200	
PCBG-1	10/15/2007	0	0.5	Iron	Lab	16800	
PSCBG-201	11/1/2011	0	0.5	Iron	Lab	25900	

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
PSCBG-202	11/1/2011	0	0.5	Iron	Lab	27700	
PSCBG-203	11/1/2011	0	0.5	Iron	Lab	51800	
SGBG-1	10/15/2007	0	0.5	Iron	Lab	24500	
SGBG201	10/31/2011	0	0.5	Iron	Lab	20300	
SHGBG-1	10/16/2007	0	0.5	Iron	Lab	22800	
SHGBG-2	10/16/2007	0	0.5	Iron	Lab	14900	
SHGBG-201	11/1/2011	0	0.5	Iron	Lab	32200	
SHGBG-202	11/1/2011	0	0.5	Iron	Lab	35100	
SHGBG-203	11/1/2011	0	0.5	Iron	Lab	18200	
SWGBG-1	10/15/2007	0	0.5	Iron	Lab	27500	
SWGBG-2	10/15/2007	0	0.5	Iron	Lab	20400	
UBRBG 201	10/31/2011	0	0.5	Iron	Lab	42100	
UBRBG 202	10/31/2011	0	0.5	Iron	Lab	48200	
UBRBG 204	10/31/2011	0	0.5	Iron	Lab	41200	
UBRBG-203	11/1/2011	0	0.5	Iron	Lab	18400	
ACBG-1	10/16/2007	0	0.5	Lead	Lab	51	
ACBG-2	10/16/2007	0	0.5	Lead	Lab	46	
BCBG 202	10/31/2011	0	0.5	Lead	Lab	74	
BCBG 203	10/31/2011	0	0.5	Lead	Lab	31	
BCBG-1	10/15/2007	0	0.5	Lead	Lab	76.6	
BCBG-201	11/1/2011	0	0.5	Lead	Lab	92	
MGBG-1	10/15/2007	0	0.5	Lead	Lab	96.8	
MGBG-2	10/15/2007	0	0.5	Lead	Lab	304	
MHBG 201	10/31/2011	0	0.5	Lead	Lab	68	
MHBG 202	10/31/2011	0	0.5	Lead	Lab	188	
PCBG 201	10/31/2011	0	0.5	Lead	Lab	294	
PCBG 202	10/31/2011	0	0.5	Lead	Lab	60	
PCBG 203	10/31/2011	0	0.5	Lead	Lab	136	
PCBG-1	10/15/2007	0	0.5	Lead	Lab	34.4	
PSCBG-201	11/1/2011	0	0.5	Lead	Lab	126	
PSCBG-202	11/1/2011	0	0.5	Lead	Lab	1010	
PSCBG-203	11/1/2011	0	0.5	Lead	Lab	1230	
SGBG-1	10/15/2007	0	0.5	Lead	Lab	115	
SGBG201	10/31/2011	0	0.5	Lead	Lab	56	
SHGBG-1	10/16/2007	0	0.5	Lead	Lab	342	
SHGBG-2	10/16/2007	0	0.5	Lead	Lab	43	
SHGBG-201	11/1/2011	0	0.5	Lead	Lab	75	
SHGBG-202	11/1/2011	0	0.5	Lead	Lab	63	
SHGBG-203	11/1/2011	0	0.5	Lead	Lab	162	
SWGBG-1	10/15/2007	0	0.5	Lead	Lab	65.8	
SWGBG-2	10/15/2007	0	0.5	Lead	Lab	145	
UBRBG 201	10/31/2011	0	0.5	Lead	Lab	70	
UBRBG 202	10/31/2011	0	0.5	Lead	Lab	45	
UBRBG 204	10/31/2011	0	0.5	Lead	Lab	462	
UBRBG-203	11/1/2011	0	0.5	Lead	Lab	222	

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
ACBG-1	10/16/2007	0	0.5	Manganese	Lab	498	
ACBG-2	10/16/2007	0	0.5	Manganese	Lab	1050	
BCBG 202	10/31/2011	0	0.5	Manganese	Lab	2570	
BCBG 203	10/31/2011	0	0.5	Manganese	Lab	549	
BCBG-1	10/15/2007	0	0.5	Manganese	Lab	2500	
BCBG-201	11/1/2011	0	0.5	Manganese	Lab	1290	
MGBG-1	10/15/2007	0	0.5	Manganese	Lab	7740	
MGBG-2	10/15/2007	0	0.5	Manganese	Lab	1810	
MHBG 201	10/31/2011	0	0.5	Manganese	Lab	1100	
MHBG 202	10/31/2011	0	0.5	Manganese	Lab	504	
PCBG 201	10/31/2011	0	0.5	Manganese	Lab	229	
PCBG 202	10/31/2011	0	0.5	Manganese	Lab	233	
PCBG 203	10/31/2011	0	0.5	Manganese	Lab	66	
PCBG-1	10/15/2007	0	0.5	Manganese	Lab	1140	
PSCBG-201	11/1/2011	0	0.5	Manganese	Lab	135	
PSCBG-202	11/1/2011	0	0.5	Manganese	Lab	646	
PSCBG-203	11/1/2011	0	0.5	Manganese	Lab	963	
SGBG-1	10/15/2007	0	0.5	Manganese	Lab	181	
SGBG201	10/31/2011	0	0.5	Manganese	Lab	126	
SHGBG-1	10/16/2007	0	0.5	Manganese	Lab	3050	
SHGBG-2	10/16/2007	0	0.5	Manganese	Lab	2580	
SHGBG-201	11/1/2011	0	0.5	Manganese	Lab	639	
SHGBG-202	11/1/2011	0	0.5	Manganese	Lab	802	
SHGBG-203	11/1/2011	0	0.5	Manganese	Lab	1290	
SWGBG-1	10/15/2007	0	0.5	Manganese	Lab	972	
SWGBG-2	10/15/2007	0	0.5	Manganese	Lab	1340	
UBRBG 201	10/31/2011	0	0.5	Manganese	Lab	216	
UBRBG 202	10/31/2011	0	0.5	Manganese	Lab	846	
UBRBG 204	10/31/2011	0	0.5	Manganese	Lab	1030	
UBRBG-203	11/1/2011	0	0.5	Manganese	Lab	1540	
ACBG-1	10/16/2007	0	0.5	Zinc	Lab	204	
ACBG-2	10/16/2007	0	0.5	Zinc	Lab	108	
BCBG 202	10/31/2011	0	0.5	Zinc	Lab	283	
BCBG 203	10/31/2011	0	0.5	Zinc	Lab	70	
BCBG-1	10/15/2007	0	0.5	Zinc	Lab	282	
BCBG-201	11/1/2011	0	0.5	Zinc	Lab	238	
MGBG-1	10/15/2007	0	0.5	Zinc	Lab	756	
MGBG-2	10/15/2007	0	0.5	Zinc	Lab	559	
MHBG 201	10/31/2011	0	0.5	Zinc	Lab	144	
MHBG 202	10/31/2011	0	0.5	Zinc	Lab	333	
PCBG 201	10/31/2011	0	0.5	Zinc	Lab	107	
PCBG 202	10/31/2011	0	0.5	Zinc	Lab	55	
PCBG 203	10/31/2011	0	0.5	Zinc	Lab	34	
PCBG-1	10/15/2007	0	0.5	Zinc	Lab	201	
PSCBG-201	11/1/2011	0	0.5	Zinc	Lab	66	

TABLE F-6: BACKGROUND ANALYTICAL DATA FOR SOIL USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
PSCBG-202	11/1/2011	0	0.5	Zinc	Lab	293	
PSCBG-203	11/1/2011	0	0.5	Zinc	Lab	279	
SGBG-1	10/15/2007	0	0.5	Zinc	Lab	45.7	
SGBG201	10/31/2011	0	0.5	Zinc	Lab	37	
SHGBG-1	10/16/2007	0	0.5	Zinc	Lab	266	
SHGBG-2	10/16/2007	0	0.5	Zinc	Lab	150	
SHGBG-201	11/1/2011	0	0.5	Zinc	Lab	120	
SHGBG-202	11/1/2011	0	0.5	Zinc	Lab	88	
SHGBG-203	11/1/2011	0	0.5	Zinc	Lab	456	
SWGBG-1	10/15/2007	0	0.5	Zinc	Lab	92.2	
SWGBG-2	10/15/2007	0	0.5	Zinc	Lab	231	
UBRBG 201	10/31/2011	0	0.5	Zinc	Lab	46	
UBRBG 202	10/31/2011	0	0.5	Zinc	Lab	160	
UBRBG 204	10/31/2011	0	0.5	Zinc	Lab	308	
UBRBG-203	11/1/2011	0	0.5	Zinc	Lab	228	

Notes:

All concentrations are in units of milligrams per kilogram.

bgs	Below ground surface
HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
U	Nondetected concentration
XRF 10	X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

TABLE F-7: BACKGROUND ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs)		Chemical	Method	Result	Qualifier
		Top	Bottom				
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Aluminum	Lab	8980	
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Arsenic	Lab	7.87	
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Arsenic	Lab	4.73	
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Arsenic	Lab	18.1	
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Arsenic	Lab	5.56	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Arsenic	Lab	15.4	
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Arsenic	Lab	12.4	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Arsenic	Lab	9.12	
PGBG-1 (6-12")	10/16/2007	0.5	1	Arsenic	Lab	9.4	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Arsenic	Lab	18.8	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Arsenic	Lab	18.5	
PGBG-2 (6-12")	10/16/2007	0.5	1	Arsenic	Lab	32.3	
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Cadmium	Lab	0.5	U
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Cadmium	Lab	0.5	U
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Cadmium	Lab	0.5	U
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Cadmium	Lab	0.5	U
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Cadmium	Lab	0.5	U
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Cadmium	Lab	1.51	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Cadmium	Lab	1.44	
PGBG-1 (6-12")	10/16/2007	0.5	1	Cadmium	Lab	0.649	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Cadmium	Lab	1.84	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Cadmium	Lab	1.54	
PGBG-2 (6-12")	10/16/2007	0.5	1	Cadmium	Lab	1.57	
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Copper	Lab	29.4	
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Copper	Lab	26.9	
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Copper	Lab	71	
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Copper	Lab	41.9	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Copper	Lab	114	
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Copper	Lab	34.7	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Copper	Lab	37	
PGBG-1 (6-12")	10/16/2007	0.5	1	Copper	Lab	22	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Copper	Lab	52	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Copper	Lab	55	
PGBG-2 (6-12")	10/16/2007	0.5	1	Copper	Lab	67.4	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Iron	Lab	23900	
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Lead	Lab	47.5	
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Lead	Lab	7.5	
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Lead	Lab	56.4	
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Lead	Lab	21.9	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Lead	Lab	81.5	
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Lead	Lab	55	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Lead	Lab	101	
PGBG-1 (6-12")	10/16/2007	0.5	1	Lead	Lab	174	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Lead	Lab	105	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Lead	Lab	108	
PGBG-2 (6-12")	10/16/2007	0.5	1	Lead	Lab	113	

TABLE F-7: BACKGROUND ANALYTICAL DATA FOR SEDIMENT USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Method	Result	Qualifier
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Manganese	Lab	408	
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Manganese	Lab	8.24	
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Manganese	Lab	55	
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Manganese	Lab	271	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Manganese	Lab	578	
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Manganese	Lab	696	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Manganese	Lab	199	
PGBG-1 (6-12")	10/16/2007	0.5	1	Manganese	Lab	88	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Manganese	Lab	586	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Manganese	Lab	498	
PGBG-2 (6-12")	10/16/2007	0.5	1	Manganese	Lab	293	
BRSW-11 SE (2007) (0-2)	10/5/2007	0	0.16666667	Zinc	Lab	136	
BRSW-21 SE (2007) (0-2)	10/5/2007	0	0.16666667	Zinc	Lab	8.5	
BRSW-21 SE (2007) (2-6)	10/5/2007	0.16666667	0.5	Zinc	Lab	48.8	
BRSW-6 SE (2007) (0-2)	10/10/2007	0	0.16666667	Zinc	Lab	65.7	
BRSW-6 SE (2008) (0-2)	6/17/2008	0	0.16666667	Zinc	Lab	128	
PGBG-1 (0-2")	10/16/2007	0	0.16666667	Zinc	Lab	158	
PGBG-1 (2-6")	10/16/2007	0.16666667	0.5	Zinc	Lab	174	
PGBG-1 (6-12")	10/16/2007	0.5	1	Zinc	Lab	133	
PGBG-2 (0-2")	10/16/2007	0	0.16666667	Zinc	Lab	263	
PGBG-2 (2-6")	10/16/2007	0.16666667	0.5	Zinc	Lab	252	
PGBG-2 (6-12")	10/16/2007	0.5	1	Zinc	Lab	275	

Notes:

All concentrations are in units of milligrams per kilogram.

bgs	Below ground surface
HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
U	Nondetected concentration

TABLE F-8: BACKGROUND ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
ANMW-9 (2008)	7/7/2008	Aluminum	Lab	0.03	U
PDGW101 (2008)	7/31/2008	Aluminum	Lab	3.47	
PDGW102 (2008)	7/31/2008	Aluminum	Lab	6.63	
PMPZ-4 (2007)	10/15/2007	Aluminum	Lab	4.51	
PMPZ-4 (2008)	7/7/2008	Aluminum	Lab	0.42	
SHGW101 (2008)	7/31/2008	Aluminum	Lab	0.03	U
SHGW102 (2008)	7/31/2008	Aluminum	Lab	0.03	U
SWGW-103 (2007)	10/17/2007	Aluminum	Lab	0.07	
SWGW-103 (2008)	7/10/2008	Aluminum	Lab	0.03	U
ANMW-9 (2008)	7/7/2008	Arsenic	Lab	0.002	U
PDGW101 (2008)	7/31/2008	Arsenic	Lab	0.002	U
PDGW102 (2008)	7/31/2008	Arsenic	Lab	0.003	
PMPZ-4 (2007)	10/15/2007	Arsenic	Lab	0.002	U
PMPZ-4 (2008)	7/7/2008	Arsenic	Lab	0.002	U
SHGW101 (2008)	7/31/2008	Arsenic	Lab	0.002	U
SHGW102 (2008)	7/31/2008	Arsenic	Lab	0	U
SWGW-103 (2007)	10/17/2007	Arsenic	Lab	0.002	U
SWGW-103 (2008)	7/10/2008	Arsenic	Lab	0.002	U
ANMW-9 (2008)	7/7/2008	Cadmium	Lab	0.00008	U
PDGW101 (2008)	7/31/2008	Cadmium	Lab	0.0014	
PDGW102 (2008)	7/31/2008	Cadmium	Lab	0.00008	U
PMPZ-4 (2007)	10/15/2007	Cadmium	Lab	0.00088	J
PMPZ-4 (2008)	7/7/2008	Cadmium	Lab	0.00008	U
SHGW101 (2008)	7/31/2008	Cadmium	Lab	0.00013	
SHGW102 (2008)	7/31/2008	Cadmium	Lab	0.0019	
SWGW-103 (2007)	10/17/2007	Cadmium	Lab	0.00156	
SWGW-103 (2008)	7/10/2008	Cadmium	Lab	0.0004	
ANMW-9 (2008)	7/7/2008	Copper	Lab	0.001	
PDGW101 (2008)	7/31/2008	Copper	Lab	0.08	
PDGW102 (2008)	7/31/2008	Copper	Lab	0.275	
PMPZ-4 (2007)	10/15/2007	Copper	Lab	0.002	
PMPZ-4 (2008)	7/7/2008	Copper	Lab	0.004	
SHGW101 (2008)	7/31/2008	Copper	Lab	0.001	U
SHGW102 (2008)	7/31/2008	Copper	Lab	0.001	
SWGW-103 (2007)	10/17/2007	Copper	Lab	0.043	
SWGW-103 (2008)	7/10/2008	Copper	Lab	0.022	
ANMW-9 (2008)	7/7/2008	Iron	Lab	0.03	U
PDGW101 (2008)	7/31/2008	Iron	Lab	8.7	
PDGW102 (2008)	7/31/2008	Iron	Lab	12.73	
PMPZ-4 (2007)	10/15/2007	Iron	Lab	14.96	
PMPZ-4 (2008)	7/7/2008	Iron	Lab	0.03	U
SHGW101 (2008)	7/31/2008	Iron	Lab	0.03	U
SHGW102 (2008)	7/31/2008	Iron	Lab	0.42	
SWGW-103 (2007)	10/17/2007	Iron	Lab	1.56	
SWGW-103 (2008)	7/10/2008	Iron	Lab	0.21	
ANMW-9 (2008)	7/7/2008	Lead	Lab	0.0005	U

