Field Sampling Report

Final

Prepared for:

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ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
COC	Chain of Custody
COCs	contaminants of concern
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
GPS	Global Positioning System
HTRW	Hazardous, Toxic, and Radioactive Waste
MS/MSD	matrix spike/matrix spike duplicate
MTCA	model toxics control act
OU	operable unit
QAPP	quality assurance project plan
QC	quality control
ROD	record of decision
SOP	standard operating procedure
SPLP	synthetic precipitation leaching procedure
TCLP	toxicity characteristic leaching procedure
USACE	U.S. Army Corps of Engineers
	-

UNITS OF MEASURE

mg/kg	milligrams per kilogram (parts per million)
µg/kg	micrograms per kilogram (parts per billion)
mg/L	milligrams per liter (parts per million)
µg/L	micrograms per liter (parts per billion)

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) recently conducted a HTRW field investigation focused on soil characterization to support remedial design and remedial action for the U.S. Environmental Protection Agency (EPA) Region 10 for the Starr Road and Island Complex Sites, located along the Spokane River just east of the city of Spokane. This work was performed to meet the requirements of the Record of Decision (ROD) for the Bunker Hill Mining and Metallurgical Complex Operable Unit (OU) 3 (USEPA 2002). The field investigation was designed to support selection of appropriate cleanup and site development options.

1.1 SITE DESCRIPTION AND HISTORY

The Starr Road and Island Complex Washington Recreation Sites designated for this field investigation are located approximately 2.5 miles west of the Idaho State line, adjacent to, and immediately north of Interstate 90, in Spokane County, Washington.

The Washington State Parks System owns the Starr Road recreational site. This primitive site is popular with local residents. The Starr Road site has been divided up into four areas, each with specific needs. These areas are the Gravel Bar, Upland, Backwater, and General Access. There is a sensitive trout-spawning habitat that is located around the Gravel Bar.

The Island Complex site is located a short distance upstream and south of the Starr Road site. The site is a long distance from the existing parking area and as such, currently has limited or low impact use. The site is directly adjacent to parkland open space recently acquired by Spokane County. This site is readily accessible to recreational users. Human health is the remediation driver for this site. The Island Complex site has been divided up into five areas; the Bar Deposit, Fine Sandy Beach, Bank Stabilization, Little Bank Separation, and Upland Path.

The goal is to reduce the risk of human exposure to contaminants of concern (COCs): lead, arsenic, zinc and cadmium. Soil action levels for protection of human health identified in the ROD are 700 mg/kg for lead. The ROD does not identify soil action levels for arsenic. Maximum contaminant levels identified by MTCA Method B for unrestricted land use are 80 mg/kg for cadmium and 24000 mg/kg for zinc.

1.2 OBJECTIVES

The objective of this project is to reduce human exposure to lead, arsenic, zinc, and cadmium contaminated soil and sediments exceeding the recreational area soil action levels and ecological goals identified in the ROD. The objective of the sampling and analysis effort is to provide data to support selection of appropriate cleanup and site development options. Specific objectives for each area of the site are described in the data quality objectives table and are summarized below.

- Determine/confirm exposure to lead, arsenic, zinc and cadmium on selected areas of the site.
- Determine suitability of excavated material for onsite disposal and the construction base of a parking lot on-site from selected areas of the site.
- Determine requirements for off-site disposal of excavated material from selected areas of the site, if on-site management is not selected.
- Determine needed characteristics for replacement material for selected areas of the site.
- Control future erosion of bank at the bank stabilization, bank slough, and upland remnant features on Island Complex site.
- Determine type of material that is suitable for a cap on the bar deposit, if that were to be pursued as a component of the remedy.

1.3 SUMMARY OF FIELD ACTIVITIES

On 17-18 August 2004, the USACE field sampling team accomplished soil sampling at the Starr Road and Island Complex sites. A backhoe and stainless steel hand tools were used to collect analytical soil samples from five composite (23 test pits) and eight grab (eight test pits) locations on the Island Complex site, and 3 composite (15 test pits) and 4 grab (4 test pits) locations on the Starr Road site. Grain Size samples were collected from 2 composite locations (ten test pits) on the Island Complex site, and 5 grab locations (five test pits) from the Starr Road site. Bottom depth ranged from six inches to three feet. Sample locations are presented in Appendix B.

Field activities in support of the soil investigation included: underground utility locating, backhoe test pit excavation, soil sieving, soil sampling, soil description, photo documentation, GPS locating of test pits, sample packaging and hand delivery to the EPA Manchester Laboratory.

2.0 DESCRIPTION OF WORK

2.1 UNDERGROUND UTILITY LOCATING

Prior to conducting the fieldwork, an underground utility check was performed on 16 August 2004 by qualified utility locator personnel. All locations designated for excavation were found to be clear of underground utility interference.

2.2 BACKHOE TEST PIT EXCAVATION

A backhoe was used at the site to excavate test pits. Each test pit was dug immediately prior to collection of samples. Following sample collection from each test pit, excavated soil was returned to the test pit. Precautions were taken to limit site impacts made by the backhoe by limiting mobilization and staying on paths and away from muddy or vegetated areas. All test pits were returned to their original state prior to personnel leaving the site each day. At no time were open test pits left unattended.

2.3 SOIL SIEVING

Prior to collecting samples, soil was sieved using a 3/8 inch sieve (9.5 mm screen openings) for SPLP and TCLP samples, and a number 10 sieve (2 mm screen openings) for total metals samples.

2.4 SOIL SAMPLING

Soil samples were collected from a total of 65 test pits, which are tabulated in the sample location coordinates table in section 6.1.

Metals samples were collected from the side of each test pit by scraping vertically from the sample interval with a stainless steel spoon and placing it into an aluminum pan. For composite samples, this was repeated at each test pit in the composite group. After any large gravel was sieved out of the sample, soil was homogenized in the pan by mixing with the spoon, then placed into one or two eight-ounce glass sample jars, depending on the amount of fines in the sample.

Moisture content samples were collected from the side of each test pit by scraping vertically from the sample interval with a stainless steel spoon. Moisture content samples were not sieved and were placed directly into a 32-ounce or 64-ounce nalgene sample container, depending on the size of the largest piece of gravel in the sample.

Grain size/frost susceptibility samples were collected using a shovel to vertically scrape the sides of the test pit from the sample interval. Material was then placed into a five-gallon pail.

All sieves and stainless steel spoons used for sampling were decontaminated prior to and between each use. A new clean aluminum foil pan was used for each sample requiring homogenization and discarded after use.

2.5 SOIL DESCRIPTION, PHOTO DOCUMENTATION, AND GPS LOCATING

At each test pit or composite area, a description of the soil was documented in the field notebook photo documentation taken, and GPS coordinates recorded. Soil descriptions are in section 6.2. Photo documentation is in appendix A. GPS coordinates were recorded in WGS84 and are located in the sample location coordinates table in section 6.1.

2.6 QC SAMPLE COLLECTION

Field duplicate samples for total metals were collected from test pits SRGB-1 from the 0-1 foot interval and the composite test pits ICUP-1Comp-1, ICUP-1Comp-2, ICUP-1Comp-3, ICUP-1Comp-4, and ICUP-1Comp-5 from the 0-0.5 foot interval and designated as SRGB-3 and ICUP-4Comp, respectively.

Matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of five percent for total metals. For samples designated MS/MSD, extra volume was collected. Total metals samples SRBB-1 and ICB-3a were designated MS/MSD.

2.7 SAMPLE PACKAGING AND HANDLING

After the soil sample containers were filled at each designated location, sample labels describing project, location, analysis, team members, sampling date, and collection time were placed on the sample containers or pails. Samples were hand delivered to the EPA Manchester Laboratory with the accompanying chain of custody form following completion of all fieldwork.

2.8 DEVIATIONS FROM THE SAMPLING AND ANALYSIS PLAN

In general, field activities were conducted in accordance with the Sampling and Analysis Plan with the following exceptions.

Actual sample locations from the Starr Road site were shifted to the west of the proposed sampling locations shown on Figure A-2 of the QAPP. This occurred due to the site changes caused by lower water levels than depicted in Figure A-2. However, it was expected that the proposed sample locations would be used as a guide in the field and that sample locations would be chosen in the field, based on current site conditions.

There were some last minute field personnel changes that occurred due to personnel availability. Sarah Bates and Marlowe Dawag performed all fieldwork.

The QAPP does not specify the backhoe operator. The backhoe company that was used was Vietzke Excavating, with Steve Bohrer as the operator.

3.0 LABORATORY ANALYSIS

The EPA Region 10 Manchester laboratory performed all analyses for the project and completed a laboratory case narrative for each sample data group. USACE staff conducted data quality reviews of all data from the analytical laboratory. A chemical data quality assessment report has been completed and is presented in Appendix G.

Chemical analyses were performed on the samples as described in section 2.0 of the Chemical Data Quality Assessment Report, and included the following analyses:

Total Metals – EPA Method 3050B/200.7 SPLP Metals – EPA Method 1312/3010A TCLP Metals – EPA Method 1311/3010A Moisture Content – ASTM Method D 2216-98 Particle-Size Analysis – ASTM Method D422-63 Frost Susceptibility - ASTM Method D422-63

4.0 DECONTAMINATION PROCEDURES

Non-dedicated sampling equipment (i.e., stainless steel sampling spoons and soil sieves) were decontaminated by washing in a phosphate-free soap and water solution and rinsed twice, using tap water and distilled water.

5.0 PROTECTION LEVEL

All sampling activities were conducted under Worker Protection Level D. Personal protective equipment included nitrile gloves and work gloves, safety steel toe boots, and high visibility vests. New pairs of nitrile gloves were donned prior to soil sampling at each sample point. Prior to conducting fieldwork, all field workers reviewed the activity hazard analysis in the Health and Safety plan and attended a tailgate meeting which included a briefing of the hazards at the site.

6.0 SAMPLE OBSERVATIONS

6.1 SAMPLE LOCATION COORDINATES

At each sample test pit, or composite location, the latitude and longitude was recorded using a GPS. Those sample locations with multiple test pit Ids are composite locations. One reading was taken at composite locations.

Sample Location Coordinates			
Sample Location	Test Pit ID	Latitude	Longitude
Upland Path			
ICUP-3Comp	ICUP-3Comp-1		
	ICUP-3Comp-2	NI 47044/04 0"	M 44700 40 00"
	ICUP-3Comp-3	- N 47°41°31.6″	VV 117°3°46.62″
	ICUP-3Comp-4		
	ICUP-3Comp-5		
ICUP-2Comp	ICUP-2Comp-1		
	ICUP-2Comp-2	NI 47044100 0"	
	ICUP-2Comp-3	N 47°41′30.6″	VV 117°5′46.2″
	ICUP-2Comp-4		
	ICUP-2Comp-5		
ICUP-1Comp	ICUP-1Comp-1		
	ICUP-1Comp-2	N 47°41'29.2"	W 117°3'48.3"
	ICUP-1Comp-3		
	ICUP-1Comp-4		
	ICUP-1Comp-5		
Little Bank Separation			
ILBS-1Comp	ILBS-1Comp-1		
	ILBS-1Comp-2	N 47°41'28.7"	W 117°3'51.3"
	ILBS-1Comp-3		
	ILBS-1Comp-4		
	ILBS-1Comp-5		
Bar Deposit			
ICB-5a&b	ICB-5	N 47°41'29.2"	W 117°3'53.7"
ICB-4a&b	ICB-4	N 47°41'27.8"	W 117°3'55.9"
ICB-3a&b	ICB-3	N 47°41'27.4"	W 117°3'54.7"
ICB-1a&b	ICB-1	N 47°41'26.5"	W 117°3'56.5"
ICB-6a&b	ICB-6	N 47°41'25.6"	W 117°3'57.5"
ICB-2a&b	ICB-2	N 47°41'26.7"	W 117°3'54.7"
ICB-GComp1a&b	ICB-GComp1-1	N 47°41'26.4"	W 117°3'54.7"

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Sample Location Coordinates				
Sample Location Test Pit ID Latitude Longitude				
	ICB-GComp1-2	N 47°41'26.9"	W 117°3'53"	
	ICB-GComp1-3	N 47°41'25.8"	W 117°3'56.9"	
	ICB-GComp1-4	N 47°41'26.5"	W 117°3'56.5"	
	ICB-GComp1-5	N 47°41'28.1"	W 117°3'55.1"	
ICB-Gcomp2a&b-	ICB-GComp2-a	N 47°41'26.8"	W 117°3'55.3"	
	ICB-GComp2-b	N 47°41'27.1"	W 117°3'55.1"	
	ICB-GComp2-c	N 47°41'26.8"	W 117°3'54.3"	
	ICB-GComp2-d	N 47°41'28.4"	W 117°3'53.8"	
	ICB-GComp2-e	N 47°41'27.3"	W 117°3'53.7"	
Sandy Beach				
ICSB-1Comp	ICSB-1Comp-1	N 47º41'04 9"	\ \/ 117 °2'57 2"	
	ICSB-1Comp-2	IN 47 41 24.0	W 117 3 57.3	
	ICSB-1Comp-3			
ICSB-3	ICSB-3	N 47°41'26.1"	W 117°3'53.7"	
ICSB-2	ICSB-2	N 47°41'25.3"	W 117°3'55.5"	
Gravel Bar				
SRGB-1 & -2	SRGB-1	N 47°41'24.8"	W 117°4'12.5"	
SRGB-G1and G2	SRGB-G1	N 47°41'25.5"	W 117°4'11.5"	
SRGB-G3	SRGB-G3	N 47°41'25.5"	W 117°4'13.1"	
Upland				
SRUP-1 & -2	SRUP-1	N 47°41'27.1"	W 117°4'7"	
SRUP1-1Comp &-2Comp	SRUP1-1	N 47°41'27"		
	SRUP1-2		W 117°4'7"	
	SRUP1-3			
	SRUP1-4			
	SRUP1-5			
SRUP2-1Comp & -2Comp	SRUP2-1			
	SRUP2-2	NI 47044100 0"		
	SRUP2-3	-N 47°41′26.6″	VV 117°4′8.4″	
	SRUP2-4			
	SRUP2-5			
SRUP3-1Comp & -2Comp	SRUP3-1			
	SRUP3-2			
	SRUP3-3	–N 47°41'25.5"	W 117°4'8.5"	
	SRUP3-4			
	SRUP3-5			
SRUP-3 & -4	SRUP-3	N 47°41'26.5"	W 117°4'8.1"	
SRUPG3&G4	SRUPG3	N 47°41'25.4"	W 117°4'8.8"	

Sample Location Coordinates			
Sample Location	Test Pit ID	Latitude	Longitude
SRUPG1&G2	SRUPG1	N 47°41'26.5"	W 117°4'8.5"
Backwater Beach			
SRBB-G1 & G2	SRBB-G1	N 47°41'27"	W 117°4'10.7"
SRBB-1 & -2	SRBB-1	N 47°41'27.1"	W 117°4'10.8"

6.2 SOIL CLASSIFICATION

The following soil type observations were made at sample locations. Sketches of composite sample test pit locations are in the field notes in Appendix E.

Island Complex, Upland Path – The surface of the path is a mix of river rocks, cobbles and gravel. Grasses are on either side of the path. Three five-point composite sample locations are on the upland path:

1) Sample Location ICUP-1Comp – In general, surface consists of sand in low areas of path, with more cobbles and gravel in the higher areas. Five six-inch test pits make up ICUP-1Comp:

Test Pit	Soil Type Observations
1	Mostly gravel with fines, some sand, larger grains on surface, organics.
	Maximum cobble size six inches.
2	Mostly gravel with sand & cobbles (maximum size six inches, large organic
	layer on surface.
3	Mostly gravel with fine sand, organic layer (1/2 inch) on surface.
4	Mostly gravel with cobbles (maximum size four inches), some sand.
5	Mostly gravel with cobbles (maximum size four inches), some sand.

2) Sample Location ICUP-2Comp – Five six-inch test pits make up ICUP-2Comp:

Test Pit	Soil Type Observations
1	Sandy gravel with cobbles (maximum size six inches)
2	Gravelly sand with cobbles (maximum size six inches)
3	Gravelly sand with many cobbles (average size one to two inches)
4	Gravelly sand with cobbles (maximum size six inches)
5	Gravelly sand with cobbles (maximum size six inches)

3) Sample Location ICUP-3Comp - Five six-inch test pits make up ICUP-3Comp. In general, soil consisted of gravelly sand with cobbles (maximum size six inches).

Island Complex, Little Bank Separation – One five-point composite sample location is on the little bank separation:

1) Sample Location ILBS-1Comp – Five one-foot test pits make up ILBS-1Comp:

Test Pit	Soil Type Observations	
1	Mostly sand with fines, organic layer on top.	
2	Mostly gravel with sand, some cobble (maximum size three inches).	
3	Mostly gravel with sand & fines, some cobbles (maximum size three inches),	
	some organics.	
4	Mostly gravel with cobbles & sand, organic layer.	
5	Mostly gravel with sand, occasional cobble (maximum size three inches).	

Island Complex, Bar Deposit –Six analytical sample locations and two five-point composite grain size sample locations are on the bar deposit:

Analytical sample locations (metals and moisture content) are each two feet deep and are described as follows:

Sample Location	Depth	Soil Type Description	
	(ft bgs)		
ICB-1	0-1	Cobbles (maximum size 12 inches) with some sandy gravel	
	1-2	Mostly cobbles (maximum size >12 inches) with gravelly sand	
ICB-2	0-1	Sandy gravel with some organics	
	1-2	Mostly gravel with some sand and few cobbles (maximum size	
		three inches)	
ICB-3	0-1	Gravelly sand with few cobbles (Maximum size three inches)	
	1-2	Gravelly sand with cobbles (maximum size six inches)	
ICB-4	0-2	Gravelly sand with few cobbles (maximum size three inches)	
ICB-5	0-1	Organic layer with many plant roots, sandy gravel with cobbles	
		(maximum size three inches)	
	1-2	Sandy gravel with cobbles (maximum size three inches)	
ICB-6	0-1	Mostly gravel with cobbles (maximum size three inches)	
	1-2	Mostly gravel with cobbles (maximum size five inches)	

Grain size composite sample locations are separated into two areas. One sample area is made up of five test pits placed around the perimeter of the bar deposit. The second sample area is made up of five test pits placed inside the bar deposit. In general, the perimeter of the bar deposit contained larger size material than the inside of the bar deposit. Sample test pits are described as follows.

1) Sample Location ICB-Gcomp1 – Five test pits on the perimeter of the bar deposit make up sample ICB-Gcomp1:

Test Pit	Soil Type Observation
1	Gravelly sand (maximum size two inches)
2	Sandy gravel (maximum size four inches).
3	Sandy gravel with cobbles (maximum size six inches).
4	River rocks with some gravelly sand (maximum size one foot).
5	Gravelly sand (maximum size one inch).

2) Sample Location ICB-GComp2 – Five test pits inside the bar deposit make up sample ICB-Gcomp1:

Test Pit	Soil Type Observations	
1	Sandy gravel (maximum size three inches).	
2	Sandy gravel (maximum size five inches).	
3	Sandy gravel (maximum size two inches).	
4	Sandy gravel (maximum size two inches).	
5	Sandy gravel (maximum size one inch).	

Island Complex, Fine Sandy Beach – Three sample locations are on the fine sandy beach, one of which is a three-point composite.

Sample Location	Test Pit	Soil Type Observation			
ICSB-1Comp		This composite sample was placed on the western extent of the			
		fine sandy beach area, where the most fine sand was exposed.			
	1	This test pit was dug down to three feet in order to determine the			
		depth of the sandy layer, which was 1.5 feet			
	2	Mostly sandy gravel			
	3	Mostly gravelly sand with some cobbles (maximum size three			
		inches)			
ICSB-2		Mostly cobbles with gravel, some sand (maximum size five			
		inches)			

Sample Location	Test Pit	Soil Type Observation
ICSB-3		Mostly sandy with gravel, some cobbles (maximum size three inches)

Starr Road, Gravel Bar – One analytical sample location and two grain size sample locations are on the gravel bar.

The analytical sample location (metals and moisture content) is two feet deep and is described as follows:

Sample Location	Depth (ft bgs)	Soil Type Observation	
SRGB-1	0-1	Gravel with some sand	
	1-2	Gravel with sand and some cobbles (maximum size four inches).	
		Slight moisture.	

Grain size sample locations:

Sample Location	Depth (ft bgs)	Soil Type Observation	
SRGB-G1	0-2	Gravelly sand (maximum size < one inch)	
SRGB-G3	0-1	Sandy gravel with some moisture	

Starr Road, Backwater Beach – One analytical sample location and one grain size sample location are on the backwater beach and are both two feet deep.

Analytical:

Sample Location	Depth (ft bgs)	Soil Type Observation	
SRBB-1	0-1	Gravel with organics, sand	
	1-2	Gravel	

Grain size:

Sample Location	Depth (ft bgs)	Soil Type Observation
SRBB-G1	0-2	Gravelly sand with some cobbles (maximum size three inches)

Starr Road, Upland –Five analytical sample locations (three of which are five-point composites) and two grain size sample locations are on the bar deposit. All test pits on the upland area are to two feet deep:

Analytical:

Sample Location	Depth (ft bgs)	Soil Type Description		
SRUP-1	0-1	bravel with sand		
	1-2	Gravel and cobbles (maximum size three inches)		
SRUP-3	0-2	Cobbles with sand and gravel		
SRUP1-Comp	0-2	In general, mostly gravelly sand		
SRUP2-Comp	0-2	In general, mostly sandy gravel		
SRUP3-Comp	0-2	In general, mostly gravelly sand		

Grain size:

Sample Location	Depth (ft bgs)	Soil Type Observation			
SRUPG1	0-2	Sandy gravel with cobbles (maximum size three inches). Some moisture.			
SRUPG3	0-2	Cobbles with gravelly sand (maximum size six inches)			

7.0 CONCLUSIONS

The data resulting from this field investigation underwent review by EPA and USACE and was found to be 100% complete, with no limitations on data usability. Data summary tables are in Appendix C and the chemical data quality assessment report is in Appendix D.

Following the Data Quality Objectives outlined in Table A-3 of the QAPP, the data were used to draw conclusions, which are the basis for the remedial design. These conclusions were included in a modified version of the data quality objectives table, which is located at the end of this section. The following table contains the comparison criteria, or evaluation values referenced in the modified data quality objectives table.

Analyte	Total Metals - Human Health Criteria (mg/kg)	SPLP (mg/L) ³	TCLP (mg/L) ⁴
Cadmium	80 ²	0.08	1.0
Copper	NA	2.2	NA
Lead	700 ¹	0.4	2.0
Zinc	24000 ²	28	NA
Arsenic	22 ¹	NA	5.0
Barium	NA	NA	100.0
Chromium	NA	NA	5.0
Selenium	NA	NA	1.0
Silver	NA	NA	5.0

Analytical Results Evaluation Values

¹ – This value was changed from the value specified in the QAPP (10 mg/kg). The basis for the change is discussed in the Remedial Design Document. ² - MTCA Method B soil criteria for unrestricted land use.

³ - SPLP criteria is based on Ambient Water Quality Criteria for the State of Washington, assuming an average hardness of 19 mg CaCO2/L, from data collected in this area of the Spokane River. As the ambient water quality criteria are more stringent than groundwater standards, the listed criteria are also protective of groundwater.

