

**WA Recreational Sites
Starr Road and Island Complex**

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.

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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	N 47°41'31.6"	W 117°3'46.62"
	ICUP-3Comp-3		
	ICUP-3Comp-4		
	ICUP-3Comp-5		
ICUP-2Comp	ICUP-2Comp-1		
	ICUP-2Comp-2	N 47°41'30.6"	W 117°5'46.2"
	ICUP-2Comp-3		
	ICUP-2Comp-4		
	ICUP-2Comp-5		
ICUP-1Comp	ICUP-1Comp-1	N 47°41'29.2"	W 117°3'48.3"
	ICUP-1Comp-2		
	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 47°41'24.8"	W 117°3'57.3"
	ICSB-1Comp-2		
	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"	W 117°4'7"
	SRUP1-2		
	SRUP1-3		
	SRUP1-4		
	SRUP1-5		
SRUP2-1Comp & -2Comp	SRUP2-1		
	SRUP2-2	N 47°41'26.6"	W 117°4'8.4"
	SRUP2-3		
	SRUP2-4		
	SRUP2-5		
SRUP3-1Comp & -2Comp	SRUP3-1		
	SRUP3-2	N 47°41'25.5"	W 117°4'8.5"
	SRUP3-3		
	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 (ft bgs)	Soil Type Description
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	Gravel 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.

Analytical Results Evaluation Values

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

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.

⁴ – Waste disposal considerations comply with and will be consistent with Washington dangerous waste regulations. (WAC 173-303-100)

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions										
Starr Road															
Gravel Bar – There is no previous data from this specific area, but it is suspected 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 trout-spawning habitat that is located in this area.															
Determine/confirm exposure to lead, arsenic, zinc and cadmium.	Concentration of lead, arsenic, zinc and cadmium in the ground surface.	Two samples will be taken from one location at 0-1' (SRGB-1) and 1-2' (SRGB-2). Samples will be analyzed for total metals.	One sample location is sufficient for this area because previous data has shown high lead levels, and the area will likely be excavated. The area is small and uniform so a central location should be representative of the area. Decision criteria are not fully dependent on this data. 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 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.	Results will be compared to evaluation values such as defined in Table A-2. Data results will be used to refine design.	<table border="0"> <tr> <td><u>SRGB-1 (0-1')</u> As = 18 mg/kg Cd = 5.69mg/kg Pb = 365 mg/kg Zn = 1660 mg/kg</td> <td><u>SRGB-2 (1-2')</u> As = 17 mg/kg Cd = 6.75 mg/kg Pb = 378 mg/kg Zn = 1760 mg/kg</td> </tr> <tr> <td colspan="2">Metals results are below human health values.</td> </tr> </table>	<u>SRGB-1 (0-1')</u> As = 18 mg/kg Cd = 5.69mg/kg Pb = 365 mg/kg Zn = 1660 mg/kg	<u>SRGB-2 (1-2')</u> As = 17 mg/kg Cd = 6.75 mg/kg Pb = 378 mg/kg Zn = 1760 mg/kg	Metals results are below human health values.							
<u>SRGB-1 (0-1')</u> As = 18 mg/kg Cd = 5.69mg/kg Pb = 365 mg/kg Zn = 1660 mg/kg	<u>SRGB-2 (1-2')</u> As = 17 mg/kg Cd = 6.75 mg/kg Pb = 378 mg/kg Zn = 1760 mg/kg														
Metals results are below human health values.															
Determine suitability of excavated material for onsite disposal and a construction base of a parking lot on-site.	Potential of lead and other metals leaching in to the groundwater and surface water from the excavated material. Moisture content of the soil. Frost susceptibility of the soil.	Samples SRGB-1 and SRGB-2 will be analyzed for metals using SPLP and TCLP and moisture content. Frost susceptibility will be determined from grain size sample results.	Because soil is expected to contain lead, samples will be analyzed for SPLP, TCLP and moisture content initially, without waiting for total lead results. The same rationale applies for number of samples and location as total metals samples.	Results will be used to evaluate on-site containment options.	<table border="0"> <tr> <td><u>SRGB-1 (0-1')</u> Cd = 9.30 ug/L Cu = 5.60 ug/L Pb = 36.9 ug/L Zn = 816 ug/L</td> <td><u>SRGB-2 (1-2')</u> Cd = 9.60 ug/L Cu = 6.60 ug/L Pb = 33.3 ug/L Zn = 827 ug/L</td> </tr> <tr> <td colspan="2">All SPLP results were below evaluation values and onsite reuse from a leachability standpoint is suitable.</td> </tr> <tr> <td colspan="2">The frost susceptibility results showed that 2 samples, SRGB-G2 and SRGB-G3, are not susceptible to frost and suitable for onsite reuse. Sample, SRGB-G1, located on the tip of the gravel bar may be frost susceptible. Material in this area may not be appropriate for onsite use.</td> </tr> <tr> <td colspan="2">Moisture Content</td> </tr> <tr> <td><u>SRGB-1 (0-1')</u> 6.3 % water</td> <td><u>SRGB-2 (1-2')</u> 6.2% water</td> </tr> </table>	<u>SRGB-1 (0-1')</u> Cd = 9.30 ug/L Cu = 5.60 ug/L Pb = 36.9 ug/L Zn = 816 ug/L	<u>SRGB-2 (1-2')</u> Cd = 9.60 ug/L Cu = 6.60 ug/L Pb = 33.3 ug/L Zn = 827 ug/L	All SPLP results were below evaluation values and onsite reuse from a leachability standpoint is suitable.		The frost susceptibility results showed that 2 samples, SRGB-G2 and SRGB-G3, are not susceptible to frost and suitable for onsite reuse. Sample, SRGB-G1, located on the tip of the gravel bar may be frost susceptible. Material in this area may not be appropriate for onsite use.		Moisture Content		<u>SRGB-1 (0-1')</u> 6.3 % water	<u>SRGB-2 (1-2')</u> 6.2% water
<u>SRGB-1 (0-1')</u> Cd = 9.30 ug/L Cu = 5.60 ug/L Pb = 36.9 ug/L Zn = 816 ug/L	<u>SRGB-2 (1-2')</u> Cd = 9.60 ug/L Cu = 6.60 ug/L Pb = 33.3 ug/L Zn = 827 ug/L														
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<u>SRGB-1 (0-1')</u> 6.3 % water	<u>SRGB-2 (1-2')</u> 6.2% 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.	<table border="0"> <tr> <td><u>SRGB-1 (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 340 ug/L Cd = 30.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</td> <td><u>SRGB-2 (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 324 ug/L Cd = 30.5 ug/L Cr ≤ 50 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</td> </tr> <tr> <td colspan="2">All results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.</td> </tr> </table>	<u>SRGB-1 (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 340 ug/L Cd = 30.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L	<u>SRGB-2 (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 324 ug/L Cd = 30.5 ug/L Cr ≤ 50 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L	All results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.							
<u>SRGB-1 (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 340 ug/L Cd = 30.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L	<u>SRGB-2 (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 324 ug/L Cd = 30.5 ug/L Cr ≤ 50 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L														
All results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.															
Determine needed characteristics for replacement material	Grain size of gravel bar and trout spawning area	Two samples from 0-1' (SRGB-G1) and 1-2' (SRGB-G2) will be taken from 1 location and analyzed for grain size. One sample will also be taken from the trout spawning area (SRGB-G3) from 0-1'.	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 gravel bar. One location is sufficient because of the uniform characteristics of the gravel bar 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. This data will determine replacement material requirements.										