TABLE F-8: BACKGROUND ANALYTICAL DATA FOR GROUNDWATER USED IN HHRA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
PDGW101 (2008)	7/31/2008	Lead	Lab	0.0027	
PDGW102 (2008)	7/31/2008	Lead	Lab	0.0007	
PMPZ-4 (2007)	10/15/2007	Lead	Lab	0.0009	J
PMPZ-4 (2008)	7/7/2008	Lead	Lab	0.0005	U
SHGW101 (2008)	7/31/2008	Lead	Lab	0.0005	U
SHGW102 (2008)	7/31/2008	Lead	Lab	0.0005	U
SWGW-103 (2007)	10/17/2007	Lead	Lab	0.0013	
SWGW-103 (2008)	7/10/2008	Lead	Lab	0.0005	U
ANMW-9 (2008)	7/7/2008	Manganese	Lab	0.008	
PDGW101 (2008)	7/31/2008	Manganese	Lab	0.668	
PDGW102 (2008)	7/31/2008	Manganese	Lab	0.376	
PMPZ-4 (2007)	10/15/2007	Manganese	Lab	0.501	
PMPZ-4 (2008)	7/7/2008	Manganese	Lab	0.133	
SHGW101 (2008)	7/31/2008	Manganese	Lab	0.005	U
SHGW102 (2008)	7/31/2008	Manganese	Lab	1.928	
SWGW-103 (2007)	10/17/2007	Manganese	Lab	0.897	
SWGW-103 (2008)	7/10/2008	Manganese	Lab	0.323	
ANMW-9 (2008)	7/7/2008	Zinc	Lab	0.01	U
PDGW101 (2008)	7/31/2008	Zinc	Lab	0.3	
PDGW102 (2008)	7/31/2008	Zinc	Lab	0.26	
PMPZ-4 (2007)	10/15/2007	Zinc	Lab	0.27	
PMPZ-4 (2008)	7/7/2008	Zinc	Lab	0.03	
SHGW101 (2008)	7/31/2008	Zinc	Lab	0.05	
SHGW102 (2008)	7/31/2008	Zinc	Lab	0.21	
SWGW-103 (2007)	10/17/2007	Zinc	Lab	0.11	
SWGW-103 (2008)	7/10/2008	Zinc	Lab	0.07	

Notes:

All concentrations are in units of micrograms per liter.

ID	Identification
J	Estimated concentration
U	Nondetected concentration

TABLE F-9: BACKGROUND ANALYTICAL DATA FOR SURFACE WATER USED IN HHRA

Baseline Human Health Risk Assessment

Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Sample ID	Sample Date	Chemical	Method	Result	Qualifier
BRSW-11 (2007)	10/5/2007	Aluminum	Lab	0.03	U
BRSW-6 (2008)	6/17/2008	Aluminum	Lab	0.03	
BRSW-11 (2007)	10/5/2007	Arsenic	Lab	0.002	U
BRSW-6 (2007)	10/9/2007	Arsenic	Lab	0.002	U
BRSW-6 (2008)	6/17/2008	Arsenic	Lab	0.003	U
BRSW-11 (2007)	10/5/2007	Cadmium	Lab	0.00008	U
BRSW-6 (2007)	10/9/2007	Cadmium	Lab	0.00008	U
BRSW-6 (2008)	6/17/2008	Cadmium	Lab	0.00008	U
BRSW-11 (2007)	10/5/2007	Copper	Lab	0.001	U
BRSW-6 (2007)	10/9/2007	Copper	Lab	0.001	U
BRSW-6 (2008)	6/17/2008	Copper	Lab	0.001	U
BRSW-11 (2007)	10/5/2007	Iron	Lab	0.61	
BRSW-6 (2007)	10/9/2007	Iron	Lab	0.03	BJ
BRSW-6 (2008)	6/17/2008	Iron	Lab	0.05	U
BRSW-11 (2007)	10/5/2007	Lead	Lab	0.0005	U
BRSW-6 (2007)	10/9/2007	Lead	Lab	0.0005	U
BRSW-6 (2008)	6/17/2008	Lead	Lab	0.0005	U
BRSW-11 (2007)	10/5/2007	Manganese	Lab	0.126	
BRSW-6 (2007)	10/9/2007	Manganese	Lab	0.003	U
BRSW-6 (2008)	6/17/2008	Manganese	Lab	0.005	U
BRSW-11 (2007)	10/5/2007	Zinc	Lab	0.01	U
BRSW-6 (2007)	10/9/2007	Zinc	Lab	0.01	U
BRSW-6 (2008)	6/17/2008	Zinc	Lab	0.01	U

Notes:

All concentrations are in units of milligrams per liter.

B	Method blank shows evidence of contamination
ID	Identification
J	Estimated concentration
U	Nondetected concentration