- Waste disposal considerations comply with and will be consistent with Washington dangerous waste regulations. (WAC 173-303-100)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions
Starr Road	Duta Requirements	Investigation bit ategy	Sumple Humber and Elocation Humbhale	ripplication	
Gravel Bar – There is no previous da	ta from this specific area, but it is sus	spected of having high levels of lead. Remedial options include excavation	to 2'. Material may be used in the construction of a new on-site parking lot or	may need to be disposed of	off-site. There is also a t rout-spawning habitat that is located in this area.
Determine/confirm exposure to	Concentration of lead, arsenic,	Two samples will be taken from one location at 0-1' (SRGB-1) and 1-2'	One sample location is sufficient for this area because previous data has	Results will be	SRGB-1 (0-1') SRGB-2 (1-2')
lead, arsenic, zinc and cadmium.	zinc and cadmium in the ground	(SRGB-2). Samples will be analyzed for total metals.	shown high lead levels, and the area will likely be excavated. The area is	compared to	As = 18 mg/kg $As = 17 mg/kg$
	surface.		small and uniform so a central location should be representative of the	evaluation values such	Cd = 5.69 mg/kg $Cd = 6.75 mg/kg$
			area. Decision criteria are not fully dependent on this data. Data down to	as defined in Table A-	Pb = 365 mg/kg $Pb = 378 mg/kg$
			the two foot depth interval is needed because past data near this area	2.	Zn = 1660 mg/kg $Zn = 1760 mg/kg$
			shows contamination from 0-1' and no data is available from the 1-2'		
			depth, which could contain high metals levels from sediment deposition	Data results will be	Matala reculta are balow human basth values
			during high river flows. If excavation occurs, or if the top foot is washed	used to refine design.	Nictais results are below numan nearth values.
			away during high flows, the 1-2' material may be exposed.		
				N 1 1 1	
Determine suitability of excavated	Potential of lead and other	Samples SRGB-1 and SRGB-2 will be analyzed for metals using SPLP	Because soil is expected to contain lead, samples will be analyzed for	Results will be used to	$\frac{\text{SRGB-1}(0-1^{2})}{\text{SRGB-2}(1-2^{2})}$
material for onsite disposal and a	metals leaching in to the	and TCLP and moisture content.	SPLP, TCLP and moisture content initially, without waiting for total lead	evaluate on-site	Cd = 9.30 ug/L $Cd = 9.60 ug/L$
construction base of a parking lot	groundwater and surface water	Frost susceptibility will be determined from grain size sample results.	results. The same rationale applies for number of samples and location as	containment options.	Cu = 5.60 ug/L $Cu = 6.60 ug/L$
on-sne.	from the excavated material.		total metals samples.		PD = 30.9 ug/L $PD = 35.3 ug/L$
	Moisture content of the soil.				Zn = 816 ug/L $Zn = 827 ug/L$
	Frost susceptionity of the soft.				
					All SDI D regults were below evaluation values and ensite rays from a
					All SPLP results were below evaluation values and onsite reuse from a
					leachaonny standpoint is suitable.
					The frost suscentibility results showed that 2 samples SPGB G2 and SPGB
					G3 are not susceptible to frost and suitable for onsite reuse Sample SRGB-
					G1 located on the tip of the gravel har may be frost susceptible. Material in
					this area may not be appropriate for onsite use.
					ans area may not be appropriate for onsite use.
					Moisture Content
					SRGB-1 (0-1') SRGB-2 (1-2')
					6.3 % water 6.2% water
Determine requirements for off-site	Toxic characteristics of			Results will be	<u>SRGB-1 (0-1')</u> <u>SRGB-2 (1-2')</u>
disposal of excavated material, if	excavated material.			compared to TCLP	$Ag \le 50 \text{ ug/L}$ $Ag \le 50 \text{ ug/L}$
on-site management is not selected.				criteria in Table A-2,	$As \le 230 \text{ ug/L}$ $As \le 230 \text{ ug/L}$
				Analytical Results	$Ba = 340 \text{ ug/L} \qquad Ba = 324 \text{ ug/L}$
				Evaluation Criteria.	Cd = 30.0 ug/L $Cd = 30.5 ug/L$
					$Cr \le 50.0 \text{ ug/L}$ $Cr \le 50 \text{ ug/L}$
				If < criteria, material	$Pb \le 125 \text{ ug/L}$ $Pb \le 125 \text{ ug/L}$
				may be disposed of in	Se $\leq 250 \text{ ug/L}$ Se $\leq 250 \text{ ug/L}$
				a subtitle D landfill.	
				If $>$ criteria, material	All results were below evaluation criteria and if material is disposed off-site, it
				transported off site	is likely that it may be disposed of in a subtitle D landfill. Confirmatory
				in a subtitle C londfill	samples at the time of excavation may be needed to confirm this.
				in a subtitle C faildfill.	
Determine needed characteristics	Grain size of gravel bar and	Two samples from 0-1' (SRGB-G1) and 1-2' (SRGB-G2) will be taken	The sample location will be determined by the sample crew in the field	Data will determine	Grain size data are shown in the chemical results tables. This data will
for replacement material	trout spawning area	from 1 location and analyzed for grain size. One sample will also be	and will be taken from a location that is representative of the gravel bar.	needs for replacement	determine replacement material requirements.
	1 0	taken from the trout spawning area (SRGB-G3) from 0-1'.	One location is sufficient because of the uniform characteristics of the	material.	A A
			gravel bar material. The amount of sample needed depends on the grain		
			size.		

In-metion Objections	Data Daminamanta	Turnetisation Studem	Comple Number and Leastin Detionals	Amplication	Construients
Stern Deed	Data Requirements	Invesugation Strategy	Sample Number and Location Rationale	Application	Conclusions
Starr Road	1.1 1				
Backwater Beach – This is a high-use	e area with no previous data. This ar	rea presents a data gap and is suspected of having high metals levels. Remedi	al options include excavation to 2'. Material may be isolated on site and used	in the construction of a ne	w on-site parking lot or may be disposed of off-site.
Determine exposure risks to lead, arsenic, cadmium, and zinc.	Total lead, arsenic, cadmium, and zinc concentration on ground surface.	Two samples from 0-1' (SRBB-1) and 1-2' (SRBB-2) will be taken from one location. Samples will be analyzed for total metals.	One sample location is sufficient for this area because the area is expected to contain high lead levels and will likely be excavated. The area is small and uniform so one location should be representative of the area. Data down to the two foot depth interval is needed because past data near this area shows contamination from $0-1'$ and no data is available from the 1-2' depth, which could contain high metals levels from sediment deposition	Results will be compared to evaluation values, such as defined in Table A-2.	SRBB-1 (0-1') SRBB-2 (1-2') As = 62.4 mg/kg As = 14 mg/kg Cd = 29.1 mg/kg Cd = 24.5 mg/kg Pb = 2520 mg/kg Pb = 399 mg/kg Zn = 3410 mg/kg Zn = 2090 mg/kg
			during high river flows. If excavation occurs, or if the top foot is washed away during high flows, the 1-2' material may be exposed.	Data results will be used to refine design.	There is a human health exposure risk to arsenic and lead at the 0-1 foot depth interval. However, this area is used infrequently by recreational visitors, the placement of hostile vegetation may be a more appropriate action than excavation.
Determine suitability of excavated	Potential of lead and other	Samples SRBB-1 and SRBB-2 will be analyzed for metals using SPLP	SPLP, TCLP and moisture content will be performed on the samples.	Results will be used to	<u>SRBB-1 (0-1')</u> <u>SRBB-2 (1-2')</u>
material for construction base of a parking lot on-site.	metals leaching from excavated material. Moisture content of the soil. Frost susceptibility of the soil.	and TCLP and moisture content. Frost susceptibility will be determined from grain size sample results.		evaluate on-site containment options.	Stell 1 (1 - 1)Stell 1 (1 - 1) $Cd \leq 3.00 \text{ ug/L}$ $Cd = 35.2 \text{ ug/L}$ $Cu \leq 5.00 \text{ ug/L}$ $Cu = 8.30 \text{ ug/L}$ $Pb \leq 36.3 \text{ ug/L}$ $Pb \leq 25.0 \text{ ug/L}$ $Zn = 121 \text{ ug/L}$ $Zn = 1700 \text{ ug/L}$ All SPLP results were below evaluation values and onsite reuse from aleachability standpoint is suitable.The frost susceptibility results showed that the 2 samples, SRBB-G1 andSRBB-G2, are susceptible to frost. Material in this area may not be appropriatefor onsite reuse.Moisture ContentSRBB-1 (0-1')11.7% water7.1% water
Determine requirements for off-site disposal of excavated material, if on-site management is not selected.	Toxic characteristics of excavated material.			Results will be compared to TCLP criteria in Table A-2, Analytical Results Evaluation Criteria. If < criteria, material may be disposed of in a subtitle D landfill. If > criteria, material transported off site would be disposed of in a subtitle C landfill.	$\label{eq:response} \begin{array}{llllllllllllllllllllllllllllllllllll$
Determine needed characteristics for replacement material.	Grain size of material that will be excavated.	Two samples will be taken from 0-1' (SRBB-G1) and 1-2' (SRBB-G2) from one location that is representative of the area and analyzed for grain size.	The sample location will be determined by the sample crew in the field and will be taken from a location that is representative of the backwater beach. One location is sufficient because of the uniform characterist ics of the backwater beach material. The amount of sample needed depends on the grain size.	Data will determine needs for replacement material.	Grain size data are shown in the chemical results tables. The design will use this data to determine replacement material requirements.

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	C		
Starr Road	Starr Road Unland Pravious data show high lavels of lead in this area. Remedial options include execution to 2' Material may be isolated on site and used in the construction of a new on site parking let or may be disposed of off site.						
Refine definition and extent of exposure risks to lead, arsenic, cadmium, and zinc.	Concentration of lead, arsenic, cadmium, and zinc on ground surface from the data gap, and areas where previous data shows lead results higher than action level.	Four samples will be collected from two locations within the data gap in the center and eastern portions of the upland area. At the first location, samples SRUP-1 (0-1') and SRUP-2 (1-2') will be collected. At the second location, samples SRUP-3 (0-1') and SRUP-4 (1-2') will be collected. Samples will be analyzed for total metals. In addition, 3 composite samples (SRUP1-1comp, SRUP2-1comp, and SRUP3- 1comp) from each of the sub-areas described in the cell below will be analyzed for total metals.	One sample is sufficient in this area, because most of the area has already been identified as lead contaminated. The highest concentrations found in this area are located on the eastern edge of the non-vegetated area (2400 mg/kg). The sample will be taken in a data gap in this area and may aid in defining the excavation boundary. Data down to the two foot depth interval is needed because past data in the area shows contamination from 0-1' and no data is available from the 1-2' depth, which could contain high metals levels from sediment deposition during high river flows If excavation occurs, or if the top foot is washed away during high flows, the 1-2' metain the amend.	Results will be compared to evaluation values, such as defined in Table A-2. Data results will be used to assist in refining the cleanup	SH As Co Pl Zr SH As Co		
			1-2' material may be exposed.	design.	PH Zr SH As CC PH Zr Zr As CC PH Zr Zr As CC PH Zr Zr Zr Zr Zr Zr Zr Zr Zr Zr Zr Zr Zr		
Det ermine suitability of excavated material for construction base of a parking lot on-site.	Potential of lead and other metals leaching from excavated material. Moisture content of the soil. Frost susceptibility of the soil.	Two 5-pt composite samples will be collected from 0-1' (SRUP1-1comp, SRUP2-1comp, SRUP3-1comp) and 1-2' (SRUP1-2comp, SRUP2- 2comp, SRUP3-2comp) each of 3 sub-areas defined in the Sample Number and Location Rationale column. Samples with the highest total metals value will be analyzed will be analyzed for metals leachate using SPLP and TCLP and moisture content. Frost susceptibility will be determined from grain size sample results.	In order to characterize excavated material for reuse or disposal, representative data from the entire upland area is needed. To do this cost effectively, composite samples are to be taken. The area is large. So, to collect data that will characterize this area, 3 sub-areas can be defined based on lead concentrations, and spatial area (defined in Figure A-2): (SRUP1), northern section of upland area, with higher lead concentrations, (SRUP2), center of upland area, with lower lead concentrations, and (SRUP3), south central part of the upland area. From each of these sub-areas, two 5-pt composite samples can be collected from 0-1' and 1-2' that is representative of that sub-area. The results should be useful in determining the appropriate use or disposal of each area.	Results will be used to evaluate on-site containment options.	SICC PT Zr SICC PT Zr Al leaning we let be The SI ap		

onclusions

- R<u>UP-1 (0-1')</u> s = 35.5 mg/kgd = 16.0 mg/kgb =1760 mg/kg Zn = 3020 mg/kgRUP-3 (0-1') s = 38.8 mg/kgCd = 16.2 mg/kgPb =1390 mg/kg Zn = 4460 mg/kgSRUP1-1comp (0-1') As = 39.3 mg/kg Cd = 16.6 mg/kgb =1830 mg/kg Zn = 3510 mg/kgRUP3-1comp (0-1') As = 22 mg/kg
- **As = 22 mg/kg** Cd = 8.90 mg/kg Pb =661 mg/kg Zn = 2040 mg/kg

Arsenic is above evaluation values for human health from both the 0-1 foot and -2 foot depth intervals across the entire upland area. Lead is above evaluation alues from the 0-1 foot depth interval in areas SRUP1 and SRUP2. Area RUP3 contains lower levels of metals, with only arsenic above evaluation alues. It is recommended for this area to be excavated from 0-1 feet.

SRUP-2 (1-2')

As = 38.7 mg/kg

Cd = 19.5 mg/kg

Pb = 326 mg/kg

SRUP-4 (1-2')

As = 32.7 mg/kg

Cd = 14.5 mg/kg Pb =630 mg/kg Zn = 3690 mg/kg

SRUP2-1comp (0-1')

As = 38.4 mg/kg Cd = 18.8 mg/kg

Pb =1820 mg/kg

Zn = 3770 mg/kg

SRUP1-2Comp (1-2')

<u>SRUP2-2Comp (1-2')</u> Cd = 20.3 ug/L Cu = 9.60 ug/L

SRUP3-2Comp (1-2')

Cd = 25.4 ug/L

Cu = 8.00 ug/L

 $Pb \le 25.0 \text{ ug/L}$

Zn = 2110 ug/L

 $Pb \leq 25.0 \text{ ug/L}$

Zn = 1440 ug/L

Cd = 35.2 ug/L

Cu = 13.5 ug/L

Zn = 3300 mg/kg

 $\frac{\text{SRUP1-1Comp (0-1')}}{\text{Cd} = 36.6 \text{ ug/L}}$ $\frac{\text{Cu} = 23.5 \text{ ug/L}}{\text{Pb} = 144 \text{ ug/L}}$ $\frac{\text{Pb} = 144 \text{ ug/L}}{\text{Zn} = 2830 \text{ ug/L}}$ $\frac{\text{SRUP2-1Comp (0-1')}}{\text{Cd} = 36.2 \text{ ug/L}}$ $\frac{\text{Cu} = 13.0 \text{ ug/L}}{\text{Cu} = 13.0 \text{ ug/L}}$ $\frac{\text{Pb} = 83.3 \text{ ug/L}}{\text{Zn} = 2370 \text{ ug/L}}$ $\frac{\text{SRUP3-1Comp (0-1')}}{\text{Cd} = 12.4 \text{ ug/L}}$ $\frac{\text{Cu} = 7.10 \text{ ug/L}}{\text{Cu} = 7.10 \text{ ug/L}}$

Pb = 90.8 ug/LPb = 40.9 ug/LZn = 1110 ug/LZn = 3120 ug/LAll SPLP results were below evaluation values and onsite reuse from aeachability standpoint may be suitable for areas with sufficient data. SPLP datantended from area SRUP1, represented in Figure A-2 of the QAPP, werecollected from further southwest than planned due to a significant decrease inwater level. It is not anticipated that data from that area would have SPLPevels exceeding the evaluation values, but additional data from this area may

e needed for confirmation if parking lot reuse is the favored option. he frost susceptibility results showed that all 4 samples, SRUP -G1, SRUPG2,

RUP-G3, and SRUP-G4, are not susceptible to frost. Material in this area is ppropriate for onsite reuse.

Investigation Objectives	Data Daguinamenta	Investigation Strategy	Somula Number and Leastion Detionals	Application	Conducions	
mvesugauon Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions Moisture Content	
					Moisture Content	
					<u>SRUP1-1Comp</u>	<u>SRUP2-2Comp</u>
					6.6% water	6.9% water
					SRUP1-2Comp	SRUP3-1Comp
					6.2% water	6.4% water
					0.270 Water	
					SPLIP2 1Comp	SPLID 3 2Comp
					<u>58012-10011p</u>	<u>SR01-3-20011p</u>
					6.5% water	6.9% water
Determine requirements for off-site	Toxic characteristics of			Results will be	<u>SRUP1-1Comp(0-1')</u>	<u>SRUP1-2Comp (1-2')</u>
disposal of excavated material, if	excavated material.			compared to TCLP	$Ag \le 50.0 \text{ ug/L}$	$Ag \le 50 \text{ ug/L}$
on-site management is not selected.				criteria in Table A-2,	$As \leq 230 \text{ ug/L}$	$As \leq 230 \text{ ug/L}$
-				Analytical Results	Ba = 552 µg/L	Ba = 611 ug/L
				Evaluation Criteria	Cd = 62.0 ug/L	Cd = 47.0 mg/L
				Evaluation enterna.	$C_{\rm U} = 02.0 \text{ ug/L}$	Cu = 47.0 ug/L
				If < EV motorial may	$Cr \leq 50.0 \text{ ug/L}$	$Cr \leq 50.0 \text{ ug/L}$
				$\Pi < \Box v$, material may	Pb ≤ 125 ug/L	$Pb \leq 125 \text{ ug/L}$
				be disposed of in a	$\text{Se} \le 250 \text{ ug/L}$	$\text{Se} \le 250 \text{ ug/L}$
				subtitle D landfill.	C C	0
				If $>$ EV, material	SRUP2-1Comp(0-1')	SRUP2-2Comp (1-2')
				transported off site	$\frac{\text{SRC12} \text{ recomp}(0,1)}{1}$	$\frac{51012}{2000}$
				would be disposed of	$Ag \leq 50 \text{ ug/L}$	$Ag \leq 50 \text{ ug/L}$
				in a subtitle C landfill	$As \le 230 \text{ ug/L}$	$As \le 230 \text{ ug/L}$
				in a subtitle e fundifii.	Ba = 464 ug/L	Ba = 467 ug/L
					Cd = 79.0 ug/L	Cd = 41.0 ug/L
					$Cr \leq 50.0 \text{ ug/L}$	$Cr \le 50.0 \text{ ug/L}$
					Pb = 129 ug/L	$Ph < 125 \mu g/L$
					$S_2 \leq 250 \text{ mg/}$	$r_0 \leq 120$ ug/L
					$Se \leq 250 \text{ ug/L}$	$Se \leq 230$ ug/L
					<u>SRUP3-1Comp(0-1')</u>	<u>SRUP3-2Comp (1-2')</u>
					$Ag \le 50 \text{ ug/L}$	$Ag \le 50 \text{ ug/L}$
					$As \le 225 \text{ ug/L}$	$As \leq 230 \text{ ug/L}$
					Ba = 401 ug/L	Ba = 608 ug/L
					Cd = 385 µg/L	Cd = 57.5 ug/J
					$C_{\pi} \leq 50.0$ ug/L	Cu = 57.5 ug/L
					$CF \leq 50.0 \text{ ug/L}$	$Cr \leq 50.0 \text{ ug/L}$
					$Pb \le 125 \text{ ug/L}$	$Pb \le 125 \text{ ug/L}$
					$\text{Se} \le 250 \text{ ug/L}$	$\text{Se} \le 250 \text{ ug/L}$
						6
					All results were below evaluation criteria	and if material is disposed off-site, it
					is likely that it may be disposed of in a su	btitle D landfill Confirmatory
					samples at the time of excavation may be	needed to confirm this
					samples at the time of excavation may be	needed to commit this.
Determine needed characteristics	Grain size of material that will	Grain size samples will be taken in 1-2 locations. The sampling team	The surface material in this area may be distributed by type in different	Data will determine	Grain size data are shown in the chemical	results tables. The design will use
for replacement material.	be excavated.	will visually determine if there are significant differences in grain size in	areas. If so, then each area should be characterized separately so that	needs for replacement	this data to determine replacement materi	al requirements.
		the area. If there are, each sample location will be placed in different	replacement activities can be performed as accurately as possible.	material.		
		areas. At each location, 2 samples will be taken, from 0-1' (SRUP-G1)				
		and 1-2' (SRUP-G2). Second set of samples would be SRUP-G3 and				
		SPUD G4				
		51(01-04.				
					1	

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	C
Island Complex				4 4 4 4 1 4 60	
Upland Path – There is no previous d	lata from the pathway in this area. R	emedial options include adding gravel as needed to the path to reduce potenti These first point composite complex will be called a from 0.052 from	al exposure, creating a defined pathway and adding vegetation to the sides of	the path to control traffic and	nd
arsenic, cadmium, and zinc on the path.	concentration of total lead, arsenic, cadmium, and zinc on the surface of the path.	three locations on the path (ICUP -1Comp, ICUP -2Comp, ICUP -3Comp) and analyzed for total metals.	Because no excavation is planned for the path, and exposure risk is limited to the surface of the ground, only the top 6 inches of soil need to be sampled. Sample locations were distributed evenly along the path, to get good representation.	in defining any needed remedial action on the path.	A C P Z
					<u>I(</u> A C P Z
					T de th re
Island Complex					<u> </u>
Bank Stabilization, bank slough, and	upland remnant features - Previous	data show some high levels of lead and other target metals in this area. Below	w the bank is a spawning bed for trout. Anticipated remedial action includes s	tabilization by adding ripra	ap c
Control future erosion of bank.	Concentration of total lead,	One five-point composite sample will be collected from 0-1'(ILBS-	Erosion of the Bank over time may have contributed contaminants to the	Results will be	II
Determine exposure risks to lead, arsenic, cadmium, and zinc on the bank slough material and the remnant bank features.	arsenic, cadmium, and zinc.	1Comp) and analyzed for total metals.	river channel below it, which is completely dry during summer months, creating a potential human exposure point. A composite sample from this area should provide representative data that would aid in establishing appropriate actions in this area.	compared to evaluation values, such as defined in Table A-2.	A C P Z
				Data results will assist in determining removal needs in the channel.	A O au re tr
Determine suitability of excavated material for on-site isolation	Potential of lead and other metals leaching from excavated material. Moisture content of the soil. Frost susceptibility of the soil.	One five-point composite sample will be collected from 0-1'(ILBS- 1Comp) and analyzed for metals using SPLP and TCLP and moisture content.	Because the area to be sampled is small and not expected have significant differences throughout, one five-point composite will be sufficient to gain representative data.	Results will be used to evaluate on-site containment options.	II C C P Z
					A fr
					N sı
					N
					<u>11</u> 7

onclusions prevent access to historically contaminated areas. CUP -1Comp (0-6") ICUP -2Comp (0-6") As = 18 mg/kgAs = 25.9 mg/kgCd = 11.0 mg/kgCd = 10.1 mg/kg**Pb = 710 mg/kg** Zn = 2350 mg/kg Pb = 804 mg/kg Zn = 1780 mg/kgCUP -3Comp (0-6") As = 22 mg/kg Cd = 10.5 mg/kg Pb = 619 mg/kgZn = 2050 mg/kgThere is a human health exposure risk to both arsenic and lead at the 0-6 inch depth interval on the majority of the upland path, with the highest lead levels on he southwestern extent. It is recommended that remedial action be taken to educe human exposure along the path, preferably a cap of clean gravel and lacement of vegetation to control foot traffic. or bioengineering aspects and localized removal. LBS-1Comp (0-1') As = 27.8 mg/kgCd = 10.5 mg/kgPb = 648 mg/kgZn - 2170 mg/kgArsenic is above human health evaluation values at the 0-1 foot depth interval. Other metals are below these values. There is a human health exposure risk to arsenic at this site and the site may need to undergo remediation, such as emoving contaminated material and replacing with clean material suitable for rout spawning habitat. LBS-1Comp (0-1') Cd = 13.6 ug/L $Cu \le 5.00 \text{ ug/L}$ $Pb \le 25.0 \text{ ug/L}$ Zn = 1300 ug/L All SPLP results were below evaluation values and onsite isolation or reuse from a leachability standpoint may be suitable. No grain size samples were collected from this area, therefore no frost susceptibility assessment was included. Moisture content LBS-1Comp 7.2% water