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions				
Starr Road									
Backwater Beach – This is a high-use area with no previous data. This area presents a data gap and is suspected of having high metals levels. Remedial options include excavation to 2'. Material may be isolated on site and used in the construction of a new 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 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.	Results will be compared to evaluation values, such as defined in Table A-2. Data results will be used to refine design.	<table border="0"> <tr> <td><u>SRBB-1 (0-1')</u> As = 62.4 mg/kg Cd = 29.1 mg/kg Pb = 2520 mg/kg Zn = 3410 mg/kg</td> <td><u>SRBB-2 (1-2')</u> As = 14 mg/kg Cd = 24.5 mg/kg Pb = 399 mg/kg Zn = 2090 mg/kg</td> </tr> </table> <p>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.</p>	<u>SRBB-1 (0-1')</u> As = 62.4 mg/kg Cd = 29.1 mg/kg Pb = 2520 mg/kg Zn = 3410 mg/kg	<u>SRBB-2 (1-2')</u> As = 14 mg/kg Cd = 24.5 mg/kg Pb = 399 mg/kg Zn = 2090 mg/kg		
<u>SRBB-1 (0-1')</u> As = 62.4 mg/kg Cd = 29.1 mg/kg Pb = 2520 mg/kg Zn = 3410 mg/kg	<u>SRBB-2 (1-2')</u> As = 14 mg/kg Cd = 24.5 mg/kg Pb = 399 mg/kg Zn = 2090 mg/kg								
Determine 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.	Samples SRBB-1 and SRBB-2 will be analyzed for metals using SPLP and TCLP and moisture content. Frost susceptibility will be determined from grain size sample results.	SPLP, TCLP and moisture content will be performed on the samples.	Results will be used to evaluate on-site containment options.	<table border="0"> <tr> <td><u>SRBB-1 (0-1')</u> Cd ≤ 3.00 ug/L Cu ≤ 5.00 ug/L Pb = 36.3 ug/L Zn = 121 ug/L</td> <td><u>SRBB-2 (1-2')</u> Cd = 35.2 ug/L Cu = 8.30 ug/L Pb ≤ 25.0 ug/L Zn = 1700 ug/L</td> </tr> </table> <p>All SPLP results were below evaluation values and onsite reuse from a leachability standpoint is suitable.</p> <p>The frost susceptibility results showed that the 2 samples, SRBB-G1 and SRBB-G2, are susceptible to frost. Material in this area may not be appropriate for onsite reuse.</p> <p>Moisture Content</p> <table border="0"> <tr> <td><u>SRBB-1 (0-1')</u> 11.7% water</td> <td><u>SRBB-2 (1-2')</u> 7.1% water</td> </tr> </table>	<u>SRBB-1 (0-1')</u> Cd ≤ 3.00 ug/L Cu ≤ 5.00 ug/L Pb = 36.3 ug/L Zn = 121 ug/L	<u>SRBB-2 (1-2')</u> Cd = 35.2 ug/L Cu = 8.30 ug/L Pb ≤ 25.0 ug/L Zn = 1700 ug/L	<u>SRBB-1 (0-1')</u> 11.7% water	<u>SRBB-2 (1-2')</u> 7.1% water
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<u>SRBB-1 (0-1')</u> 11.7% water	<u>SRBB-2 (1-2')</u> 7.1% 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.	<table border="0"> <tr> <td><u>SRBB-1 (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 604 ug/L Cd = 112 ug/L Cr ≤ 50.0 ug/L Pb = 167 ug/L Se ≤ 250 ug/L</td> <td><u>SRBB-2 (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 395 ug/L Cd = 53.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</td> </tr> </table> <p>All results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.</p>	<u>SRBB-1 (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 604 ug/L Cd = 112 ug/L Cr ≤ 50.0 ug/L Pb = 167 ug/L Se ≤ 250 ug/L	<u>SRBB-2 (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 395 ug/L Cd = 53.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L		
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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 characteristics 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	Conclusions
Starr Road					
Upland – Previous data show high levels of lead in this area. Remedial options include excavation to 2'. Material may be isolated on site and used in the construction of a new on-site parking lot 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' material may be exposed.	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 design.	<p><u>SRUP-1 (0-1')</u> As = 35.5 mg/kg Cd = 16.0 mg/kg Pb = 1760 mg/kg Zn = 3020 mg/kg</p> <p><u>SRUP-2 (1-2')</u> As = 38.7 mg/kg Cd = 19.5 mg/kg Pb = 326 mg/kg Zn = 3300 mg/kg</p> <p><u>SRUP-3 (0-1')</u> As = 38.8 mg/kg Cd = 16.2 mg/kg Pb = 1390 mg/kg Zn = 4460 mg/kg</p> <p><u>SRUP-4 (1-2')</u> As = 32.7 mg/kg Cd = 14.5 mg/kg Pb = 630 mg/kg Zn = 3690 mg/kg</p> <p><u>SRUP1-1comp (0-1')</u> As = 39.3 mg/kg Cd = 16.6 mg/kg Pb = 1830 mg/kg Zn = 3510 mg/kg</p> <p><u>SRUP2-1comp (0-1')</u> As = 38.4 mg/kg Cd = 18.8 mg/kg Pb = 1820 mg/kg Zn = 3770 mg/kg</p> <p><u>SRUP3-1comp (0-1')</u> As = 22 mg/kg Cd = 8.90 mg/kg Pb = 661 mg/kg Zn = 2040 mg/kg</p> <p>Arsenic is above evaluation values for human health from both the 0-1 foot and 1-2 foot depth intervals across the entire upland area. Lead is above evaluation values from the 0-1 foot depth interval in areas SRUP1 and SRUP2. Area SRUP3 contains lower levels of metals, with only arsenic above evaluation values. It is recommended for this area to be excavated from 0-1 feet.</p>
Determine 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 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.	<p><u>SRUP1-1Comp (0-1')</u> Cd = 36.6 ug/L Cu = 23.5 ug/L Pb = 144 ug/L Zn = 2830 ug/L</p> <p><u>SRUP1-2Comp (1-2')</u> Cd = 25.4 ug/L Cu = 8.00 ug/L Pb ≤ 25.0 ug/L Zn = 2110 ug/L</p> <p><u>SRUP2-1Comp (0-1')</u> Cd = 36.2 ug/L Cu = 13.0 ug/L Pb = 83.3 ug/L Zn = 2370 ug/L</p> <p><u>SRUP2-2Comp (1-2')</u> Cd = 20.3 ug/L Cu = 9.60 ug/L Pb ≤ 25.0 ug/L Zn = 1440 ug/L</p> <p><u>SRUP3-1Comp (0-1')</u> Cd = 12.4 ug/L Cu = 7.10 ug/L Pb = 90.8 ug/L Zn = 1110 ug/L</p> <p><u>SRUP3-2Comp (1-2')</u> Cd = 35.2 ug/L Cu = 13.5 ug/L Pb = 40.9 ug/L Zn = 3120 ug/L</p> <p>All SPLP results were below evaluation values and onsite reuse from a leachability standpoint may be suitable for areas with sufficient data. SPLP data intended from area SRUP1, represented in Figure A-2 of the QAPP, were collected from further southwest than planned due to a significant decrease in water level. It is not anticipated that data from that area would have SPLP levels exceeding the evaluation values, but additional data from this area may be needed for confirmation if parking lot reuse is the favored option.</p> <p>The frost susceptibility results showed that all 4 samples, SRUP-G1, SRUPG2, SRUP-G3, and SRUP-G4, are not susceptible to frost. Material in this area is appropriate for onsite reuse.</p>