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Arsenic	52.8		39.78	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	253		1201.81	
1	UAW2-200 (0-6")	10/12/2007	0	0.5	Arsenic	77.7		174.07	
1	UAW2-250 (0-6")	10/12/2007	0	0.5	Arsenic	79.4		115.21	U
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	50.7		25.09	U
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	158		2702.7	
1	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	121	JM74	469.79	
1	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Arsenic	40		50.16	U
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Copper	79.6		89.33	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	3050		478.81	
1	UAW2-200 (0-6")	10/12/2007	0	0.5	Copper	661		498.16	
1	UAW2-250 (0-6")	10/12/2007	0	0.5	Copper	631		487.93	
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	198		61.54	
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	1060		1560.56	
1	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	954		673.69	
1	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Copper	255		223.14	
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Iron	27800		23946.2	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	97300		39330.65	
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	30600		16784.46	
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	68100		79648.82	
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Lead	771		767.99	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	55200		41468.69	
1	UAW2-200 (0-6")	10/12/2007	0	0.5	Lead	4540		3708.11	
1	UAW2-250 (0-6")	10/12/2007	0	0.5	Lead	5600		4393.83	
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	2740		323.18	
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	55100		78258.55	
1	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	22600	JM10	13337.09	
1	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Lead	1140		980.24	
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Manganese	2250		2271.31	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	38.7		244.99	U
1	UAW2-200 (0-6")	10/12/2007	0	0.5	Manganese	601		586.81	
1	UAW2-250 (0-6")	10/12/2007	0	0.5	Manganese	363		212.57	U
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	489		473.34	
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	224		481.4	U
1	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	117		242.16	
1	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Manganese	1430		937.28	
1	UAW1-150+75 (0-6")	7/18/2008	0	0.5	Zinc	1020		1229	
1	UAW1-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	1270		728.34	
1	UAW2-200 (0-6")	10/12/2007	0	0.5	Zinc	362		263.18	
1	UAW2-250 (0-6")	10/12/2007	0	0.5	Zinc	312		179.64	
1	UAW2-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	156		57.06	
1	UAW3-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	3200		10101.98	
1	UAW4-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	641		511.41	
1	UAW5-COMP 1 (0-6")	10/16/2007	0	0.5	Zinc	588		452.09	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Arsenic	15.1		20.56	U
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	72.6		115.35	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Arsenic	115		207.58	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Arsenic	264		207.62	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Arsenic	238		472.42	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Arsenic	298		411.76	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Arsenic	14.2		18.85	U
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Arsenic	128	JM74	103.32	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	240		289.71	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Arsenic	23.9	JM74	18.09	U
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Arsenic	62.4	JM74	85.01	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	69.6		56.25	U
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	121		96.64	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Arsenic	76.8		83.77	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Arsenic	143		126.72	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Arsenic	21.1		24.62	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Arsenic	19		19.72	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Arsenic	28.8		55.7	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Arsenic	14.3		19.61	U
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Arsenic	252		374.23	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Arsenic	26.8		12.3	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Arsenic	204		209.06	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Arsenic	34.6		42.32	U
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Arsenic	10.8		24.78	U
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Arsenic	73.2		83.17	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Arsenic	36.4	JM74	29.11	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Arsenic	32.1	JM74	28.14	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	215	JM74	201.66	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Arsenic	389	JM74	330.71	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Arsenic	105		41.54	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Arsenic	30.5		15.87	U
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Arsenic	47.8		64.85	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Copper	328	J	301.99	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Copper	286	J	292.34	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Copper	330	J	315.02	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Copper	930	J	515.35	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Copper	1110	J	925.35	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Copper	2750	J	2168.38	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Copper	133	J	63.42	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Copper	584	J	451.91	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Copper	328		236.9	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Copper	260		178.49	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Copper	230		181.04	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Copper	328		300.08	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Copper	310		277.83	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Copper	141		92.85	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Copper	423		321.29	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Copper	65.8		55.59	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Copper	73.4		53.21	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Copper	123		156.25	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Copper	123	J	144.72	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Copper	541	J	315.66	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Copper	69.6		64	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Copper	286	J	227.84	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Copper	276	J	203.33	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Copper	178	J	129.78	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Copper	286	J	197.51	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Copper	1280		1103.69	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Copper	1220		1049.79	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Copper	889		695.84	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Copper	683		451.4	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Copper	184	JM73	87.68	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Copper	118	JM73	82.02	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Copper	188	JM73	172.93	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Iron	16900		17033.8	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Lead	170	J	138.02	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Lead	1970	J	1521.42	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Lead	3950	J	3523.56	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Lead	1630	J	1205.43	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Lead	11900	J	11405.62	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Lead	15400	J	10203.9	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Lead	181	J	137.19	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Lead	3960	J	3253.89	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Lead	3680	JM10	3438.68	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Lead	147	JM10	104.43	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Lead	540	JM10	506.1	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Lead	1170		1163.4	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Lead	1260		1281.62	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Lead	668		565.16	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Lead	2560		2220.21	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Lead	111		91.64	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Lead	106		80.31	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Lead	361		340.33	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Lead	165	J	141.8	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Lead	3260	J	2577.77	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Lead	123		101.2	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Lead	3390	J	2775.6	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Lead	666	J	704.65	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Lead	291	J	235.4	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Lead	1000	J	888.6	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Lead	175	JM10	125.6	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Lead	180	JM10	153.02	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Lead	1420	JM10	1290.14	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Lead	1710	JM10	1686.75	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Lead	165		138.65	
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Lead	80.4		96.56	
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Lead	498		638.13	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Manganese	1130		897.4	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Manganese	1600		2241.87	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Manganese	171		215.87	U
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Manganese	4050		2998.84	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Manganese	1540		2628.88	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Manganese	6790		7569.65	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Manganese	810		602.78	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Manganese	2230		1971.04	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Manganese	368		401.88	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Manganese	514		372.98	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Manganese	784		1385.83	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Manganese	1680		3408.44	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Manganese	789		703.76	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Manganese	922		655.3	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Manganese	1670		1788.13	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Manganese	596		523.7	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Manganese	538		360.09	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Manganese	969		1137.09	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Manganese	1770		1384.26	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Manganese	204		293.49	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Manganese	832		763	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Manganese	2610		3541.93	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Manganese	688		893.57	
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Manganese	298		188.55	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Manganese	2560		3918.11	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Manganese	5340		5145.65	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Manganese	5580		4916.1	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Manganese	6890		11757.94	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Manganese	5350		4277.16	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Manganese	83.6	JM21	127.82	U
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Manganese	86.1	JM21	127.99	U
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Manganese	842	JM21	1546.7	
2	BREOT-N11+25 (0-6")	10/9/2007	0	0.5	Zinc	204		182.9	
2	BREOT-N12-12.5 (0-6")	10/9/2007	0	0.5	Zinc	1440		1176.38	
2	BREOT-N21+25 (0-6")	10/9/2007	0	0.5	Zinc	581		428.16	
2	BREOT-N23-0 (0-6")	10/10/2007	0	0.5	Zinc	2490	J	1192.53	
2	BREOT-N26-0 (0-6")	10/10/2007	0	0.5	Zinc	5020	J	2123.6	
2	BREOT-N27-75 (0-6")	10/10/2007	0	0.5	Zinc	14300	J	10273.2	
2	BREOT-N28+25 (0-6")	10/10/2007	0	0.5	Zinc	198	J	185.96	
2	BREOT-N30-12.5 (0-6")	10/10/2007	0	0.5	Zinc	1040	J	775.58	
2	BREOT-N33-12.5 (0-6")	10/11/2007	0	0.5	Zinc	462		356	
2	BREOT-N37+25 (0-6")	10/11/2007	0	0.5	Zinc	91.9		78.59	
2	BREOT-N37-0 (0-6")	10/11/2007	0	0.5	Zinc	363		414.47	
2	BREOT-N41-12.5 (0-6")	10/11/2007	0	0.5	Zinc	1060		1034.53	
2	BREOT-N47-12.5 (0-6")	10/12/2007	0	0.5	Zinc	346		251.86	
2	BREOT-N56-0 (0-6")	10/12/2007	0	0.5	Zinc	348		249.69	
2	BREOT-N56-12.5 (0-6")	10/12/2007	0	0.5	Zinc	1000		689.53	
2	BREOT-N60+25 (0-6")	10/16/2007	0	0.5	Zinc	223		235.93	
2	BREOT-N60-0 (0-6")	10/16/2007	0	0.5	Zinc	246		226.75	
2	BREOT-N63-0 (0-6")	10/16/2007	0	0.5	Zinc	422		464.62	
2	BREOT-S1+25 (0-6")	10/8/2007	0	0.5	Zinc	400		448.39	
2	BREOT-S15-12.5 (0-6")	10/9/2007	0	0.5	Zinc	820		350.03	
2	BREOT-S20+75 (0-6")	7/8/2008	0	0.5	Zinc	219		218	
2	BREOT-S27-0 (0-6")	10/10/2007	0	0.5	Zinc	381	J	214.66	
2	BREOT-S29+25 (0-6")	10/10/2007	0	0.5	Zinc	276	J	180.92	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	BREOT-S30-0 (0-6")	10/10/2007	0	0.5	Zinc	72.1	J	86.3	
2	BREOT-S31-25 (0-6")	10/10/2007	0	0.5	Zinc	499	J	412.5	
2	BREOT-S37+25 (0-6")	10/11/2007	0	0.5	Zinc	1220		1021.98	
2	BREOT-S38+25 (0-6")	10/11/2007	0	0.5	Zinc	1400		1190.89	
2	BREOT-S38-12.5 (0-6")	10/11/2007	0	0.5	Zinc	2180		1917.93	
2	BREOT-S41-12.5 (0-6")	10/11/2007	0	0.5	Zinc	2230		1302.05	
2	BREOT-S48+25 (0-6")	10/15/2007	0	0.5	Zinc	28.5	JM73	27.29	U
2	BREOT-S54-0 (0-6")	10/15/2007	0	0.5	Zinc	29.2	JM73	28.81	U
2	BREOT-S55-12.5 (0-6")	10/15/2007	0	0.5	Zinc	284	JM73	210.09	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Arsenic	58.4		64.9	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Arsenic	150		118.59	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Arsenic	52		32.4	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	1570		184	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Arsenic	354		1103.09	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Copper	529		390	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Copper	130		112.57	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Copper	166		137.48	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	361		288.88	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Copper	462		269.55	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Iron	40900		44549.4	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Iron	34600		33223.55	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	194000		29769.05	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Iron	51600		243112.63	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Lead	574		593.8	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Lead	476		401.74	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Lead	356		314.72	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	2140		1570.95	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Lead	2270		1986.73	
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Manganese	1000		1216	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Manganese	741		744.47	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Manganese	258		330.8	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	178		334.22	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Manganese	712		338.24	U
3	CMWA-0+12.5 (0-6")	7/16/2008	0	0.5	Zinc	475		435.9	
3	CMWA-250 (0-6")	10/8/2007	0	0.5	Zinc	343		265.98	
3	CMWA-250+50 (0-6")	7/21/2008	0	0.5	Zinc	132		151.64	
3	CMWA-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	628		1066.52	
3	CMWA-COMP 2 (0-6")	10/8/2007	0	0.5	Zinc	1230		362.67	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Arsenic	28.3		49.02	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Arsenic	24.4		33.62	U
4	CARM-400 (0-6")	10/15/2007	0	0.5	Arsenic	27.8		32.3	U
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Copper	443		452.23	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Copper	324		329	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Copper	439		548.5	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Lead	524		496.36	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Lead	405		329.57	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Lead	226		260.31	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Manganese	845		1040.68	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Manganese	1100		1094.94	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
4	CARM-400 (0-6")	10/15/2007	0	0.5	Manganese	1460		2576.21	
4	CARM-1150 (0-6")	10/15/2007	0	0.5	Zinc	260		278.62	
4	CARM-250 (0-6")	10/16/2007	0	0.5	Zinc	399		449.68	
4	CARM-400 (0-6")	10/15/2007	0	0.5	Zinc	384		514.53	
5	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Arsenic	19.1		25.05	
5	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Arsenic	20.8		24.85	U
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Arsenic	24.5		27.53	U
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Arsenic	21.7		21.05	U
5	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Arsenic	84.5		86.51	
5	EEA2-150 (0-6")	10/11/2007	0	0.5	Arsenic	11.3	JM74	12.7	U
5	EEA2-200 (0-6")	10/11/2007	0	0.5	Arsenic	12.6	JM74	19.41	U
5	WEA1-00 (0-6")	10/15/2007	0	0.5	Arsenic	19		23.16	U
5	WEA1-400 (0-6")	10/15/2007	0	0.5	Arsenic	27.6		22.68	U
5	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Copper	78.9	JM73	79.55	
5	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Copper	107		112.22	
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Copper	167		166.02	
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Copper	175		108.5	
5	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Copper	286		237.44	
5	EEA2-150 (0-6")	10/11/2007	0	0.5	Copper	53.9		75.94	
5	EEA2-200 (0-6")	10/11/2007	0	0.5	Copper	66.2		81.15	
5	WEA1-00 (0-6")	10/15/2007	0	0.5	Copper	119	JM73	9	
5	WEA1-400 (0-6")	10/15/2007	0	0.5	Copper	105	JM73	119.03	
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Iron	28700		27970.32	
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Iron	31400		16153.74	
5	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Lead	96.3		87.59	
5	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Lead	224		261.67	
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Lead	284		283.22	
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Lead	198		163.05	
5	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Lead	1380		1133.01	
5	EEA2-150 (0-6")	10/11/2007	0	0.5	Lead	76.3	JM10	52.42	
5	EEA2-200 (0-6")	10/11/2007	0	0.5	Lead	120	JM10	157.32	
5	WEA1-00 (0-6")	10/15/2007	0	0.5	Lead	246		24	
5	WEA1-400 (0-6")	10/15/2007	0	0.5	Lead	242		211.19	
5	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Manganese	461	JM21	459.75	
5	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Manganese	300		202.47	
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Manganese	302		299.69	
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Manganese	518		232	
5	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Manganese	243		242.48	
5	EEA2-150 (0-6")	10/11/2007	0	0.5	Manganese	524		439.35	
5	EEA2-200 (0-6")	10/11/2007	0	0.5	Manganese	488		508.92	
5	WEA1-00 (0-6")	10/15/2007	0	0.5	Manganese	396	JM21	452.56	
5	WEA1-400 (0-6")	10/15/2007	0	0.5	Manganese	324	JM21	239.38	
5	CEA1-3-550 (0-6")	10/15/2007	0	0.5	Zinc	256	JM73	240.4	
5	CEA1-3-850 (0-6")	10/15/2007	0	0.5	Zinc	114		124.1	
5	CEA1-3-COMP 1 (0-6")	10/12/2007	0	0.5	Zinc	117		82.14	
5	CEA1-3-COMP 2 (0-6")	10/12/2007	0	0.5	Zinc	234		62.73	
5	CEA1-3-COMP 3 (0-6")	10/12/2007	0	0.5	Zinc	868		188.26	
5	EEA2-150 (0-6")	10/11/2007	0	0.5	Zinc	64.8		64.63	
5	EEA2-200 (0-6")	10/11/2007	0	0.5	Zinc	72.7		61	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
5	WEA1-00 (0-6")	10/15/2007	0	0.5	Zinc	129	JM73	128.51	
5	WEA1-400 (0-6")	10/15/2007	0	0.5	Zinc	97.3	JM73	71.86	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Arsenic	1010		1087.56	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Arsenic	105		73.3	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Arsenic	21.2		23.95	U
6	CONM-750 (0-6")	10/9/2007	0	0.5	Arsenic	83.6		92.56	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Arsenic	16.4		14.16	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Arsenic	148		46.33	U
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Arsenic	283		60.6	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Arsenic	673		486.49	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Copper	366		318.42	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Copper	203		178	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Copper	107		77.44	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Copper	282		315.38	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Copper	56.9		6	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Copper	410		216.81	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Copper	394		135.25	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Copper	296		276.34	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Iron	40400		34872.5	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Iron	23700		24739.39	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Iron	60100		42987.15	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Iron	73600		25072.45	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Iron	65700		60003.03	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Lead	5010		4696.69	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Lead	942		872.6	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Lead	410		275.09	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Lead	2350		1691.71	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Lead	125		136.49	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Lead	1600		900.8	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Lead	1540		713.17	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Lead	6780		5934.86	
6	CONM-250 (0-6")	10/9/2007	0	0.5	Manganese	476		514.29	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Manganese	1500		1385	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Manganese	702		237.76	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Manganese	747		742.19	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Manganese	313		571.61	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Manganese	1220		801.82	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Manganese	1250		429.54	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Manganese	232		206.59	U
6	CONM-250 (0-6")	10/9/2007	0	0.5	Zinc	474		494.42	
6	CONM-250+25 (0-6")	7/9/2008	0	0.5	Zinc	498		607.4	
6	CONM-700 (0-6")	10/10/2007	0	0.5	Zinc	228		239.77	
6	CONM-750 (0-6")	10/9/2007	0	0.5	Zinc	740		745.86	
6	CONM-750+6.0 (0-6")	7/10/2008	0	0.5	Zinc	126		156.69	
6	CONM-COMP 1 (0-6")	10/10/2007	0	0.5	Zinc	419		232.83	
6	CONM-COMP 2 (0-6")	10/10/2007	0	0.5	Zinc	914		782.29	
6	CONM-Pile 1 (0-6")	10/10/2007	0	0.5	Zinc	333		258.66	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Arsenic	29.5		23.12	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Copper	377		479.77	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Iron	28400		42434.35	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Manganese	190		282.55	
7	MPWA-200+0 (0-6")	7/16/2008	0	0.5	Zinc	123		145.75	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Arsenic	17.9	JM74	17.57	U
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Arsenic	37		22.6	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Arsenic	200		173.02	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Arsenic	70		32.52	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	75.3	JM74	77.85	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Arsenic	59.2		47.58	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Arsenic	86.8		130.25	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Arsenic	16.6		11.9	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Arsenic	193		263.56	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Arsenic	144		356.08	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Arsenic	29.4		28.1	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Arsenic	313		218.03	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Arsenic	262		660.57	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Copper	88		52.99	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Copper	33.8		31.85	U
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Copper	116	J	106.87	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Copper	69.2		47.11	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	105		111.97	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Copper	94.2		83.74	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Copper	130		120.05	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Copper	19.2		35	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Copper	264		474.55	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Copper	605		934.65	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Copper	63.6		77	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Copper	873		669.92	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Copper	1340		880.18	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Iron	30700		28572.3	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Iron	18400		17546.7	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Iron	23800		30062.86	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Iron	29800		34206.83	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Iron	21300		20466	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Iron	36400		25898.42	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Iron	50700		49847.02	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Lead	153	JM10	110.86	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Lead	116		102.61	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Lead	447	J	373.88	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Lead	217		178.38	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	460	JM10	451.62	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Lead	380		300.22	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Lead	2240		1936.56	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Lead	90.2		75.7	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Lead	5660		7916.71	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Lead	9820		10329.23	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Lead	534		369.1	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Lead	13600		8725.32	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Lead	30700		14375.43	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Manganese	624		206.14	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Manganese	425		401.16	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Manganese	7480		9058.73	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Manganese	784		455.41	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	496		386.56	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Manganese	588		485.36	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Manganese	7540		4218.67	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Manganese	2340		1527	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Manganese	3560		4565.28	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Manganese	3820		5564.43	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Manganese	684		484	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Manganese	1320		831.97	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Manganese	1270		1516.96	
8	AMHR-200 (0-6")	10/11/2007	0	0.5	Zinc	173		134.45	
8	MHCS-200-E25 (0-6")	10/16/2007	0	0.5	Zinc	194		202.26	
8	MHCS-525-E5 (0-6")	10/18/2007	0	0.5	Zinc	3840		2488.39	
8	MHCS-700-E25 (0-6")	10/16/2007	0	0.5	Zinc	291		257.55	
8	MHTS-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	212		203.02	
8	MHTS-COMP 2 (0-6")	10/12/2007	0	0.5	Zinc	190		156.8	
8	UMH1-COMP (0-6")	10/11/2007	0	0.5	Zinc	1600		1391.04	
8	UMH2-400+25 (0-6")	7/15/2008	0	0.5	Zinc	587		732.8	
8	UMH2-COMP 1 (0-6")	10/11/2007	0	0.5	Zinc	765		1310.25	
8	UMH2-COMP 2 (0-6")	10/11/2007	0	0.5	Zinc	1150		1339.45	
8	UMH3-400+25 (0-6")	7/15/2008	0	0.5	Zinc	240		270.6	
8	UMH3-COMP 2 (0-6")	10/11/2007	0	0.5	Zinc	2940		772.78	
8	UMH3-COMP 3 (0-6")	10/11/2007	0	0.5	Zinc	1270		2246.32	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Arsenic	10.1		28.22	U
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	19.2		42.79	U
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Arsenic	18		41.05	U
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Arsenic	20.6		28.91	U
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	20.4		40.66	U
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Copper	388		305.62	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	328		326.66	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Copper	339		230.18	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Copper	395		336.71	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	344		300.12	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	55900		58094.71	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Iron	63600		58427.81	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Iron	49800		54116.34	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Lead	290		265.02	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	679		631.56	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Lead	725		564.84	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Lead	330		281.23	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	559		592.1	
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Manganese	359		352.64	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	343		385.93	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Manganese	269		226.23	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Manganese	264		344.88	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	376		418.17	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
9	PMWA1-50 (0-6")	10/8/2007	0	0.5	Zinc	115		125.87	
9	PMWA1-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	142		117.22	
9	PMWA1-COMP 2 (0-6")	10/8/2007	0	0.5	Zinc	133		97.15	
9	PMWA2-150 (0-6")	10/8/2007	0	0.5	Zinc	109		128.84	
9	PMWA2-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	149		100.15	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Arsenic	11		18.74	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Arsenic	50.3		46.27	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Arsenic	27		25.2	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Copper	75.9		66.92	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Copper	970		726.13	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Copper	188		157.25	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Lead	143		102.07	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Lead	246		225.65	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Lead	62.4		42.22	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Manganese	200		121.56	U
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Manganese	3700		3323.06	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Manganese	348		187	
10	N3TA-1000-EOT (0-6")	10/9/2007	0	0.5	Zinc	67.1		66.62	
10	N3TA-750 (0-6")	10/9/2007	0	0.5	Zinc	330		275.71	
10	N3TA-COMP 1 (0-6")	10/8/2007	0	0.5	Zinc	59.2		38.34	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Arsenic	31.2		33.5	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Arsenic	161		107.98	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Arsenic	22.9		22.15	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	169		178.7	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Arsenic	69.5		65.52	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Arsenic	82.1		105.56	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Arsenic	48.7		94.09	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Arsenic	11.1		16.44	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Arsenic	17.8		16.51	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Arsenic	39.9		18.68	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	199		165.57	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Arsenic	31.6		19.16	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Arsenic	308		176.9	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Arsenic	18.2		22.15	U
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Arsenic	13.6		12.61	U
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Copper	16.6		111.63	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Copper	26.9		218.19	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Copper	103		44.12	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Copper	2000		200.23	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Copper	134		152.2	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Copper	67.8		100.01	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Copper	101		126.81	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Copper	30.7		33.18	U
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Copper	103	J	32.34	U
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Copper	903	J	74.85	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Copper	214	J	1958.04	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Copper	348	J	134.42	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Copper	140		607.17	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Copper	120		70.96	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Copper	134		30.62	U
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Lead	84.4		103.11	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Lead	1730	J	1175.78	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Lead	47.5		33.66	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Lead	2160	J	1595.97	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Lead	369		376.17	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Lead	414		404.78	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Lead	219		388.55	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Lead	31.5		32.09	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Lead	62.2		83.45	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Lead	126		99.92	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Lead	5560		3486.92	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Lead	153		106.83	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Lead	1620	J	1276.87	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Lead	380	J	187.5	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Lead	36		45.97	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Manganese	1180	JM21	1276.15	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Manganese	2260		1794.27	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Manganese	1340	JM21	1058.27	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Manganese	2000		2288.87	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Manganese	2190		1765.56	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Manganese	984		1052.99	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Manganese	1630	JM21	2321.07	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Manganese	392	JM21	380.04	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Manganese	832	JM21	958.52	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Manganese	722	JM21	597.4	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Manganese	23700	JM21	41403.96	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Manganese	634	JM21	592.16	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Manganese	9080		10653.23	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Manganese	2820		1253.9	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Manganese	679	JM21	413.71	
11	BCEOT-E18+25 (0-6")	10/17/2007	0	0.5	Zinc	281		287.34	
11	BCEOT-E19-12.5 (0-6")	10/18/2007	0	0.5	Zinc	1270		934.08	
11	BCEOT-E20+25 (0-6")	10/17/2007	0	0.5	Zinc	175		163.93	
11	BCEOT-E21-12.5 (0-6")	10/17/2007	0	0.5	Zinc	383		248.93	
11	BCEOT-E3-8 (0-6")	10/16/2007	0	0.5	Zinc	294		236.91	
11	BCEOT-E4-12.5 (0-6")	10/16/2007	0	0.5	Zinc	210		162.11	
11	BCEOT-E5+25 (0-6")	10/17/2007	0	0.5	Zinc	314		421.24	
11	BCEOT-W10+25 (0-6")	10/17/2007	0	0.5	Zinc	91.6		81.03	
11	BCEOT-W13-0 (0-6")	10/17/2007	0	0.5	Zinc	134		153.77	
11	BCEOT-W17+25 (0-6")	10/17/2007	0	0.5	Zinc	164		124.11	
11	BCEOT-W22-12.5 (0-6")	10/17/2007	0	0.5	Zinc	13700		14604.84	
11	BCEOT-W23+25 (0-6")	10/17/2007	0	0.5	Zinc	223		192.38	
11	BCEOT-W25-12.5 (0-6")	10/17/2007	0	0.5	Zinc	3040		1923.13	
11	BCEOT-W26-0 (0-6")	10/17/2007	0	0.5	Zinc	340		233.62	
11	BCEOT-W8-0 (0-6")	10/17/2007	0	0.5	Zinc	81.8		65.93	

TABLE F-10: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR TETRA TECH XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs)		Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
			Top	Bottom					

Notes:

All concentrations are in units of milligrams per kilogram.