Investigation Objections	Data Daguinamanta	Turnetication Stantom	Comula Number and Leastien Detionals	Amplication	Canalusiana	
Determine an animeter for off site	Taria characteristics of	nivesugation Strategy	Sample Number and Location Rationale	Application Desults will be	U DS 1 Comer (0, 12)	
Determine requirements for on-site	Toxic characteristics of			Results will be	$\frac{\text{ILBS-IComp}(0-1)}{1}$	
disposal of excavated material.	excavated material.			compared to TCLP	Ag = 50 ug/L	
				criteria in Table A-2,	As = 230 ug/L	
				Analytical Results	Ba = 426 ug/L	
				Evaluation Criteria.	Cd = 32.5 ug/L	
					Cr = 50.0 ug/L	
				If < AL, material may	Pb = 125 ug/L	
				be disposed of in a	Se = 250 µg/L	
				subtitle D landfill	50 200 ug 2	
				If > AL material	All TCI P results were below evaluation of	ritoria and if matorial is disposed off
				II > AL, Indenial	All ICLF lesuits were below evaluation of	n a subtitle D landfill Confirmations
					site, it is likely that it may be disposed of i	If a subtrue D fandrin. Committatory
				would be disposed of	samples at the time of excavation may be n	leeded to confirm this.
				in a subtitle C landfill.		
Island Complex						
Bar Deposit – Previous data from the	e eastern edge of the ba					remedial options
include capping with larger cobbles,	stabilization, or removal of contamir	nated material and replacement with similar clean material to provide human	health and ecological exposure protection.			
Determine exposure risks to lead,	Concentration of lead, arsenic,	Six discreet samples will be collected from 0-1' (ICB-1a through ICB-	The 6 discreet sample locations will be widely-spaced and placed over the	Results will be	ICB-1A (0-1')	ICB-1B (1-2')
arsenic, cadmium, and zinc on the	cadmium, and zinc on the	6a) and 1-2' (ICB-1b through ICB-6b). Samples will be analyzed for	entire bar deposit to get representation from the whole area. Data down	compared to	As = 22 mg/kg	As = 31.7 mg/kg
har deposit	ground surface from areas with	total metals	to the two-foot depth interval is needed because past data in the area	evaluation values	Cd = 6.22 mg/kg	Cd = 6.76 mg/kg
bui deposit.	no previous data	total metals.	shows contamination from 0.1' and no data is available from the 1.2'	such as defined in	Ph = 438 mg/kg	Ph = 230 mg/kg
	no previous data.		shows containination from 0-1 and no data is available from the 1-2	such as defined in	FU = 438 mg/kg	FU = 230 mg/kg
			depth, which could contain high metals levels from sediment deposition	Table A-2.	Zn = 1980 mg/kg	Zn = 2130 mg/kg
			during high river flows. If excavation occurs, or if the top foot is washed			
			away during high flows, the 1-2' material may be exposed.		<u>ICB-2A (0-1')</u>	<u>ICB-2B (1-2')</u>
					As = 18 mg/kg	As = 18 mg/kg
					Cd = 8.92 mg/kg	Cd = 10.9 mg/kg
					Ph = 550 mg/kg	Ph = 468 mg/kg
					7 = 300 mg/kg	$T_{0} = 400 \text{ mg/kg}$
					Zn = 1980 mg/kg	Zn = 2320 mg/kg
					<u>ICB-3A (0-1')</u>	<u>ICB-3B (1-2')</u>
					As = 11 mg/kg	As = 14 mg/kg
					Cd = 4.00 mg/kg	Cd = 5.18 mg/kg
					$Ph = 228 m\sigma/k\sigma$	Ph = 352 mg/kg
					70 = 220 mg/kg	7n - 1260 mg/kg
					Zn = 1070 mg/kg	$Z \Pi = 1260 \text{ mg/kg}$
					<u>ICB-4A (0-1')</u>	<u>ICB-4B (1-2')</u>
					As = 20 mg/kg	As = 14 mg/kg
					Cd = 6.70 mg/kg	Cd = 4.99 mg/kg
					Pb = 507 mg/kg	Pb = 287 mg/kg
					7n - 1610 mg/kg	7n - 1520 mg/kg
					211-1010 119/119	211-1520 ing/kg
					$ICD = 5A (0, 1^2)$	$ICD = 5D (1, 2^2)$
					$\underline{\text{ICB-SA}(0-1^{\circ})}$	<u>ICB-5B (1-2)</u>
					As = 15 mg/kg	As = 23.8 mg/kg
					Cd = 5.33 mg/kg	Cd = 8.84 mg/kg
					Pb = 350 mg/kg	Pb = 580 mg/kg
					Zn = 1180 mg/kg	Zn = 1580 mg/kg
					$ICB_{-64}(0,1')$	$ICB_{-6B}(1_{-2})$
					$\frac{1 \times 1 \times 10^{-1} \times 10^{$	<u>ICD-0D (1-2)</u>
					As = 28.8 mg/kg	As = 24.3 mg/kg
					Cd = 4.80 mg/kg	Cd = 4.57 mg/kg
					Pb = 445 mg/kg	Pb = 366 mg/kg
					Zn = 4410 mg/kg	Zn = 5170 mg/kg
					Arsenic is above human health evaluation	values at both the $0-1$ and $1-2$ foot
					donth intervals on the her deposit alegest to	the water the highest concentration
					deput intervais on the bar deposit closest to) the water, the highest concentration
					being 31.7 mg/kg. Other metals are below	human health evaluation values.
					Because this area is isolated from human c	contact during high water, and arsenic
					levels are at the most only 10 mg/kg above	the evaluation value, remediation
					may not be necessary from a human expos	ure standpoint. If conservative
					options are preferable, then the site may up	idergo capping or excavation and
					replacement with clean material	ider 50 cupping or excavation and
					replacement with clean material.	
Determine type of material that is	Existing size of material	Existing size of material can be determined visually by a civil engineer		Suitable material used		
suitable for a cap if that were to be	Enisting size of material	No samples are necessary		for a can would be		
suitable for a cap, if that were to be		no samples are necessary.		lot a cap would be		
pursued as a component of the				determined by a civil		
remedy.	1	1		engineer.		

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions	
Characterize gradation of present material to determine replacement material needs if removal and replacement is pursued.	Gradation of exist ing material.	One to four 5-pt composite samples will be taken from 0-1' (ICB-Gcomp1a and ICB-Gcomp2a)and 1-2' (ICB-Gcomp1b and ICB-Gcomp2b), depending on if there are significant differences in grain size in the area. If there are, each composite sample location will be placed in different areas. Samples will be analyzed for grain size. For the purposes of planning for remedial options and obtaining data within the shortest time possible, one sample (ICB-Gcomp1a) will be initially analyzed for Grain Size.	The surface material in this area may be distributed by type in different areas. If so, then each area should be characterized separately so that replacement activities can be performed as accurately as possible.	Data will determine needs for replacement material.	Grain size data are shown in the chemical results tables. The this data to determine replacement material requirements.	design will use
Determine suitability of excavated material for reuse onsite.	Potential of lead and other metals leachin g from excavated material. Moisture content of the soil. Frost susceptibility of the soil.	If any samples from the 0-1' or 1-2' intervals contain total metals concentrations above the evaluation values, the samples with the highest concentration of metals from the 0-1' interval and the 1-2' interval will be analyzed for metals using TCLP, SPLP and moisture content. For the purposes of planning for remedial options and obtaining data within the shortest time possible, one sample (ICB-3a) will be initially analyzed for SPLP and TCLP. Frost susceptibility will be determined from grain size sample results.	By selecting the samples with the highest concentration of total metals above the evaluation values from the 0-1' interval and the 1-2' interval for SPLP, TCLP and moisture content analysis, a conservative determination can be made on the reuse and disposal characteristics throughout the bar deposit. Any SPLP or TCLP samples not selected for analysis will be archived at the laboratory until a determination is made whether further characterization by analysis is necessary, which will occur within the six month holding time of the samples.	Results will be used to evaluate on-site containment options.	ICB-3A (0-1') ICB-2A (0-1') Cd = 6.40 ug/L Cd = 7.60 ug/L Cu \leq 5.00 ug/L Pb \leq 25.0 ug/L Pb \leq 25.0 ug/L Pb \leq 31.3 ug/L Zn = 663 ug/L Zn = 679 ug/L ICB-5B (1-2') ICB-6A (0-1') Cd = 7.5 ug/L Cd = 5.40 ug/L Cu \leq 5.00 ug/L Pb \leq 31.3 ug/L Zn = 663 ug/L Zn = 679 ug/L Cd = 7.5 ug/L Cd = 5.40 ug/L Cu \leq 5.00 ug/L Pb \leq 25.0 ug/L Zn = 767 ug/L Zn = 1040 ug/L ICB-6B (1-2') Cd = 6.20 ug/L Cd = 6.20 ug/L Zn = 1040 ug/L Ve \leq 5.00 ug/L Zn = 1040 ug/L Pb \leq 25.0 ug/L Zn = 1020 ug/L It ier SPLP data from 0-1' show no results above evaluation Moisture content ICB-3A (0-1') ICB-2A (0-1') 6.2% water 5.8% water ICB-5B (1-2') ICB-6A (0-1') 6.2% water 11.2% water	values.

				A 39 /8		
Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions	
Determine requirements for off-site	Toxic characteristics of			Results will be	<u>ICB-3A (0-1')</u>	<u>ICB-1B (1-2')</u>
disposal of excavated material, if	excavated material.			compared to TCLP	$Ag \leq 50 ug/L$	$Ag \leq 50 \text{ ug/L}$
on-site management is not selected.				criteria in Table A-2.	$\Lambda_{\rm S} \leq 225 \mu {\rm g/I}$	$\Lambda_{\rm S} \leq 230 \mu {\rm g/I}$
				Analytical Results	$A_3 \leq 223 \text{ ug/L}$ $B_2 = 220 \text{ ug/L}$	As = 250 ug/L $D_0 = 622 \text{ ug/L}$
				Evaluation Criteria	Ba = 520 ug/L	$\mathbf{D}a = \mathbf{O}\mathbf{S}\mathbf{Z} \ \mathbf{u}\mathbf{g}/\mathbf{L}$
				Evaluation Criteria.	Cd = 19.0 ug/L	Cd = 24.0 ug/L
					$Cr \le 50.0 \text{ ug/L}$	$Cr \le 50.0 \text{ ug/L}$
				If < criteria, material	$Pb \le 125 \text{ ug/L}$	$Pb \le 125 \text{ ug/L}$
				may be disposed of in	$Se < 250 \mu g/L$	$Se < 250 \mu g/L$
				a subtitle D landfill.	50 <u>2</u> 250 ug 2	50 <u>2</u> 250 ug E
				If > criteria, material		ICD 5D (1.2)
				transported off site	ICB-2A(0-1)	<u>ICB-5B (1-2)</u>
				would be disposed of	$Ag \leq 50 \text{ ug/L}$	$Ag \leq 50.0 \text{ ug/L}$
				in a subtitle C landfill	$As \le 230 \text{ ug/L}$	$As \le 225 \text{ ug/L}$
				in a subtitle C fandrin.	Ba = 430 ug/L	Ba = 335 ug/L
					Cd = 41.5 ug/L	Cd = 23.0 ug/L
					$C_{\rm r} \leq 50.0$ µg/I	$C_r \leq 50.0 \mathrm{mg/I}$
					$CI \leq 50.0 \text{ ug/L}$	$CI \leq 50.0 \text{ ug/L}$
					$Pb \le 125 \text{ ug/L}$	$Pb \le 125 \text{ ug/L}$
					$\text{Se} \le 250 \text{ ug/L}$	Se ≤250 ug/L
					-	
					ICB-6A (0-1')	
					$Ag \leq 50.0 \mu g/I$	
					$Ag \leq 50.0 \text{ ug/L}$	
					$AS \leq 225 \text{ ug/L}$	
					Ba = 503 ug/L	
					Cd = 18.5 ug/L	
					$Cr \leq 50.0 \text{ ug/L}$	
					$Ph < 125 \mu g/I$	
					$r_{0} \leq 125 \text{ ug/L}$	
					$3e \leq 230 \text{ ug/L}$	
					at ad	
					1 st and 2 st tier TCLP data show no result	s above evaluation values.
Island Complex					<u> </u>	
E' C 1 D 1 i i i	11 1 2 1	11 11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	111 4' D 111 (111 1 1 1 1 1 1 1 1 1 1 1 1 1 1		4.	
Fine Sandy Beach Zone and associate	ed bar deposit – The sandy zone is m	ore accessible and has a higher human exposure risk. No previous data is av	anable on this area. Remedial options include capping or removal of contamin	hated material as appropria		
Determine exposure risks to lead	Concentration of lead and	Samples will be collected from three locations (ICSB-1Comp, ICSB-2,	There are no previous data from this area. The sandy zone is small, but	Results will be	$\underline{\text{ICSB-1Comp}(0-1')}$	$ICSB-2(0-1^2)$
and arsenic.	arsenic from ground surface.	ICSB-3) from the 0-1' interval and analyzed for total metals. ICSB-	there is a higher accessibility to children. For this reason, samples will	compared to	As = 11 mg/kg	As = 20 mg/kg
		1Comp will be a 3-point composite collected from the western point of	be collected and analyzed from three locations so that concentration and	evaluation values,	Pb = 206 mg/kg	Pb = 520 mg/kg
		the fine sandy beach.	location of contamination in this area can be characterized.	such as defined in		
				Table A-2.	ICSB-3(0-1')	
					$\Delta s = 15 \text{ mg/kg}$	
					As = 10 mg/kg Db = 406 mg/kg	
					PD = 400 mg/kg	
					Arconic concentrations in the 0.1 fact do	th interval ranged from 11 mg/kg to
					Arsenic concentrations in the 0-1 loot de	
					20 mg/kg, above the evaluation value. N	o other results were above evaluation
					values. There is not a significant human	health exposure risk in this area, as the
					lowest concentrations (11 mg/kg As) wer	e found in the areas most likely used
					by children. Limited capping or removal	of existing material may be performed
					in order to comply with Washington state	background cleanup levels
					in order to compry with washington state	caenground croundp to versi
Characterize existing material to	Depth of the sand layer	A hole will be dug to the depth of the sand layer or to 3' It will be no	The area is already known to be sand therefore, a grain size analysis is	Data will determine	Test pit ICSB-1Comp was dug down to 3	feet and the sand layer was measured
determine replacement material	Depth of the stand hayer.	deeper than 3' The depth of the sand layer will then be measured	not needed. However, the denth of the sand layer is not known, and that	the needed depth of	at 0.15 feet below ground surface. There	fore if existing sand is excavated 15
		deeper than 5. The depth of the sand layer will then be measured.	not needed. However, the depth of the said layer is not known, and that		at 0-1.5 feet below ground surface. Then	solore, in existing said is excavated, 1.5
needs if removal occurs.			information is needed for potential material replacement. One centrally	sand for replacement,	feet of clean sand will be needed for repla	acement material.
			placed location should be representative of the area.	if appropriate.		
Assess materials to assist planning	Toxic characteristics of	If any samples contain total metals concentrations above the evaluation	By selecting the sample with the highest concentration of total metals	Results will be compared	<u>ICSB-2 (0-1')</u>	
and determine disposal	excavated material.	values, the sample with the highest concentration of metals will be	above the evaluation values for TCLP analysis, a conservative	to TCLP criteria in Table	$Ag \leq 50.0 ug/L$	
requirements if off site disposal of		analyzed for metals using TCLP.	determination can be made on the reuse and disposal characteristics of the	A-2, Analytical Results	$\Delta s \leq 225 \mu g/I$	
materials were to occur			fine sandy heach Any TCLP samples not selected for analysis will be	Evaluation Criteria.	$B_{2} = 262 \mu g/L$	
materials were to becur.			archived at the laboratory until a determination is made whether further	If < criteria, material may	Da = 202 ug/L	
			archived at the faboratory unit a determination is made whether further	be disposed of in a	Ca = 15.0 ug/L	
			characterization by analysis is necessary, which will occur within the six	subtitle D landfill.	$Cr \le 50.0 \text{ ug/L}$	
			month holding time of the samples.	If > criteria, material	$Pb \le 125 \text{ ug/L}$	
				transported off site would	$Se < 250 \mu g/L$	
				be disposed of in a	50 - 250 ug/L	
				subtitle C landfill.	TCLP data show no results above evaluat	ion values
	1			1	I I CLA GATA SHOW HO ICSUITS ADOVE EVALUAT	N/II YAILLON

Appendix A Photo Documentation



Photo 1. Island Complex Upland Path Test Pits





Photo 3. Homogenizing Samples



Photo 4. Island Complex Little Bank Separation Composite Locations



Photo 5. Island Complex Bar Deposit Test Pit Near River



Photo 6. Island Complex Middle of Bar Deposit Test Pit



Photo 7. Island Complex Fine Sandy Beach Test Pit



Photo 8. Starr Road Upland Composite Sample Test Pits



Photo 9. Starr Road Gravel Bar Test Pit



Photo 10. Starr Road Backwater Beach Test Pit

Appendix B

Figures Location Map Starr Road and Island Complex Sites Total Metals Sampling Results Arsenic and Lead Results





\bigcirc	Sample Locations, August 2004*	$\langle \rangle$	Composite Areas
¢	Historical Sampling 1999, 2000		Approximate Water Line at Time of Sampling**
\otimes	Composite Sample Increments		
	* Red and Blue labels denote grain-size samples	** [Due to fluctuating water levels, samples pictured here in water were actually collected on land



Photo Source: Avista, August 2003







Sample Locations, August 2004
 Composite Areas
 Observed Spawning Areas*
 Composite Sample Increments
 * Rainbow Trout Spawning Survey, 2003 Final Report. Parametrix.
 ** Due to fluctuating water levels, samples pictured here in water were actually collected on land



Photo Source: Avista, August 2003






 \otimes Composite Sample Increments *Red Text indicates Lead Levels > Evaluation Values (700 mg/kg Lead)

Approximate Water Line at Time of Sampling** ** Due to fluctuating water levels, samples pictured here in water were actually collected on land



Photo Source: Avista, August 2003







Appendix C Data Summary Tables Metals and Moisture Content Results Table

Metals and Moisture Content Results Table Frost Susceptibility Determination by ASTM Method D422-63 Table Particle Size Analysis Sheets

Sample ID	Evaluation	04344300	04344301	04344302	04344303	04344304	04344305	04344306	04344307	04344308	04344309	
Sample Location	Value	ICB-1A	ICB-1B	ICB-2A	ICB-2B	ICB-3A	ICB-3B	ICB-4A	ICB-4B	ICB-5A	ICB-5B	
Date Sampled		8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	
Analyte												
TCLP Metals (ug/L)												
Arsenic	5000		230	U 230	n	225 L					225 U	
Barium	100000		632	430		320 J					335	
Cadmium	1000		24.0	41.5		19.0					23.0	
Chromium	5000		50.0	U 50.0	n	20.0 L	_				50.0 U	
Lead	2000		125	U 125	n	125 L					125 U	
Selenium	1000		250	U 250	n	250 L					250 U	
Silver	5000		50	UJ 50	ſŊ	20 L	ſſ				50.0 U.	ſ
SPLP Metals (ug/L)												
Cadmium	80			7.6		6.40					7.5	
Copper	2200			5.00	n	<u>2.00 ר</u>					5.00 U	
Lead	400			31.3		25.0 L					25.0 U	
Zinc	28000			679		663					767	
Total Metals (mg/kg)												
Arsenic	22	22	31.7	18	18	11	14	20	14	15	23.8	
Cadmium	80	6.22	6.76	8.92	10.9	4.00	5.18	6.70	4.99	5.33	8.84	
Lead	200	438	230	550	468	228	352	507	287	350	580	
Zinc	24000	1980	2130	1980	2320	1070	1260	1610	1520	1180	1580	
Moisture Content												
% Water		11.3	11.7	5.8	5.8	6.2	6.3	6.3	6.2	6.6	6.2	
Data Qualifiers: U - The ana	Ivte was not det	tected at or abov	e the reported va	lue.	ā	old text indicates	a detection.					

Metals and Moisture Content Results

J – The identification of the analyte is acceptable; the reported value is an estimate. UJ - The analyte was not detected at or above the reported value. The reported value is an estimate. .

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Sample ID	Evaluation	04344310	04344311	04344312	04344313	04344314	04344315	04344316	04344317	04344318	04344319
Sample Location	Value	ICB-6A	ICB-6B	ICB-7B (F Dup)	ICSB-1Comp	ICSB-2	ICSB-3	ICUP-1Comp	ICUP-2Comp	ICUP-3Comp	ICUP-4Comp (F Dup)
Date Sampled		8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04	8/17/04
Analyte											
TCLP Metals (ug/L)											
Arsenic	5000	225 L	ſ			225 U					
3arium	100000	503				262					
Cadmium	1000	18.5				15.0					
Chromium	5000	20.0 L				50.0 U					
-ead	2000	125 L				125 U					
Selenium	1000	ב20 ר				250 U					
Silver	5000	20.0 L	n n			50.0 U	ſ				
SPLP Metals (ug/L)											
Sadmium	80	5.40	6.20								
Copper	2200	5.00 L	J 5.00 U								
-ead	400	25.0 L	J 25.0 U								
Zinc	28000	1040	1020								
Total Metals (mg/kg)											
Arsenic	22	28.8	24.3	14	11	20	15	18	25.9	22	19
Cadmium	80	4.80	4.57	4.69	3.39	7.12	6.47	11.0	10.1	10.5	11.6
-ead	700	445	366	274	206	520	406	804	710	619	847
Zinc	24000	4410	5170	1490	988	1330	1310	1780	2350	2050	1890
Moisture Content											
% Water		11.2	11.3								
:						•					

Metals and Moisture Content Results Cont'd.

Data Qualifiers: U - The analyte was not detected at or above the reported value.

Bold text indicates a detection.

J - The identification of the analyte is acceptable; the reported value is an estimate.

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

Metals and Moisture	Content Re	esults Cont'd.											
Sample ID	Evaluation	04344320	04344325	04344326	04344327	04344331	04344332	Ō	4344333	04344334	04344335	04344336	
Sample Location	Value	ILBS-1Comp	SRGB-1	SRGB-2	SRGB-3 (F Du	p)SRUP-1	SRUP1-1Comp	S	RUP1-2Comp	SRUP-2	SRUP2-1Comp	SRUP2-2Comp	
Date Sampled		8/17/04	8/18/04	8/18/04	8/18/04	8/18/04	8/18/04	8	18/04	8/18/04	8/18/04	8/18/04	
Analyte													
TCLP Metals (ug/L)													
Arsenic	5000	230	U 230 I	J 230 U			230	ы П	30 U		230 U	230	_
Barium	100000	426	J 340 .	J 324 J			552	9	11		464 J	467	_
Cadmium	1000	32.5	30.0	30.5			62.0	4	7.0		79.0	41.0	
Chromium	5000	50.0	U 50.0 I	U 50 U			50.0	U 5(0.0 U		50.0 U	50.0 IL	
Lead	2000	125	U 125 (U 125 U			125	U 1	25 U		129	125 L	_
Selenium	1000	250	U 250 I	U 250 U			250	U 2	50 U		250 U	250	_
Silver	5000	50	UJ 50 [JJ 50 U	ſ		50.0	UJ 5(D C		50 U	J 50 L	3
SPLP Metals (ug/L)													
Cadmium	80	13.6	9.30	9.60			36.6	Ñ	5.4		36.2	20.3	
Copper	2200	5.00	U 5.60	6.60			23.5	ø	00		13.0	9.60	
Lead	400	25.0	U 36.9	33.3			144	ÿ	5.0 U		83.3	25.0 L	
Zinc	28000	1300	816	827			2830	Ň	110		2370	1440	
Total Metals (mg/kg)													
Arsenic	22	27.8	18	17	19	35.5	39.3			38.7	38.4		
Cadmium	80	10.5	5.69	6.75	5.74	16.0	16.6			19.5	18.8		
Lead	700	648	365	378	374	1760	1830			326	1820		
Zinc	24000	2170	1660	1760	1670	3020	3510			3300	3770		
Moisture Content													
% Water		7.2	6.3	6.2			6.6	Ö	2		6.5	6.9	
Data Qualifiers: U - The an	alyte was not d	etected at or abov	e the reported valu-	e.	Bold to	ext indicates a dete	sction.						
J - The identification of the	analyte is acce	ptable; the reporte	∋d value is an estim	late.									

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

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Metals and Moisture Content F	Results Cont'd.									
Sample ID	Evaluation	04344337	04344338	04344339	C	04344340	04344345		04344346	
Sample Location	Value	SRUP-3	SRUP3-1Comp	SRUP3-2Comp		SRUP-4	SRBB-1		SRBB-2	
Date Sampled		8/18/04	8/18/04	8/18/04	<u>_</u>	3/18/04	8/18/04		8/18/04	
Analyte										
TCLP Metals (ug/L)										
Arsenic	5000		225	U 230	n		230	N	230	D
Barium	100000		401	J 608	ſ		604		395	٦
Cadmium	1000		38.5	57.5			112		53.5	
Chromium	5000		50.0	U 50.0	_		50.0		50.0	⊃
Lead	2000		125	U 125	_		167		125	∍
Selenium	1000		250	U 250	D		250	N	250	D
Silver	5000		50	UJ 50	З		50	n	50	S
SPLP Metals (ug/L)										
Cadmium	80		12.4	35.2			3.00	N	35.2	
Copper	2200		7.10	13.5			5.00	N	8.30	
Lead	400		90.8	40.9			36.3		25.0	
Zinc	28000		1110	3120			121	ſ	1700	
Total Metals (mg/kg)										
Arsenic	22	38.8	22			32.7	62.4		14	
Cadmium	80	16.2	8.90		~	14.5	29.1		24.5	
Lead	200	1390	661		9	330	2520		399	
Zinc	24000	4460	2040			3690	3410		2090	
Moisture Content										
% Water			6.4	6.9			11.7		7.1	
Data Qualifiers: U - The analyte was not	detected at or above t	the reported value.	Bold text indicates a dete	ection.						

Data Qualitiers: U - The analyte was not detected at or above the reported value.