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions
					<p>Moisture Content</p> <p><u>SRUP1-1Comp</u> 6.6% water</p> <p><u>SRUP1-2Comp</u> 6.2% water</p> <p><u>SRUP2-1Comp</u> 6.5% water</p> <p><u>SRUP2-2Comp</u> 6.9% water</p> <p><u>SRUP3-1Comp</u> 6.4% water</p> <p><u>SRUP-3-2Comp</u> 6.9% water</p>
Determine requirements for off-site disposal of excavated material, if on-site management is not selected.	Toxic characteristics of excavated material.			<p>Results will be compared to TCLP criteria in Table A-2, Analytical Results Evaluation Criteria.</p> <p>If < EV, material may be disposed of in a subtitle D landfill. If > EV, material transported off site would be disposed of in a subtitle C landfill.</p>	<p><u>SRUP1-1Comp (0-1')</u> Ag ≤ 50.0 ug/L As ≤ 230 ug/L Ba = 552 ug/L Cd = 62.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p><u>SRUP1-2Comp (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 611 ug/L Cd = 47.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p><u>SRUP2-1Comp (0-1')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 464 ug/L Cd = 79.0 ug/L Cr ≤ 50.0 ug/L Pb = 129 ug/L Se ≤ 250 ug/L</p> <p><u>SRUP2-2Comp (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 467 ug/L Cd = 41.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p><u>SRUP3-1Comp (0-1')</u> Ag ≤ 50 ug/L As ≤ 225 ug/L Ba = 401 ug/L Cd = 38.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p><u>SRUP3-2Comp (1-2')</u> Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 608 ug/L Cd = 57.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>All results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.</p>
Determine needed characteristics for replacement material.	Grain size of material that will be excavated.	Grain size samples will be taken in 1-2 locations. The sampling team will visually determine if there are significant differences in grain size in the area. If there are, each sample location will be placed in different 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 SRUP-G4.	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 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	Conclusions
Island Complex					
Upland Path – There is no previous data from the pathway in this area. Remedial options include adding gravel as needed to the path to reduce potential exposure, creating a defined pathway and adding vegetation to the sides of the path to control traffic and prevent access to historically contaminated areas.					
Determine exposure risks to lead, arsenic, cadmium, and zinc on the path.	Concentration of total lead, arsenic, cadmium, and zinc on the surface of the path.	Three five-point composite samples will be collected from 0-0.5' from 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.	Data results will assist in defining any needed remedial action on the path.	<p><u>ICUP -1Comp (0-6")</u> As = 18 mg/kg Cd = 11.0 mg/kg Pb = 804 mg/kg Zn = 1780 mg/kg</p> <p><u>ICUP -2Comp (0-6")</u> As = 25.9 mg/kg Cd = 10.1 mg/kg Pb = 710 mg/kg Zn = 2350 mg/kg</p> <p><u>ICUP -3Comp (0-6")</u> As = 22 mg/kg Cd = 10.5 mg/kg Pb = 619 mg/kg Zn = 2050 mg/kg</p> <p>There 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 the southwestern extent. It is recommended that remedial action be taken to reduce human exposure along the path, preferably a cap of clean gravel and placement of vegetation to control foot traffic.</p>
Island Complex					
Bank Stabilization, bank slough, and upland remnant features – Previous data show some high levels of lead and other target metals in this area. Below the bank is a spawning bed for trout. Anticipated remedial action includes stabilization by adding riprap or bioengineering aspects and localized removal.					
Control future erosion of bank. Determine exposure risks to lead, arsenic, cadmium, and zinc on the bank slough material and the remnant bank features.	Concentration of total lead, arsenic, cadmium, and zinc.	One five-point composite sample will be collected from 0-1' (ILBS-1Comp) and analyzed for total metals.	Erosion of the Bank over time may have contributed contaminants to the 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.	Results will be compared to evaluation values, such as defined in Table A-2. Data results will assist in determining removal needs in the channel.	<p><u>ILBS-1Comp (0-1')</u> As = 27.8 mg/kg Cd = 10.5 mg/kg Pb = 648 mg/kg Zn = 2170 mg/kg</p> <p>Arsenic 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 removing contaminated material and replacing with clean material suitable for trout spawning habitat.</p>
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.	<p><u>ILBS-1Comp (0-1')</u> Cd = 13.6 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1300 ug/L</p> <p>All SPLP results were below evaluation values and onsite isolation or reuse from a leachability standpoint may be suitable.</p> <p>No grain size samples were collected from this area, therefore no frost susceptibility assessment was included.</p> <p>Moisture content</p> <p><u>ILBS-1Comp</u> 7.2% water</p>

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions
Determine requirements for off-site disposal of excavated material.	Toxic characteristics of excavated material.			Results will be compared to TCLP criteria in Table A-2, Analytical Results Evaluation Criteria. If < AL, material may be disposed of in a subtitle D landfill. If > AL, material transported off site would be disposed of in a subtitle C landfill.	<u>ILBS-1Comp (0-1')</u> Ag = 50 ug/L As = 230 ug/L Ba = 426 ug/L Cd = 32.5 ug/L Cr = 50.0 ug/L Pb = 125 ug/L Se = 250 ug/L All TCLP results were below evaluation criteria and if material is disposed off-site, it is likely that it may be disposed of in a subtitle D landfill. Confirmatory samples at the time of excavation may be needed to confirm this.
Island Complex					
Bar Deposit – Previous data from the eastern edge of the bar include capping with larger cobbles, stabilization, or removal of contaminated material and replacement with similar clean material to provide human health and ecological exposure protection. remedial options					
Determine exposure risks to lead, arsenic, cadmium, and zinc on the bar deposit.	Concentration of lead, arsenic, cadmium, and zinc on the ground surface from areas with no previous data.	Six discrete samples will be collected from 0-1' (ICB-1a through ICB-6a) and 1-2' (ICB-1b through ICB-6b). Samples will be analyzed for total metals.	The 6 discrete sample locations will be widely-spaced and placed over the entire bar deposit to get representation from the whole area. 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' material may be exposed.	Results will be compared to evaluation values, such as defined in Table A-2.	<p><u>ICB-1A (0-1')</u> As = 22 mg/kg Cd = 6.22 mg/kg Pb = 438 mg/kg Zn = 1980 mg/kg</p> <p><u>ICB-2A (0-1')</u> As = 18 mg/kg Cd = 8.92 mg/kg Pb = 550 mg/kg Zn = 1980 mg/kg</p> <p><u>ICB-3A (0-1')</u> As = 11 mg/kg Cd = 4.00 mg/kg Pb = 228 mg/kg Zn = 1070 mg/kg</p> <p><u>ICB-4A (0-1')</u> As = 20 mg/kg Cd = 6.70 mg/kg Pb = 507 mg/kg Zn = 1610 mg/kg</p> <p><u>ICB-5A (0-1')</u> As = 15 mg/kg Cd = 5.33 mg/kg Pb = 350 mg/kg Zn = 1180 mg/kg</p> <p><u>ICB-6A (0-1')</u> As = 28.8 mg/kg Cd = 4.80 mg/kg Pb = 445 mg/kg Zn = 4410 mg/kg</p> <p><u>ICB-1B (1-2')</u> As = 31.7 mg/kg Cd = 6.76 mg/kg Pb = 230 mg/kg Zn = 2130 mg/kg</p> <p><u>ICB-2B (1-2')</u> As = 18 mg/kg Cd = 10.9 mg/kg Pb = 468 mg/kg Zn = 2320 mg/kg</p> <p><u>ICB-3B (1-2')</u> As = 14 mg/kg Cd = 5.18 mg/kg Pb = 352 mg/kg Zn = 1260 mg/kg</p> <p><u>ICB-4B (1-2')</u> As = 14 mg/kg Cd = 4.99 mg/kg Pb = 287 mg/kg Zn = 1520 mg/kg</p> <p><u>ICB-5B (1-2')</u> As = 23.8 mg/kg Cd = 8.84 mg/kg Pb = 580 mg/kg Zn = 1580 mg/kg</p> <p><u>ICB-6B (1-2')</u> As = 24.3 mg/kg Cd = 4.57 mg/kg Pb = 366 mg/kg Zn = 5170 mg/kg</p> <p>Arsenic is above human health evaluation values at both the 0-1 and 1-2 foot depth intervals 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 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 exposure standpoint. If conservative options are preferable, then the site may undergo capping or excavation and replacement with clean material.</p>
Determine type of material that is suitable for a cap, if that were to be pursued as a component of the remedy.	Existing size of material	Existing size of material can be determined visually by a civil engineer. No samples are necessary.		Suitable material used for a cap would be determined by a civil engineer.	