Tetra Tech results were combined into two groups for correlation analysis. EUs 1, 3, 4, 5, 6, 7, 8, 9, and 10 were combined, and EUs 2 and 11 were combined.

Correlations were developed using linear regression and forcing the fit through the origin, and are shown in Figures F-1 and F-2.

--	Not applicable - no conversions were performed for laboratory data. The final result is the original result.
bgs	Below ground surface
EU	Exposure Unit
HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
J	Estimated concentration
U	Nondetected concentration
XRF 10	X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Arsenic	230		225.58	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Arsenic	22		87.06	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Arsenic	24		20.75	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Arsenic	24		32.91	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Arsenic	133		327.86	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Arsenic	16		13.81	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Arsenic	23		66.72	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Arsenic	18		17.76	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Arsenic	429		68.92	U
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Arsenic	342		447.58	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Arsenic	22		17.13	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Arsenic	24		22.38	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Arsenic	147		186.57	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Arsenic	58		107.06	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Arsenic	16		12.23	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Arsenic	12		13.66	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Arsenic	15		28.73	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Arsenic	165		85.93	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Arsenic	18		19.25	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Arsenic	17		28.03	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Copper	563		670.14	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Copper	125		449.44	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Copper	74		72.41	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Copper	136		191.36	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Copper	1620		1695.63	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Copper	83		82.79	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Copper	148		283.72	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Copper	232		407.37	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Copper	3150		3636.9	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Copper	3450		4763.06	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Copper	238		359.02	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Copper	177		209.85	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Copper	495		740.49	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Copper	281		362.35	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Copper	151		201.41	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Copper	167		251.84	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Copper	414		810.56	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Copper	533		690.17	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Copper	131		210.08	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Copper	210		496.03	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Iron	89200		133149.06	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Iron	23100		50667.19	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Iron	23400		36447.97	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Iron	27900		54726.07	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Iron	50000		51588.1	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Iron	29300		50295.67	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Iron	39400		85438.31	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Iron	28500		52843.8	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Iron	80500		96862.23	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Iron	78800		74391.49	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Iron	34400		54658.98	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Iron	29200		49277.72	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Iron	66000		98098.56	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Iron	40800		80874.6	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Iron	35800		53677.81	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Iron	44200		81554.5	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Iron	43300		107921.75	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Iron	63300		95106.37	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Iron	23700		43741.36	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Iron	36600		84902.57	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Lead	1200		1415.67	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Lead	338		793.7	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Lead	169		136.09	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Lead	126		185.89	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Lead	12600		9698.73	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Lead	152		157.81	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Lead	584		927.84	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Lead	104		124.22	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Lead	36100		32222.55	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Lead	31700		32232.99	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Lead	437		528.46	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Lead	381		125.27	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Lead	1120		1424.79	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Lead	2490		2878.25	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Lead	145		174.19	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Lead	52		53.27	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Lead	178		262.28	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Lead	7380		8253.3	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Lead	120		188.96	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Lead	99		160.41	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Manganese	4140		8401.42	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Manganese	1100		4139.63	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Manganese	1320		1501.9	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Manganese	1350		2915.9	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Manganese	6740		9455.3	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Manganese	513		730.34	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Manganese	1240		3568.33	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Manganese	1340		3415.31	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Manganese	6470		7189.6	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Manganese	7980		9197.96	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Manganese	2030		2347.72	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Manganese	1830		1991.7	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Manganese	4780		12859.82	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Manganese	3200		6390.82	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Manganese	241		179.54	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Manganese	380		692.12	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Manganese	235		525.25	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Manganese	1060		899.82	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Manganese	516		569.53	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Manganese	752		2130.91	
2	TP-FP-32(0.0-0.4)	9/24/2012	0	0	Zinc	1130		1304.72	
2	TP-FP-33(8.0-8.5)	9/24/2012	8	9	Zinc	1020		2000.79	
2	TP-FP-35(0.5-0.7)	9/24/2012	0.5	1	Zinc	297		297.34	
2	TP-FP-36(3.5-4.0)	9/24/2012	3.5	4	Zinc	1460		1755.23	
2	TP-FP-38A(1.0-1.5)	9/27/2012	1	2	Zinc	6560		4778.14	
2	TP-FP-40(1.5-2.0)	9/27/2012	1.5	2	Zinc	242		299.52	
2	TP-FP-41(2.0-2.5)	9/27/2012	2	3	Zinc	183		256.89	
2	TP-FP-42(6.6-7.0)	9/27/2012	6.6	7	Zinc	1010		1445.77	
2	TP-FP-44(0.0-0.7)	10/1/2012	0	1	Zinc	8690		8917.43	
2	TP-FP-45(0.5-1.0)	10/1/2012	0.5	1	Zinc	13200		14798.24	
2	TP-FP-45A(0.8-1.2)	10/1/2012	0.8	1	Zinc	1100		1330.05	
2	TP-FP-46(8.5-9.0)	10/1/2012	8.5	9	Zinc	1190		1274.68	
2	TP-FP-48(1.5-2.0)	10/1/2012	1.5	2	Zinc	3160		4127.07	
2	TP-FP-49A(2.8-3.2)	10/2/2012	2.8	3	Zinc	412		469.33	
2	TP-FP-50(9.0-10.0)	10/3/2012	9	10	Zinc	396		448.77	
2	TP-FP-50A(8.5-9.0)	10/3/2012	8.5	9	Zinc	35		69.53	
2	TP-FP-53(9.5-10.0)	10/10/2012	9.5	10	Zinc	263		390.2	
2	TP-FP-55(0.6-1.0)	10/10/2012	0.6	1	Zinc	523		436.99	
2	TP-FP-57(0.5-1.0)	10/15/2012	0.5	1	Zinc	338		429.35	
2	TP-FP-58(6.0-6.5)	10/15/2012	6	7	Zinc	387		632.27	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Arsenic	138		219.47	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Arsenic	117		75.32	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Arsenic	215		572.21	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Arsenic	283		282.29	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Arsenic	39		35.72	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Arsenic	88		107.02	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Arsenic	157		162.08	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Arsenic	39		43.41	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Arsenic	174		418.84	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Arsenic	24		27.34	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Arsenic	59		124.81	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Arsenic	268		226.8	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Arsenic	223		261.61	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Arsenic	17		33.93	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Arsenic	19		22.84	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Copper	860		1330.21	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Copper	505		782.01	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Copper	1600		682.54	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Copper	2170		3138.99	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Copper	179		329.18	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Copper	169		264.12	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Copper	254		234.02	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Copper	114		201.7	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Copper	1060		1558.86	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Copper	125		280.1	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Copper	344		546.3	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Copper	377		292.13	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Copper	786		1050.4	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Copper	89		570.48	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Copper	35		33.45	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Iron	46900		63580.05	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Iron	48400		61991.13	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Iron	110000		168065.53	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Iron	106000		126223.93	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Iron	28200		49334.07	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Iron	55000		91609.3	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Iron	60200		84076.05	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Iron	29000		51857.82	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Iron	54800		119944.65	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Iron	23800		45999.85	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Iron	28100		46028.29	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Iron	116000		151338.56	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Iron	76200		112792.7	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Iron	19800		57245.26	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Iron	19200		42654.85	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Lead	6750		8285.74	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Lead	5330		3877.54	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Lead	2220		4339.62	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Lead	2940		3641.13	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Lead	205		320.35	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Lead	287		397.63	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Lead	1160		1364.61	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Lead	184		228.38	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Lead	6470		11621.44	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Lead	76		256.21	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Lead	2030		2055.99	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Lead	1730		1772.33	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Lead	5520		4538.02	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Lead	182		747.66	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Lead	63		104.78	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Manganese	4570		7754.53	
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Manganese	2540		4126.65	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Manganese	701		318.44	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Manganese	1590		2517.36	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Manganese	1850		3110.95	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Manganese	1060		1078.41	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Manganese	3370		3846.16	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Manganese	2560		1834.79	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Manganese	5090		9007.79	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Manganese	1460		17571.98	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Manganese	3260		14388.46	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Manganese	421		548.26	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Manganese	9980		24044.18	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Manganese	1240		7526.57	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Manganese	411		843.17	
11	TP-FP-05(6.0-7.0)	8/16/2012	6	7	Zinc	5630		4952.28	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
11	TP-FP-06(7.0-8.0)	8/16/2012	7	8	Zinc	4500		4420.56	
11	TP-FP-08(2.4-2.9)	8/17/2012	2.4	3	Zinc	6870		4089.11	
11	TP-FP-09(3.2-3.3)	8/23/2012	3.2	3	Zinc	5610		5718.98	
11	TP-FP-10A(2.1-2.6)	8/23/2012	2.1	3	Zinc	504		722.52	
11	TP-FP-13(2.4-2.7)	8/29/2012	2.4	3	Zinc	403		489.03	
11	TP-FP-15(0.0-0.2)	8/31/2012	0	0	Zinc	835		1280.94	
11	TP-FP-15A(8.5-9.0)	8/31/2012	8.5	9	Zinc	357		502.65	
11	TP-FP-18(0.6-0.8)	9/10/2012	0.6	1	Zinc	2690		2799.34	
11	TP-FP-19(1.8-2.4)	9/11/2012	1.8	2	Zinc	849		1743.4	
11	TP-FP-20(8.0-8.5)	9/13/2012	8	9	Zinc	1340		2334.3	
11	TP-FP-25(0.4-0.9)	9/17/2012	0.4	1	Zinc	860		764.61	
11	TP-FP-26(4.0-4.5)	9/18/2012	4	5	Zinc	6190		5181.1	
11	TP-FP-27(6.5-7.0)	9/18/2012	6.5	7	Zinc	561		2444.32	
11	TP-FP-28(9.0-9.5)	9/19/2012	9	10	Zinc	174		418.91	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Arsenic	214		164.65	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Arsenic	69		78.65	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Arsenic	19		16.8	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Arsenic	15		16.16	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Arsenic	6		4.43	U
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Arsenic	179		130.92	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Arsenic	21		8.02	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Arsenic	15		27.6	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Arsenic	18		21.56	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Arsenic	149		136.1	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Arsenic	15		16.8	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Arsenic	33		24.66	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Arsenic	9		9.14	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Arsenic	76		62.31	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Arsenic	19		15.41	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Copper	458		522.99	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Copper	327		511.25	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Copper	155		282.33	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Copper	167		328.49	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Copper	214		304.32	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Copper	690		930.93	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Copper	229		332.93	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Copper	208		548.94	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Copper	108		163.4	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Copper	373		598.28	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Copper	98		146.21	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Copper	186		288.08	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Copper	367		589.32	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Copper	1500		2437.23	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Copper	253		419.78	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Iron	87500		98888.68	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Iron	32900		51109.08	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Iron	27200		66858.66	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Iron	14200		28121.43	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Iron	16500		32693.24	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Iron	65600		75209.87	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Iron	19600		36827.15	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Iron	20700		44305.41	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Iron	22700		50079.61	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Iron	48900		75738.13	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Iron	106000		138132.97	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Iron	68100		91119.79	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Iron	25400		52805.42	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Iron	39000		60151.84	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Iron	24800		48984.75	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Lead	1120		1326.87	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Lead	1230		1483.19	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Lead	85		100.2	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Lead	115		152.36	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Lead	161		225.18	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Lead	2310		2985.02	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Lead	288		395.74	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Lead	305		679.98	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Lead	145		170.22	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Lead	773		1042.59	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Lead	94		106.98	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Lead	177		272.75	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Lead	278		436.95	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Lead	4160		5559.72	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Lead	134		175.92	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Manganese	9240		12794.02	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Manganese	1890		2899.72	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Manganese	212		675.25	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Manganese	119		43.73	U
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Manganese	129		123.44	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Manganese	11100		17203.47	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Manganese	238		246.16	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Manganese	441		727.64	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Manganese	133		255.92	
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Manganese	252		165.44	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Manganese	107		52.41	U
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Manganese	1230		1753.24	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Manganese	125		199.58	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Manganese	5480		8511	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Manganese	226		397.46	
12	TP-MS-03(1.0-2.0)	10/8/2012	1	2	Zinc	2100		2185.59	
12	TP-MS-04(1.0-2.0)	10/4/2012	1	2	Zinc	1300		1424.46	
12	TP-MS-05(1.8-2.0)	10/3/2012	1.8	2	Zinc	191		302.39	
12	TP-MS-07(2.75-3.5)	10/10/2012	2.75	4	Zinc	104		154.34	
12	TP-MS-09(6.0-7.0)	10/4/2012	6	7	Zinc	261		366.04	
12	TP-MS-10B(1.0-2.0)	10/8/2012	1	2	Zinc	4840		5361.31	
12	TP-MS-11B(2.0-3.0)	10/9/2012	2	3	Zinc	687		901.43	
12	TP-MS-11C(2.0-3.0)	10/9/2012	2	3	Zinc	1060		2072.49	
12	TP-MS-15(3.0-3.7)	10/9/2012	3	4	Zinc	192		273.87	

TABLE F-11: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR PIONEER XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
12	TP-MS-16(0.1-0.2)	10/10/2012	0.1	0	Zinc	312		368.26	
12	TP-MS-19(1.0-2.0)	10/3/2012	1	2	Zinc	103		136.79	
12	TP-MS-23(0.0-1.0)	10/9/2012	0	1	Zinc	550		688.68	
12	TP-MS-24(5.3-5.75)	10/9/2012	5.3	6	Zinc	507		694.58	
12	TP-MS-25(0.5-1.0)	10/4/2012	0.5	1	Zinc	3900		5048.74	
12	TP-MS-27(2.0-2.5)	10/5/2012	2	3	Zinc	345		473.43	

Notes:

All concentrations are in units of milligrams per kilogram.