J - The identification of the analyte is acceptable; the reported value is an estimate. UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

9

Frost Susceptibili	ty Determination	h by ASTM Method D422-63
Corps Sample ID	Lab Sample ID	Frost Susceptibility
ICB-GComp1A	04344321	No
ICB-GComp1B	04344322	No
ICB-GComp2A	04344323	No
ICB-GComp2B	4344324	No
SRGB-G1	04344328	Very Close
SRGB-G2	04344329	No
SRGB-G3	04344330	No
SRUP-G1	04344341	No
SRUP-G2	04344342	No
SRUP-G3	04344343	No
SRUP-G4	04344344	No
SRBB-G1	04344347	Yes
SRBB-G2	04344348	Yes

Frost Susceptibility Determination Summary

Particle-Size Analysis of Soils

Sample ID	ICB-GComp1A	04344321
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Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		83.4
.75"		66.6
0.375"		53.5
#4 (4.75 mm)		41.2
#10 (2.0 mm)		25.2
#40 (425 um)		4.5
#60 (250 um)		2.4
#100 (150 um)		1.7
#200 (75 um)		1.4

Hydrometer Analysis

Particle Size	Percent Smaller	
(micron)	Than	
45.2		1.03
32.5		0.86
21.7		0.78
15.2		0.73
10.8		0.66
8.9		0.62
6.3		0.61
4.3		0.57
3.2		0.55
2.8		0.52
1.4		0.43

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	ICB-GComp1B	04344322

Sieve Analysis

Sieve Size	Percent	
	Passing	
3"		100.0
1.5"		87.8
.75"		66.0
0.375"		50.3
#4 (4.75 mm)		38.4
#10 (2.0 mm)		24.5
#40 (425 um)		4.0
#60 (250 um)		2.1
#100 (150 um)		1.5
#200 (75 um)		1.2

Hydrometer Analysis

36.2 0.	94
28.2 0.	91
20.0 0.	90
14.4 0.	82
10.3 0.	79
8.4 0.	76
6.1 0.1	71
3.3 0.	66
2.8 0.	63
1.3 0.	53

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	ICB-GComp2A	04344323
-----------	-------------	----------

Sieve Analysis

Sieve Size	Percent	
	Passing	
3"		100.0
1.5"		99.4
.75"		82.9
0.375"		62.4
#4 (4.75 mm)		42.7
#10 (2.0 mm)		23.3
#40 (425 um)		4.3
#60 (250 um)		2.4
#100 (150 um)		1.6
#200 (75 um)		1.1

Hydrometer Analysis

(micron) Than	
48.8	1.01
33.5	0.92
21.7	0.78
15.9	0.75
12.2	0.69
9.0	0.63
6.3	0.63
3.7	0.61
3.1	0.61
1.4	0.52

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		99.0
.75"		85.2
0.375"		61.3
#4 (4.75 mm)		44.3
#10 (2.0 mm)		26.3
#40 (425 um)		3.7
#60 (250 um)		2.1
#100 (150 um)		1.4
#200 (75 um)		0.9

Hydrometer Analysis

Particle Size	Percent Smaller	
(micron)	Than	
45.3		0.74
31.8		0.68
21.4		0.58
15.2		0.56
11.0		0.51
9.0		0.50
6.0		0.43
3.6		0.42
1.4		0.32

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRGB-G1	04344328
		0.0.010

Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		100.0
.75"		94.0
0.375"		80.3
#4 (4.75 mm)		62.7
#10 (2.0 mm)		40.2
#40 (425 um)		12.3
#60 (250 um)		8.3
#100 (150 um)		6.3
#200 (75 um)		4.7

Hydrometer Analysis

Particle Size (micron)	Percent Smaller Than	
37.9		2.73
29.9		2.59
19.9		2.23
14.4		2.01
10.4		1.80
8.5		1.76
5.6		1.58
3.1		1.37
1.3		1.08

Frost Susceptibility VERY CLOSE

Particle-Size Analysis of Soils

Sample ID	SRGB-G2	04344329

Sieve Analysis

Sieve Size	Percent	
	Passing	
	Ū	
3"		100.0
1.5"		76.8
.75"		64.5
0.375"		47.6
#4 (4.75 mm)		33.1
#10 (2.0 mm)		19.1
#40 (425 um)		3.6
#60 (250 um)		2.3
#100 (150 um)		1.7
#200 (75 um)		1.4

Hydrometer Analysis

Percent Smaller Than	
	0.68
	0.62
	0.60
	0.57
	0.54
	0.53
	0.50
	0.45
	0.36
	Percent Smaller Than

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRGB-G3	04344330

Sieve Analysis

Sieve Size	Percent	
	Passing	
3"		100.0
1.5"		99.0
.75"		85.1
0.375"		55.5
#4 (4.75 mm)		32.8
#10 (2.0 mm)		17.3
#40 (425 um)		3.6
#60 (250 um)		2.4
#100 (150 um)		1.7
#200 (75 um)		1.4

Hydrometer Analysis

Percent Smaller Than	
	0.61
	0.59
	0.52
	0.49
	0.44
	0.44
	0.42
	0.40
	0.35
	Percent Smaller Than

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRUP-G1	04344341

Sieve Analysis

Sieve Size	Percent Passing	
	1 assing	
3"		100.0
1.5"		67.8
.75"		47.1
0.375"		38.1
#4 (4.75 mm)		32.5
#10 (2.0 mm)		25.4
#40 (425 um)		5.6
#60 (250 um)		4.6
#100 (150 um)		3.9
#200 (75 um)		3.3

Hydrometer Analysis

Percent Smaller	
Than	
	1.04
	1.94
	1.75
	1.60
	1.48
	1.36
	1.31
	1.29
	1.16
	0.87
	Percent Smaller Than

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRUP-G2	04344342
Campio ID		01011012

Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		74.7
.75"		54.9
0.375"		40.9
#4 (4.75 mm)		30.9
#10 (2.0 mm)		20.4
#40 (425 um)		2.3
#60 (250 um)		1.4
#100 (150 um)		1.1
#200 (75 um)		1.0

Hydrometer Analysis

Particle Size	Percent Smaller	
(micron)	Than	
48.6		0.70
34.6		0.66
21.9		0.66
15.6		0.62
11.0		0.62
7.8		0.58
5.4		0.58
3.8		0.55
1.4		0.47

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRUP-G3	04344343

Sieve Analysis

Sieve Size	Percent Passing	
3"		59.3
1.5"		40.2
.75"		28.8
0.375"		21.6
#4 (4.75 mm)		16.4
#10 (2.0 mm)		8.4
#40 (425 um)		1.6
#60 (250 um)		1.0
#100 (150 um)		0.7
#200 (75 um)		0.6

Hydrometer Analysis

(micron) Than	
39.8 0.4	43
32.3 0.	40
21.1 0.	37
15.0 0.	35
10.6 0.	35
8.4 0.	34
6.4 0.	32
3.2 0.	27
1.3 0.	22

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRUP-G4	04344344
• • • • • • • • • • •		• • • • • • •

Sieve Analysis

Sieve Size	Percent Passing	
3"		61.6
1.5"		41.4
.75"		34.6
0.375"		26.9
#4 (4.75 mm)		20.7
#10 (2.0 mm)		11.7
#40 (425 um)		1.6
#60 (250 um)		1.1
#100 (150 um)		1.0
#200 (75 um)		0.9

Hydrometer Analysis

Particle Size	Percent Smaller	
(micron)	Than	
15.0		0.40
45.9		0.46
32.8		0.44
20.8		0.43
14.9		0.40
7.5		0.38
6.2		0.36
3.1		0.33
1.3		0.27

Frost Susceptibility NO

Particle-Size Analysis of Soils

Sample ID	SRBB-G1	04344347
oumpro ib		01011011

Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		85.4
.75"		69.8
0.375"		59.2
#4 (4.75 mm)		53.4
#10 (2.0 mm)		45.8
#40 (425 um)		23.4
#60 (250 um)		22.6
#100 (150 um)		17.2
#200 (75 um)		12.8

Hydrometer Analysis

Percent Smaller	
Than	
	9.97
	8.31
	6.93
	6.37
	6.09
	5.82
	4.99
	4.85
	3.60
	Percent Smaller Than

Frost Susceptibility YES

Particle-Size Analysis of Soils

Sample ID	SRBB-G2	04344348

Sieve Analysis

Sieve Size	Percent Passing	
3"		100.0
1.5"		93.8
.75"		89.6
0.375"		79.6
#4 (4.75 mm)		70.8
#10 (2.0 mm)		57.8
#40 (425 um)		18.1
#60 (250 um)		12.3
#100 (150 um)		9.2
#200 (75 um)		7.3

Hydrometer Analysis

Particle Size	Percent Smaller	
(micron)	Than	
32.8		5.20
25.1		4.91
18.7		4.61
13.4		4.32
9.7		4.02
8.1		3.84
5.8		3.55
3.4		3.43
1.3		2.72

Frost Susceptibility YES

Appendix D Chemical Data Quality Review

Washington Recreation Sites Investigation Starr Road and Island Complex Sites Bunker Hill Mining and Metallurgical Complex OU 3

Chemical Data Quality Assessment Report

21 December 2004

In total, 49 soil samples, including field duplicates were collected on August 17 and 18, 2004 at the Starr Road and Island Complex sites on the bank of the Spokane River Liberty Lake, Washington. Samples were submitted to the EPA Manchester Environmental Laboratory in Manchester, Washington for analysis of total metals, SPLP metals, TCLP metals, moisture content, and grain size/frost susceptibility according to Table 2.

A tiered approach was used in selecting samples for analysis. Some samples were not analyzed but were archived. Table 1 summarizes the number of samples archived, and analyzed in each tier.

Second tier samples were selected from each of three different sample groups:

- 1) Island Complex bar deposit 0-1' samples
- 2) Island Complex bar deposit 1-2' samples
- 3) Island Complex Sandy beach samples

Because SPLP and TCLP analyses have different analytes of concern, samples were selected for tier 2 SPLP and TCLP analysis independently of each other. The decision process was basically the same for each, the only difference being that the relevant analyte concentrations used for tier 2 selection were cadmium, lead, and arsenic for TCLP and cadmium, lead and zinc for SPLP. For each group of samples two factors for selecting tier 2 samples were used:

1) For each sample, relevant analyte concentrations were totaled. The sample with the highest sum was chosen for tier 2 analysis.

2) The sample with the highest analyte concentrations were selected for TCLP or SPLP analysis based on their respective relevant analytes. In some cases, more than one sample contained the highest concentrations of analytes. In these cases, a decision was made based on professional judgement.

The following samples were selected for tier 2 analysis: ICB-6A (TCLP& SPLP), ICB-2A (TCLP & SPLP), ICB-5B (TCLP & SPLP), ICB-1B (TCLP), ICB-6B (SPLP), and ICSB-2 (TCLP). The following samples were archived:

ICB-1A (TCLP & SPLP), ICB-1B (SPLP), ICB-2B (TCLP & SPLP), ICB-3B (TCLP & SPLP), ICB-4A (TCLP & SPLP), ICB-4B (TCLP & SPLP), ICB-5A (TCLP & SPLP), ICB-6B (TCLP), ICSB-1Comp (TCLP), and ICSB-3 (TCLP.

Analysis	Tier 1	Tier 2	Archived
	# of \$	Sample A	Analyses
Total Metals	33	0	0
SPLP Metals	12	4	7
TCLP Metals	12	5	9
Moisture Content	23	0	0
Grain Size/Frost Susceptibility	10	3	0

 Table 1. Number of Sample Analyses Performed or Archived

								Analysis				
Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals
Starr Road/Gravel Bar	SRGB-1	SRGB-1	04344325	0-1'	8/18/2004	1323	Primary		x	x	x	x
		SRGB-3	04344327	0-1'	8/18/2004	1324	Field Duplicate		~	x		
		SRGB-2	04344326	1-2'	8/18/2004	1325	Primary		X	Х	Х	Х
	SRGB-G1	SRGB-G1	04344328	0-1'	8/18/2004	1250	Primary	x				
		SRGB-G2	04344329	1-2'	8/18/2004	1230	Primary	x				
	SRGB-G3	SRGB-G3	04344330	0-1'	8/18/2004	1245	Primary	x				
Starr Road/Backwater												
Beach	SRBB-1	SRBB-1	04344345	0-1'	8/18/2004	1355	Primary		x	X	X	X
		SRBB-2	04344346	1-2'	8/18/2004	1349	Primary		X	X	X	X
	SRBB-G1	SRBB-G1	04344347	0-1'	8/18/2004	1215	Primary	X				
		SRBB-G2	04344348	1-2'	8/18/2004	1210	Primary	X				
Starr Road/Upland	SRUP-1	SRUP-1	04344331	0-1'	8/18/2004	1411	Primary			x		

Table 2. Sample Table Summary

Table 2. Sample Table Summary	Table 2.	Sample	Table	Summary
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								Analysis				
Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals
		SRUP-2	04344334	1-2'	8/18/2004	1406	Primary			Х		
	SRUP-3	SRUP-3	04344337	0-1'	8/18/2004	1350	Primary			Х		
		SRUP-4	04344340	1-2'	8/18/2004	1352	Primary			Х		
	SRUP1-1 SRUP1-2	SRUP1- 1Comp	04344332	0-1'	8/18/2004	1433	Primary		x	x	x	x
	SRUP1-3 SRUP1-4 SRUP1-5	SRUP1- 2Comp	04344333	1-2'	8/18/2004	1425	Primary		x		x	x
	SRUP2-1 SRUP2-2	SRUP2- 1Comp	04344335	0-1'	8/18/2004	1451	Primary		x	x	x	x
	SRUP2-3 SRUP2-4 SRUP2-5	SRUP2- 2Comp	04344336	1-2'	8/18/2004	1500	Primary		x		x	x
	SRUP3-1 SRUP3-2	SRUP3- 1Comp	04344338	0-1'	8/18/2004	1536	Primary		x	x	x	x
	SRUP3-3 SRUP3-4 SRUP3-5	SRUP3- 2Comp	04344339	1-2'	8/18/2004	1530	Primary		x		x	x
		SRUP-G1	04344341	0-1'	8/18/2004	1310	Primary	x				
	SRUP-G1	SRUP-G2	04344342	1-2'	8/18/2004	1305	Primary	X				
		SRUP-G3	04344343	0-1'	8/18/2004	1300	Primary	X				
	SRUP-G3	SRUP-G4	04344344	1-2'	8/18/2004	1240	Primary	X				
Island Complex/Upland Path	ICUP1Comp1 ICUP1Comp2 ICUP1Comp3	ICUP- 1Comp	04344316	0-0.5"	8/17/2004	1057	Primarv			x		

Table 2. Sample Table Summary

								Analysis				
Site/Area	_Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals
	ICUP1Comp4	ICUP-	0.40.4.040	0.0.5"	0/47/0004	4445	Field			v		
	ICUP1Comp5 ICUP2Comp1 ICUP2Comp2 ICUP2Comp3 ICUP2Comp4 ICUP2Comp5	ICUP- 2comp	04344319	0-0.5"	8/17/2004	1015	Primary			x x		
	ICUP3Comp1 ICUP3Comp2 ICUP3Comp3 ICUP3Comp4 ICUP3Comp5	ICUP- 3Comp	04344318	0-0.5"	8/17/2004	0939	Primary			x		
Island Complex/Little Bank Separation	ILBS1Comp1 ILBS1Comp2 ILBS1Comp3 ILBS1Comp4 ILBS1Comp5	ILBS- 1Comp	04344320	0-1'	8/17/04	1140	Primary		x	x	x	x
Island Complex/Bar Deposit		ICB-1A	04344300	0-1'	8/17/2004	1449	Primary		x	x	Δ	Δ
	ICB-1	ICB-1B	04344301	1-2'	8/17/2004	1505	Primary		X	x	A	x
		ICB-2A	04344302	0-1'	8/17/2004	1607	Primary		X	X	X	X
	ICB-2	ICB-2B	04344303	1-2'	8/17/2004	1614	Primary		X	Х	A	A
		ICB-3A	04344304	0-1'	8/17/2004	1414	Primary		X	Х	x	х
	ICB-3	ICB-3B	04344305	1-2'	8/17/2004	1431	Primary		X	X	A	А
	ICB-4	ICB-4A	04344306	0-1'	8/17/2004	1338	Primary		X	Х	A	A
		ICB-4B	04344307	1-2'	8/17/2004	1353	Primary		Χ	X	A	A

Table 2. Sample Table Summary

								Analysis				
Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals
		ICB-7B	04344312	1-2'	8/17/2004	1415	Field Duplicate			x		
		ICB-54	04344308	0-1'	8/17/2004	1246	Primary		x	x	Δ	Δ
	ICB-5	ICB-5B	04344309	1-2'	8/17/2004	1307	Primary		x	x	x	x
		ICB-6A	04344310	0-1'	8/17/2004	1523	Primary		x	x	x	x
	ICB-6	ICB-6B	04344311	1-2'	8/17/2004	1534	Primary		x	x	x	A
	ICBGComp1-1 ICBGComp1-2 ICBGComp1-3 ICBGComp1-4 ICBGComp2-5 ICBGComp2-2 ICBGComp2-3 ICBGComp2-4 ICBGComp2-5	ICB- GComp1A ICB- GComp1B ICB- GComp2A ICB- GComp2B	04344321 04344322 04344323 04344324	0-1' 1-2' 0-1' 1-2'	8/18/2004 8/18/2004 8/18/2004 8/18/2004	0900 0915 0945 0930	Primary Primary Primary Primary	x x x x				
Island	ICSB1Comp-1											
Complex/Fine	ICSB1Comp-2	ICSB-	04244242	0.1,	0/17/2004	1646	Drimon			v		
Sandy Beach			04344313	0-1	0/17/2004	1646	Primary			X V		A V
		1038-2	04344314	0-1	0/17/2004	1655	Primary			A V		Λ
	102R-3	1028-3	04344315	0-1	0/17/2004	1655	Primary			^		А

X = Samples analyzed

A = Samples archived

This QA/QC review includes evaluation of total metals, SPLP, and TCLP data by assessing field and analytical precision, accuracy (bias), representativeness, comparability, completeness, and sensitivity. Precision is defined as the degree of agreement between or among independent, similar, or repeated measures, and is measured by the relative percent difference between both field and laboratory duplicate pairs. Accuracy is the amount of agreement between a measured value and the true value, and is measured as the percent recovery of matrix spike samples and laboratory control samples and the analysis of method blank samples. Representativeness is the degree to which sample results represent the system under study. The results of all analyses are used to evaluate the data in terms of its intended use. Comparability is the degree to which data from one study can be compared with data from other similar studies, reference values, reference materials, and screening values and is achieved by the use of standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units and with sufficient sensitivity. Completeness for usable data is defined as the percentage of usable data out of the total amount of planned data. Sensitivity is the ability to attain data that allows comparison of results to decision criteria and is determined by the laboratory's reporting and detection limits.

The following criteria were evaluated in the data quality review process:

- Holding times;
- Method blanks;
- Laboratory Control Samples (LCS) recoveries;
- Matrix spike/Matrix Spike duplicate (MS/MSD) recoveries; and
- Laboratory and field duplicates relative percent differences (RPDs)

Precision

Blind field duplicates were collected for total metals analysis at a rate of 10%. All relative percent differences (RPDs) between primary environmental samples and field duplicates were well within the quality control requirements and are presented in Table 3.

All laboratory duplicate pair RPDs were within control limits for all sample delivery groups.

Corps Sample ID.	Lab Sample ID.	Туре	As	RPD	Cd	RPD	Pb	RPD	Zn	RPD
SRGB-1	04344325	Primary	18	5.4	5.69	0.9	365	2.4	1660	0.6
SRGB-3	04344327	Duplicate	19		5.74		374		1670	
ICUP-1Comp	04344316	Primary	18	5.4	11	5.3	804	5.2	1780	6.0
ICUP-4Comp	04344319	Duplicate	19		11.6		847		1890	
ICB-4B	04344307	Primary	14	0	4.99	6.2	287	4.6	1520	2.0
ICB-7B	04344312	Duplicate	14		4.69		274		1490	

Table 3 - Results of Field Duplicates (mg/kg) for Total Metals

All MS/MSD RPDs were within control limits for all sample delivery groups with the following exception:

The MS/MSD performed on sample 04344301 had an RPD of 27 % for silver, due to poor recovery on the matrix spike duplicate. There were no detections of silver in any of the data results, and all were qualified "UJ" due to possible low bias. This qualification does not affect data usability.

Accuracy

All MS/MSD percent recoveries were within control limits for all sample delivery groups with the following exceptions:

In sample 04344304 the MS/MSD had low silver recoveries of 57% and 55%. In sample 04344301 the MSD had a low silver recovery of 64%. There were no detections of silver in any of the data results, and all were qualified "UJ" due to possible low bias. This qualification does not affect data usability.

All LCS percent recoveries were within control limits for all sample delivery groups with the following exceptions:

There were five occurrences of low silver recoveries ranging from 55% to 69%. According to the laboratory, the levels of silver required for the spike for the TCLP method are not retained in solution by the method. There were no detections of silver in any of the data results, and all were qualified "UJ" due to possible low bias. This qualification does not affect data usability.

The laboratory analyzed at least one method blank for each analytical batch. Target compounds were non-detect in all of the blanks except for the following:

Three of the TCLP method blanks contained trace levels of barium at concentrations ranging from 26.0 ug/L to 65.5 ug/L. According to the laboratory, this is a contaminant routinely detected in TCLP extraction blanks, and is

suspected to leach from the required glass fiber filters used in the process. Due to the possible high bias, some barium results were qualified with "J" for estimated by the laboratory. Because all of the barium results were below project evaluation values, this qualification does not affect data usability.

Two of the SPLP method blanks contained trace levels of zinc at 46.9 ug/L and 40.3 ug/L. Due to the possible high bias, although very minimal, sample 04344345 was qualified with "J" for estimated by the laboratory. Because all SPLP zinc results were well below the project evaluation values, this qualification does not affect data usability.

Representativeness

Sample locations were selected based on the data quality objectives in the QAPP. Appropriate sieving and sampling techniques were used in the field.

Tested and approved analytical methods were used for all analyses. USEPA Method 6010B was planned for total metals analysis in the QAPP, but the laboratory utilized method 200.7. Method 200.7 is an ICP-AES method prepared and performed by the EPA, and is sufficient to meet project objectives. The use of this method does not affect data quality. All holding times, preservation, and sample handling requirements were met.

The COC forms indicate that samples were maintained under proper custody. Forms were signed upon receipt at the laboratory. Upon receipt of the samples at the laboratory, samples were logged in. No discrepancies were noted during the sample log-in.

Based on the sampling and analytical methods, and the results of the quality control parameters, the data is determined to be representative of the system under study and meets project data quality objectives.

Comparability

The sample data results found in this study are similar to results found in previous studies. Standard sampling techniques and analytical methods were used to collect and analyze representative samples, which supplied data at a high enough sensitivity to allow comparison to evaluation values. Analytical results were reported in appropriate units.

Completeness

The overall data quality objectives (DQOs), as set forth in the Quality Assurance Project Plan (Corps, 2004) are met. The data for this project are acceptable for use as qualified. There are no significant data quality concerns observed. The completeness for the associated data is 100%.

Sensitivity

For the total metals, SPLP metals, and TCLP metals, the project-required sensitivity levels and the method reporting limits by Method 6010B are shown in Table 4.