Data Quality Objectives Table (Modified)

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 existing 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 design will use this data to determine replacement material requirements.												
Determine suitability of excavated material for reuse onsite.	Potential of lead and other metals leaching 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.	<table border="0"> <tr> <td><u>ICB-3A (0-1')</u> Cd = 6.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 663 ug/L</td> <td><u>ICB-2A (0-1')</u> Cd = 7.60 ug/L Cu ≤ 5.00 ug/L Pb = 31.3 ug/L Zn = 679 ug/L</td> </tr> <tr> <td><u>ICB-5B (1-2')</u> Cd = 7.5 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 767 ug/L</td> <td><u>ICB-6A (0-1')</u> Cd = 5.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1040 ug/L</td> </tr> <tr> <td><u>ICB-6B (1-2')</u> Cd = 6.20 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1020 ug/L</td> <td></td> </tr> </table> <p>1st tier SPLP data from 0-1' show no results above evaluation values.</p> <table border="0"> <tr> <td>Moisture content <u>ICB-3A (0-1')</u> 6.2% water</td> <td><u>ICB-2A (0-1')</u> 5.8% water</td> </tr> <tr> <td><u>ICB-5B (1-2')</u> 6.2% water</td> <td><u>ICB-6A (0-1')</u> 11.2% water</td> </tr> <tr> <td><u>ICB-6B (1-2')</u> 11.3% water</td> <td></td> </tr> </table>	<u>ICB-3A (0-1')</u> Cd = 6.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 663 ug/L	<u>ICB-2A (0-1')</u> Cd = 7.60 ug/L Cu ≤ 5.00 ug/L Pb = 31.3 ug/L Zn = 679 ug/L	<u>ICB-5B (1-2')</u> Cd = 7.5 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 767 ug/L	<u>ICB-6A (0-1')</u> Cd = 5.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1040 ug/L	<u>ICB-6B (1-2')</u> Cd = 6.20 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1020 ug/L		Moisture content <u>ICB-3A (0-1')</u> 6.2% water	<u>ICB-2A (0-1')</u> 5.8% water	<u>ICB-5B (1-2')</u> 6.2% water	<u>ICB-6A (0-1')</u> 11.2% water	<u>ICB-6B (1-2')</u> 11.3% water	
<u>ICB-3A (0-1')</u> Cd = 6.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 663 ug/L	<u>ICB-2A (0-1')</u> Cd = 7.60 ug/L Cu ≤ 5.00 ug/L Pb = 31.3 ug/L Zn = 679 ug/L																
<u>ICB-5B (1-2')</u> Cd = 7.5 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 767 ug/L	<u>ICB-6A (0-1')</u> Cd = 5.40 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1040 ug/L																
<u>ICB-6B (1-2')</u> Cd = 6.20 ug/L Cu ≤ 5.00 ug/L Pb ≤ 25.0 ug/L Zn = 1020 ug/L																	
Moisture content <u>ICB-3A (0-1')</u> 6.2% water	<u>ICB-2A (0-1')</u> 5.8% water																
<u>ICB-5B (1-2')</u> 6.2% water	<u>ICB-6A (0-1')</u> 11.2% water																
<u>ICB-6B (1-2')</u> 11.3% water																	

Data Quality Objectives Table (Modified)

Investigation Objectives	Data Requirements	Investigation Strategy	Sample Number and Location Rationale	Application	Conclusions
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.	<p>ICB-3A (0-1') Ag ≤ 50 ug/L As ≤ 225 ug/L Ba = 320 ug/L Cd = 19.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>ICB-1B (1-2') Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 632 ug/L Cd = 24.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>ICB-2A (0-1') Ag ≤ 50 ug/L As ≤ 230 ug/L Ba = 430 ug/L Cd = 41.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>ICB-5B (1-2') Ag ≤ 50.0 ug/L As ≤ 225 ug/L Ba = 335 ug/L Cd = 23.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>ICB-6A (0-1') Ag ≤ 50.0 ug/L As ≤ 225 ug/L Ba = 503 ug/L Cd = 18.5 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>1st and 2nd tier TCLP data show no results above evaluation values.</p>
Island Complex					
Fine Sandy Beach zone and associated bar deposit– The sandy zone is more accessible and has a higher human exposure risk. No previous data is available on this area. Remedial options include capping or removal of contaminated material as appropriate.					
Determine exposure risks to lead and arsenic.	Concentration of lead and arsenic from ground surface.	Samples will be collected from three locations (ICSB-1Comp, ICSB-2, ICSB-3) from the 0-1' interval and analyzed for total metals. ICSB-1Comp will be a 3-point composite collected from the western point of the fine sandy beach.	There are no previous data from this area. The sandy zone is small, but there is a higher accessibility to children. For this reason, samples will be collected and analyzed from three locations so that concentration and location of contamination in this area can be characterized.	Results will be compared to evaluation values, such as defined in Table A-2.	<p>ICSB-1Comp (0-1') As = 11 mg/kg Pb = 206 mg/kg</p> <p>ICSB-3 (0-1') As = 15 mg/kg Pb = 406 mg/kg</p> <p>Arsenic concentrations in the 0-1 foot depth interval ranged from 11 mg/kg to 20 mg/kg, above the evaluation value. No 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) were 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.</p>
Characterize existing material to determine replacement material needs if removal occurs.	Depth of the sand layer.	A hole will be dug to the depth of the sand layer, or to 3'. It will be no deeper than 3'. The depth of the sand layer will then be measured.	The area is already known to be sand, therefore, a grain size analysis is not needed. However, the depth of the sand layer is not known, and that information is needed for potential material replacement. One centrally placed location should be representative of the area.	Data will determine the needed depth of sand for replacement, if appropriate.	Test pit ICSB-1Comp was dug down to 3 feet and the sand layer was measured at 0-1.5 feet below ground surface. Therefore, if existing sand is excavated, 1.5 feet of clean sand will be needed for replacement material.
Assess materials to assist planning and determine disposal requirements if off site disposal of materials were to occur.	Toxic characteristics of excavated material.	If any samples contain total metals concentrations above the evaluation values, the sample with the highest concentration of metals will be analyzed for metals using TCLP.	By selecting the sample with the highest concentration of total metals above the evaluation values for TCLP analysis, a conservative determination can be made on the reuse and disposal characteristics of the fine sandy beach. Any 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 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.	<p>ICSB-2 (0-1') Ag ≤ 50.0 ug/L As ≤ 225 ug/L Ba = 262 ug/L Cd = 15.0 ug/L Cr ≤ 50.0 ug/L Pb ≤ 125 ug/L Se ≤ 250 ug/L</p> <p>TCLP data show no results above evaluation values.</p>