Pioneer samples for EUs 2, 11, and 12 were combined into a single group for correlation analysis.

Correlations were developed using linear regression and forcing the fit through the origin, and are shown in Figure F-3.

--	Not applicable - no conversions were performed for laboratory data. The final result is the original result.
bgs	Below ground surface
EU	Exposure Unit
HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
J	Estimated concentration
U	Nondetected concentration
XRF 10	X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

TABLE F-12: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR HYDROMETRICS XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

EU	Sample ID	Sample Date	Depth Sampled (feet bgs) Top	Bottom	Chemical	Laboratory Result	Laboratory Qualifier	XRF Result	XRF Qualifier
8	UMH-A7	9/14/2006	0	1	Arsenic	89.4		272.45	
8	UMH-C3	9/14/2006	0	1	Arsenic	952		789.93	
8	UMH-C7	9/14/2006	0	1	Arsenic	70.8		157.75	
8	UMH-D5	9/14/2006	0	1	Arsenic	348		559.34	
8	UMH-F7	9/14/2006	0	1	Arsenic	342		342.74	
8	UMH-G8	9/14/2006	0	1	Arsenic	177		151.74	
8	UMH-H7	9/14/2006	0	1	Arsenic	68		45.85	
8	UMH-J4	9/14/2006	0	1	Arsenic	100		305.8	
8	UMH-A7	9/14/2006	0	1	Copper	572		643.17	
8	UMH-C3	9/14/2006	0	1	Copper	4940		2502.65	
8	UMH-C7	9/14/2006	0	1	Copper	399		437.5	
8	UMH-D5	9/14/2006	0	1	Copper	2590		1560.04	
8	UMH-F7	9/14/2006	0	1	Copper	1420		1241.14	
8	UMH-G8	9/14/2006	0	1	Copper	798		549.22	
8	UMH-H7	9/14/2006	0	1	Copper	505		329.76	
8	UMH-J4	9/14/2006	0	1	Copper	1260		961.37	
8	UMH-A7	9/14/2006	0	1	Lead	3620		3693.71	
8	UMH-C3	9/14/2006	0	1	Lead	9300		7640.59	
8	UMH-C7	9/14/2006	0	1	Lead	1770		1994.09	
8	UMH-D5	9/14/2006	0	1	Lead	7740		6133.77	
8	UMH-F7	9/14/2006	0	1	Lead	3580		3193.55	
8	UMH-G8	9/14/2006	0	1	Lead	3870		1551.29	
8	UMH-H7	9/14/2006	0	1	Lead	1340		1117.33	
8	UMH-J4	9/14/2006	0	1	Lead	3560		4542.71	
8	UMH-A7	9/14/2006	0	1	Manganese	2220		4016.1	
8	UMH-C3	9/14/2006	0	1	Manganese	1460		3787.51	
8	UMH-C7	9/14/2006	0	1	Manganese	1810		3016.54	
8	UMH-D5	9/14/2006	0	1	Manganese	1210		2846.99	
8	UMH-F7	9/14/2006	0	1	Manganese	1670		3108.79	
8	UMH-G8	9/14/2006	0	1	Manganese	3000		3544.58	
8	UMH-H7	9/14/2006	0	1	Manganese	1360		2842.18	
8	UMH-J4	9/14/2006	0	1	Manganese	314		2645.08	
8	UMH-A7	9/14/2006	0	1	Zinc	2020		1358.15	
8	UMH-C3	9/14/2006	0	1	Zinc	7610		2318.42	
8	UMH-C7	9/14/2006	0	1	Zinc	662		521.65	
8	UMH-D5	9/14/2006	0	1	Zinc	1660		1598.52	
8	UMH-F7	9/14/2006	0	1	Zinc	1260		1456.63	
8	UMH-G8	9/14/2006	0	1	Zinc	1010		462.15	
8	UMH-H7	9/14/2006	0	1	Zinc	382		271.56	
8	UMH-J4	9/14/2006	0	1	Zinc	424		525.51	

TABLE F-12: ANALYTICAL DATA USED TO DEVELOP CONVERSION FACTORS FOR HYDROMETRICS XRF DATA

Baseline Human Health Risk Assessment
Upper Blackfoot Mine Complex, Lewis and Clark County, Montana

Notes:

All concentrations are in units of milligrams per kilogram.

Correlations were developed using linear regression and forcing the fit through the origin, and are shown in Figure F-4.

--	Not applicable - no conversions were performed for laboratory data. The final result is the original result.
bgs	Below ground surface
EU	Exposure Unit
HHRA	Human Health Risk Assessment
ID	Identification Number
Lab	Laboratory analysis
J	Estimated concentration
U	Nondetected concentration
XRF 10	X-ray fluorescence analysis, sample sieved with a 10-mesh (2-millimeter) screen

APPENDIX G
DEVELOPMENT OF SITE-SPECIFIC SOIL SCREENING LEVELS

LIST OF TABLES

Table G-1: Comparison to Background Value and Selection of EU-specific SSL

EU	COPC	Soil Screening Level based on SPLP results (mg/kg)	Background (mg/kg)	Final Screening Value (mg/kg)	Source for Final Screening Value
EU1A	Aluminum	NFE	31,092	31,092	1
	Arsenic	253	40.4	253	2
	Cadmium	15.3	4.8	15.3	2
	Copper	3,050	275	3,050	2
	Iron	1,000,000	58,270	1,000,000	*3
	Lead	5,600	1,109	5,600	2
	Manganese	NFE	4,893	4,893	1
	Zinc	3,200	551	3,200	2
EU1B	Aluminum	NFE	31,092	31,092	1
	Arsenic	2,507	40.4	2,507	3
	Cadmium	15.3	4.8	15.3	2
	Copper	3,050	275	3,050	2
	Iron	1,000,000	58,270	1,000,000	*3
	Lead	6,026	1,109	6,026	3
	Manganese	NFE	4,893	4,893	1
	Zinc	3,200	551	3,200	2
EU2	Aluminum	NFE	31,092	31,092	1
	Arsenic	177	40.4	177	3
	Cadmium	14.00	4.80	14.00	2
	Copper	5,295	275	5,295	2
	Iron	259,173	58,270	259,173	3
	Lead	123	1,109	1,109	**1
	Manganese	1,130	4,893	4,893	**1
	Zinc	2,946	551	2,946	3
EU3	Aluminum	NFE	31,092	31,092	1
	Arsenic	1,112	40.4	1,112	3
	Cadmium	NFE	4.80	4.80	1
	Copper	23,925	275	23,925	3
	Iron	1,000,000	58,270	1,000,000	*3
	Lead	2,270	1,109	2,270	2
	Manganese	NFE	4,893	4,893	1
	Zinc	42,189	551	42,189	3
EU4	Aluminum	NFE	31,092	31,092	1
	Arsenic	28	40.4	40.4	**1
	Cadmium	11.1	4.80	11.1	2
	Copper	20,637	275	20,637	3
	Iron	NV	58,270	58,270	1
	Lead	226	1,109	1,109	**1
	Manganese	3,144	4,893	4,893	**1
	Zinc	16,459	551	16,459	3
EU5	Aluminum	NFE	31,092	31,092	1
	Arsenic	1,898	40.4	1,898	3
	Cadmium	NFE	4.8	4.8	1
	Copper	466,497	275	466,497	3
	Iron	NFE	58,270	58,270	1
	Lead	3,094	1,109	3,094	3
	Manganese	NFE	4,893	4,893	1
	Zinc	16,459	551	16,459	3

EU	COPC	Soil Screening Level based on SPLP results (mg/kg)	Background (mg/kg)	Final Screening Value (mg/kg)	Source for Final Screening Value
EU6	Aluminum	NFE	31,092	31,092	1
	Arsenic	288	40.4	288	3
	Cadmium	573.00	4.80	573.00	3
	Copper	410	275	410	2
	Iron	1,000,000	58,270	1,000,000	*3
	Lead	1,609	1,109	1,609	3
	Manganese	NFE	4,893	4,893	1
	Zinc	104,008	551	104,008	3
EU7	Aluminum	NFE	31,092	31,092	1
	Arsenic	623	40.4	623	3
	Cadmium	NFE	4.80	4.8	1
	Copper	119,814	275	119,814	3
	Iron	762,134	58,270	762,134	3
	Lead	980	1,109	1,109	**1
	Manganese	NFE	4,893	4,893	1
	Zinc	NFE	551	551	1
EU8	Aluminum	NFE	31,092	31,092	1
	Arsenic	2,485	40.4	2,485	3
	Cadmium	1,067	4.80	1,067	3
	Copper	105,390	275	105,390	2
	Iron	1,000,000	58,270	1,000,000	*1
	Lead	9,820	1,109	9,820	2
	Manganese	49,789	4,893	49,789	3
	Zinc	169,458	551	169,458	3
EU9	Aluminum	NFE	31,092	31,092	1
	Arsenic	NFE	40.4	40.4	1
	Cadmium	NFE	4.80	4.8	1
	Copper	60,844	275	60,844	3
	Iron	NV	58,270	58,270	1
	Lead	NFE	1,109	1,109	1
	Manganese	NFE	4,893	4,893	1
	Zinc	NFE	551	551	1
EU10	***Aluminum	NV	31,092	31,092	1
	Arsenic	60	40.4	60	3
	Cadmium	NFE	4.80	4.80	1
	Copper	28,709	275	28,709	3
	Iron	NV	58,270	58,270	1
	Lead	NFE	1,109	1,109	1
	Manganese	11,982	4,893	11,982	3
	Zinc	5,095	551	5,095	3
EU11	Aluminum	NFE	31,092	31,092	1
	Arsenic	6,138	40.4	6,138	3
	Cadmium	33.8	4.80	33.80	2
	Copper	3,652	275	3,652	3
	Iron	199,000	58,270	199,000	2
	Lead	8,522	1,109	8,522	3
	Manganese	397	4,893	4,893	**1
	Zinc	13,700	551	13,700	2
EU12	Aluminum	6	8,030	8,030	**1
	Arsenic	0.009	32.3	32.3	**1
	Cadmium	0.671	1.84	1.840	**1
	Copper	1,240	67.4	1,240	2
	Iron	9,840	14,500	14,500	**1
	Lead	7.04	174	174	**1
	Manganese	100	696	696	**1
	Zinc	300	275	300	2

EU	COPC	Soil Screening Level based on SPLP results (mg/kg)	Background (mg/kg)	Final Screening Value (mg/kg)	Source for Final Screening Value

Notes:
* The calculated SSCL exceeds the maximum possible concentration of 1.0E+06 representing 100 percent by weight of the sample. A contaminant concentration of greater than 1.0E+06 is not possible. Therefore, the value 1E+06 is used as the calculated SSCL.
** Calculated screening level based on SPLP is < Background
***
COPC = Contaminant of Potential Concern
EU = Exposure Unit
mg/kg = milligrams per kilogram
NV = No Value - SPLP was not run for this metal
SPLP = synthetic precipitation leaching procedure
NFE = No Further Evaluation - Max soil concentration < Background
Sources:

1- Option 1. Background

2- Option 2. Highest soil concetration for which this, and all lower soil concentrations,
have leachate concentration at or below the Leachate Criterion (NJDEP 2008).
3- Option 3. Determination of a site-specific soil remediation standard using a Site-Specific K_d value (NJDEP 2008).

Table G-2: Soil and Sediment Screening Level for Leaching to Groundwater based on SPLP Results

COPC	Soil Screening Level based on SPLP Results (mg/kg)																									
	EU1A		EU1B		EU2		EU3		EU4		EU5		EU6		EU7		EU8		EU9		EU10		EU11		EU12	
Aluminum	17,000	1	17,000	1	163,470	2	14,900	1	NV	--	NV	--	562,461	2	536,142	2	789,267	2	NV	--	NV	--	81,044	2	354	2
Arsenic	253	1	2,507	2	177	2	1,112	2	28	1	1,898	2	288	2	623	2	2,485	2	20	1	60	2	6,138	2	1	2
Cadmium	15.30	1	15.30	1	14.00	2	3.04	1	11.1	1	1,589	2	573	2	295	2	1,067	2	205	2	1	2	34	1	0.67	1
Copper	3,050	1	770	1	5,295	2	23,925	2	20,637	2	466,497	2	410	1	119,814	2	105,390	2	60,844	2	28,709	2	3,652	2	1,240	1
Iron	1,000,000	*2	1,000,000	*2	259,173	2	1,000,000	*2	NV	--	NV	--	1,000,000	*2	762,134	2	1,000,000	*2	NV	--	NV	--	199,000	1	9,840	1
Lead	5,600	1	6,026	2	123	1	2,270	1	183	2	3,094	2	1,609	2	980	2	9,820	1	618	2	217	2	8,522	2	7.04	1
Manganese	2,250	1	2,250	1	1,130	1	1,000	1	3,114	2	518	1	1,500	1	19,253	2	49,789	2	71,364	2	11,982	2	832	1	100	1
Zinc	3,200	1	3,200	1	2,946	2	42,189	2	16,459	2	16,459	2	104,008	2	86,218	2	169,458	2	242,890	2	5,095	2	13,700	1	300	1

Notes:

COPC = Contaminant of Potential Concern
EU = Exposure Unit
mg/kg = milligrams per kilogram
NV = No Value
SPLP = synthetic precipitation leaching procedure
***** The calculated SSCL exceeds the maximum possible concentration of 1.0E+06 representing 100 percent by weight of the sample. A contaminant concentration of greater than 1.0E+06 is not possible. Therefore, the value 1E+06 is used as the calculated SSCL.

Sources:

1- Option 1. Highest soil concetration for which this, and all lower soil concentrations, have leachate concentration at or below the Leachate Criterion. (NJDEP 2008)
2- Option 2. Determination of a site-specific soil remediation standard using a Site-Specific K_d value (NJDEP 2008).