Table 4. Repo	rting Limits					
Analyte	Project- required Senisitvity Levels (mg/L)	Method Reporting Limit (mg/L)				
Total Metals						
Lead	700	3.0				
Arsenic	10	4.5				
Zinc	410	0.5				
Cadmium	5	0.5				
SPLP Metals						
Cadmium	0.08	0.015				
Copper	2.2	0.025				
Lead	0.4	0.125				
Zinc	28	0.025				
TCLP Metals						
Cadmium	1.0	0.015				
Lead	2.0	0.125				
Arsenic	5.0	0.225				
Barium	100.0	0.005				
Chromium	5.0	0.050				
Selenium	1.0	0.250				
Silver	1.0	0.050				

Appendix E Field Documentation

Field Notes Chain Of Custody Soil Classification Sheet

2	wae	ihington 1 Sample	Recreation Table	n Sides	الاستنباط المراجع المر	A A A A A A A A A A A A A A A A A A A	Martin Story Way	10 10 10 10 10 10 10 10 10 10 10 10 10 1	318 10	Ky gor Strin	Notes
	Locatron Test Pit	sample iD	Reph	Date	Time	ଜ୍ୟ		Sieve	Sicue	Siene	lande and an experimental and an a Construction of the construction of the second of the second and and an
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11	washington Recreation Sites		
	Field Notes	1	, , , , , , , , , , , , , , , , , , ,
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, ¹ 7 _a unan kanan kanan K	personnel - marloup Dawag, SampBates	ہ ج قومینی میں میں میں میں اور	0800 - Arrived on-site weifing
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en presidenti della d	at 0800, Arrivelat Site about 1330.		and a second sec
	Staked Locatons at Island Complex AT 3:00 1500		0815 - met backnoe perater
, Ale and the second second in the last last term that the second s	went to River Roadt Starr Roadto meet		0922 - Began excavoriting 5
	utility locote people waited there for 30 minutes	م مېرىكى بېرىكى بېرىكى تېرى	an a
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Referenced	AT+T - 1-800-2.52-(133		X0
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4257006	Electric Light Wave 589-924-7980		locations.
	Kootenai Electric coop	ی در در میشود به است. ۱۹۹۵ - میروند از میروند از این از این از این	tor ICUL. COUNT
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	Spokane County Engineer Roads Dept - 477-3600		f
	Touch America - 206-275-6772	· · · · · · · · · · · · · · · · · · ·	0930 - began sampling
	Washington State Dept of Transportation- 509-324-6555		sufficient fines
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and the second sec			Datum : WGS 84

्र गु. स्था Sas Brickie operator Mar -- Steve sample holes al icup-scomp DEY RIVER CHANNEL 1N writ log D gravely sand w/ Cobbles (largest size =") , holes used 's collected 2 jars er sampling 31.6" ; 46.62"

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17 8/17/04 C t' composité AN - car (fender? ש not to scale hunder w/ cobbles (max size 6") w/ cobbles w cobbiles w/ lots of cobbles (ava stat.) w/ cobbles (max size 6") 11' 30.6" 03' 46.2"

18 8/17/04 19 ICUREN, Comple location X - - Sample Locations ILBS-IComp NT Nit X® C yr cy , D +4 X° Street Charge - X-(5) UPLAND X Ð (AS) and the second and the siano of for ×O NOT TO SCALE mostly and sustaines w or dury sustaines (small busines in an hoarles. O-mostly gravel my fines sort such , ager on to low light area w more marcobble 10" (3) Moistly gravel w/ sand: E cobbles lager or top in abundare fines & grave Cobble 4" Aniosty grover in cobbes some sand () mostly pand w fines grorgunic layer on top () mostly agrand w sand, occasione could () some origins shot #67 () mostly gravel w sand & fines some could () Shot #68 () mostly gravel w could be some could ager some Shot #68 () mostly gravel w could be some could ager some Cobble : 4 " missi in Enost by grave 1: W cobbles, same sand at this location, sand in low pots of path to more copples/gravel on high spots 3 mostly gravel w/ sand occassimal gobble ("3" size (.) coordinates N 47° 41' 29.2" (.) Coordinates N 47° 41'28.7" W117°03 48.3 W 117° 03' 51.3"

	8/17/04	Sample	1CB 1A {0-1')
Sumple	EB-BQ (0-1) orgon 5b (1-2') & approximate Lastin noted m		1B (1-2')
	0-1' organic layer (lots of plant works) w Sandy & grower w cobbles (max size)	PIC#712 #72	0-1' Cobbles w/ sand 0-2' mostly cobbles w 5 w/ Lan
Nana na ana amin'ny fisiana amin'ny fisi Amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana	q'-2' Game as O-1' but no organic lyon		Coordinates N 47° 41 W 117° 0
 	Coordinates N 47° 41' 29.2" W 117° 03' 53.7"	Sample	1CB 6A (0-1') 6B (1-2')
A manufacture of the second se	$\frac{1}{2}(B-4a(0-1))$	PICS# 73&74	0-1' mostly gravel w/ 1-2' mostly gravel w/
hol (th	2 gravely sand w/ some cobbles (max 3") Mu-ont depth		Courdinates N 47° W 117°
	Courdinates N 47° 41 07.8" W 117° 3' 55.9"	Sanple	1CP 2A (6-1') 2B (1-2')
te and a set a local and a set a	$\frac{1CB - 3q(0-1')}{3b(1'-2')}$	9 9 1919 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	0-1' sanay gravel w/ 1-2' mostly gravel u
	1n hold 0-1' - gravelly sand w/ for cobbles (not 3') 1-2' - gravelly sand w/ cobbles (mat 6')	Dice # 75	cotofies (ex cotordinates NA7°
	Coordinates N 47° 41' 27.4" W 117° 03' 54.7"		BUTTON AND AND AND AND AND AND AND AND AND AN

21 \$117/04 C y gravel toget # (mod collided of gravelly sand ng nocker > 12" 1'210.5" 3'56.5" Cobbles (max six cobbles) Cobbles (max six cobbles) 41'25.6" 03'57.5 Some organics w some sand & few max cottle size 3" 41 26.7 03 54.7

23 8/17/04 8/17/04 1CSB-3 (0-1' Sample 01720 left site toward car. Soil in hole mostly sandy gravel some coubles (max size 3") 1730 Steve Cloackhoe operator) of f-clock pic#76 coordinates N 47° 41' 26.1" W 117° 03' 537" 1CSB-2 (0-1) Sample mostly cobbles w/ gravel some sand cobble max size 5" Courdinates N 47° 41' 25,3" W 117° 03' 55.5" PIC# 77 1C3B-1 comp X= Sample point. Sample NI bush X^O X^O X^O Coodinates W 11703'57,3" piz #78 O dus down to 3' -> sandy layer 0-1.5' pic #99 @ mostly gravelly sand w/ some cobbles (my 3")

25 24 8/18/04 Field Notes @ sandy grow largest 1" Pic# 85 Coordinates: N 47° 41'28.1" WP 164 W 117° 3' 545.1" 0800 Arrive af Sofe - Steve (backhere) not here get 0820-Sterre Arrived 0852 marked OS sample locations @ sandy gravel largest size I'm pic # 86 charged approach. 1 5-pt campuoill be coordinates N 47° 241' 26.8" WP65 colleaged from points on perimeter of W 117° 3' 54,3" bar deposit one will be collected from points in middle of bardeposit. (a) of Sandy gravel pic # 87 removed 5' rock from 1-2" sample Coordinadee N 47° 41' 26.8" WP66 W 117° 3' 55.3" (b) sandy gravel laggest 2" pic #88 X-10B-GComplat15 wording N 47° 41' 27.1" WP67 Bar · - 1 CB6 (1mp 2adB DPONT W 117 3' 55.1" @ sandy gravel largest 2" pic # 87 Ognively sand wrgist size 2" pic # 81 JP60 coordinates N 47° 41'26.4 Desandy source W117° 3'54.7" WP 60 Traverty source largest size 4" pic #82 coordinates N 47° 41' 27.3" 1756 WP68 W117° 3' 53.7" Coordinates NATO 41 26.9" WP61 QCD Sandy gravel verzest 1" Pic #90 coordinates N 47° 41' 28.4" -478 0P69 W 117° 3' 53.8" (3) gravely sand w/ cobbies larget 6" pic #83 W117° 3' 56.9" WP62 (hiver rocks we some gravely sand pic # 84 1000 Left Island Complex Site removed 1, 6" & 4" river rock from samples 8-1" 1045 Arrived at Starr Rd noted that gated didn't have a combo lock but horse shoe both & cables. UP123 Coord: N 47" 41'26.5" W11703' 56.5

1100 Used & synch buy Wrenchs & open git pit \$95 SRUT 3R & B-G1 & G2 (1200 returned and opened geteer & Stor RA gravelly, sand bel smark 1200 Brain Size, Sittingles W17° od (1201 Size, Sittingles W17° od (1202 Correlinate N 44° 41' 26,5" WP 74 1203 Correlinate N 44° 41' 26,5" WP 74 1204 Correlinate N 44° 41' 26,5" WP 74 1205 SR GD - G3 (O 7) P(c# 92 1204 W113° 04' (1.5" Siger microlinate N 44° 41' 26,5" 1205 Wery, very het' still Correlinate N 44° 41' 26,5" 1205 SR Wry, very het' still Siger microlinate N 44° 41' 26,5" 1205 Wery, very het' still Correlinate N 44° 41' 26,5" 1206 WI 117° 04' 12,1" Stagel SR WP - 3 (O -1') 1207 WI 117° 04' 12,1" Stagel SR WP, wery het' still 0000 Gordinate N 44° 41' 26,5" WT 30 O-1 corbits will stand 0000 Gordinate N 44° 41' 26,5" WT 30 O-1 corbits will stand 0000 Inter 04' 13,1" Stagel SR WP - 3 (O -1') <	Stay	V RA T 8/18	104	and with the second
1200 returned and opened gates b Storr EdBrain Size SaturplesBrain Size SaturplesBrain Size SaturplesBrain Size SaturplesBrain Size SaturplesBrain Size SaturplesConversionates N AP all 25.5Brain Nith P of 11.5"Brain Nith P of 12.5Brain Nith P of 12.5Brain Nith P of 13.1"Brain Nith P of 13.1" <td></td> <td>1100 went to store to buy wrenchs to open gete</td> <td>pic#95</td> <td>SRUP SR 8B-G1 & G2 (</td>		1100 went to store to buy wrenchs to open gete	pic#95	SRUP SR 8B-G1 & G2 (
Orain 3/2 3droples D 119° 04' 11' 23 Orain 3/2 3droples D 119° 04' 12 Except 61 & G2 (0-1 \dot{e} 1-2) pc*9‡ 3enple SRGP4 (0-1') Agrawthy cand max soc <1"		1200 returned and opened gates to Storr Rd		gravelly sand w/ some
Brain Size Samples $W 117^{\circ} o4' 15$ Grain Size Samples $W 117^{\circ} o4' 15$ Grawlly, and max Size S1" Sample Gordinates N 44° 41' 20,5" $W 77$ W 117 04' 11.5" -2 (1-2') Corrdinates N 44° 41' 20,5" $W 77$ W 117 04' 11.5" -2 gravel will send 5 G 5RGB -G3 (0 7) Pic#92 Samag grad at some moisture $0 117^{\circ} 04' 14' 20$ Obrdinates N 47° 41' 20,5' $W 770$ W 117 04' 13.1" Sample SRUP G3 & G4 (0 - 1 & 1-2) Pic#92 SRUP G3 & G4 (0 - 1 & 1-2) Pic#93 Cordinates N 47° 41' 20,5' $W 770$ SRUP G3 & G4 (0 - 1 & 1-2) Pic#93 Cordinates N 47° 41' 20,5' $W 770$ SRUP G3 & G4 (0 - 1 & 1-2) Pic#93 Cordinates N 47° 41' 70.4" $W 17^{\circ} 04' 13.1''$ SRUP G3 & G4 (0 - 1 & 1-2) Pic#93 Cordinates N 47° 41' 70.4" $W 17^{\circ} 04' 13.1''$ SRUP G3 & G4 (0 - 1 & 1-2) Pic#93 Cordinates N 47° 41' 70.4" $W 17^{\circ} 04' 05.8''''''''''''''''''''''''''''''''''''$	n na		w/watta-610.55%/wattatatatatate/min-6011119/0000000115166/0000119/0000011000011000000000000000	coordinates N 47° 41' 27
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Ge SRGB -G3 (07) Pic # 92 $W 117^{0} 04'$ Sanay gravel at some moisture C 1328 Very, very hot! su Obordinatee N 47° 41' 25.5' WETO $C 1328 Very, very hot! su Obordinatee N 47° 41' 25.5' WETO C 1328 Very, very hot! su Obordinatee N 47° 41' 25.5' WETO SRUP - 3 (0 - 1') tir SRUP G3 & GA (0 - 1 & 1 - 2) Pic # 93 O -1 cobbles w] gravely pand -4 (1 - 2') Bayest size (0'') D - 1 cobles w] sand Ingrest size (0'') C 0 - 1 & 1 - 2 W 117° 04' 08.8'' S - 4 1' Serve G1 & G2 (0 - 1 & 1 - 2) Pic # 94 Sandy gravel w] cooldus ungest size 3'' C 0 - 1 & 1 - 2 Sandy gravel w] cooldus ungest size 3'' C 0 - 1 & 1 - 2 Sandy gravel w] cooldus ungest size 3'' C 0 - 1 & 1 - 2 W 117° 04' 08.5'' S - 2'' W 117° 04' 08.5'' C 0 - 1 & 1 - 2 W 117° 04' 08.5'' C 0 - 1 & 1 - 2 W 117° 04' 08.5'' C 0 - 1 & 1 - 2 Since moisture W 17° 04' 08.5'' $	α δα δ δ δ δ δ δ δ δ δ δ δ δ δ		ላለም - ለዚና ሳራቱ ምሽብ ከቀይነል በራይነት ለሆኑ እና አይገኛ ህዝብ የመመ ከመር መ ስ መደም የሆኑ ምግር የሚሰሩ የሚሰሩ የሚሰሩ ምግር የሚሰሩ ምግር ምግር የሚሰሩ የሚሰሩ መ በ 1	Slight mojetue
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27 (0-1) = 15 1-2) Le Cobbles Largest 81 ze 3" A.0" WP 74 E 10.7" some cottoles (most \$132) 24.8" WP 75 12.5" gut breeze from E re Sampled 1330 1845 1530 - 2 gracel photo[#]96 26.5 WP74 08.1"

29 28 8/18/04 8/18/04 SRUP2-1 Comp CO-17 mostly gr sendy gravel unless noted below SRBB-1 = (0-1') -2 (1-2') 2-2 cmp (1-2) Photo #97 X y some cobbles (mar 3) E 0-1 gravel w/ organics [sand $X_7 6"-2"$ Scandy gruce (mar 4") Y wicorbles (mar 4") 1-2 gravel Coordinates N 47° 41'27, 1" +- NJ wP77 X_{I} HZO W117° 04' 10.8" xЗ X-sample locations (locations "20-35' aport) SH SRUP-1 (0-1) Thoto #98 · - Coordinate N 47° 41' 26.6" W 117° 04' 08.4" -2 (1-z') WP80 O-1 gravel w sand 1-2 gravel & cobbles mox size 3" coordinates N 47° 41'27.1" WP78 W117° 04' 07.0" Stu SRUPI-1 comp (0-1') Mostly gravelly sand 1-2 comp (1-2') SRUP3-1 comp (0-1) most holes gravelly sand unless noted 3-2 cmp (1-2) Kiok <-N Spokane River NV 3 SAMA OS X SKUPBBBCA X , X 5 more 4 coubles max size 6") X Sand C (Same tos 1-2' x-Sample locations (locations ~20-25' apart) - coordinate N47° 41' 25.5" WP81 W 117° 04' 08.5" X-Sample docations (~20' apart Photo #99 · - Coordinates N47° 41'27.0' WP79 W 117° 04' 07.0'

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				ր Այն այլ <u>հարձակել է լիլի</u> այլ թարավար այս հայտ, այն բուր ուղղ լյլ կուրջ ուր բարձ մա տործություն է են մանդես է է Այ
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♦ EF	Generic	Contra Chai	act Laboratory n of Custody	Program			Reference Client No:	Case:	R
Region: Project Cod	10 e: TEC-618V		an an Anna Anna Anna Anna Anna Anna Ann	Date Shipped: 8/20/200 Carrier Name: Hand De	4 Niverv	Chain of Custody	Record	Sampler Signature: Jarah	Bahn
Account Co CERCLIS ID Spill ID:	de: 04T10P302	DD2C10	2QLA00	Airbill: Shipped to: EPA Mar	nchester	Relinquished By 1 Jasah Bath	(Date / Time) $\sim 812809-102$	Received By	(Date / Time) - 8/20/4/18:2
Site Name/S Project Lead	tate: CDA BH Mi ler: Ravi Sanga	ining & M	letallurgical Complex O	7411 Bea Port Orcl (360) 87	ach Drive East hard WA 98366 1-8728	2 ··· 3			
Sampling Co	USACE	ivestigat				4			
SAMPLE N	MATRIX/ o. SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE DAT	E COLLECT E/TIME		QC Type
04344300	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (5)	ICB-1A	S: 8/17/2004	14:49		-
04344301	Subsurface Soil (>12")/ Bates, Dawag	/G	Meta (21) ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (5)	ICB-1B	S: 8/17/2004	15:05		••••••••••••••••••••••••••••••••••••••
04344302	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-2A	S: 8/17/2004	16:07	- 	-
04344303	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-2B	S: 8/17/2004	16:14	-	-
04344304	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (9)	ICB-3A	S: 8/17/2004	14:14	-	-
04344305	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-3B	S: 8/17/2004	14:31	-	
04344306	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-4A	S: 8/17/2004	13:38	-	-
			····· ··· ··· ··· ··· ··· ··· ··· ···						

Shipment for Case	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Complete ? N. Y	04344304, 04344345		
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?
ASTM 4222 = ASTM 42	2 <mark>2, ASTM D 221 = ASTM D 2216-98, S-Metals = SPLP-M</mark>	etals, TCLP-Met = TCLP Metals (No Hg), Total Meta = Pb, As,	, Zn, Cd
TR Number:	10-533326683-081904-0001		REGION COPY

TR Number: 10-533326683-081904-0001 PR provides preliminary results. Requests for preliminary results will increase analytical costs.

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F2V5.1.047 Page 1 of 6

€EP/	A USEPA C Generic	Contra Chair	act Laboratory n of Custody	Program			Reference (Client No:	Case: R
Region: Project Code: Account Code CERCLIS ID: Spill ID: Site Name/Sta Project Leader Action: Sampling Co:	10 TEC-618V 04T10P3021 te: CDA BH Mi r: Ravi Sanga Remedial In USACE	DD2C10: ning & M nvestigati	2QLA00 letallurgical Complex Ol	Date Shipped: 8/20/200 Carrier Name: Hand De Airbill: Shipped to: EPA Mar Laborato 7411 Ber Port Orcl (360) 87	4 elivery nchester by ach Drive East hard WA 98366 1-8728	Chain of Custody R Relinquished By 1 <u>Janaw Batt</u> 2 3 4	Record (Date / Time) 1- 812104-02	Sampler Signature: Janah Battys Received By, (Date / Time) Durchligh 8/20/4 (0:30
SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE C DATE/	DILECT TIME	QC Type
04344307	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (5)	ICB-4B	S: 8/17/2004	13:53	
04344308	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-5A	S: 8/17/2004	12:46	
04344309	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-5B	S: 8/17/2004	13:07	· · ·
04344310	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-6A	S: 8/17/2004	15:23	• •••
04344311	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-6B	S: 8/17/2004	15:34	-
04344312	Subsurface Soil (>12")/ Bates, Dawag	/G	Total Meta (21)	(Not preserved) (2)	ICB-7B	S: 8/17/2004	14:15	Field Duplicate
04344313	Surface Soil (0"-12")/ Bates, Dawag	/C	TCLP-Met (21), Total Meta (21)	(Not preserved) (3)	ICSB-1Comp	S: 8/17/2004	16:46	
04344314	Surface Soil (0"-12")/ Bates, Dawag	/G	TCLP-Met (21), Total Meta (21)	(Not preserved) (3)	ICSB-2	S: 8/17/2004	16:55	

Shipment for Case	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Somple Print 1	04344304, 04344345		
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?
ASTM 4222 = ASTM 42	2, ASTM D 221 = ASTM D 2216-98, S-Metals = SPLP-Meta	als, TCLP-Met = TCLP Metals (No Hg), Total Meta = Pb, As, Zn, Cd	·
TR Number:	10-533326683-081904-0001		REGION COPY

TR Number: 10-533326683-081904-0001 PR provides preliminary results. Requests for preliminary results will increase analytical costs.

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F2V5.1.047 Page 2 of 6

€EP/	USEPA (Generic	Contra Chair	act Laboratory 1 of Custody	Program			Reference C Client No:	Rase:
Region: Project Code: Account Code: CERCLIS ID: Spill ID: Site Name/Stat Project Leader: Action: Sampling Co:	10 TEC-618V 04T10P302 e: CDA BH Mi Ravi Sanga Remedial Ir USACE	DD2C10: ining & M nvestigati	2QLA00 letallurgical Complex O ¹ ion	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Mancheste Laboratory 7411 Beach Driv Port Orchard W (360) 871-8728	er ve East A 98366	Chain of Custody Re Relinquished By 1 Shah Ports 2 3 4	(Date / Time) 8122104-(024	Sampler Signature: Bush Bate Received By (Date / Time) Duchty 8/20/4 10:30
SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE CO DATE/TI	LLECT ME	QC Type
04344315	Surface Soil (0"-12")/	/G	TCLP-Met (21), Total Meta (21)	(Not preserved) (3)	ICSB-3	S: 8/17/2004 1	7:03	
04344316	Bates, Dawag Surface Soil (0"-12")/	/C	Total Meta (21)	(Not preserved) (2)	ICUP-1Com	S: 8/17/2004 1	0:57	. - .
04344317	Bates, Dawag Surface Soil (0"-12")/	/C	Total Meta (21)	(Not preserved) (2)	ICUP-2Com	S: 8/17/2004 10	0:15	-
04344318	Bates, Dawag Surface Soil (0"-12")/	/C	Total Meta (21)	(Not preserved) (2)	ICUP-3Com	S: 8/17/2004 9	9:39	.
04344319	Bates, Dawag Surface Soil (0"-12")/	/C	Total Meta (21)	(Not preserved) (2)	ICUP-4Comp	S: 8/17/2004 1	1:15	Field Duplicate
04344320	Bates, Dawag Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (6)	ILBS-1Comp	S: 8/17/2004 1	1:40	
04344321	Surface Soil (0"-12")/	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp1	A S: 8/18/2004 9	:00	
04344322	Bates, Dawag Subsurface Soil (>12")/	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp1	B S: 8/18/2004 9	:15	
04344323	Bates, Dawag Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp2	A S: 8/18/2004 9	:45	-

Shipment for Case	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Complete KL 7	04344304, 04344345		
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?
ASTM 4222 = ASTM 42	2, ASTM D 221 = ASTM D 2216-98, S-Metals = SPLP-Metals	s, TCLP-Met = TCLP Metals (No Hg), Total Meta = Pb, As, Zn, Cd	······
TR Number:	10-533326683-081904-0001		REGION COPY

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TR Number: 10-533326683-081904-0001

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F2V5.1.047 Page 3 of 6

\$EP/	A USEPA Generi	Contra c Chair	act Laboratory 1 of Custody	Program			Reference	Case:	R
Region: Project Code: Account Code CERCLIS ID: Spill ID:	10 TEC-618\ 04T10P30	/ 02DD2C10	2QLA00	Date Shipped: 8/20/2004 Carrier Name: Hand Deli Airbill: Shipped to: EPA Mand	very chester	Chain of Custody R Relinquished By 1 Jan Weat	(Date / Time)	Sampler Signature: Janed Received By	(Date / Time) - 8/20/4 10:3
Site Name/Sta Project Leader Action: Sampling Co:	te: CDA BH I r: Ravi Sang Remedial USACE	Mining & M ga Investigati	letallurgical Complex O	Laboratory 7411 Beac Port Orcha (360) 871-	/ ch Drive East ard WA 98366 8728	2 3 4			
SAMPLE No.	Matrix/ Sampler	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE C DATE/	OLLECT		QC Type
04344324 04344325	Subsurface Soi (>12")/ Bates, Dawag Surface Soil (0"-12")/ Bates, Dawag	I /C /G	ASTM 4222 (21) ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (1) (Not preserved) (5)	ICB-GComp2	B S: 8/18/2004 S: 8/18/2004	9:30	8 8125104 E	
04344326	Subsurface Soi (>12")/ Bates, Dawag	/G	Meta (21) ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (4)	SRGB-2	S: 8/18/2004	13:25		
04344327	Surface Soil (0"-12")/ Bates Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRGB-3	S: 8/18/2004	13:24	JB SL20/04 Field	d Duplicate
)4344328	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G1	S: 8/18/2004	12:50 _ +	3	-
)4344329	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G2	S: 8/18/2004	12:30		-
4344330	Surface Soil (0"-12")/ Bates Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G3	S: 8/18/2004	12:45		
)4344331	Surface Soil (0"-12")/ Bates Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-1	S: 8/18/2004	14:11		
4344332	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRUP1-1Com	p S: 8/18/2004 1	4:33		_
hipment for Case omplete? N.Y	Sample 043443	(s) to be use 104, 04344	ed for laboratory QC: 345	Additional S	ampler Signature(s):			Chain of Custody Sea	l Number:
Analysis Kev:	Concer	tration:	L = Low, M = Low/Medium,	H = High Type/Desig	nate: Composite = C,	Grab = G		Shipment Iced?	