Appendix A
Photo Documentation



Photo 1. Island Complex Upland Path Test Pits



Photo 2. Island Complex Upland Path Sampling



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



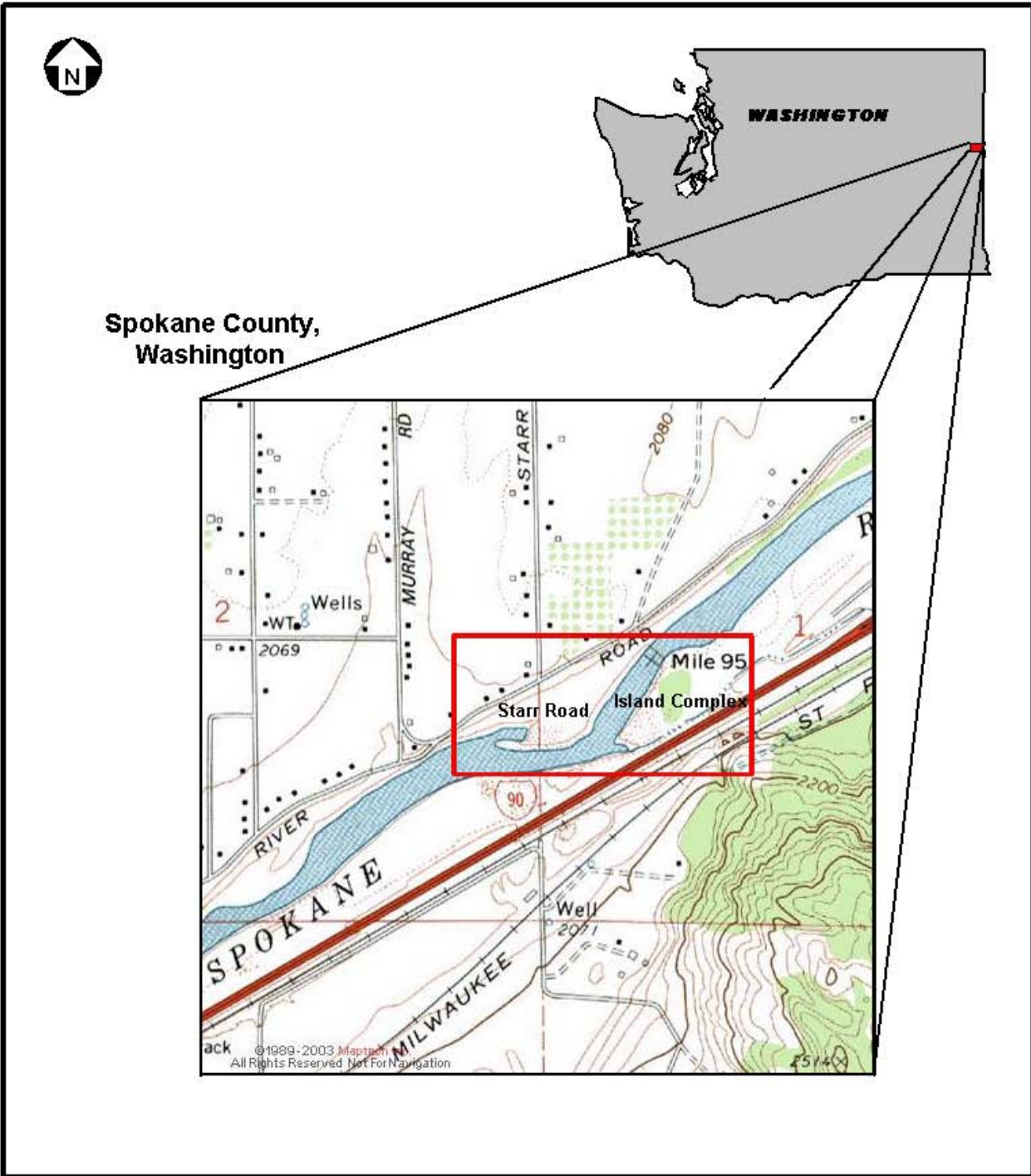
Photo 9. Starr Road Gravel Bar Test Pit



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



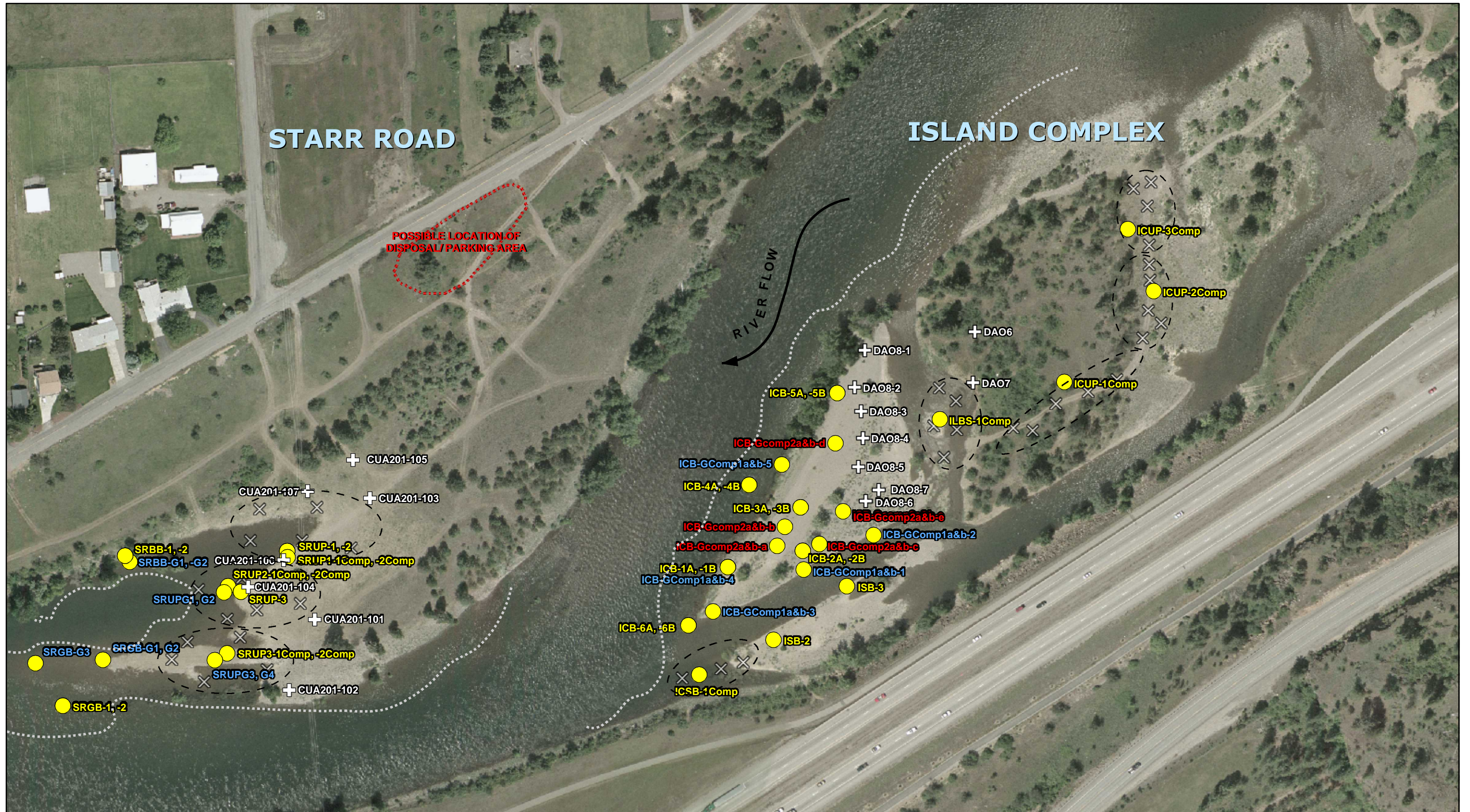
**LOCATION MAP
WASHINGTON RECREATION SITES INVESTIGATION**

**SPOKANE COUNTY, WASHINGTON VICINITY
Not to Scale**

Figure A-1



US Army Corps
of Engineers
Seattle District



	Sample Locations, August 2004*		Composite Areas
	Historical Sampling 1999, 2000		Approximate Water Line at Time of Sampling**
	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