Table G-3: Background Levels for Soil and Sediment

COPC	DEQ-7 HH GW Standard (µg/L)	Source	DEQ-7 HH GW Standard (mg/L)	Soil Background (mg/kg)	Marsh Sediments Background (mg/kg)
Aluminum	16000	3	16	31,092	8,030
Arsenic	10	1, 2	0.01	40.4	32.3
Cadmium	5	1, 2	0.005	4.8	1.84
Copper	1300	1, 2	1.3	275	67.4
Iron	11000	3	11	58,270	14,500
Lead	15	1, 2	0.015	1,109	174
Manganese	320	3	0.32	4,893	696
Zinc	2000	1	2	551	275

Notes

µg/L = micrograms per liter
COPC = Contaminant of Potential Concern
mg/l = milligrams per liter
mg/kg = milligrams per kilogram
NV = No Value

Sources:

1 Montana Department of Environmental Quality (DEQ). 2012. Planning Prevention and Assistance Division, Water Quality Planning Bureau, Water Quality Standards Section. 2012. DEQ 7 Montana Numeric Water Quality Standards. Helena, Montana. October.
Accessed at: deq.mt.gov/wqinfo/Standards/PDF/DEQ-7.pdf

2 USEPA. 2012a. Maximum Contaminant Level (MCL). National Primary Drinking Water Regulations. June 5.
Accessed at: http://water.epa.gov/drink/contaminants/index.cfm