TR Number: 10-533326683-081904-0001

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F2V5.1.047 Page 4 of 6

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€EP/	USEPA C Generic	Contra Chair	act Laboratory n of Custody	Program			Reference C Client No:	ase:	R
Region: Project Code: Account Code CERCLIS ID: Spill ID: Site Name/Sta Project Leader Action: Sampling Co:	10 TEC-618V 04T10P302I te: CDA BH Mi Ravi Sanga Remedial In USACE	DD2C10 ning & M ivestigati	2QLA00 letallurgical Complex O ^l ion	Date Shipped: 8/20/2004 Carrier Name: Hand Deliv Airbill: Shipped to: EPA Manc Laboratory 7411 Beac Port Orcha (360) 871-8	very hester h Drive East rd WA 98366 3728	Chain of Custody R Relinquished By 1 Asrah Botto 2 3 4	ecord (Date / Time) 8 2 2 0	Sampler Signature: Linah Received By Doculuty) Bottz (Date / Time) 8/20/4 10:30
SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	Sample C Date/T	DILLECT		QC Type
04344333	Subsurface Soil (>12")/	/C	ASTM D 221 (21), S-Metals (21).	(Not preserved) (3)	SRUP1-2Co	mp S: 8/18/2004	14:25		
04344334	Bates, Dawag Subsurface Soil (>12")/	/G	TCLP-Met (21) Total Meta (21)	(Not preserved) (2)	SRUP-2	S: 8/18/2004	14:06		-
04344335	Bates, Dawag Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved) (5)	SRUP2-1Co	mp S: 8/18/2004 1	14:51		-
04344336	Subsurface Soil (>12")/	/C	ASTM D 221 (21), S-Metals (21),	(Not preserved) (3)	SRUP2-2Co	mp S: 8/18/2004 1	15:00		
04344337	Surface Soil (0"-12")/ Bates Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-3	S: 8/18/2004 1	3:50		- .
04344338	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Mete (21)	(Not preserved) (5)	SRUP3-1Co	mp S: 8/18/2004 1	5:36		
04344339	Subsurface Soil (>12")/	/C	ASTM D 221 (21), S-Metals (21),	(Not preserved) (3)	SRUP3-2Co	mp S: 8/18/2004 1	5:30		
04344340	Bates, Dawag Subsurface Soil (>12")/	/G	Total Meta (21)	(Not preserved) (2)	SRUP-4	S: 8/18/2004 1	3:52		-
04344341	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRUP-G1	S: 8/18/2004 1	3:10		

Shipment for Case	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:					
	04344304, 04344345							
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?					
ASTM 4222 = ASTM 422, ASTM D 221 = ASTM D 2216-98, S-Metals = SPLP-Metals, TCLP-Met = TCLP Metals (No Hg), Total Meta = Pb, As, Zn, Cd								
TR Number:	10-533326683-081904-0001 sults. Requests for preliminary results will increase analytical cos	ts.	REGION COPY					

10-533326683-081904-0001 IR Numper.

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

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F2V5.1.047 Page 5 of 6

€EPA	USEPA C Generic	Contra Chair	act Laboratory 1 of Custody	Program				Refe Client	r ence C No:	ase:		R
Region: Project Code: Account Code:	10 TEC-618V 04T10P302	DD2C10	2QLA00	Date Shipped: Carrier Name: Airbill:	8/20/2004 Hand Delivery		Chain of Custody Relinquished By	Record (Date /	Time)	Sampler Signature:	is hBate	万 / Time)
Spill ID:				Shipped to:	EPA Manchester Laboratory		abisch Both	~ <u>812ë</u>	101-10	1 Dedwa	y-8/201	4 10:2
Site Name/State Project Leader:	CDA BH Mi Ravi Sanga	ning & M	letallurgical Complex O		7411 Beach Drive Port Orchard WA (360) 871-8728	East 98366	3	<u> </u>				•••••••
Action: Sampling Co:	Remedial Ir USACE	ivestigati	ion				4					
SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG N PRESERVATIN	o./ /E/ Bottles	STATION LOCATION	sample Dat	ECOLLECT E/TIME			QC Type	
)4344342	Subsurface Soil (>12")/	/G	ASTM 4222 (21)	(Not preserved)	(1)	SRUP-G2	S: 8/18/2004	13:05		<u>, <u>, , , , , , , , , , , , , , , , , ,</u></u>		
)4344343	Bates, Dawag Surface Soil (0"-12")/	/G	ASTM 4222 (21)	(Not preserved)	(1)	SRUP-G3	S: 8/18/2004	13:00				
)4344344	Bates, Dawag Subsurface Soil (>12")/	/G	ASTM 4222 (21)	(Not preserved)	(1)	SRUP-G4	S: 8/18/2004	12:40				
)4344345	Bates, Dawag Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved)	(9)	SRBB-1	S: 8/18/2004	13:55				
)4344346 (Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total	(Not preserved)	(5)	SRBB-2	S: 8/18/2004	13:49			-	
4344347	Surface Soil (0"-12")/	/G	ASTM 4222 (21)	(Not preserved)	(1)	SRBB-G1	S: 8/18/2004	12:15			80.80	
)4344348	Bates, Dawag Subsurface Soil (>12")/ Bates, Dawag	- /G	ASTM 4222 (21)	(Not preserved)	(1)	SRBB-G2	S: 8/18/2004	12:10				
hipment for Case	Sample(s) to be us	ed for laboratory QC:		Additional Sampler	Signature(s):			0	Chain of Custody	Seal Number:	
complete ? N	0434430	4, 04344	1345									
Analysis Key:	Concent	ation:	L = Low, M = Low/Medium,	H = High	Type/Designate:	Composite = C	, Grab = G			Shipment Iced?		
ASTM 4222 = AS	TM 422, ASTM L	221 = 7	STM D 2216-98, S-Met	als = SPLP-Metal	s, TCLP-Met = TCL	P Metals (No	Hg), Total Meta = Pb, /	As, Zn, Cd	I			

Send Copy to: Sample 703/818-4602

- 1. Guide for Written Soils Description
 - a. Classification
 - b. Plasticity (Record Pl, when available)
 - c. Relative Density or Consistency
 - d. Moisture (Record %, when available)
 - e. Color
- 2. Representation of Minor Constituents
 - a. Less than 5% by weight
 - b. Between 5% and 12% by weight
 - c. Greater than 12% by weight
- 3. Basic Classification
- GRAVEL: a. GW, Well-graded Gravel (0-5% Fine Content)
 - b. GW-GM or GC, Well-graded Gravel w/silt or clay (5%-12% Fine Content)
 - c. GM or GC, Well-graded silty or clayey Gravel (+12% Fine Content)
 - d. GP, Poorly-graded Gravel (0-5% Fine Content)
 - e. GP-GM or GC, Poorly-graded Gravel w/silt or clay (5%-12% Fine Content)
 - f. GM or GC, Poorly-graded silty or clayey Gravel (+12% Fine Content)
 - g. Gravel Size: Coarse 3" to 3/4"; Fine 3/4" to #4 Sieve
- SAND: a. SW, Well-graded Sand (0-5% Fine Content)
 - b. SW-SM or SC, Well-graded Sand w/silt or clay (5%-12% Fine Content)
 - c. SM or SC, Well-graded silty or clayey Sand (+12% Fine Content)
 - d. SP, Poorly-graded Sand (0-5% Fine Content)
 - e. SP-SM or SC, Poorly-graded Sand w/silt or clay (5%-12% Fine Content)
 - f. SM or SC, Poorly-graded silty or clayey Sand (+12% Fine Content)
 - g. Sand Size: Coarse #4 to #10; Medium #10 to #40; Fine #40 to #200

FINES: (Minus.#200 Sieve) a. ML, Inorganic Silts, Fine Sands, Clayey Silts or Sands of slight plasticity.

- b. CL, Inorganic Clays, Sandy or Silty Clays of low or medium plasticity.
 - c. OL, Organic Silts or Clays of low plasticity.
 - d. MH, Inorganic Silty or Silty Soils, Elastic Silts.
 - e. CH, Inorganic Clays of high plasticity, Fat Clays.
 - f. OH, Organic Clays or Silts of medium to high plasticity.
- g. Pt. Peat and other highly organic soils.

COBBLES a Cobbles: 3"-12", Numerous Scattered or Occasional (Note Maximum Size) &BOULDERS: b. Boulders: Greater than 12", Numerous or Occassional (Note Maximum Size) c. Indicate depth to isolated cobbles or boulders.

MINOR ORGANIC CONTENT: a. w/wood debris (such as, roots, branches, logs, etc.)

- b. w/organic debris (such as, decaying vegetation, etc.)
 - c. w/lenses of organic debris

4. Condition

a. Relative Density for Sand or Gravel (Standard Penetration Test-Blows/Foot)

- 0-4 Very Loose 30-50 Dense
- 4-10 Loose Greater than 50 Very Dense
- 10-30 Medium
- b. Relative Density for Sand or Gravel (No testing)
 - Sand and/or gravel which can be excavated with a shovel Loose
 - Compact Sand and/or gravel requiring use of a pick for removal
- c. Relationship of Consistency for Fines

0-2	Very Soft	8–15 Stiff
2-4	Soft	15–30 Very Stiff
4-8	Medium	Greater than 30 Hard

(Continued, next page)

- Example: SP-SM, gravelly sand (fine) w/silt, cobbles (8"), NP, Medium, Wet, Gray
- Not Recorded
- Classification with (w/) Minority
- Predominate Minority preceeds classification

5. Moisture Dry

Dry Wet Moist Saturated

6. Field Identification for Fine Grained Soils

a. Dilatancy

B. Dry Strength

c. Toughness

d. Consistency

(1) Very Soft - Easily penetrated several inches by fist

(2) Soft - Easily penetrated several inches by thumb

(3) Medium - Can be penetrated several inches by thumb with moderate effort

(4) Stiff - Readily indented by thumb but penetrated only with great effort

(5) Very Stiff - Readily indented by thumbnail

(6) Hard – Indented with difficulty by thumbnail

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

a. After removing particles larger than No. 40 sieve size, prepare a pat of moistusoib with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

b. Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

c. Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction. 11. Dry Strength (crushing characteristics)

a. After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air-drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

b. High dry strength is characteristic for clays of the CH group. A typical inorganic silt posses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

III. Toughness (consistency near plastic limit)

a. After particles larger than the No. 40 sieve size are removed, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to loose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

b. After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

c. The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay or low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

d. Highly organic clays have a very weak and spongy feel at the plastic limit.

Appendix F Laboratory Data Deliverables

Tier 1 Total Metals Data Tier 1 SPLP & TCLP Data Tier 2 SPLP & TCLP Data



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

SUBJECT:	Data Release for Metals Analysis Results from the Region 10 Manchester Environmental Laboratory.
PROJECT NAME:	CDA BH Mining and Metallurgical
PROJECT CODE:	TEC-618V
FROM:	Linda Anderson-Carnahan Director
TO:	Ravi Sanga, EPA Region 10 Project Officer
CC:	Sarah Bates, USACE

I have authorized release of this data package. Attached you will find the Tier 1 Total metals results for the CDA BH Mining and Metallurgical project for the samples collected on 08/17/2004 and 08/18/2004. The results for the TCLP-ICP, SPLP-ICP, and Moisture analyses for this project will follow. For further information regarding the attached data, contact Katie Adams at 360-871-8748. For the schedule for the remaining analyses, contact Gerald Dodo at 360-871-8728.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

DATE:	October 25, 2004
To:	Ravi Sanga, Project Manager, EPA Region 10
From:	Katie Adams, Chemist, EPA Region 10 OEA, Manchester Environmental Laboratory
SUBJECT:	Data Review of the Tier 1 Total Metals Analyses for the CDA BH Mining and Metallurgical Site
	Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00
CC:	Sarah Bates, USACE

The following is a data review of the total metals analysis of 33 solid samples. The analyses were performed by ESAT chemists at the EPA Manchester Environmental Laboratory in Port Orchard, WA, following USEPA and Laboratory guidelines.

This review was conducted for the following samples:

Samples

Set #1	04344300 04344306 04344312 04344318	04344301 04344307 04344313 04344319	04344302 04344308 04344314	04344303 04344309 04344315	04344304 04344310 04344316	04344305 04344311 04344317
Set #2	04344320 04344334 04344346	04344325 04344335	04344326 04344337	04344327 04344338	04344331 04344340	04344332 04344345

Data Qualifications

The following comments refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Plan, and the QAPP. These specifications are adapted from those in the National Functional Guidelines for Inorganic Data Review. The qualifications recommended herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection until the date of analysis for metals in water is 180 days, except mercury (28 days). The holding time for solid samples is not defined, but the Laboratory applies the 180 day holding time to solid samples as well. Sample collection began on 08/17/2004, and the analyses were completed on 09/16/2004. No data qualification was required based on holding time criteria.

2.0 Sample Preparation - Acceptable

Prior to the total metals digestion, the samples were dried at 60 °C and passed through a #80 sieve. The portion of the sample that passed the sieve was used when preparing the sample for analysis following EPA Method 3050B. Sample digestion took place on 09/13/2004 and 09/14/2004.

All sample preparation was in accordance with Manchester Laboratory protocols. No qualification of the data was required based on sample preparation.

3.0 Calibration / Calibration Verification - Acceptable

ICP-AES (Inductively Coupled Plasma- Atomic Emission Spectroscopy) analysis was conducted on 09/15/2004 and 09/16/2004 for arsenic, cadmium, lead, and zinc. The instrument was standardized using one blank and a single calibration standard for each element. The calibrations were performed as required by the appropriate Method and SOPs and met acceptance criteria.

Calibration verification standards are required before and after sample analysis and after every ten samples during analysis. Metal recoveries must be within 90-110%. All ICP-AES calibration verification checks met the recovery criteria for the analytes of interest.

No qualification was required on based on ICP-AES calibration or calibration verification.

4.0 Laboratory Control/Reference Material Samples - Acceptable

Laboratory control samples (spike blanks) and Standard Reference Material samples are digested and analyzed along with the project samples to verify the efficiency of laboratory procedures. All Laboratory Control sample results met the recovery acceptance criterion (85 - 115% of the standard's true value). The results obtained for the Reference Material also met Laboratory requirements. No qualifiers were necessary based on laboratory control and standard reference material analysis.

5.0 Blanks - Acceptable

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was detected in the associated procedural blank, the sample results were qualified (J) if the analyte concentration in the unknown samples was less than a factor of ten times the analyte value detected in the procedural blank.

The blanks did not contain detectable levels of the analytes of interest; therefore, no qualification was required on the basis of blank contamination.

6.0 ICP-AES Interference Check Sample - Acceptable

An interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120% of the true value for analytes present, and plus or minus the reporting limit (RL) for analytes not present in the solution. Analyses of the ICS standard met these criteria for all reported analytes; therefore, no qualification is required on this basis.

7.0 **Duplicate Analysis** - Acceptable

Duplicate analysis was performed on samples 04344304 and 04344345. All results which were above the Low Range Standard (LRS) level were within the $\pm 20\%$ RPD (relative percent difference) criterion. No qualification was required based on duplicate analysis.

8.0 Matrix Spike/Matrix Spike Duplicate Analysis - Acceptable

Matrix spike/matrix spike duplicate (MS/MSD) sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. The laboratory requires that matrix spike recoveries for digested samples be within the limits of 75-125%. Post spike recoveries are required to be within 85-115% of the spike added to the sample. A post spike in the acceptance range is an indication of the analytical performance but does not represent analyte recovery from the digestion process.

If the spike amount added is less than one quarter of the sample concentration, the recovery is reported "NA" and the result is not qualified. Also, if the spike recovery is above 125% or the post spike is above 115%, and the sample result is below the detection limit of the analyte, the result is not qualified.

MS/MSD analysis was performed on samples 04344304 and 04344345. All matrix spike recoveries met the specified acceptance limits. No qualifiers were required based on matrix spike recovery.

9.0 ICS -AES Serial Dilution - Acceptable

Samples 04344304 and 04344345 were analyzed by serial dilution to check for potential interferences in the ICP-AES analysis. In cases where the elements of interest exceeded the minimum concentration criterion (10 times the LRS level), the results agreed within 10% difference. No qualification was required on this basis.

10.0 Reporting Limits - Acceptable

Sample results that fall below the Reporting Limit (RL) are assigned the value of the Reporting Limit and the 'U' qualifier is attached. Sample results above the RL but below the LRS are reported to two significant figures; results above the LRS level are reported to three significant figures.

11.0 Overall Assessment of the Data

The (U) qualifier was added to results below the Reporting Limit. No other qualification was required.

Below are the definitions for the qualifiers used in the Inorganic area when qualifying data from Inorganic analysis.

DATA QUALIFIERS

U	-	The analyte was not detected at or above the reported value.
J	-	The identification of the analyte is acceptable; the reported value is an estimate.
JK	-	The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased high</u> . The actual value is expected to be less than the reported value.
JL	-	The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased low</u> . The actual value is expected to be greater than the reported value.
UJ	-	The analyte was not detected at or above the reported value. The reported value is an estimate.
NA	-	Not Applicable, the parameter was not analyzed for, or other is no analytical result for this parameter. No value is reported with this qualification.

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 1

Project Code:	TEC-618V	Collected:	8/17/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344300	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	ICB-1A			
		Result	Units	Qlfr
MET				

MET

Metals, ICP-SAS			
200.7	ICP Inductively Coupled Plasma-Atomic Emi	ission Spectrosco	opy (22 elements)
3050B			
7440382	Arsenic	22	mg/Kg
7440439	Cadmium	6.22	mg/Kg
7439921	Lead	438	mg/Kg
7440666	Zinc	1980	mg/Kg
	Metals, ICP-SAS 200.7 3050B 7440382 7440439 7439921 7440666	Metals, ICP-SAS200.7ICP Inductively Coupled Plasma-Atomic Emil3050B7440382Arsenic7440439Cadmium7439921Lead7440666Zinc	Metals, ICP-SAS200.7ICP Inductively Coupled Plasma-Atomic Emission Spectrosco3050B74403827440439Cadmium6.227439921Lead4387440666Zinc1980

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

MET Parameter · Metals ICP-SAS								
		Result	Units	Qlfr				
Station Description:	ICB-1B							
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample					
Project Officer:	RAVI SANGA	Sample Number:	04344301					
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid					
Project Code:	TEC-618V	Collected:	8/17/04					

	metalo, iei orio			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	31.7	mg/Kg
	7440439	Cadmium	6.76	mg/Kg
	7439921	Lead	230	mg/Kg
	7440666	Zinc	2130	mg/Kg

7440439

7439921

7440666

Cadmium

Lead

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344302 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** ICB-2A Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 18 Analytes(s): 7440382 Arsenic mg/Kg

8.92

550

1980

mg/Kg

mg/Kg

mg/Kg

MET

7440439

7439921

7440666

Cadmium

Lead

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344303 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** ICB-2B Result Units Qlfr Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 18 Analytes(s): 7440382 Arsenic mg/Kg

10.9

468

2320

mg/Kg

mg/Kg

mg/Kg

7440666

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344304 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** ICB-3A Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B Analytes(s): 7440382 Arsenic 11 mg/Kg 7440439 Cadmium 4.00 mg/Kg 7439921 Lead 228 mg/Kg

1070

mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Type:	Duplicate
Station Description:			-

MET

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Emi	ssion Spectrosco	opy (22 elements)
Prep Method 🗄	3050B			
Analytes(s):	7440382	Arsenic	11	mg/Kg
	7440439	Cadmium	3.92	mg/Kg
	7439921	Lead	223	mg/Kg
	7440666	Zinc	1050	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike
Station Description:			-
-			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-SAS				
Method :	200.7	ICP Inductively Coupled Plasma-Atom	ic Emission Spectro	oscopy (22 elen	nents)
Prep Method :	3050B				
Analytes(s):	7440666	Zinc			NA
Surrogate(s):	7440382	Arsenic	98	%Rec	
	7440439	Cadmium	95	%Rec	
	7439921	Lead	87	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike Dupl
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-SAS				
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosc	opy (22 element	s)
Prep Method :	3050B				
Analytes(s):	7440666	Zinc			NA
Surrogate(s):	7440382	Arsenic	99	%Rec	
	7440439	Cadmium	96	%Rec	
	7439921	Lead	89	%Rec	

7440666

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344305 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** ICB-3B Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 14 Analytes(s): 7440382 Arsenic mg/Kg 7440439 Cadmium 5.18 mg/Kg 7439921 Lead 352 mg/Kg

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mg/Kg

Manchester Environmental Laboratory **Report by Parameter for Project TEC-618V**

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Project Code:	TEC-618V	Collected:	8/17/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344306	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	ICB-4A			
		Result	Units	Qlfr
MET				

MET

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Emi	ssion Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	20	mg/Kg
	7440439	Cadmium	6.70	mg/Kg
	7439921	Lead	507	mg/Kg
	7440666	Zinc	1610	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344307	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	ICB-4B			
		Result	Units	Qlfr
MET Parameter : Meta	als, ICP-SAS			

Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	14	mg/Kg
	7440439	Cadmium	4.99	mg/Kg
	7439921	Lead	287	mg/Kg
	7440666	Zinc	1520	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected: 8/17/04			
Project Name:	CDA BH MINING & METALLURGICAL	& METALLURGICAL Matrix:			
Project Officer:	RAVI SANGA	Sample Number:	ber: 04344308 Reg sample		
Account Code:	04T10P302DD2C102QLA00	Туре:			
Station Description:	ICB-5A				
		Result	Units	Qlfr	
MET					
Parameter : Met	tals, ICP-SAS				
Method : 200	.7 ICP Inductively Coupled Plasma-Ator	tomic Emission Spectroscopy (22 elements)			

			2	1	1	1 2 \
Prep Method :	3050B					
Analytes(s):	7440382	Arsenic		-	15	mg/Kg
	7440439	Cadmium			5.33	mg/Kg
	7439921	Lead			350	mg/Kg
	7440666	Zinc			1180	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:	8/17/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344309	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	ICB-5B			
		Result	Units	Qlfr

MET

Metals, ICP-SAS			
200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
3050B			
7440382	Arsenic	23.8	mg/Kg
7440439	Cadmium	8.84	mg/Kg
7439921	Lead	580	mg/Kg
7440666	Zinc	1580	mg/Kg
	Metals, ICP-SAS 200.7 3050B 7440382 7440439 7439921 7440666	Metals, ICP-SAS200.7ICP Inductively Coupled Plasma-Atomic Emil3050B7440382Arsenic7440439Cadmium7439921Lead7440666Zinc	Metals, ICP-SAS200.7ICP Inductively Coupled Plasma-Atomic Emission Spectrosco3050B74403827440382Arsenic23.87440439Cadmium8.847439921Lead5807440666Zinc1580
Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344310	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	ICB-6A			
		Result	Units	Qlfr
MET				

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ssion Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	28.8	mg/Kg
	7440439	Cadmium	4.80	mg/Kg
	7439921	Lead	445	mg/Kg
	7440666	Zinc	4410	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:		Collected:	8/1//04					
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid					
Project Officer:	RAVI SANGA	Sample Number:	04344311					
Account Code: 04T10P302DD2C102QLA00		Туре:	Reg sample					
Station Description:	ICB-6B							
		Result	Units	Qlfr				
	MET Parameter - Matels ICD SAS							

Method :	200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
Prep Method :	3050B				
Analytes(s):	7440382	Arsenic	24.3	mg/Kg	
	7440439	Cadmium	4.57	mg/Kg	
	7439921	Lead	366	mg/Kg	
	7440666	Zinc	5170	mg/Kg	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid		
Project Officer:	RAVI SANGA	Sample Number:	04344312		
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample		
Station Description:	ICB-7B				
		Result	Units	Qlfr	
MET					
Parameter : Met	tals, ICP-SAS				
Method : 200	.7 ICP Inductively Coupled Plasma-Ator	nic Emission Spectros	scopy (22 elemer	nts)	

Prep Method :	3050B		2	1	1	
Analytes(s):	7440382	Arsenic			14	mg/Kg
• • • •	7440439	Cadmium			4.69	mg/Kg
	7439921	Lead			274	mg/Kg
	7440666	Zinc			1490	mg/Kg



7439921

7440666

Lead

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:TEC-61Project Name:CDA BProject Officer:RAVI SAccount Code:04T10FStation Description:ICSB-1		3V I MINING & METALLURGICA ANGA 302DD2C102QLA00 Comp	Collected: AL Matrix: Sample Number: Type:	8/17/04 Solid 04344313 Reg sample	
			Result	Units	Qlfr
MET Parameter :	Metals, ICP-SA	S			
Method :	200.7	ICP Inductively Coupled Plasma-	Atomic Emission Spectros	copy (22 eleme	ents)
Prep Method 🗄	3050B				
Analytes(s):	7440382	Arsenic	11	mg/Kg	
	7440439	Cadmium	3.39	mg/Kg	

206

988

mg/Kg mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid		
Project Officer:	RAVI SANGA	Sample Number:	04344314		
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample		
Station Description:	ICSB-2				
		Result	Units	Qlfr	
MET					
Parameter : Met	tals, ICP-SAS				
Method : 200	.7 ICP Inductively Coupled Plasma-Ator	mic Emission Spectros	scopy (22 elemer	ıts)	

/Kg	
/Kg	
/Kg	
/Kg	
ブブ ブブ ブラ フロ	y/Kg y/Kg y/Kg g/Kg



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid		
Project Officer:	RAVI SANGA	Sample Number:	04344315		
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample		
Station Description:	ICSB-3				
		Result	Units	Qlfr	
MET					
Parameter : Met	tals, ICP-SAS				
Method : 200	.7 ICP Inductively Coupled Plasma-Ator	mic Emission Spectros	scopy (22 elemer	its)	

Method :	200.7	ICP Inductively Coupled Plasma-Atomic E	Emission Spectrosc	copy (22 elemen
Prep Method 3	3050B			
Analytes(s):	7440382	Arsenic	15	mg/Kg
	7440439	Cadmium	6.47	mg/Kg
	7439921	Lead	406	mg/Kg
	7440666	Zinc	1310	mg/Kg