Starr Road and Island Complex Sites

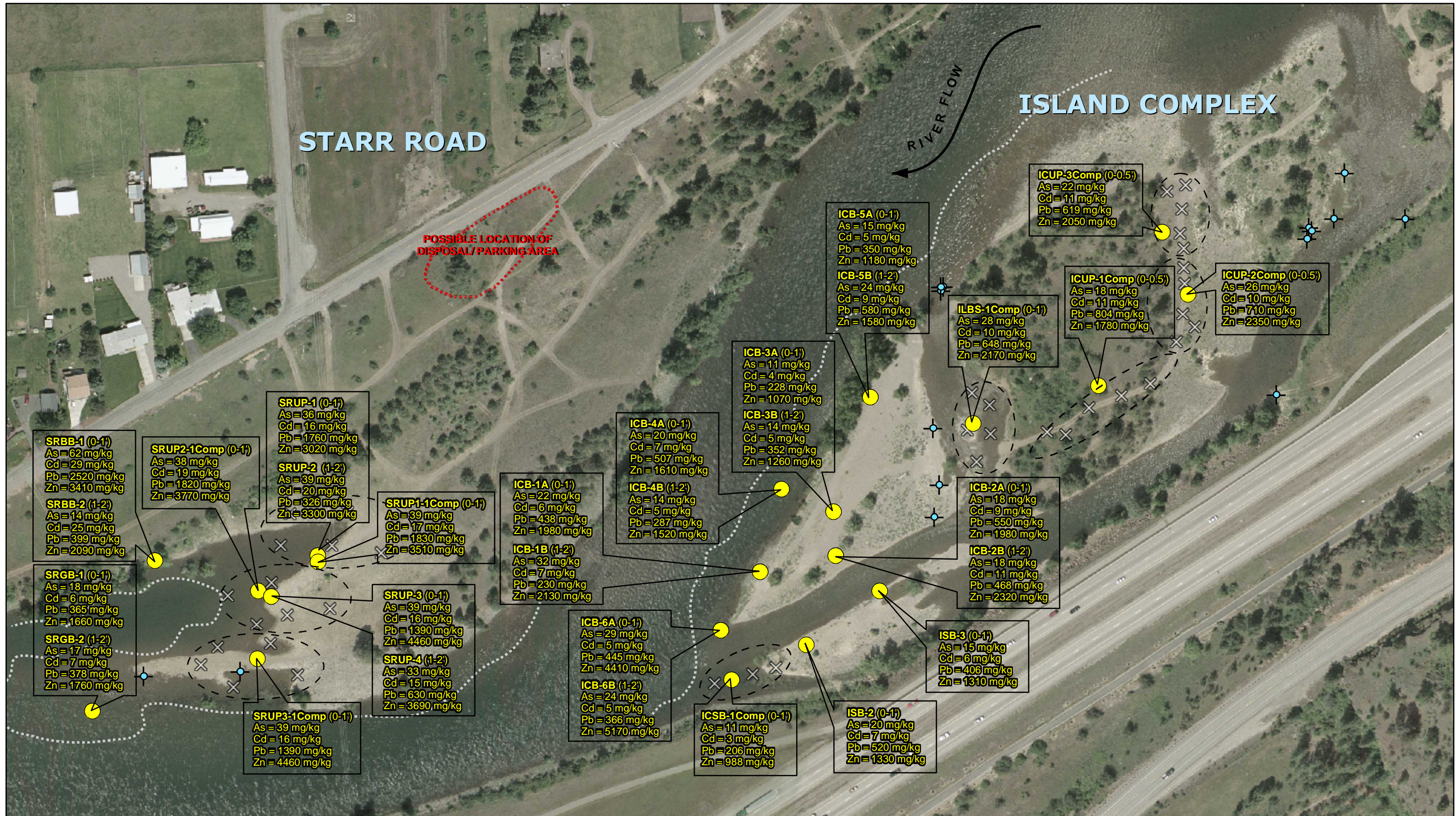
Washington Recreation Sites
Spokane River, WA