3 USEPA 2012b. Regional Screening Levels (RSLs). November 29.
Accessed at: http://www.epa.gov/region9/superfund/prg/

Table G-4: Calculation of SSL using SPLP Results

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
1A - Reclaimed Area	115	Aluminum	16	1840	20	No	17000	1527482	18200	UAW5-500+50 (0-6")	31,092	Used Option 1 **Background** screening criteria
(UAW2/UAW5)	115	Arsenic	0.01	1.15	0.02	No	**253**	2507	126	UAW2-300 (0-6")	40.4	
	115	Arsenic	0.01	1.15	0.024	No	52.8	2507	126	UAW2-300 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Arsenic	0.01	1.15	0.018	No	50.7	2507	126	UAW2-300 (0-6")	40.4	
	115	Cadmium	0.005	0.575	0.28	No	**15.3**	20	6.7	UAW5-500+50 (0-6")	4.80	
	115	Cadmium	0.005	0.575	0.0014	No	6.85	20	6.7	UAW5-500+50 (0-6")	4.80	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Cadmium	0.005	0.575	0.0091	No	3.41	20	6.7	UAW5-500+50 (0-6")	4.80	
	115	Cadmium	0.005	0.575	0.02	No	1.40	20	6.7	UAW5-500+50 (0-6")	4.80	
	115	Copper	1.3	149.5	1.5	No	**3050**	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	2.2	No	1060	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	0.3	No	954	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	0.1	No	661	69092	770	UAW2-300 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Copper	1.3	149.5	0.5	No	631	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	0.2	No	255	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	0.062	No	198	69092	770	UAW2-300 (0-6")	275	
	115	Copper	1.3	149.5	0.023	No	79.6	69092	770	UAW2-300 (0-6")	275	
	115	Iron	11	1265	12	No	**27800**	2905899	135404	UAW5-500 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	115	Lead	0.015	1.725	3.5	**Yes**	55200	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	3.7	**Yes**	55100	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	6.2	**Yes**	22600	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	0.2	No	**5600**	6026	5600	UAW2-250 (0-6")	1,109	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Lead	0.015	1.725	1.6	No	4540	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	0.78	No	2740	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	1.3	No	1140	6026	5600	UAW2-250 (0-6")	1,109	
	115	Lead	0.015	1.725	0.32	No	771	6026	5600	UAW2-250 (0-6")	1,109	
	115	Manganese	0.32	36.8	0.85	No	2250	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.8	No	1430	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.12	No	489	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.2	No	363	778	3256	UAW2-100+250 (0-6")	4,893	Used Option 1 **Background** screening criteria
	115	Manganese	0.32	36.8	5.5	No	224	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Manganese	0.32	36.8	1.4	No	117	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.52	No	38.7	778	3256	UAW2-100+250 (0-6")	4,893	
	115	Zinc	2	230	51	No	**3200**	9925	943	UAW5-300 (0-6")	551	
	115	Zinc	2	230	1.8	No	1270	9925	943	UAW5-300 (0-6")	551	
	115	Zinc	2	230	0.68	No	1020	9925	943	UAW5-300 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Zinc	2	230	3.3	No	641	9925	943	UAW5-300 (0-6")	551	
	115	Zinc	2	230	0.6	No	588	9925	943	UAW5-300 (0-6")	551	
	115	Zinc	2	230	0.07	No	156	9925	943	UAW5-300 (0-6")	551	
1B - Waste Piles	115	Aluminum	16	1840	20	No	17000	1527482	17000	UAW1-150+75 (0-6")	31,092	Used Option 1 **Background** screening criteria
(UAW1/UAW3/UAW4)	115	Arsenic	0.01	1.15	0.02	No	**253**	2507	255	UAW1-Comp 1 (0-6")	40.4	
	115	Arsenic	0.01	1.15	0.024	No	52.8	2507	255	UAW1-Comp 1 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific K_d Value** screening criteria
	115	Arsenic	0.01	1.15	0.018	No	50.7	2507	255	UAW1-Comp 1 (0-6")	40.4	
	115	Cadmium	0.005	0.575	0.28	No	**15.3**	20	15.3	UAW3-Comp 1 (0-6")	4.80	
	115	Cadmium	0.005	0.575	0.0014	No	6.85	20	15.3	UAW3-Comp 1 (0-6")	4.80	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Cadmium	0.005	0.575	0.0091	No	3.41	20	15.3	UAW3-Comp 1 (0-6")	4.80	
	115	Cadmium	0.005	0.575	0.02	No	1.40	20	15.3	UAW3-Comp 1 (0-6")	4.80	
	115	Copper	1.3	149.5	1.5	No	**3050**	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	2.2	No	1060	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	0.3	No	954	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	0.1	No	661	69092	3050	UAW1-Comp 1 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Copper	1.3	149.5	0.5	No	631	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	0.2	No	255	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	0.062	No	198	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Copper	1.3	149.5	0.023	No	79.6	69092	3050	UAW1-Comp 1 (0-6")	275	
	115	Iron	11	1265	12	No	27800	2905899	132278	UAW1-00 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	115	Lead	0.015	1.725	3.5	**Yes**	55200	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	3.7	**Yes**	55100	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	6.2	**Yes**	22600	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	0.2	No	**5600**	6026	55200	UAW1-Comp 1 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	115	Lead	0.015	1.725	1.6	No	4540	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	0.78	No	2740	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	1.3	No	1140	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Lead	0.015	1.725	0.32	No	771	6026	55200	UAW1-Comp 1 (0-6")	1,109	
	115	Manganese	0.32	36.8	0.85	No	2250	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.8	No	1430	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.12	No	489	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.2	No	363	778	2250	UAW1-0150+75 (0-6")	4,893	Used Option 1 **Background** screening criteria
	115	Manganese	0.32	36.8	5.5	No	224	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Manganese	0.32	36.8	1.4	No	117	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Manganese	0.32	36.8	0.52	No	38.7	778	2250	UAW1-0150+75 (0-6")	4,893	
	115	Zinc	2	230	51	No	**3200**	9925	3200	UAW3-Comp 1 (0-6")	551	
	115	Zinc	2	230	1.8	No	1270	9925	3200	UAW3-Comp 1 (0-6")	551	
	115	Zinc	2	230	0.68	No	1020	9925	3200	UAW3-Comp 1 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	115	Zinc	2	230	3.3	No	641	9925	3200	UAW3-Comp 1 (0-6")	551	
	115	Zinc	2	230	0.6	No	588	9925	3200	UAW3-Comp 1 (0-6")	551	
	115	Zinc	2	230	0.07	No	156	9925	3200	UAW3-Comp 1 (0-6")	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
2	8	Aluminum	16	128	8.3	No	10600.0	160916	25500	BREOT-S32+300 (0-6")	31,092	Used Option 1 **Background** screening criteria
	8	Arsenic	0.01	0.08	0.012	No	**26.8**	177	1057	BREOT-N13-0 (0-6")	40.4	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	8	Cadmium	0.005	0.04	0.11	**Yes**	17.2	14	161	UBDT-TP-6 (12-24")	4.80	
	8	Cadmium	0.005	0.04	0.06	**Yes**	15.7	14	161	UBDT-TP-6 (12-24")	4.80	
	8	Cadmium	0.005	0.04	0.03	No	**9.99**	14	161	UBDT-TP-6 (12-24")	4.80	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	8	Cadmium	0.005	0.04	0.03	No	4.35	14	161	UBDT-TP-6 (12-24")	4.80	
	8	Cadmium	0.005	0.04	0.0002	No	1.09	14	161	UBDT-TP-6 (12-24")	4.80	
	8	Copper	1.3	10	0.8	No	**423**	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.5	No	328	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.3	No	310	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.3	No	286	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.4	No	286	5295	4246	BREOT-N10-0 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria.
	8	Copper	1.3	10	0.1	No	260	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.1	No	188	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Copper	1.3	10	0.024	No	69.6	5295	4246	BREOT-N10-0 (0-6")	275	
	8	Iron	11	88	5.7	No	**16900**	259173	201203	BREOT-S64+25 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria.
	8	Lead	0.015	0.12	2.8	**Yes**	3390	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	3.4	**Yes**	2560	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	3.7	**Yes**	1970	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	0.2	**Yes**	1260	61	38839	TP-FP-45(1.8-2.0)	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	8	Lead	0.015	0.12	0.2	**Yes**	498	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	0.2	**Yes**	361	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	0.3	**Yes**	170	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Lead	0.015	0.12	0.032	No	**123**	61	38839	TP-FP-45(1.8-2.0)	1,109	
	8	Manganese	0.32	2.6	31	**Yes**	6890	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	39	**Yes**	5350	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.3	No	5340	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	35	**Yes**	4050	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	3.4	**Yes**	2610	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	2.8	**Yes**	2230	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.8	No	1770	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	13	Yes	1670	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	3	**Yes**	1600	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	2	No	**1130**	791	15083	BREOT-S24-0 (0-6")	4,893	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value
	8	Manganese	0.32	2.6	0.4	No	969	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.2	No	842	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.15	No	832	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.4	No	810	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	2.4	No	789	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.4	No	688	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.2	No	596	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Manganese	0.32	2.6	0.2	No	514	791	15083	BREOT-S24-0 (0-6")	4,893	
	8	Zinc	2	16	5.8	No	**2490**	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	0.8	No	2230	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	1.8	No	2180	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	1.1	No	1440	2946	26000	UBDT-TP-6 (12-24")	551	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	8	Zinc	2	16	0.6	No	1040	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	4.9	No	1000	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	0.7	No	346	2946	26000	UBDT-TP-6 (12-24")	551	
	8	Zinc	2	16	0.07	No	219	2946	26000	UBDT-TP-6 (12-24")	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
3	23	Aluminum	16	368	3.4	No	14900	1113624	14900	CMWA-0+12.5 (0-6")	31,092	Used Option 1 **Background** screening criteria
	23	Aluminum	16	368	7.9	No	13500	1113624	14900	CMWA-0+12.5 (0-6")	31,092	
	23	Arsenic	0.01	0.2	0.042	No	**354**	1112	1570	CMWA-COMP 1 (0-6")	40.4	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value
	23	Arsenic	0.01	0.2	0.018	No	58.4	1112	1570	CMWA-COMP 1 (0-6")	40.4	
	23	Arsenic	0.01	0.2	0.018	No	52	1112	1570	CMWA-COMP 1 (0-6")	40.4	
	23	Cadmium	0.005	0.115	0.0058	No	3.04	58	3.0	CMWA-COMP 1 (0-6")	4.80	Used Option 1 **Background** screening criteria
	23	Cadmium	0.005	0.115	0.00025	No	2.7	58	3.0	CMWA-COMP 1 (0-6")	4.80	
	23	Cadmium	0.005	0.115	0.00086	No	0.611	58	3.0	CMWA-COMP 1 (0-6")	4.80	
	23	Copper	1.3	29.9	0.069	No	**529**	23925	759	CMWA-50 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	23	Copper	1.3	29.9	0.008	No	462	23925	759	CMWA-50 (0-6")	275	
	23	Copper	1.3	29.9	0.44	No	361	23925	759	CMWA-50 (0-6")	275	
	23	Copper	1.3	29.9	0.033	No	166	23925	759	CMWA-50 (0-6")	275	
	23	Iron	11	253	6.6	No	**40900**	1386732	224789	CMWA-200 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	23	Iron	11	253	7.2	No	34600	1386732	224789	CMWA-200 (0-6")	58,270	
	23	Lead	0.015	0.345	0.015	No	**2270**	2450	2270	CMWA-COMP 2 (0-6")	1,109	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	23	Lead	0.015	0.345	0.16	No	2140	2450	2270	CMWA-COMP 2 (0-6")	1,109	
	23	Lead	0.015	0.345	0.14	No	574	2450	2270	CMWA-COMP 2 (0-6")	1,109	
	23	Lead	0.015	0.345	0.09	No	356	2450	2270	CMWA-COMP 2 (0-6")	1,109	
	23	Manganese	0.32	7.36	0.12	No	1000	4704	1458	CMWA-50 (0-6")	4,893	Used Option 1 **Background** screening criteria
	23	Manganese	0.32	7.36	0.089	No	258	4704	1458	CMWA-50 (0-6")	4,893	
	23	Manganese	0.32	7.36	2.7	No	178	4704	1458	CMWA-50 (0-6")	4,893	
	23	Zinc	2	46	0.02	No	**1230**	42189	1875	CMWA-100 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	23	Zinc	2	46	0.67	No	628	42189	1875	CMWA-100 (0-6")	551	
	23	Zinc	2	46	0.07	No	475	42189	1875	CMWA-100 (0-6")	551	
	23	Zinc	2	46	0.05	No	132	42189	1875	CMWA-100 (0-6")	551	
4	11	Aluminum	16	176	--	--	--	--	18800	CARM-100+25 (0-6")	31,092	Used Option 1 **Background** screening criteria - SPLP analysis was not run for Al.
	11	Arsenic	0.01	0.11	0.1	No	27.8	28	49	CARM-1050 (0-6")	40.4	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	11	Cadmium	0.005	0.055	0.01	No	11.1	60	11.1	CARM-400 (0-6")	4.80	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	11	Copper	1.3	14.3	0.3	No	439	20637	648	CARM-800 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	11	Iron	11	121	--	--	114005		144414	CARM-1000 (0-6")	58,270	Used Option 1 Background screening criteria - SPLP analysis was not run for Fe.
	11	Lead	0.015	0.165	0.2	**Yes**	226	183	2223	CARM-1050 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	11	Manganese	0.32	3.52	1.6	No	1460	3144	14145	CARM-1000 (0-6")	4,893	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	11	Zinc	2	22	0.5	No	384	16459	833	CARM-1050+6.25 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
5	90	Aluminum	16	1440	--	--	--	--	12200	CEA1-3-COMP 1 (0-6")	31,092	Used Option 1 **Background** screening criteria - SPLP analysis was not run for Al.
	90	Arsenic	0.01	0.9	0.01	No	**24.5**	1898	85	CEA1-3-COMP 3 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	90	Arsenic	0.01	0.9	0.012	No	21.7	1898	85	CEA1-3-COMP 3 (0-6")	40.4	
	90	Cadmium	0.005	0.45	0.0003	No	**1.35**	1589	4.3	CEA1-3-COMP 3 (0-6")	4.8	Used Option 1 **Background** screening criteria
	90	Cadmium	0.005	0.45	0.0002	No	0.52	1589	4.3	CEA1-3-COMP 3 (0-6")	4.8	
	90	Copper	1.3	117	0.05	No	**175**	466497	1354	CEA1-3-COMP-600 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	90	Copper	1.3	117	0.037	No	167	466497	1354	CEA1-3-COMP-600 (0-6")	275	
	90	Iron	11	990	--	--	--	--	53326	WEA1-350 (0-6")	58,270	Used Option 1 **Background** screening criteria - SPLP analysis was not run for Fe.
	90	Lead	0.015	1.35	0.11	No	**284**	3094	1380	CEA1-3-COMP 3 (0-6")	1,109	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	90	Lead	0.015	1.35	0.097	No	198	3094	1380	CEA1-3-COMP 3 (0-6")	1,109	
	90	Manganese	0.32	28.8	0.093	No	518	159844	2784	WEA1-COMP 2 (0-6")	4,893	Used Option 1 **Background** screening criteria
	90	Manganese	0.32	28.8	0.026	No	302	159844	2784	WEA1-COMP 2 (0-6")	4,893	
	90	Zinc	2	180	0.08	No	**234**	470368	868	CEA1-3-COMP 3 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	90	Zinc	2	180	0.05	No	117	470368	868	CEA1-3-COMP 3 (0-6")	551	
6	25	Aluminum	16	400	13	No	20900	562461	27000	CONM-50+50 (0-6")	31,092	Used Option 1 **Background** screening criteria
	25	Arsenic	0.01	0.25	0.021	No	**283**	288	1010	CONM-250 (0-6")	40.4	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	25	Arsenic	0.01	0.25	0.018	No	148	288	1010	CONM-250 (0-6")	40.4	
	25	Arsenic	0.01	0.25	0.034	No	105	288	1010	CONM-250 (0-6")	40.4	
	25	Arsenic	0.01	0.25	0.014	No	16.4	288	1010	CONM-250 (0-6")	40.4	
	25	Cadmium	0.005	0.125	0.00054	No	**3.2**	573	6.7	CONM-750 (0-6")	4.8	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific K_d Value** screening criteria
	25	Cadmium	0.005	0.125	0.0004	No	2.05	573	6.7	CONM-750 (0-6")	4.8	
	25	Cadmium	0.005	0.125	0.00022	No	0.605	573	6.7	CONM-750 (0-6")	4.8	
	25	Copper	1.3	32.5	0.069	No	**410**	410	410	CONM-COMP 1 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	25	Copper	1.3	32.5	0.028	No	394	410	410	CONM-COMP 1 (0-6")	275	
	25	Copper	1.3	32.5	0.012	No	296	410	410	CONM-COMP 1 (0-6")	275	
	25	Copper	1.3	32.5	0.031	No	203	410	410	CONM-COMP 1 (0-6")	275	
	25	Copper	1.3	32.5	0.026	No	56.9	410	410	CONM-COMP 1 (0-6")	275	
	25	Iron	11	275	8.5	No	**40400**	1031567	77437	CONM-250 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	25	Lead	0.015	0.375	0.0024	No	6780	1609	6780	CONM-Pile 1 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	25	Lead	0.015	0.375	0.4	**Yes**	2350	1609	6780	CONM-Pile 1 (0-6")	1,109	
	25	Lead	0.015	0.375	0.25	No	**1600**	1609	6780	CONM-Pile 1 (0-6")	1,109	
	25	Lead	0.015	0.375	0.13	No	1540	1609	6780	CONM-Pile 1 (0-6")	1,109	
	25	Lead	0.015	0.375	0.2	No	942	1609	6780	CONM-Pile 1 (0-6")	1,109	
	25	Lead	0.015	0.375	0.061	No	125	1609	6780	CONM-Pile 1 (0-6")	1,109	
	25	Manganese	0.32	8	0.38	No	1500	14569	1996	CONM-350+50 (0-6")	4,893	Used Option 1 **Background** screening criteria
	25	Manganese	0.32	8	0.069	No	1250	14569	1996	CONM-350+50 (0-6")	4,893	
	25	Manganese	0.32	8	0.28	No	1220	14569	1996	CONM-350+50 (0-6")	4,893	
	25	Manganese	0.32	8	0.17	No	313	14569	1996	CONM-350+50 (0-6")	4,893	
	25	Manganese	0.32	8	0.014	No	232	14569	1996	CONM-350+50 (0-6")	4,893	
	25	Zinc	2	50	0.1	No	**914**	104008	914	CONM-COMP 2 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	25	Zinc	2	50	0.2	No	498	104008	914	CONM-COMP 2 (0-6")	551	
	25	Zinc	2	50	0.1	No	419	104008	914	CONM-COMP 2 (0-6")	551	
	25	Zinc	2	50	0.06	No	126	104008	914	CONM-COMP 2 (0-6")	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
7	32	Aluminum	16	512	12	No	12800	536142	12900	MPWA-0 (0-6")	31,092	Used Option 1 **Background** screening criteria
	32	Arsenic	0.01	0.32	0.015	No	**29.5**	623	116	MPWA-75+20 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	32	Cadmium	0.005	0.16	0.00031	No	0.578	295	0.9	MPWA-0 (0-6")	4.8	Used Option 1 **Background** screening criteria
	32	Copper	1.3	41.6	0.13	No	**377**	119814	579	MPWA-0 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	32	Iron	11	352	13	No	**28400**	762134	95905	MPWA-0 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	32	Lead	0.015	0.48	0.13	No	268	980	3480	MPWA-0 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	32	Manganese	0.32	10.24	0.1	No	190	19253	902	MPWA-230+25 (0-6")	4,893	Used Option 1 **Background** screening criteria
	32	Zinc	2	64	0.09	No	123	86218	525	MPWA-50+39 (0-6")	551	Used Option 1 **Background** screening criteria
8	60	Aluminum	16	960	19	No	16000	789267	20200	UMH1-400+12.5 (0-6")	31,092	Used Option 1 **Background** screening criteria
	60	Aluminum	16	960	8.9	No	14300	789267	20200	UMH1-400+12.5 (0-6")	31,092	
	60	Arsenic	0.01	0.6	0.04	No	**313**	2485	952	UMH-C3	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	60	Arsenic	0.01	0.6	0.066	No	193	2485	952	UMH-C3	40.4	
	60	Arsenic	0.01	0.6	0.023	No	144	2485	952	UMH-C3	40.4	
	60	Arsenic	0.01	0.6	0.027	No	86.8	2485	952	UMH-C3	40.4	
	60	Arsenic	0.01	0.6	0.011	No	29.4	2485	952	UMH-C3	40.4	
	60	Arsenic	0.01	0.6	0.008	No	16.6	2485	952	UMH-C3	40.4	
	60	Cadmium	0.005	0.3	0.0005	No	**15.9**	1067	33.4	UMH-C3	4.8	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	60	Cadmium	0.005	0.3	0.0003	No	9.74	1067	33.4	UMH-C3	4.8	
	60	Cadmium	0.005	0.3	0.0007	No	9.12	1067	33.4	UMH-C3	4.8	
	60	Cadmium	0.005	0.3	0.0011	No	5.73	1067	33.4	UMH-C3	4.8	
	60	Cadmium	0.005	0.3	0.0006	No	4.95	1067	33.4	UMH-C3	4.8	
	60	Cadmium	0.005	0.3	0.0013	No	4.65	1067	33.4	UMH-C3	4.8	
	60	Cadmium	0.005	0.3	0.00018	No	0.758	1067	33.4	UMH-C3	4.8	
	60	Copper	1.3	78	0.007	No	**1340**	105390	4940	UMH-C3	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	60	Copper	1.3	78	0.11	No	873	105390	4940	UMH-C3	275	
	60	Copper	1.3	78	0.054	No	605	105390	4940	UMH-C3	275	
	60	Copper	1.3	78	0.057	No	264	105390	4940	UMH-C3	275	
	60	Copper	1.3	78	0.009	No	130	105390	4940	UMH-C3	275	
	60	Copper	1.3	78	0.022	No	63.6	105390	4940	UMH-C3	275	
	60	Copper	1.3	78	0.014	No	19.2	105390	4940	UMH-C3	275	
	60	Iron	11	660	5.8	No	**21300**	1851401	221158	MHCS-525-W15 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	60	Iron	11	660	9.3	No	18400	1851401	221158	MHCS-525-W15 (0-6")	58,270	
	60	Lead	0.015	0.9	0.026	No	30700	1935	30700	UMH3-COMP 3 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 2 value.
	60	Lead	0.015	0.9	1.6	**Yes**	13600	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	0.86	No	9820	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	1.2	Yes	5660	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	0.11	No	2240	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	0.22	No	534	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	0.1	No	217	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Lead	0.015	0.9	0.035	No	90.2	1935	30700	UMH3-COMP 3 (0-6")	1,109	
	60	Manganese	0.32	19.2	0.16	No	**7540**	49789	9626	MHCS-700-W10 (0-6")	4,893	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria.
	60	Manganese	0.32	19.2	0.31	No	3820	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	1.1	No	3560	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	0.69	No	2340	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	0.096	No	1320	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	0.23	No	1270	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	0.3	No	784	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Manganese	0.32	19.2	0.23	No	684	49789	9626	MHCS-700-W10 (0-6")	4,893	
	60	Zinc	2	120	0.09	No	**2940**	169458	7824	UMH-A1	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	60	Zinc	2	120	0.09	No	1600	169458	7824	UMH-A1	551	
	60	Zinc	2	120	0.05	No	1270	169458	7824	UMH-A1	551	
	60	Zinc	2	120	0.13	No	1150	169458	7824	UMH-A1	551	
	60	Zinc	2	120	0.26	No	765	169458	7824	UMH-A1	551	
	60	Zinc	2	120	0.41	No	587	169458	7824	UMH-A1	551	
	60	Zinc	2	120	0.1	No	240	169458	7824	UMH-A1	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
9	18	Aluminum	16	288	--	--	--	--	19200	PMWA1-100+25 (0-6")	31,092	Used Option 1 **Background** screening criteria - SPLP analysis was not run for Al.
	18	Arsenic	0.01	0.18	0.015	No	**20.4**	167	40	PMWA1-200 (0-6")	40.4	
	18	Arsenic	0.01	0.18	0.010	No	19.2	167	40	PMWA1-200 (0-6")	40.4	Used Option 1 **Background** screening criteria
	18	Arsenic	0.01	0.18	0.019	No	18	167	40	PMWA1-200 (0-6")	40.4	
	18	Cadmium	0.005	0.09	0.0003	No	**0.69**	205	0.7	PMWA2-200+25 (0-6")	4.8	Used Option 1 **Background** screening criteria
	18	Copper	1.3	23.4	0.14	No	**344**	60844	608	PMWA2-100 (0-6")	275	
	18	Copper	1.3	23.4	0.14	No	339	60844	608	PMWA2-100 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific K_d Value** screening criteria
	18	Copper	1.3	23.4	0.11	No	328	60844	608	PMWA2-100 (0-6")	275	
	18	Iron	11	198	--	--	--	--	73228	PMWA1-200 (0-6")	58,270	Used Option 1 Background screening criteria - SPLP analysis was not run for Fe.
	18	Lead	0.015	0.27	0.43	**Yes**	725	618	741	PMWA1-200 (0-6")	1,109	
	18	Lead	0.015	0.27	0.23	No	679	618	741	PMWA1-200 (0-6")	1,109	Used Option 1 **Background** screening criteria
	18	Lead	0.015	0.27	0.33	**Yes**	559	618	741	PMWA1-200 (0-6")	1,109	
	18	Lead	0.015	0.27	0.1	No	**290**	618	741	PMWA1-200 (0-6")	1,109	
	18	Manganese	0.32	5.76	0.19	No	**376**	14614	762	PMWA2-50 (0-6")	4,893	
	18	Manganese	0.32	5.76	0.091	No	343	14614	762	PMWA2-50 (0-6")	4,893	Used Option 1 **Background** screening criteria
	18	Manganese	0.32	5.76	0.14	No	269	14614	762	PMWA2-50 (0-6")	4,893	
	18	Zinc	2	36	0.11	No	**149**	47778	161	PMWA2-50 (0-6")	551	
	18	Zinc	2	36	0.09	No	142	47778	161	PMWA2-50 (0-6")	551	Used Option 1 **Background** screening criteria
	18	Zinc	2	36	0.12	No	133	47778	161	PMWA2-50 (0-6")	551	
9 (subsurface)	18	Aluminum	16	288	--	--	--	--	10100	PAYRD-1 (0-6")	31,092	Used Option 1 **Background** screening criteria - SPLP analysis was not run for Al.
	18	Arsenic	0.01	0.18	0.015	No	**20.4**	167	1370	PAYCW-3 (0-6")	40.4	
	18	Arsenic	0.01	0.18	0.010	No	19.2	167	1370	PAYCW-3 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific K_d Value** screening criteria
	18	Arsenic	0.01	0.18	0.019	No	18	167	1370	PAYCW-3 (0-6")	40.4	
	18	Cadmium	0.005	0.09	0.0003	No	**0.69**	205	0.22	PAYCW-2 (0-6")	4.8	Used Option 1 **Background** screening criteria
	18	Copper	1.3	23.4	0.14	No	**344**	60844	264	PAYRD-1 (0-6")	275	
	18	Copper	1.3	23.4	0.14	No	339	60844	264	PAYRD-1 (0-6")	275	Used Option 1 **Background** screening criteria
	18	Copper	1.3	23.4	0.11	No	328	60844	264	PAYRD-1 (0-6")	275	
	18	Iron	11	198	--	--	--	--	218000	PAYCW-2 (12-24")	58,270	Used Option 1 Background screening criteria - SPLP analysis was not run for Fe.
	18	Lead	0.015	0.27	0.43	**Yes**	725	618	422	PAYCW-1 (0-6")	1,109	
	18	Lead	0.015	0.27	0.23	No	679	618	422	PAYCW-1 (0-6")	1,109	Used Option 1 **Background** screening criteria
	18	Lead	0.015	0.27	0.33	**Yes**	559	618	422	PAYCW-1 (0-6")	1,109	
	18	Lead	0.015	0.27	0.1	No	**290**	618	422	PAYCW-1 (0-6")	1,109	
	18	Manganese	0.32	5.76	0.19	No	**376**	14614	216	PAYCW-1 (12-24")	4,893	
	18	Manganese	0.32	5.76	0.091	No	343	14614	216	PAYCW-1 (12-24")	4,893	Used Option 1 **Background** screening criteria
	18	Manganese	0.32	5.76	0.14	No	269	14614	216	PAYCW-1 (12-24")	4,893	
	18	Zinc	2	36	0.11	No	**149**	47778	53	PAYCW-1 (0-6")	551	
	18	Zinc	2	36	0.09	No	142	47778	53	PAYCW-1 (0-6")	551	Used Option 1 **Background** screening criteria
	18	Zinc	2	36	0.12	No	133	47778	53	PAYCW-1 (0-6")	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
10	24	Aluminum	16	384	--	--	--	--	--	--	31,092	Used Option 1 **Background** screening criteria - No analysis run for Al at this EU.
	24	Arsenic	0.01	0.24	0.1	No	**27**	60	53	N3TA-700 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	24	Arsenic	0.01	0.24	0.1	No	11	60	53	N3TA-700 (0-6")	40.4	
	24	Cadmium	0.005	0.12	0.01	No	0.22	1	1.4	N3TA-750 (0-6")	4.8	Used Option 1 **Background** screening criteria
	24	Cadmium	0.005	0.12	0.01	No	**0.36**	1	1.4	N3TA-750 (0-6")	4.8	
	24	Copper	1.3	31.2	0.2	No	**188**	28709	1001	N3TA-Pile #1 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	24	Iron	11	264	--	--	--	--	83328	N3TA-750 (0-6")	58,270	Used Option 1 Background screening criteria - SPLP analysis was not run for Fe.
	24	Lead	0.015	0.36	0.1	No	**143**	217	708	N3TA-COMP 3 (0-6")	1,109	Used Option 1 **Background** screening criteria
	24	Lead	0.015	0.36	0.1	No	62.4	217	708	N3TA-COMP 3 (0-6")	1,109	
	24	Manganese	0.32	7.68	0.6	No	**348**	11982	5152	N3TA-Pile #1 (0-6")	4,893	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	24	Zinc	2	48	0.5	No	**67.1**	5095	713	N3TA-800 (0-6")	551	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
11	8	Aluminum	16	128	3.8	No	2480	81044	11500	BCEOT-E22+70 (0-6")	31,092	Used Option 1 **Background** screening criteria
	8	Aluminum	16	128	0.003	No	2470	81044	11500	BCEOT-E22+70 (0-6")	31,092	
	8	Aluminum	16	128	0.003	No	5580	81044	11500	BCEOT-E22+70 (0-6")	31,092	
	8	Aluminum	16	128	0.003	No	3450	81044	11500	BCEOT-E22+70 (0-6")	31,092	
	8	Arsenic	0.01	0.08	0.003	No	**491**	6138	616	BCEOT-E17-12.5 (0-6")	40.4	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	8	Arsenic	0.01	0.08	0.003	No	253	6138	616	BCEOT-E17-12.5 (0-6")	40.4	
	8	Arsenic	0.01	0.08	0.003	No	277	6138	616	BCEOT-E17-12.5 (0-6")	40.4	
	8	Arsenic	0.01	0.08	0.004	No	307	6138	616	BCEOT-E17-12.5 (0-6")	40.4	
	8	Cadmium	0.005	0.04	0.02	No	**33.8**	4	72.2	BCEOT-W22-12.5 (0-6")	4.8	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 2 value.
	8	Cadmium	0.005	0.04	0.0034	No	6.1	4	72.2	BCEOT-W22-12.5 (0-6")	4.8	
	8	Cadmium	0.005	0.04	0.028	No	3.4	4	72.2	BCEOT-W22-12.5 (0-6")	4.8	
	8	Cadmium	0.005	0.04	0.0009	No	1.2	4	72.2	BCEOT-W22-12.5 (0-6")	4.8	
	8	Copper	1.3	10.4	0.013	No	**1280**	3652	3232	BCEOT-E17-12.5 (0-6")	275	Didn't meet Option 1 **Background** screening criteria - Didn't meet Option 2 **Tabular Format** screening criteria - Used Option 3: **Site-specific Kd Value** screening criteria
	8	Copper	1.3	10.4	1.7	No	631	3652	3232	BCEOT-E17-12.5 (0-6")	275	
	8	Copper	1.3	10.4	0.096	No	375	3652	3232	BCEOT-E17-12.5 (0-6")	275	
	8	Copper	1.3	10.4	0.062	No	149	3652	3232	BCEOT-E17-12.5 (0-6")	275	
	8	Iron	11	88	10	No	75400	661773	152094	BCEOT-W23-12.5 (0-6")	58,270	Didn't meet Option 1 **Background** screening criteria - Used Option 2 **Tabular Format** screening criteria
	8	Iron	11	88	0.05	No	**199000**	661773	152094	BCEOT-W23-12.5 (0-6")	58,270	
	8	Iron	11	88	0.05	No	44500	661773	152094	BCEOT-W23-12.5 (0-6")	58,270	
	8	Iron	11	88	0.05	No	64300	661773	152094	BCEOT-W23-12.5 (0-6")	58,270	
	8	Lead	0.015	0.12	0.001	No	2400	8522	21699	BCEOT-E17-12.5 (0-6")	1,109	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used the Option 3 value.
	8	Lead	0.015	0.12	0.007	No	**2510**	8522	21699	BCEOT-E17-12.5 (0-6")	1,109	
	8	Lead	0.015	0.12	0.029	No	2060	8522	21699	BCEOT-E17-12.5 (0-6")	1,109	
	8	Lead	0.015	0.12	0.0055	No	1600	8522	21699	BCEOT-E17-12.5 (0-6")	1,109	
	8	Manganese	0.32	2.56	7.2	**Yes**	2260	49	23700	BCEOT-W22-12.5 (0-6")	4,893	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	8	Manganese	0.32	2.56	0.3	No	832	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	0.3	No	722	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	0.1	No	23700	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	0.2	No	634	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	4.3	**Yes**	9080	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	13	**Yes**	509	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	3.7	**Yes**	6730	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	0.1	No	**397**	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Manganese	0.32	2.56	0.48	No	298	49	23700	BCEOT-W22-12.5 (0-6")	4,893	
	8	Zinc	2	16	1.5	No	**13700**	2066	18108	BCEOT-E17-12.5 (0-6")	551	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 2 value.
	8	Zinc	2	16	2.1	No	5170	2066	18108	BCEOT-E17-12.5 (0-6")	551	
	8	Zinc	2	16	1	No	1270	2066	18108	BCEOT-E17-12.5 (0-6")	551	
	8	Zinc	2	16	0.38	No	1230	2066	18108	BCEOT-E17-12.5 (0-6")	551	
	8	Zinc	2	16	5.5	No	822	2066	18108	BCEOT-E17-12.5 (0-6")	551	
	8	Zinc	2	16	0.1	No	339	2066	18108	BCEOT-E17-12.5 (0-6")	551	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
12	1	Aluminum	16	16	110	**Yes**	23500	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	36	**Yes**	20900	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	25	**Yes**	17600	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	35	**Yes**	17100	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	18	**Yes**	16400	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	180	**Yes**	15700	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	38	**Yes**	12100	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	78	**Yes**	11000	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	130	**Yes**	10800	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	28	**Yes**	10600	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	20	**Yes**	9340	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	46	**Yes**	9320	354	33600	TP-MS-07(2.75-3.5)	8030	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Aluminum	16	16	3.4	No	8400	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	0.04	No	8220	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	0.06	No	8080	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	0.68	No	7740	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	4.7	No	7320	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	6.3	No	5980	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	3.3	No	5440	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	5.7	No	3800	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	4	No	3660	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	3.6	No	2670	354	33600	TP-MS-07(2.75-3.5)	8030	
	1	Aluminum	16	16	40	**Yes**	1660	354	33600	TP-MS-07(2.75-3.5)	8030	
12	1	Arsenic	0.01	0.01	0.072	**Yes**	132	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.047	**Yes**	119	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.03	**Yes**	66	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.1	**Yes**	66	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.015	**Yes**	35.8	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.057	**Yes**	29	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.031	**Yes**	24.6	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.023	**Yes**	17.4	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.02	**Yes**	16.8	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.024	**Yes**	14.9	1	507	BRSD-16 (2-6")	32.3	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Arsenic	0.01	0.01	0.033	**Yes**	14.7	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.11	**Yes**	12.6	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.076	**Yes**	11.6	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.02	**Yes**	10.3	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.069	**Yes**	9.89	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.047	**Yes**	9.85	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.027	**Yes**	8.58	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.009	No	7.35	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.041	**Yes**	7.23	1	507	BRSD-16 (2-6")	32.3	
	1	Arsenic	0.01	0.01	0.049	**Yes**	6.44	1	507	BRSD-16 (2-6")	32.3	
12	1	Cadmium	0.005	0.005	0.001	No	34.7	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0048	No	28	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0048	No	16.9	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0018	No	15.8	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.03	**Yes**	8	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0077	**Yes**	7.69	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0043	No	6.25	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0042	No	5.64	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0042	No	5.55	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0014	No	5.02	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0022	No	3.62	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00065	No	3.38	0.11	78	UM-0N-500E (2-6")	1.84	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Cadmium	0.005	0.005	0.001	No	2.44	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00015	No	2.34	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.0071	**Yes**	2.04	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00037	No	1.83	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00046	No	1.75	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00068	No	1.52	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.02	**Yes**	0.824	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00083	No	**0.671**	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00099	No	0.552	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00066	No	0.404	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00029	No	0.2	0.11	78	UM-0N-500E (2-6")	1.84	
	1	Cadmium	0.005	0.005	0.00015	No	0.15	0.11	78	UM-0N-500E (2-6")	1.84	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
12	1	Copper	1.3	1.3	0.017	No	1240	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.007	No	1120	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.01	No	1120	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	894	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	801	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.18	No	740	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.5	No	729	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.14	No	690	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	571	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	514	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	513	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	450	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	438	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.21	No	409	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	315	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	302	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.6	No	286	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.27	No	265	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.13	No	200	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.28	No	194	69	2760	UM-0N-500E (2-6")	67.4	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 2 value.
	1	Copper	1.3	1.3	0.31	No	191	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.66	No	153	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.79	No	148	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	147	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.074	No	143	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.52	No	143	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	135	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.36	No	133	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.18	No	129	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.2	No	128	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.072	No	97.9	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.3	No	90.2	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.11	No	89.2	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	86.9	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	82	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.17	No	79.4	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.1	No	52.9	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.36	No	48.6	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.25	No	18.2	69	2760	UM-0N-500E (2-6")	67.4	
	1	Copper	1.3	1.3	0.011	No	15.9	69	2760	UM-0N-500E (2-6")	67.4	
12	1	Iron	11	11	3.9	No	47800	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	30	**Yes**	40500	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	3	No	38500	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	7.2	No	33100	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	28	**Yes**	32200	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	33	**Yes**	23100	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	8.3	No	23000	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	18	**Yes**	22800	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	60	**Yes**	21800	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	19	**Yes**	20800	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	25	**Yes**	16800	1696	199000	BRSD-16 (2-6")	14500	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Iron	11	11	36	**Yes**	16600	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	85	**Yes**	16600	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	47	**Yes**	16200	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	82	**Yes**	15200	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	87	**Yes**	15100	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	49	**Yes**	14800	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	0.35	No	12900	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	12	**Yes**	11700	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	3.1	No	**9840**	1696	199000	BRSD-16 (2-6")	14500	
	1	Iron	11	11	5	No	8760	1696	199000	BRSD-16 (2-6")	14500	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
12	1	Lead	0.015	0.015	0.1	**Yes**	3280	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.0099	No	3130	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.6	**Yes**	2660	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.2	**Yes**	2480	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.7	**Yes**	2410	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.1	**Yes**	2120	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.3	**Yes**	1950	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.6	**Yes**	1730	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.9	**Yes**	1590	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	2.2	**Yes**	1460	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.0052	No	1090	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.2	**Yes**	1070	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.8	**Yes**	1050	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.8	**Yes**	968	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.3	**Yes**	931	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	1.7	**Yes**	836	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.22	**Yes**	804	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.4	**Yes**	794	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.0082	No	348	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.2	**Yes**	320	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.16	**Yes**	300	2	30867	TP-MS-116(1.0-1.5)	174	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Lead	0.015	0.015	0.1	**Yes**	282	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.3	**Yes**	226	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.095	**Yes**	192	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.1	**Yes**	163	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.22	**Yes**	115	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.1	**Yes**	114	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.1	**Yes**	112	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.1	**Yes**	107	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.51	**Yes**	104	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.3	**Yes**	98.7	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.49	**Yes**	96.2	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.3	**Yes**	95.4	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.1	**Yes**	95.3	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.12	**Yes**	93.3	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.21	**Yes**	92.4	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.082	**Yes**	87	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.094	**Yes**	66.9	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.14	**Yes**	58.8	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.19	**Yes**	23.8	2	30867	TP-MS-116(1.0-1.5)	174	
	1	Lead	0.015	0.015	0.0033	No	**7.04**	2	30867	TP-MS-116(1.0-1.5)	174	
12	1	Manganese	0.32	0.32	5.8	**Yes**	10100	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.3	No	8360	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.4	**Yes**	7810	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	1.1	**Yes**	7440	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	1.2	**Yes**	7430	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.2	No	6350	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.1	No	6090	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.17	No	3330	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.098	No	2860	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	1.2	**Yes**	2110	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.18	No	1500	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.1	No	1470	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.2	No	1360	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.48	**Yes**	1310	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	2.8	**Yes**	1240	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.3	No	1170	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.82	**Yes**	1130	7	75108	TP-MS-10B(0.0-0.5)	696	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 1 value.
	1	Manganese	0.32	0.32	0.46	**Yes**	648	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.73	**Yes**	635	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.23	No	493	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	10	**Yes**	428	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.28	No	292	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.2	No	281	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.026	No	279	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.05	No	174	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.69	**Yes**	126	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.27	No	**99.6**	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.064	No	95.4	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.095	No	84.8	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.16	No	76.7	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.1	No	69.5	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.18	No	32.8	7	75108	TP-MS-10B(0.0-0.5)	696	
	1	Manganese	0.32	0.32	0.016	No	25.6	7	75108	TP-MS-10B(0.0-0.5)	696	