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: Project Name: Project Officer: Account Code: Station Descriptio	TEC-618 CDA BH RAVI SA 04T10P3 n: ICUP-1C	V MINING & METALLURGICAL NGA 02DD2C102QLA00 omp	Collected: Matrix: Sample Number: Type:	8/17/04 Solid 04344316 Reg sample	
			Result	Units	Qlfr
MET Parameter : Method : Prep Method :	Metals, ICP-SAS 200.7 3050B	ICP Inductively Coupled Plasma-Atc	mic Emission Spectroso	copy (22 elemen	ts)
Analytes(s):	7440382	Arsenic	18	mg/Kg	

s(s):	/440382	Arsenic	10	mg/ĸg
	7440439	Cadmium	11.0	mg/Kg
	7439921	Lead	804	mg/Kg
	7440666	Zinc	1780	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code: Project Name: Project Officer: Account Code: Station Description:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00 ICUP-2Comp	Collected: Matrix: Sample Number: Type:	8/17/04 Solid 04344317 Reg sample	
		Result	Units	Qlfr
MET Parameter : Met Method : 200 Prep Method : 305	als, ICP-SAS .7 ICP Inductively Coupled Plasma-Ato 0B	omic Emission Spectros	copy (22 eleme	nts)

Analytes(s): 7440382 Arsenic 25.9 mg/Kg 7440439 Cadmium 10.1 mg/Kg 7439921 Lead mg/Kg 710 7440666 Zinc 2350 mg/Kg

04344317 Reg sample .

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code: Project Name: Project Officer: Account Code: Station Description	TEC-618 CDA BH RAVI SA 04T10P30 n: ICUP-3C	V MINING & METALLURGI NGA)2DD2C102QLA00 omp	Collected: CAL Matrix: Sample Number: Type:	8/17/04 Solid 04344318 Reg sample	
			Result	Units	Qlfr
MET Parameter : Method : Prep Method :	Metals, ICP-SAS 200.7 3050B	ICP Inductively Coupled Plass	na-Atomic Emission Spectros	copy (22 elemer	nts)
Analytes(s):	7440382	Arsenic	22	mg/Kg	

10.5

619

2050

mg/Kg

mg/Kg

mg/Kg

7440439

7439921

7440666

Cadmium

Lead

Zinc

04344318 Reg sample

7440666

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344319 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description: ICUP-4Comp** Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 19 Analytes(s): 7440382 Arsenic mg/Kg 7440439 Cadmium 11.6 mg/Kg 7439921 Lead 847 mg/Kg

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mg/Kg

1890

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: Project Name: Project Officer: Account Code: Station Description	TEC-618 CDA BH RAVI SA 04T10P30 n: ILBS-1C0	V MINING & METALLURC NGA)2DD2C102QLA00 omp	Collected: HCAL Matrix: Sample Number: Type:	8/17/04 Solid 04344320 Reg sample	
			Result	Units	Qlfr
MET Parameter : Method : Prep Method :	Metals, ICP-SAS 200.7 3050B	ICP Inductively Coupled Plas	sma-Atomic Emission Spectros	copy (22 elemer	ıts)
Analytes(s):	7440382	Arsenic	27.8	mg/Kg	

Method	3050B			
nalytes(s):	7440382	Arsenic	27.8	mg/Kg
	7440439	Cadmium	10.5	mg/Kg
	7439921	Lead	648	mg/Kg
	7440666	Zinc	2170	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/18/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344325 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** SRGB-1 Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 18 Analytes(s): 7440382 Arsenic mg/Kg 7440439 Cadmium 5.69 mg/Kg 7439921 Lead 365 mg/Kg

7440666

Zinc

mg/Kg

1660

MET

Method

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

8/18/04 **Project Code:** TEC-618V **Collected:** CDA BH MINING & METALLURGICAL **Project Name:** Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344326 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** SRGB-2 Result Units Qlfr Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)

Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	17	mg/Kg
	7440439	Cadmium	6.75	mg/Kg
	7439921	Lead	378	mg/Kg
	7440666	Zinc	1760	mg/Kg



7440666

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/18/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344327 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** SRGB-3 Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 19 Analytes(s): 7440382 Arsenic mg/Kg 7440439 Cadmium 5.74 mg/Kg 7439921 Lead 374 mg/Kg

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mg/Kg

1670

7439921

7440666

Lead

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/18/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344331 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** SRUP-1 Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B 35.5 Analytes(s): 7440382 Arsenic mg/Kg 7440439 Cadmium 16.0 mg/Kg

1760

3020

mg/Kg

mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code: Project Name: Project Officer: Account Code: Station Description:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00 SRUP1-1Comp	Collected: Matrix: Sample Number: Type:	8/18/04 Solid 04344332 Reg sample	
		Result	Units	Qlfr
MET Parameter : Met Method : 200 Prep Method : 305	als, ICP-SAS .7 ICP Inductively Coupled Plasma-Ato 0B	mic Emission Spectros	copy (22 elemer	nts)

rep Method	3030B			
Analytes(s):	7440382	Arsenic	39.3	mg/Kg
	7440439	Cadmium	16.6	mg/Kg
	7439921	Lead	1830	mg/Kg
	7440666	Zinc	3510	mg/Kg

04344332 Reg sample

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344334	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	SRUP-2			
		Result	Units	Qlfr
MET Parameter · Mot				

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	38.7	mg/Kg
	7440439	Cadmium	19.5	mg/Kg
	7439921	Lead	326	mg/Kg
	7440666	Zinc	3300	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: Project Name: Project Officer: Account Code: Station Description:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00 SRUP2-1Comp	Collected: Matrix: Sample Number: Type:	8/18/04 Solid 04344335 Reg sample	
		Result	Units	Qlfr
MET Met Parameter : Met Method : 200 Prep Method : 305	als, ICP-SAS .7 ICP Inductively Coupled Plasma-A 0B	tomic Emission Spectros	copy (22 elemer	nts)

ep Method 🗄	3050B			
Analytes(s):	7440382	Arsenic	38.4	mg/Kg
	7440439	Cadmium	18.8	mg/Kg
	7439921	Lead	1820	mg/Kg
	7440666	Zinc	3770	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344337	
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample	
Station Description:	SRUP3			
		Result	Units	Qlfr
MET				

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	38.8	mg/Kg
	7440439	Cadmium	16.2	mg/Kg
	7439921	Lead	1390	mg/Kg
	7440666	Zinc	4460	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code: Project Name: Project Officer: Account Code: Station Description:		TEC-618 CDA BH RAVI SA 04T10P30 sr: SRUP3-10	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00 SRUP3-1Comp		Collected: Matrix: Sample Number: Type:	8/18/04 Solid 04344338 Reg sample	
					Result	Units	Qlfr
MET Parameter Method Prep Method	:] : 2 : :	Metals, ICP-SAS 200.7 3050B	ICP Inductively C	Coupled Plasma-Atomi	c Emission Spectrosc	copy (22 element	s)

Analytes(s): 7440382 Arsenic 22 mg/Kg 7440439 Cadmium 8.90 mg/Kg 7439921 mg/Kg Lead 661 7440666 Zinc 2040 mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

MET							
		Result	Units	Qlfr			
Station Description:	SRUP-4						
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample				
Project Officer:	RAVI SANGA	Sample Number:	04344340				
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid				
Project Code:	TEC-618V	Collected:	8/18/04				

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Em	ission Spectrosco	opy (22 elements)
Prep Method :	3050B			
Analytes(s):	7440382	Arsenic	32.7	mg/Kg
	7440439	Cadmium	14.5	mg/Kg
	7439921	Lead	630	mg/Kg
	7440666	Zinc	3690	mg/Kg

7440666

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/18/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344345 04T10P302DD2C102QLA00 Reg sample Account Code: Type: **Station Description:** SRBB-1 Result Units Qlfr MET Parameter : Metals, ICP-SAS : 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements) Method Prep Method : 3050B Analytes(s): 7440382 Arsenic 62.4 mg/Kg 7440439 Cadmium 29.1 mg/Kg 7439921 Lead 2520 mg/Kg

mg/Kg

3410

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344345
Account Code:	04T10P302DD2C102QLA00	Туре:	Duplicate
Station Description:	-		•
-			

				Result	Units	Qlfr
MET						
Parameter :	Metals, ICP-SAS	I.				
Method :	200.7	ICP Inductively	Coupled Plasma-Atomic Emi	ission Spect	troscopy (22 elem	ents)
Prep Method :	3050B	-	-	_		
Analytes(s):	7440382	Arsenic		60.9	mg/Kg	
	7440439	Cadmium		28.7	mg/Kg	
	7439921	Lead		2460	mg/Kg	
	7440666	Zinc		3270	mg/Kg	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344345
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike
Station Description:			
_			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-SAS				
Method :	200.7	ICP Inductively Coupled Plasma-Atomic	Emission Spectre	oscopy (22 elem	ients)
Prep Method :	3050B				
Analytes(s):	7439921	Lead			NA
	7440666	Zinc			NA
Surrogate(s):	7440382	Arsenic	98	%Rec	
	7440439	Cadmium	94	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344345
Account Code:	04T10P302DD2C102QLA00	Type:	Matrix Spike Dupl
Station Description:	-		
-			

			Res	ult	Units	Qlfr
MET						
Parameter :	Metals, ICP-SAS					
Method :	200.7	ICP Inductively Coupled	Plasma-Atomic Emission	n Spectrosco	py (22 element	s)
Prep Method :	3050B					
Analytes(s):	7439921	Lead				NA
	7440666	Zinc				NA
Surrogate(s):	7440382	Arsenic	99		%Rec	
	7440439	Cadmium	90		%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: Project Name: Project Officer: Account Code: Station Description:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00 SRBB-2	Collected: Matrix: Sample Number: Type:	8/18/04 Solid 04344346 Reg sample	
		Result	Units	Qlfr
MET Parameter : Met Method : 200 Prep Method : 305	cals, ICP-SAS .7 ICP Inductively Coupled Plasma-Ato 0B	mic Emission Spectros	copy (22 eleme	nts)

rep memou ·	3030D			
Analytes(s):	7440382	Arsenic	14	mg/Kg
	7440439	Cadmium	24.5	mg/Kg
	7439921	Lead	399	mg/Kg
	7440666	Zinc	2090	mg/Kg

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXS040913A
Account Code:	04T10P302DD2C102QLA00	Type:	Blank
Station Description:			

				Result	Units	Qlfr
MET						
Parameter :	Metals, ICP-SAS	5				
Method :	200.7	ICP Inductively Couple	d Plasma-Atomic Emi	ssion Spectrosc	opy (22 elemen	ts)
Prep Method :	3050B					
Analytes(s):	7440382	Arsenic		4.5	mg/kg	U
	7440439	Cadmium		0.50	mg/kg	U
	7439921	Lead		3.0	mg/kg	U
	7440666	Zinc		0.50	mg/kg	U

MXS040913 Blank

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXS040913A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			

MET

Parameter :	Metals, ICP-SAS			
Method :	200.7	ICP Inductively Coupled Plasma-Atomic Emi	ssion Spectrosco	ppy (22 elements)
Prep Method :	3050B			
Surrogate(s):	7440382	Arsenic	103	%Rec
	7440439	Cadmium	106	%Rec
	7439921	Lead	106	%Rec
	7440666	Zinc	102	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXS040914A
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

				Result	Units	Qlfr
MET						
Parameter :	Metals, ICP-SAS	5				
Method :	200.7	ICP Inductively Coup	led Plasma-Atomic Em	ission Spectro	scopy (22 elem	ents)
Prep Method :	3050B					
Analytes(s):	7440382	Arsenic		4.5	mg/Kg	U
	7440439	Cadmium		0.50	mg/Kg	U
	7439921	Lead		3.0	mg/Kg	U
	7440666	Zinc		0.50	mg/Kg	U

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXS040914A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-SAS				
Method :	200.7	ICP Inductively Coupled Plasma-Atomic En	nission Spectrosc	copy (22 element	s)
Prep Method :	3050B				
Surrogate(s):	7440382	Arsenic	96	%Rec	
	7440439	Cadmium	99	%Rec	
	7439921	Lead	99	%Rec	
	7440666	Zinc	92	%Rec	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

SUBJECT:	Data Release for Metals Analysis Results from the Region 10 Manchester Environmental Laboratory.
PROJECT NAME:	CDA BH Mining and Metallurgical
PROJECT CODE:	TEC-618V
FROM:	Linda Anderson-Carnahan Director
TO:	Ravi Sanga, EPA Region 10 Project Officer
CC:	Sarah Bates, USACE

I have authorized release of this data package. Attached you will find the Tier 1 TCLP and SPLP results for the CDA BH Mining and Metallurgical project for the samples collected on 08/17/2004 and 08/18/2004. The additional results for SPLP-ICP, TCLP-ICP, and Moisture analyses for this project will follow. For further information regarding the attached data, contact Katie Adams at 360-871-8748. For the schedule for the remaining analyses, contact Gerald Dodo at 360-871-8728.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

DATE: October 25, 2004
To: Ravi Sanga, Project Manager, EPA Region 10
From: Katie Adams, Chemist, EPA Region 10 OEA, Manchester Environmental Laboratory
SUBJECT: Data Review of the Tier 1 TCLP and SPLP Analyses for the CDA BH Mining and Metallurgical Site Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00
CC: Sarah Bates, USACE

The following is a data review of the TCLP and SPLP analysis of 12 solid samples. The analyses were performed by ESAT chemists at the EPA Manchester Environmental Laboratory in Port Orchard, WA, following USEPA and Laboratory guidelines.

This review was conducted for the following samples:

Samples

04344304	04344320	04344325	04344326	04344332	04344333
04344335	04344336	04344338	04344339	04344345	04344346

Data Qualifications

The following comments refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Plan, and the QAPP. These specifications are adapted from those in the National Functional Guidelines for Inorganic Data Review. The qualifications recommended herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection until the date of analysis for metals in water is 180 days, except mercury (28 days). The holding time for solid samples is not defined, but the Laboratory applies the 180 day holding time to solid samples as well. Sample collection began on 08/17/2004, and the analyses were completed on 10/05/2004. No data qualification was required based on holding time criteria.

2.0 Sample Preparation - Acceptable

The samples were extracted following EPA Methods 1311 (TCLP) on 09/08/2004 and 09/09/2004, and EPA Method 1312 (SPLP) on 09/13/2004. The extracts were then digested following EPA Method 3010A on 09/15/2004, 09/16/2004, and 09/24/2004.

All sample preparation was in accordance with Manchester Laboratory protocols. No qualification of the data was required based on sample preparation.

CDA BH Mining and Metallurgical TCLP As, Cd, Pb, Ba, Cr, Se, and Ag SPLP Cd, Cu, Pb, and Zn Page 2 of 4

3.0 Calibration / Calibration Verification - Acceptable

ICP-AES (Inductively Coupled Plasma- Atomic Emission Spectroscopy) analysis was conducted on the SPLP extracts on 09/27/2004 for cadmium, copper, lead, and zinc. ICP-AES analysis was conducted on the TCLP extracts on 10/04/2004 and 10/05/2004 for arsenic, cadmium, lead, barium, chromium, selenium, and silver. The instrument was standardized using one blank and a single calibration standard for each element. The calibrations were performed as required by the appropriate Method and SOPs and met acceptance criteria.

Calibration verification standards are required before and after sample analysis and after every ten samples during analysis. Metal recoveries must be within 90-110%. All ICP-AES calibration verification checks met the recovery criteria for the analytes of interest.

No qualification was required on based on ICP-AES calibration or calibration verification.

4.0 Laboratory Control/Reference Material Samples

Laboratory control samples (spike blanks) and Standard Reference Material samples are digested and analyzed along with the project samples to verify the efficiency of laboratory procedures. All Laboratory Control sample results met the recovery acceptance criterion (85 - 115% of the standard's true value), with the exception of silver, which had a recovery of 61%. The levels of silver required for the spike for the TCLP method are not retained in solution by the method. All silver results were qualified (J) due to the Laboratory Control Sample recovery. No additional qualifiers were necessary based on laboratory control and standard reference material analysis.

5.0 Blanks

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was detected in the associated procedural blank, the sample results were qualified (J) if the analyte concentration in the unknown samples was less than a factor of ten times the analyte value detected in the procedural blank.

The TCLP extraction blanks contained trace levels of barium (a contaminant routinely detected in TCLP extraction blanks, and suspected to leach from the required glass fiber filters used in the process). All barium results for the TCLP extracts, except those for samples 04344332, -4333, and -4345, were qualified (J) based on the criteria above.

The SPLP extraction blank contained trace levels of zinc. The zinc result for sample 04344345 was qualified (J) based on the above criteria.

No other qualification was required based on blank contamination.

6.0 ICP-AES Interference Check Sample - Acceptable

An interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120% of the true value for analytes present, and plus or minus the reporting limit (RL) for analytes not present in the solution. Analyses of the ICS standard met these criteria for all reported analytes; therefore, no qualification is required on this basis.

7.0 Duplicate Analysis - Acceptable

Duplicate analysis was performed on samples 04344325 and 04344335. All results which were above the Low Range Standard (LRS) level were within the $\pm 20\%$ RPD (relative percent difference) criterion. No qualification was required based on duplicate analysis.

8.0 Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike/matrix spike duplicate (MS/MSD) sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. The laboratory requires that matrix spike recoveries for digested samples be within the limits of 75-125%. Post spike recoveries are required to be within 85-115% of the spike added to the sample. A post spike in the acceptance range is an indication of the analytical performance but does not represent analyte recovery from the digestion process.

If the spike amount added is less than one quarter of the sample concentration, the recovery is reported "NA" and the result is not qualified. Also, if the spike recovery is above 125% or the post spike is above 115%, and the sample result is below the detection limit of the analyte, the result is not qualified.

MS/MSD analysis was performed on sample 04344304. All matrix spike recoveries met the specified acceptance limits, with the exception of silver which had recoveries of 57% and 55%. All silver results were qualified (J). No additional qualifiers were required based on matrix spike recovery.

9.0 ICS -AES Serial Dilution - Acceptable

Samples 04344304 was analyzed by serial dilution to check for potential interferences in the ICP-AES analysis. In cases where the elements of interest exceeded the minimum concentration criterion (10 times the LRS level), the results agreed within 10% difference. No qualification was required on this basis.

10.0 Reporting Limits - Acceptable

Sample results that fall below the Reporting Limit (RL) are assigned the value of the Reporting Limit and the 'U' qualifier is attached. Sample results above the RL but below the LRS are reported to two significant figures; results above the LRS level are reported to three significant figures.

11.0 Overall Assessment of the Data

The (U) qualifier was added to results below the Reporting Limit. All Barium results for the TCLP analysis were qualified (J) due to blank contamination. The SPLP zinc result for sample 04344345 was qualified (J) due to blank contamination. All TCLP silver results were qualified (UJ) due to poor Laboratory Control Sample and Matrix Spike recoveries. No other qualification was required.

Below are the definitions for the qualifiers used in the Inorganic area when qualifying data from Inorganic analysis.

DATA QUALIFIERS

- U The analyte was not detected at or above the reported value.
- J The identification of the analyte is acceptable; the reported value is an estimate.
- JK The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased high</u>. The actual value is expected to be less than the reported value.
- JL The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased low</u>. The actual value is expected to be greater than the reported value.
- UJ The analyte was not detected at or above the reported value. The reported value is an estimate.
- NA Not Applicable, the parameter was not analyzed for, or other is no analytical result for this parameter. No value is reported with this qualification.

CDA BH Mining and Metallurgical TCLP As, Cd, Pb, Ba, Cr, Se, and Ag SPLP Cd, Cu, Pb, and Zn Page 4 of 4

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/17/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	ICB-3A		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method 3	1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	320	ug/L	J
	7440439	Cadmium	19.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method :	1312		1		,
Analytes(s):	7440439	Cadmium	6.40	ug/L	
	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	663	ug/L	
Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Post Spike
Station Description:			-

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCL	Р			
Method :	1311	TCLP Extraction-Metals			
Prep Method 🗄	1311				
Surrogate(s):	7440224	Silver	100	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike
Station Description:			-

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	CLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Surrogate(s):	7440382	Arsenic	103	%Rec	
-	7440393	Barium	100	%Rec	
	7440439	Cadmium	106	%Rec	
	7440473	Chromium	100	%Rec	
	7439921	Lead	101	%Rec	
	7782492	Selenium	105	%Rec	
	7440224	Silver	57	%Rec	
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomi	c Emission Spectromet	try, SW-846 (22	elements)
Prep Method :	1312	• •			,
Surrogate(s):	7440439	Cadmium	104	%Rec	
8 ()	7440508	Copper	114	%Rec	
	7439921	Lead	108	%Rec	
	7440666	Zinc	94	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344304
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike Dupl
Station Description:			

			Result	Units	Qlfr
МЕТ					
Parameter :	Metals, ICP-7	ГСЬР			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Surrogate(s):	7440382	Arsenic	106	%Rec	
C ()	7440393	Barium	103	%Rec	
	7440439	Cadmium	110	%Rec	
	7440473	Chromium	103	%Rec	
	7439921	Lead	105	%Rec	
	7782492	Selenium	107	%Rec	
	7440224	Silver	55	%Rec	
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomi	c Emission Spectrome	try, SW-846 (22	elements)
Prep Method :	1312			•	,
Surrogate(s):	7440439	Cadmium	106	%Rec	
0	7440508	Copper	113	%Rec	
	7439921	Lead	110	%Rec	
	7440666	Zinc	94	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

TEC-618V 8/17/04 **Project Code: Collected:** CDA BH MINING & METALLURGICAL Solid **Project Name:** Matrix: 04344320 **Project Officer: RAVI SANGA** Sample Number: Account Code: 04T10P302DD2C102QLA00 Type: Reg sample **Station Description:** ILBS-1Comp

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TC	LP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	426	ug/L	J
	7440439	Cadmium	32.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic	Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312		-	-	
Analytes(s):	7440439	Cadmium	13.6	ug/L	
-	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	1300	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

TEC-618V 8/18/04 **Project Code: Collected:** CDA BH MINING & METALLURGICAL Solid **Project Name:** Matrix: 04344325 **Project Officer: RAVI SANGA** Sample Number: Account Code: 04T10P302DD2C102QLA00 Type: Reg sample **Station Description:** SRGB-1

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TC	LP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
-	7440393	Barium	340	ug/L	J
	7440439	Cadmium	30.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic E	Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312		L.		
Analytes(s):	7440439	Cadmium	9.30	ug/L	
• • • •	7440508	Copper	5.60	ug/L	
	7439921	Lead	36.9	ug/L	
	7440666	Zinc	816	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344325
Account Code:	04T10P302DD2C102QLA00	Туре:	Duplicate
Station Description:			_

			Result	Units	Qlfr
мет					
Parameter :	Metals, ICP-7	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	364	ug/L	J
	7440439	Cadmium	30.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atom	ic Emission Spectromet	try, SW-846 (22	elements)
Prep Method :	1312	· ·	L.	•	
Analytes(s):	7440439	Cadmium	8.50	ug/L	
	7440508	Copper	5.70	ug/L	
	7439921	Lead	34.8	ug/L	
	7440666	Zinc	803	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

TEC-618V 8/18/04 **Project Code: Collected:** CDA BH MINING & METALLURGICAL Solid **Project Name:** Matrix: **Project Officer: RAVI SANGA** Sample Number: 04344326 Account Code: 04T10P302DD2C102QLA00 Type: Reg sample **Station Description:** SRGB-2

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	CLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method 3	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
-	7440393	Barium	324	ug/L	J
	7440439	Cadmium	30.5	ug/L	
	7440473	Chromium	50	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Ato	omic Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312		-		
Analytes(s):	7440439	Cadmium	9.60	ug/L	
-	7440508	Copper	6.60	ug/L	
	7439921	Lead	33.3	ug/L	
	7440666	Zinc	827	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

TEC-618V 8/18/04 **Project Code: Collected:** CDA BH MINING & METALLURGICAL Solid **Project Name:** Matrix: 04344332 **Project Officer: RAVI SANGA** Sample Number: Account Code: 04T10P302DD2C102QLA00 Type: Reg sample **Station Description:** SRUP1-1Comp