0 50 100 200 300 Feet

1 inch equals 150 feet



Photo Source: Avista, August 2003



SRBB-1 (0-1)
As = 62 mg/kg
Cd = 29 mg/kg
Pb = 2520 mg/kg
Zn = 3410 mg/kg

SRBB-2 (1-2)
As = 14 mg/kg
Cd = 25 mg/kg
Pb = 399 mg/kg
Zn = 2090 mg/kg

SRUP2-1Comp (0-1)
As = 38 mg/kg
Cd = 19 mg/kg
Pb = 1820 mg/kg
Zn = 3770 mg/kg

SRUP-1 (0-1)
As = 36 mg/kg
Cd = 16 mg/kg
Pb = 1760 mg/kg
Zn = 3020 mg/kg

SRUP-2 (1-2)
As = 39 mg/kg
Cd = 20 mg/kg
Pb = 326 mg/kg
Zn = 3300 mg/kg

SRUP1-1Comp (0-1)
As = 39 mg/kg
Cd = 17 mg/kg
Pb = 1830 mg/kg
Zn = 3510 mg/kg

SRUP-3 (0-1)
As = 39 mg/kg
Cd = 16 mg/kg
Pb = 1390 mg/kg
Zn = 4460 mg/kg

SRUP-4 (1-2)
As = 33 mg/kg
Cd = 15 mg/kg
Pb = 630 mg/kg
Zn = 3690 mg/kg

SRUP3-1Comp (0-1)
As = 39 mg/kg
Cd = 16 mg/kg
Pb = 1390 mg/kg
Zn = 4460 mg/kg

ICB-1A (0-1)
As = 22 mg/kg
Cd = 6 mg/kg
Pb = 438 mg/kg
Zn = 1980 mg/kg

ICB-1B (1-2)
As = 32 mg/kg
Cd = 7 mg/kg
Pb = 230 mg/kg
Zn = 2130 mg/kg

ICB-4A (0-1)
As = 20 mg/kg
Cd = 7 mg/kg
Pb = 507 mg/kg
Zn = 1610 mg/kg

ICB-4B (1-2)
As = 14 mg/kg
Cd = 5 mg/kg
Pb = 287 mg/kg
Zn = 1520 mg/kg

ICB-6A (0-1)
As = 29 mg/kg
Cd = 5 mg/kg
Pb = 445 mg/kg
Zn = 4410 mg/kg

ICB-6B (1-2)
As = 24 mg/kg
Cd = 5 mg/kg
Pb = 366 mg/kg
Zn = 5170 mg/kg

ICB-3A (0-1)
As = 11 mg/kg
Cd = 4 mg/kg
Pb = 228 mg/kg
Zn = 1070 mg/kg

ICB-3B (1-2)
As = 14 mg/kg
Cd = 5 mg/kg
Pb = 352 mg/kg
Zn = 1260 mg/kg

ICB-5A (0-1)
As = 15 mg/kg
Cd = 5 mg/kg
Pb = 350 mg/kg
Zn = 1180 mg/kg

ICB-5B (1-2)
As = 24 mg/kg
Cd = 9 mg/kg
Pb = 580 mg/kg
Zn = 1580 mg/kg

ICB-2A (0-1)
As = 18 mg/kg
Cd = 9 mg/kg
Pb = 550 mg/kg
Zn = 1980 mg/kg

ICB-2B (1-2)
As = 18 mg/kg
Cd = 11 mg/kg
Pb = 468 mg/kg
Zn = 2320 mg/kg

ISB-3 (0-1)
As = 15 mg/kg
Cd = 6 mg/kg
Pb = 406 mg/kg
Zn = 1310 mg/kg

ICSB-1Comp (0-1)
As = 11 mg/kg
Cd = 3 mg/kg
Pb = 206 mg/kg
Zn = 988 mg/kg

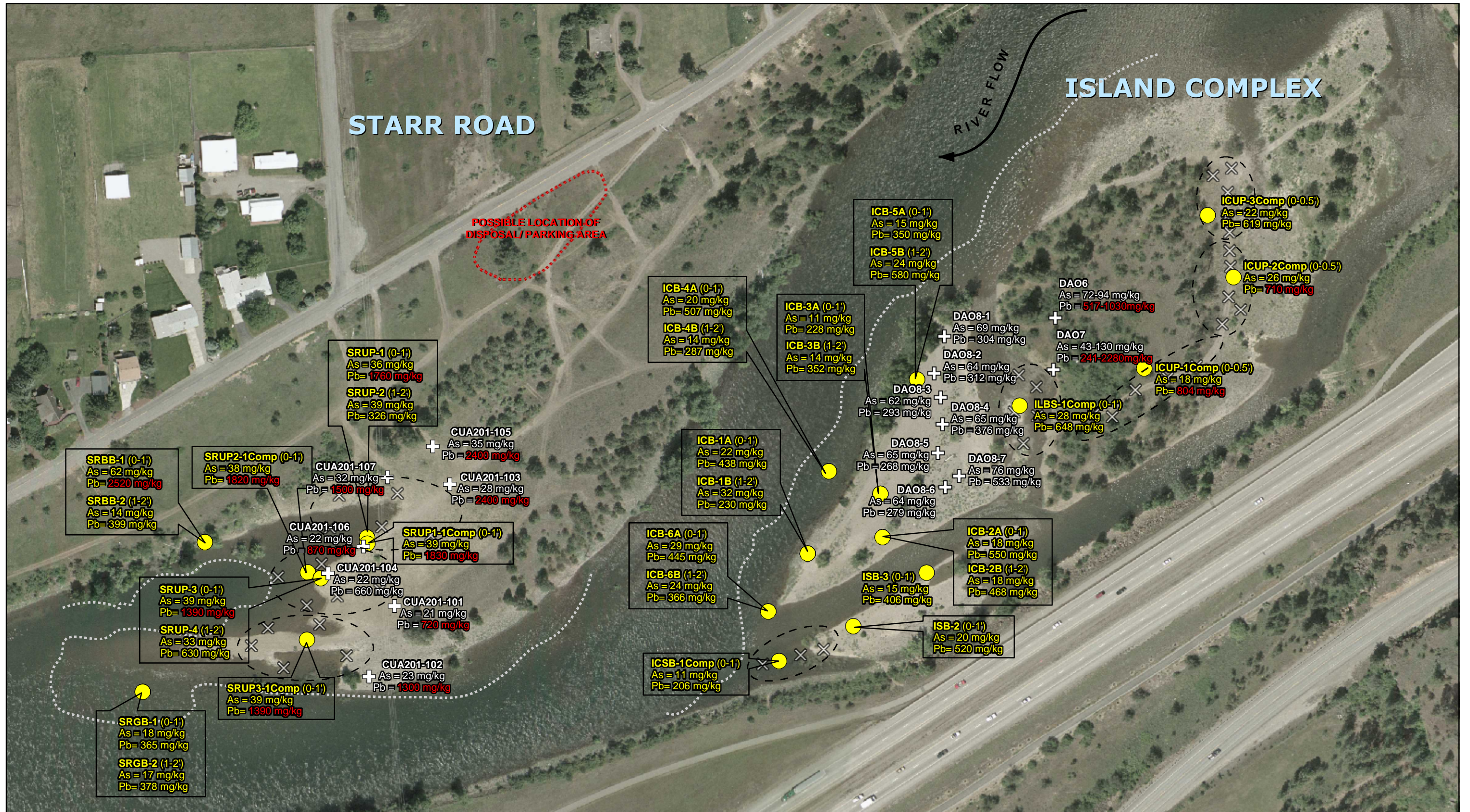
ISB-2 (0-1)
As = 20 mg/kg
Cd = 7 mg/kg
Pb = 520 mg/kg
Zn = 1330 mg/kg

ILBS-1Comp (0-1)
As = 28 mg/kg
Cd = 10 mg/kg
Pb = 648 mg/kg
Zn = 2170 mg/kg

ICUP-1Comp (0-0.5)
As = 18 mg/kg
Cd = 11 mg/kg
Pb = 804 mg/kg
Zn = 1780 mg/kg

ICUP-3Comp (0-0.5)
As = 22 mg/kg
Cd = 11 mg/kg
Pb = 619 mg/kg
Zn = 2050 mg/kg

ICUP-2Comp (0-0.5)
As = 26 mg/kg
Cd = 10 mg/kg
Pb = 710 mg/kg
Zn = 2350 mg/kg



Arsenic & Lead Results
Washington Recreation Sites
Spokane River, WA

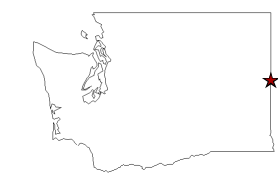
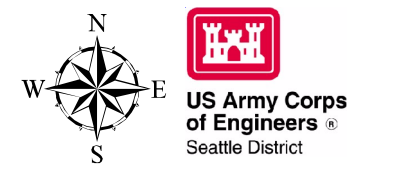


Photo Source: Avista, August 2003



Appendix C

Data Summary Tables

Metals and Moisture Content Results Table

Frost Susceptibility Determination by ASTM Method D422-63 Table

Particle Size Analysis Sheets

Metals and Moisture Content Results

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	U 230	U	U	U	225	U				225
Barium	100000	632	430			320	J				335
Cadmium	1000	24.0	41.5			19.0					23.0
Chromium	5000	50.0	U 50.0	U	U	50.0	U				50.0
Lead	2000	125	U 125	U	U	125	U				125
Selenium	1000	250	U 250	U	U	250	U				250
Silver	5000	50	UJ 50	UJ	UJ	50	UJ				50.0
SPLP Metals (ug/L)											
Cadmium	80			7.6		6.40					7.5
Copper	2200			5.00	U	5.00	U				5.00
Lead	400			31.3		25.0	U				25.0
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	700	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 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 Results Cont'd.

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-1 Comp	ICSB-2	ICSB-3	ICUP-1 Comp	ICUP-2 Comp	ICUP-3 Comp	ICUP-4 Comp (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	U			225	U				
Barium	100000	503				262					
Cadmium	1000	18.5				15.0					
Chromium	5000	50.0	U			50.0	U				
Lead	2000	125	U			125	U				
Selenium	1000	250	U			250	U				
Silver	5000	50.0	UJ			50.0	UJ				
SPLP Metals (ug/L)											
Cadmium	80	5.40	6.20								
Copper	2200	5.00	U	5.00	U						
Lead	400	25.0	U	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
Lead	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								

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.

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

Bold text indicates a detection.

Metals and Moisture Content Results Cont'd.

Sample ID	Evaluation	04344320	04344325	04344326	04344327	04344331	04344332	04344333	04344334	04344335	04344336
Sample Location	Value	ILBS-1Comp	SRGB-1	SRGB-2	SRGB-3 (F Dup)	SRUP-1	SRUP1-1Comp	SRUP1-2Comp	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	U 230			230	U 230		230	U 230
Barium	100000	426	J 340	J 324			552	611		464	J 467
Cadmium	1000	32.5	30.0	30.5			62.0	47.0		79.0	41.0
Chromium	5000	50.0	U 50.0	U 50			50.0	U 50.0		50.0	U 50.0
Lead	2000	125	U 125	U 125			125	U 125		129	125
Selenium	1000	250	U 250	U 250			250	U 250		250	U 250
Silver	5000	50	UJ 50	UJ 50			50.0	UJ 50		50	UJ 50
SPLP Metals (ug/L)											
Cadmium	80	13.6	9.30	9.60			36.6	25.4		36.2	20.3
Copper	2200	5.00	5.60	6.60			23.5	8.00		13.0	9.60
Lead	400	25.0	U 36.9	33.3			144	25.0		83.3	25.0
Zinc	28000	1300	816	827			2830	2110		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	6.2		6.5	6.9

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.

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

Bold text indicates a detection.

Metals and Moisture Content Results Cont'd.

Sample ID	Evaluation	04344337	04344338	04344339	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	8/18/04	8/18/04	8/18/04
Analyte							
TCLP Metals (ug/L)							
Arsenic	5000		225	U 230	U	230	U 230
Barium	100000		401	J 608	J	604	395
Cadmium	1000		38.5	57.5		112	53.5
Chromium	5000		50.0	U 50.0	U	50.0	U 50.0
Lead	2000		125	U 125	U	167	125
Selenium	1000		250	U 250	U	250	U 250
Silver	5000		50	UJ 50	UJ	50	UJ 50
SPLP Metals (ug/L)							
Cadmium	80		12.4	35.2		3.00	U 35.2
Copper	2200		7.10	13.5		5.00	U 8.30
Lead	400		90.8	40.9		36.3	25.0
Zinc	28000		1110	3120		121	J 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	700	1390	661		630	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 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.