EU	DAF	COPC	DEQ-7 Human Health Groundwater Standard (mg/L)	Leachate Criterion (mg/L) [1]	SPLP Result (mg/L)	SPLP Result > Leachate Criterion?	Opion 2: SSCL Using Tabular Format (mg/kg) [2]	Option 3: SSCL Using Site-Specific K_d Value (mg/kg)	Maximum Soil Concentration for Each EU (mg/kg)	Location of Maximum Soil Concentration for Each EU	Option 1: SSCL Using Background (mg/kg)	Origin of Final Site-specific Soil Cleanup Level for Protection of Groundwater
12	1	Zinc	2	2	0.02	No	3890	246	36572	TP-MS-11B(0.0-0.5)	275	Didn't meet any of the screening criteria options for establishing a Leaching to Groundwater Screening Level. Used Option 2 value.
	1	Zinc	2	2	0.98	No	3450	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	1.2	No	2760	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.63	No	2340	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.78	No	1990	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.7	No	1930	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	1.1	No	1740	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	2.7	**Yes**	1250	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	1.1	No	1030	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.06	No	1020	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.8	No	948	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.68	No	836	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	3	**Yes**	668	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.52	No	663	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.9	No	652	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.28	No	640	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.53	No	590	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.05	No	538	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.88	No	521	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	1.2	No	456	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	2.1	**Yes**	301	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.59	No	**300**	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.26	No	282	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.22	No	214	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.31	No	167	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.19	No	140	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.62	No	126	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.56	No	116	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.35	No	99.5	246	36572	TP-MS-11B(0.0-0.5)	275	
	1	Zinc	2	2	0.02	No	21.7	246	36572	TP-MS-11B(0.0-0.5)	275	

Notes:
EU = Exposure Unit
DAF = dilution attenuation factor
COPC = Contaminant of Potential Concern
mg/L = milligrams per liter
SPLP = synthetic precipitation leaching procedure
mg/kg = milligrams per kilogram
SSCL = Site-Specific Cleanup Level for Protection to Groundwater
All soil metals concentrations are below background, no further SSCL evaluation is necessary
All soil metals concentrations are below the SSCL determined by the "highest soil concentration for which this, and all lower soil concentrations have leachate concentrations at or below the Leachate Criterion (NJDEP 2008)" - no further SSCL evaluation is necessary
All soil metals concentrations are below the SSCL determined by the "site-specific Kd value (NJDEP 2008)" - no further SSCL evaluation is necessary
At least some soil metals concentrations exceed the designated SSCL
NV = No Value

1- The Leachate Criterion is calculated by the following equation:
LC (mg/L) = DEQ-7 HH GW Standard (mg/L) x DAF
where:
LC = Leachate Criterion
DEQ-7 HH GW Standard = Montana Numeric Water Quality Standard for human health

2- A "**Bolded**" value is the SSCL based on Option 2.