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCI	LP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
• • • •	7440393	Barium	552	ug/L	
	7440439	Cadmium	62.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50.0	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emissi	on Spectrometry	, SW-846 (22 e	lements)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	36.6	ug/L	
• • • •	7440508	Copper	23.5	ug/L	
	7439921	Lead	144	ug/L	
	7440666	Zinc	2830	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344333
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRUP1-2Comp		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCL	_P			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	611	ug/L	
	7440439	Cadmium	47.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	SW-846 (22 elem	ients)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	25.4	ug/L	
-	7440508	Copper	8.00	ug/L	
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	2110	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344335
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRUP2-1Comp		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-7	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
• • • •	7440393	Barium	464	ug/L	J
	7440439	Cadmium	79.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	129	ug/L	
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atom	ic Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312	•	L.	•	,
Analytes(s):	7440439	Cadmium	36.2	ug/L	
5 ()	7440508	Copper	13.0	ug/L	
	7439921	Lead	83.3	ug/L	
	7440666	Zinc	2370	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344335
Account Code:	04T10P302DD2C102QLA00	Туре:	Duplicate
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method 🗄	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	502	ug/L	J
	7440439	Cadmium	73.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344336
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRUP2-2Comp		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCI	LP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	467	ug/L	J
	7440439	Cadmium	41.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	n Spectrometry, S	SW-846 (22 elen	nents)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	20.3	ug/L	
• • • •	7440508	Copper	9.60	ug/L	
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	1440	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344338
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRUP3-1Comp		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	CLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
• • • •	7440393	Barium	401	ug/L	J
	7440439	Cadmium	38.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Ator	mic Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312	5 1	1		,
Analytes(s):	7440439	Cadmium	12.4	ug/L	
•	7440508	Copper	7.10	ug/L	
	7439921	Lead	90.8	ug/L	
	7440666	Zinc	1110	ug/L	
				-	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344339
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRUP3-2Comp		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-7	ГСLР			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	608	ug/L	J
	7440439	Cadmium	57.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atom	ic Emission Spectrome	try, SW-846 (22	elements)
Prep Method :	1312		L.	•	
Analytes(s):	7440439	Cadmium	35.2	ug/L	
• • • •	7440508	Copper	13.5	ug/L	
	7439921	Lead	40.9	ug/L	
	7440666	Zinc	3120	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344345
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRBB-1		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	CLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	604	ug/L	
	7440439	Cadmium	112	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	167	ug/L	
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Aton	nic Emission Spectrome	try, SW-846 (22	elements)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	3.00	ug/L	U
-	7440508	Copper	5.00	ug/L	U
	7439921	Lead	36.3	ug/L	
	7440666	Zinc	121	ug/L	J

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344346
Account Code:	04T10P302DD2C102QLA00	Туре:	Reg sample
Station Description:	SRBB-2		

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-7	ГСLР			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
• • • •	7440393	Barium	395	ug/L	J
	7440439	Cadmium	53.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-At	omic Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312	v	L.		,
Analytes(s):	7440439	Cadmium	35.2	ug/L	
• • • •	7440508	Copper	8.30	ug/L	
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	1700	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE040908A
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	41.0	ug/L	
	7440439	Cadmium	15	ug/L	U
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	U

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE040908A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			_

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-T	CLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Surrogate(s):	7440382	Arsenic	107	%Rec	
	7440393	Barium	103	%Rec	
	7440439	Cadmium	109	%Rec	
	7440473	Chromium	103	%Rec	
	7439921	Lead	104	%Rec	
	7782492	Selenium	109	%Rec	
	7440224	Silver	61	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE040909A
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	65.5	ug/L	
	7440439	Cadmium	15	ug/L	U
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	U

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE040909A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-	TCLP			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Surrogate(s):	7440382	Arsenic	105	%Rec	
	7440393	Barium	102	%Rec	
	7440439	Cadmium	107	%Rec	
	7440473	Chromium	102	%Rec	
	7439921	Lead	102	%Rec	
	7782492	Selenium	107	%Rec	
	7440224	Silver	58	%Rec	

MXE040909 Spike Blank

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE040913A
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

Μ	\mathbf{E}^{T}	
T A	_	-

	7440666	Zinc	46.9	ug/L	
	7439921	Lead	25	ug/L	U
	7440508	Copper	5.00	ug/L	U
Analytes(s):	7440439	Cadmium	3.00	ug/L	U
Prep Method :	1312				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	n Spectrometry,	SW-846 (22 elem	nents)
Parameter :	SPLP-ICP				



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	MXE04091	3A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blanl	k
Station Description:				
		Result	Units	Qlfr

Parameter :	SPLP-ICP			
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1312			
Surrogate(s):	7440439	Cadmium	105	%Rec
	7440508	Copper	110	%Rec
	7439921	Lead	104	%Rec
	7440666	Zinc	109	%Rec

Manchester Environmental Laboratory **Report by Parameter for Project TEC-618V**

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Project Code: Project Name: Project Officer: Account Code:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00	Collected: Matrix: Sample Number: Type:	Liquid MXW040915B Blank	
Station Description.		Result	Units	Qlfr

Parameter :	Metals, ICP-TCL	P			
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elem	ents)
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	5.00	ug/L	U
	7440439	Cadmium	15	ug/L	U
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Name:	CDA BH MINING & METALLURGICAL	Collected: Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	MXW040915B
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			•

Parameter : Method : Prep Method :	Metals, ICP-TCI 6010B 1311	P Inductively Coupled Plasma-Atomic Emission	1 Spectrometry, S	SW-846 (22 elements)
Surrogate(s):	7440382	Arsenic	108	%Rec
	7440393	Barium	105	%Rec
	7440439	Cadmium	112	%Rec
	7440473	Chromium	106	%Rec
	7439921	Lead	111	%Rec
	7782492	Selenium	107	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	MXW040916
Account Code:	04T10P302DD2C102QLA00	Type:	Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emis	sion Spectrome	try, SW-846 (22	elements)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	3.00	ug/L	U
	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25	ug/L	U
	7440666	Zinc	5.0	ug/L	U

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid	
Project Officer:	RAVI SANGA	Sample Number:	MXW040916	
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank	
Station Description:				
		Result	Units	Qlfr

Parameter : SPLP-ICP			
Method : 6010B	Inductively Couple	d Plasma-Atomic Emission Spectrome	etry, SW-846 (22 elements)
Prep Method : 1312			
Surrogate(s): 7440439	Cadmium	108	%Rec
7440508	Copper	110	%Rec
7439921	Lead	107	%Rec
7440666	Zinc	105	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	MXW040924
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCL	P			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Analytes(s):	7440224	Silver	50	ug/L	U

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	MXW040924
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TCL	Р			
Method :	1311	TCLP Extraction-Metals			
Prep Method :	1311				
Surrogate(s):	7440224	Silver	61	%Rec	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

SUBJECT:	Data Release for Metals Analysis Results from the Region 10 Manchester Environmental Laboratory.
PROJECT NAME:	CDA BH Mining and Metallurgical
PROJECT CODE:	TEC-618V
FROM:	Linda Anderson-Carnahan Director
TO:	Ravi Sanga, EPA Region 10 Project Officer
CC:	Sarah Bates, USACE

I have authorized release of this data package. Attached you will find the Tier 2 TCLP and SPLP results for the CDA BH Mining and Metallurgical project for the samples collected on 08/17/2004. The results for moisture and particle sizing analyses for this project will follow. For further information regarding the attached data, contact Katie Adams at 360-871-8748. For the schedule for the remaining analyses, contact Gerald Dodo at 360-871-8728.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY 7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

DATE:	November 8, 2004
To:	Ravi Sanga, Project Manager, EPA Region 10
From:	Katie Adams, Chemist, EPA Region 10 OEA, Manchester Environmental Laboratory
SUBJECT:	Data Review of the Tier 2 TCLP and SPLP Analyses for the CDA BH Mining and Metallurgical Site
	Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00
CC:	Sarah Bates, USACE

The following is a data review of the TCLP and SPLP analysis of 6 solid samples. The analyses were performed by ESAT chemists at the EPA Manchester Environmental Laboratory in Port Orchard, WA, following USEPA and Laboratory guidelines.

This review was conducted for the following samples:

Samples					
TCLP:	04344302	04344301	04344309	04344310	04344314
SPLP:	04344302	04344309	04344310	04344311	

Data Qualifications

The following comments refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, and the QAPP. These specifications are adapted from those in the National Functional Guidelines for Inorganic Data Review. The qualifications recommended herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection until the date of analysis for metals in water is 180 days, except mercury (28 days). The holding time for solid samples is not defined, but the Laboratory applies the 180 day holding time to solid samples as well. Sample collection began on 08/17/2004, and the analyses were completed on 10/13/2004. No data qualification was required based on holding time criteria.

2.0 Sample Preparation - Acceptable

The samples were extracted following EPA Methods 1311 (TCLP) on 10/07/2004, and EPA Method 1312 (SPLP) on 10/06/2004. The extracts were then digested following EPA Method 3010A on 10/07/2004 and 10/08/2004.

All sample preparation was in accordance with Manchester Laboratory protocols. No qualification of the data was required based on sample preparation.

CDA BH Mining and Metallurgical TCLP As, Cd, Pb, Ba, Cr, Se, and Ag SPLP Cd, Cu, Pb, and Zn Page 2 of 4

3.0 Calibration / Calibration Verification - Acceptable

ICP-AES (Inductively Coupled Plasma- Atomic Emission Spectroscopy) analysis was conducted on the SPLP extracts on 10/11/2004 for cadmium, copper, lead, and zinc. ICP-AES analysis was conducted on the TCLP extracts on 10/13/2004 for arsenic, cadmium, lead, barium, chromium, selenium, and silver. The instrument was standardized using one blank and a single calibration standard for each element. The calibrations were performed as required by the appropriate Method and SOPs and met acceptance criteria.

Calibration verification standards are required before and after sample analysis and after every ten samples during analysis. Metal recoveries must be within 90-110%. All ICP-AES calibration verification checks met the recovery criteria for the analytes of interest.

No qualification was required based on ICP-AES calibration or calibration verification.

4.0 Laboratory Control/Reference Material Samples

Laboratory control samples (spike blanks) and Standard Reference Material samples are digested and analyzed along with the project samples to verify the efficiency of laboratory procedures. All Laboratory Control sample results met the recovery acceptance criterion (85 - 115% of the standard's true value), with the exception of silver, which had a recovery of 55%. The levels of silver required for the spike for the TCLP method are not retained in solution by the method. All silver results were qualified (J) due to the Laboratory Control Sample recovery. No additional qualifiers were necessary based on laboratory control and standard reference material analysis.

5.0 Blanks

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was detected in the associated procedural blank, the sample results were qualified (J) if the analyte concentration in the unknown samples was less than a factor of ten times the analyte value detected in the procedural blank.

The TCLP extraction blank contained trace levels of barium (a contaminant routinely detected in TCLP extraction blanks, and suspected to leach from the required glass fiber filters used in the process). The SPLP extraction blank contained trace levels of zinc. However, no sample qualification was required for either barium or zinc based on the above criteria.

No qualification was required based on blank contamination.

6.0 ICP-AES Interference Check Sample - Acceptable

An interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120% of the true value for analytes present, and plus or minus the reporting limit (RL) for analytes not present in the solution. Analyses of the ICS standard met these criteria for all reported analytes; therefore, no qualification is required on this basis.

7.0 Duplicate Analysis - Acceptable

Duplicate analysis was performed on samples 04344301 and 04344302. All results which were above the Low Range Standard (LRS) level were within the $\pm 20\%$ RPD (relative percent difference) criterion. No qualification was required based on duplicate analysis.

8.0 Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike/matrix spike duplicate (MS/MSD) sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. The laboratory requires that matrix spike recoveries for digested samples be within the limits of 75-125%. Post spike recoveries are required to be within 85-115% of the spike added to the sample. A post spike in the acceptance range is an indication of the analytical performance but does not represent analyte recovery from the digestion process.

If the spike amount added is less than one quarter of the sample concentration, the recovery is reported "NA" and the result is not qualified. Also, if the spike recovery is above 125% or the post spike is above 115%, and the sample result is below the detection limit of the analyte, the result is not qualified.

MS/MSD analysis was performed on samples 04344301 and 04344302. All matrix spike recoveries met the specified acceptance limits, with the exception of silver for sample 04344301 which had recoveries of 84% and 64%. All silver results were qualified (J). No additional qualifiers were required based on matrix spike recovery.

9.0 ICS -AES Serial Dilution - Acceptable

Samples 04344301 and 04344302 were analyzed by serial dilution to check for potential interferences in the ICP-AES analysis. In cases where the elements of interest exceeded the minimum concentration criterion (10 times the LRS level), the results agreed within 10% difference. No qualification was required on this basis.

10.0 Reporting Limits - Acceptable

Sample results that fall below the Reporting Limit (RL) are assigned the value of the Reporting Limit and the 'U' qualifier is attached. Sample results above the RL but below the LRS are reported to two significant figures; results above the LRS level are reported to three significant figures.

11.0 Overall Assessment of the Data

The (U) qualifier was added to results below the Reporting Limit. All TCLP silver results were qualified (UJ) due to poor Laboratory Control Sample and Matrix Spike recoveries. No other qualification was required.

Below are the definitions for the qualifiers used in the Inorganic area when qualifying data from Inorganic analysis.

DATA QUALIFIERS

U	-	The analyte was not detected at or above the reported value.
J	-	The identification of the analyte is acceptable; the reported value is an estimate.
JK	-	The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased high</u> . The actual value is expected to be less than the reported value.
JL	-	The identification of the analyte is acceptable; the reported value is an estimate and may be <u>biased low</u> . The actual value is expected to be greater than the reported value.
UJ	-	The analyte was not detected at or above the reported value. The reported value is an estimate.
NA	-	Not Applicable, the parameter was not analyzed for, or other is no analytical result for this parameter. No value is reported with this qualification.

CDA BH Mining and Metallurgical TCLP As, Cd, Pb, Ba, Cr, Se, and Ag SPLP Cd, Cu, Pb, and Zn Page 4 of 4

11/17/04

7440439

7440473

7439921

7782492

7440224

Cadmium

Chromium

Selenium

Lead

Silver

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 1

Project Code:TEC-6Project Name:CDA 1Project Officer:RAVIAccount Code:04T10Station Description:ICB-1		V MINING & METALLURGICAL NGA)2DD2C102QLA00	Collected: Matrix: Sample Number: Type:	8/17/04 Solid 04344301 Reg sample	
			Result	Units	Qlfr
MET					
Parameter :]	Metals, ICP-TCL	P			
Method : (5010B	Inductively Coupled Plasma-Atomic Em	ission Spectrometry,	SW-846 (22 ele	ments)
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	632	ug/L	

24.0

50.0

125

250

50

ug/L

ug/L

ug/L

ug/L

ug/L

U

U

U

UJ

04344301 Reg sample

11/17/04

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 2

Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344301
Account Code:	04T10P302DD2C102QLA00	Туре:	Duplicate
Station Description:			

Parameter :	Metals, ICP-TCL	.P			
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	n Spectrometry, S	W-846 (22 elem	ents)
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	580	ug/L	
	7440439	Cadmium	24.0	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50	ug/L	UJ

11/17/04

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 3

Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344301	
Account Code:	04T10P302DD2C102QLA00	Туре:	Post Spike	
Station Description:				
		Result	Units	Qlfr
MET				

 Parameter
 Metals, ICP-TCLP

 Method
 6010B
 Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)

 Prep Method
 1311
 Silver
 95
 % Rec
Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 4

Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344301
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike
Station Description:			

Parameter :	Metals, ICP-TCL	.P		
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1311			
Surrogate(s):	7440382	Arsenic	108	%Rec
	7440393	Barium	108	%Rec
	7440439	Cadmium	109	%Rec
	7440473	Chromium	103	%Rec
	7439921	Lead	105	%Rec
	7782492	Selenium	110	%Rec
	7440224	Silver	84	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 5

Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344301
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike Dupl
Station Description:			
-			

Parameter :	Metals, ICP-TCL	P		
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1311			
Surrogate(s):	7440382	Arsenic	106	%Rec
	7440393	Barium	106	%Rec
	7440439	Cadmium	107	%Rec
	7440473	Chromium	101	%Rec
	7439921	Lead	104	%Rec
	7782492	Selenium	105	%Rec
	7440224	Silver	64	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 CDA BH MINING & METALLURGICAL Matrix: Solid **Project Name: Project Officer: RAVI SANGA** Sample Number: 04344302 04T10P302DD2C102QLA00 Account Code: Type: Reg sample ICB-2A **Station Description:** Result Units Qlfr MET Parameter : Metals, ICP-TCLP : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) Method Prep Method : 1311 U Arsenic 230 ug/L Analytes(s): 7440382 Barium 430 ug/L 7440393 7440439 Cadmium 41.5 ug/L U 7440473 Chromium 50.0 ug/L 7439921 Lead U 125 ug/L 7782492 Selenium 250 ug/L U 7440224 Silver 50 ug/L UJ Parameter : SPLP-ICP Method : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) **Prep Method** : 1312 Analytes(s): 7440439 Cadmium 7.60 ug/L 7440508 Copper 5.00 ug/L U 7439921 Lead 31.3 ug/L Zinc 679 7440666 ug/L

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	04344302	
Account Code:	04T10P302DD2C102QLA00	Туре:	Duplicate	
Station Description:				
		Result	Units	Olfr

Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 eleme	nts)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	7.80	ug/L	
	7440508	Copper	5.00	ug/L l	J
	7439921	Lead	32.4	ug/L	
	7440666	Zinc	691	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Page 8

Qlfr

Units

Result

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344302
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike
Station Description:			-

Parameter : SPLP-ICP			
Method : 6010B	Inductively Coupled Plasma-Atomic Emission	on Spectrometry,	SW-846 (22 elements)
Prep Method : 1312			
Surrogate(s): 7440439	Cadmium	109	%Rec
7440508	Copper	104	%Rec
7439921	Lead	107	%Rec
7440666	Zinc	97	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344302
Account Code:	04T10P302DD2C102QLA00	Туре:	Matrix Spike Dupl
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	SW-846 (22 elen	nents)
Prep Method :	1312				
Surrogate(s):	7440439	Cadmium	114	%Rec	
	7440508	Copper	105	%Rec	
	7439921	Lead	112	%Rec	
	7440666	Zinc	108	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344309 04T10P302DD2C102QLA00 Account Code: Type: Reg sample ICB-5B **Station Description:** Result Units Qlfr MET Parameter : Metals, ICP-TCLP : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) Method Prep Method : 1311 U Arsenic 225 ug/L Analytes(s): 7440382 Barium 335 ug/L 7440393 7440439 Cadmium 23.0 ug/L U 7440473 Chromium 50.0 ug/L 7439921 Lead U 125 ug/L 7782492 Selenium 250 ug/L U 7440224 Silver 50.0 ug/L UJ Parameter : SPLP-ICP Method : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) **Prep Method** : 1312 Analytes(s): 7440439 Cadmium 7.50 ug/L 7440508 Copper 5.00 ug/L U U 7439921 Lead 25.0 ug/L Zinc 767 7440666 ug/L

MET

Method

Method

7439921

7440666

Lead

Zinc

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code: TEC-618V **Collected:** 8/17/04 **Project Name:** CDA BH MINING & METALLURGICAL Matrix: Solid **Project Officer: RAVI SANGA** Sample Number: 04344310 04T10P302DD2C102QLA00 Account Code: Type: Reg sample ICB-6A **Station Description:** Result Units Qlfr Parameter : Metals, ICP-TCLP : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) Prep Method : 1311 U Arsenic 225 ug/L Analytes(s): 7440382 Barium 503 ug/L 7440393 7440439 Cadmium 18.5 ug/L U 7440473 Chromium 50.0 ug/L 7439921 Lead U 125 ug/L 7782492 Selenium 250 ug/L U 7440224 Silver 50.0 ug/L UJ Parameter : SPLP-ICP : 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements) **Prep Method** : 1312 Analytes(s): 7440439 Cadmium 5.40 ug/L 7440508 Copper 5.00 ug/L U

25.0

1040

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U

ug/L

ug/L

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:TEC-618VProject Name:CDA BH MINING & METALLURGIOProject Officer:RAVI SANGAAccount Code:04T10P302DD2C102QLA00Station Description:ICB-6B		Collected: ICAL Matrix: Sample Number: Type:	8/17/04 Solid 04344311 Reg sample	
		Result	Units	Qlfr
MET Parameter : SPI Method : 601	LP-ICP OB Inductively Coupled Plasma-A	tomic Emission Spectrometry	, SW-846 (22 el	ements)

	7440666	Zinc	1020	ug/L	
	7439921	Lead	25.0	ug/L	U
	7440508	Copper	5.00	ug/L	U
Analytes(s):	7440439	Cadmium	6.20	ug/L	
Prep Method :	1312				
Method :	6010B	Inductively Coupled Plasma-Atomic Emi	ssion Spectrome	try, SW-846 (22	elements



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code: Project Name: Project Officer: Account Code: Station Description	TEC-618 CDA BH RAVI SA 04T10P3 : ICSB-2	3V I MINING & METALLURGICAL ANGA 302DD2C102QLA00	Collected: Matrix: Sample Number: Type:	8/17/04 Solid 04344314 Reg sample	e
			Result	Units	Qlfr
MET					
Parameter : N	Metals, ICP-TC	LP			
Method : 6	5010B	Inductively Coupled Plasma-Atomic	Emission Spectrometry,	SW-846 (22	elements)
Prep Method : 1	311				
Analytes(s): 7	7440382	Arsenic	225	ug/L	U
7	7440393	Barium	262	ug/L	
7	7440439	Cadmium	15.0	ug/L	
7	7440473	Chromium	50.0	ug/L	U

7439921

7782492

7440224

Lead

Silver

Selenium

04344314 Reg sample .

ug/L

ug/L

ug/L

125

250

50.0

U

U

UJ

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	MXE041006A	
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank	
Station Description:				

			Result	Units	Qlfr
MET					
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasma-Atomic En	mission Spectromet	try, SW-846 (22	elements)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	3.00	ug/L	U
	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	40.3	ug/L	

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	MXE0410	06A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blan	ık
Station Description:				
		Result	Units	Qlfr

Parameter :	SPLP-ICP			
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1312			
Surrogate(s):	7440439	Cadmium	110	%Rec
	7440508	Copper	107	%Rec
	7439921	Lead	109	%Rec
	7440666	Zinc	108	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Officer:RAVI SANGASample Number:MXE04Account Code:04T10P302DD2C102OLA00Type:Blank	
	-1007A
Station Description:	

Parameter :	Metals, ICP-TCI	,P			
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	n Spectrometry, S	W-846 (22 elem	ents)
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	26.0	ug/L	
	7440439	Cadmium	15	ug/L	U
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	130	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50.0	ug/L	U



Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Code: Project Name:	TEC-618V CDA BH MINING & METALLURGICAL	Collected: Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXE041007A
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank
Station Description:			-

Parameter :	Metals, ICP-TCL	P		
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1311			
Surrogate(s):	7440382	Arsenic	107	%Rec
	7440393	Barium	105	%Rec
	7440439	Cadmium	108	%Rec
	7440473	Chromium	103	%Rec
	7439921	Lead	104	%Rec
	7782492	Selenium	107	%Rec
	7440224	Silver	69	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXW041007
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			

			Result	Units	Qlfr
MET					
Parameter :	SPLP-ICP				
Method :	6010B	Inductively Coupled Plasn	na-Atomic Emission Spectromet	ry, SW-846 (22	elements)
Prep Method :	1312				
Analytes(s):	7440439	Cadmium	3.00	ug/L	U
	7440508	Copper	5.0	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	5.00	ug/L	U

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Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:		
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid	
Project Officer:	RAVI SANGA	Sample Number:	MXW041007	
Account Code:	04T10P302DD2C102QLA00	Туре:	Spike Blank	
Station Description:				
		Result	Units	Qlfr

Parameter : S	SPLP-ICP			
Method : 6	5010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method : 1	1312			
Surrogate(s): 7	7440439	Cadmium	115	%Rec
7	7440508	Copper	108	%Rec
7	7439921	Lead	113	%Rec
7	7440666	Zinc	105	%Rec

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXW041008
Account Code:	04T10P302DD2C102QLA00	Туре:	Blank
Station Description:			
-			

			Result	Units	Qlfr
MET					
Parameter :	Metals, ICP-TC	LP			
Method :	6010B	Inductively Coupled Plasma-A	tomic Emission Spectrometry	y, SW-846 (22	elements)
Prep Method :	1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	5.00	ug/L	U
	7440439	Cadmium	15.0	ug/L	U
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50.0	ug/L	U

MXW04100 Blank

Manchester Environmental Laboratory Report by Parameter for Project TEC-618V

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Qlfr

Units

Result

Project Code: Project Name: Project Officer: Account Code:	TEC-618V CDA BH MINING & METALLURGICAL RAVI SANGA 04T10P302DD2C102QLA00	Collected: Matrix: Sample Number: Type:	Solid MXW041008 Spike Blank
Station Description:			

Parameter :	Metals, ICP-TCL	P		
Method :	6010B	Inductively Coupled Plasma-Atomic Emission	Spectrometry, S	W-846 (22 elements)
Prep Method :	1311			
Surrogate(s):	7440382	Arsenic	106	%Rec
	7440393	Barium	108	%Rec
	7440439	Cadmium	109	%Rec
	7440473	Chromium	106	%Rec
	7439921	Lead	109	%Rec
	7782492	Selenium	106	%Rec
	7440224	Silver	55	%Rec