Frost Susceptibility Determination Summary**Frost Susceptibility Determination 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

ASTM Method D422-63
Particle-Size Analysis of Soils

Sample ID **ICB-GComp1A** 04344321

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 (micron)	Percent Smaller 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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
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

Particle Size (micron)	Percent Smaller Than
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	0.71
3.3	0.66
2.8	0.63
1.3	0.53

Frost Susceptibility NO

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
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

Particle Size (micron)	Percent Smaller 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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
Particle-Size Analysis of Soils

Sample ID **ICB-GComp2B** 04344324

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 (micron)	Percent Smaller 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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
Particle-Size Analysis of Soils

Sample ID **SRUP-G1** 04344341

Sieve Analysis

Sieve Size	Percent Passing
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

Particle Size (micron)	Percent Smaller Than
41.5	1.94
30.4	1.75
19.7	1.60
14.2	1.48
10.2	1.36
8.4	1.31
5.9	1.29
3.5	1.16
1.3	0.87

Frost Susceptibility NO

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
Particle-Size Analysis of Soils

Sample ID **SRUP-G2** 04344342

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 (micron)	Percent Smaller 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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
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

Particle Size (micron)	Percent Smaller Than
39.8	0.43
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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
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 (micron)	Percent Smaller Than
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**

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
Particle-Size Analysis of Soils

Sample ID **SRBB-G1** 04344347

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

Particle Size (micron)	Percent Smaller Than
43.0	9.97
31.8	8.31
20.8	6.93
14.9	6.37
10.6	6.09
8.7	5.82
5.9	4.99
3.4	4.85
1.3	3.60

Frost Susceptibility YES

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

ASTM Method D422-63
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 (micron)	Percent Smaller 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

A material is susceptible to frost if 5 percent or more material is less than or equal to 0.075 mm (passes #200 sieve) or 3 percent or more material is less than or equal to 0.02 mm (20 micron) by the hydrometer analysis.

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).

Table 1. Number of Sample Analyses Performed or Archived

Analysis	Tier 1	Tier 2	Archived
	# of Sample 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 2. Sample Table Summary

Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Analysis				
								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	X	X	X
	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

Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Analysis					
								Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals	
		SRUP-2	04344334	1-2'	8/18/2004	1406	Primary			X			
	SRUP-3	SRUP-3	04344337	0-1'	8/18/2004	1350	Primary			X			
		SRUP-4	04344340	1-2'	8/18/2004	1352	Primary			X			
	SRUP1-1 SRUP1-2 SRUP1-3 SRUP1-4 SRUP1-5	SRUP1-1Comp	04344332	0-1'	8/18/2004	1433	Primary		X	X	X	X	
		SRUP1-2Comp	04344333	1-2'	8/18/2004	1425	Primary		X		X	X	
	SRUP2-1 SRUP2-2 SRUP2-3 SRUP2-4 SRUP2-5	SRUP2-1Comp	04344335	0-1'	8/18/2004	1451	Primary		X	X	X	X	
		SRUP2-2Comp	04344336	1-2'	8/18/2004	1500	Primary		X		X	X	
	SRUP3-1 SRUP3-2 SRUP3-3 SRUP3-4 SRUP3-5	SRUP3-1Comp	04344338	0-1'	8/18/2004	1536	Primary		X	X	X	X	
		SRUP3-2Comp	04344339	1-2'	8/18/2004	1530	Primary		X		X	X	
	SRUP-G1	SRUP-G1	SRUP-G1	04344341	0-1'	8/18/2004	1310	Primary	X				
		SRUP-G2	SRUP-G2	04344342	1-2'	8/18/2004	1305	Primary	X				
	SRUP-G3	SRUP-G3	SRUP-G3	04344343	0-1'	8/18/2004	1300	Primary	X				
		SRUP-G4	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	Primary			X			

Table 2. Sample Table Summary

Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Analysis				
								Grain size/Frost Susceptibility	Moisture Content	Total Metals	SPLP Metals	TCLP Metals
	ICUP1Comp4 ICUP1Comp5	ICUP-4Comp	04344319	0-0.5"	8/17/2004	1115	Field Duplicate			X		
	ICUP2Comp1 ICUP2Comp2 ICUP2Comp3 ICUP2Comp4 ICUP2Comp5	ICUP-2comp	04344317	0-0.5"	8/17/2004	1015	Primary			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	A	A
	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	X	A	A
		ICB-3A	04344304	0-1'	8/17/2004	1414	Primary		X	X	x	x
	ICB-3	ICB-3B	04344305	1-2'	8/17/2004	1431	Primary		X	X	A	A
	ICB-4	ICB-4A	04344306	0-1'	8/17/2004	1338	Primary		X	X	A	A
		ICB-4B	04344307	1-2'	8/17/2004	1353	Primary		X	X	A	A

Table 2. Sample Table Summary

Site/Area	Test Pit ID	Sample ID	Lab ID	Depth (bgs)	Date	Time	Sample Type	Analysis				
								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-5	ICB-5A	04344308	0-1'	8/17/2004	1246	Primary		X	X	A	A
		ICB-5B	04344309	1-2'	8/17/2004	1307	Primary		X	X	X	X
	ICB-6	ICB-6A	04344310	0-1'	8/17/2004	1523	Primary		X	X	X	X
		ICB-6B	04344311	1-2'	8/17/2004	1534	Primary		X	X	X	A
	ICBGComp1-1	ICB-GComp1A	04344321	0-1'	8/18/2004	0900	Primary	X				
	ICBGComp1-2											
	ICBGComp1-3	ICB-GComp1B	04344322	1-2'	8/18/2004	0915	Primary	X				
	ICBGComp1-4											
	ICBGComp1-5											
	ICBGComp2-1	ICB-GComp2A	04344323	0-1'	8/18/2004	0945	Primary	X				
	ICBGComp2-2											
	ICBGComp2-3	ICB-GComp2B	04344324	1-2'	8/18/2004	0930	Primary	X				
	ICBGComp2-4											
	ICBGComp2-5											
Island Complex/Fine Sandy Beach	ICSB1Comp-1	ICSB-1Comp	04344313	0-1'	8/17/2004	1646	Primary			X		A
	ICSB1Comp-2											
	ICSB1Comp-3											
	ICSB-2	ICSB-2	04344314	0-1'	8/17/2004	1655	Primary			X		X
	ICSB-3	ICSB-3	04344315	0-1'	8/17/2004	1655	Primary			X		A

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.

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

Corps Sample ID.	Lab Sample ID.	Type	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	

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. Reporting Limits

Analyte	Project-required Sensitivity 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

Washington Recreation Sites
Sample Table

Location	sample ID	Depth	Date	Time	Grain Size First Sieve - bucket	Moisture Content - %	Total Metals # 10 Sieve	SPLP 3/8 in Sieve	TCLP 5/16 in Sieve	Notes
Starr Road / Gravel Bar	SRGB-1	0-1'	8/18/04	1323		X (1)	X (2)	X (1)		
	SRGB-2	0-1'	8/18/04	1324		X (1)	X (2)	X (1)		
	SRGB-2	1-2'	8/18/04	1325		X (1)	X (1)	X (1)	Had only enough for 1 T. metals container	
Starr Road / Backwater Beach	SRGB-61	0-1'	8/18/04	1250	X (1)					
	SRGB-62	1-2'	8/18/04	1230	X (1)					
	SRGB-63	0-1'	8/18/04	1245	X (1)					
Starr Road / upland	SRBB-1	0-1'	8/18/04	1355		X (1)	X (2)	X (1)	+ MS(MSD)	
	SRBB-2	1-2'	8/18/04	1349		X (1)	X (2)	X (1)		
	SRBB-61	0-1'	8/18/04	1215	X (1)					
	SRBB-62	1-2'	8/18/04	1210	X (1)					
Starr Road / upland	SRUP-1	0-1'	8/18/04	1411			X (2)			
	SRUP-2	1-2'	8/18/04	1406			X (2)			
	SRUP-3	0-1'	8/18/04	1350			X (2)			
	SRUP-4	1-2'	8/18/04	1352			X (2)			
	SRUP1-1	SRUP1-comp	0-1'	8/18/04	1433	X (1)	X (2)	X (1)	X (1)	5 pt composite for each
	SRUP1-2		1-2'	8/18/04	1425	X (1)	X (2)	X (1)	X (1)	
	SRUP1-3		0-1'	8/18/04	1451	X (1)	X (2)	X (1)	X (1)	
	SRUP1-4		1-2'	8/18/04	1500	X (1)	X (2)	X (1)	X (1)	
	SRUP1-5		0-1'	8/18/04	1536	X (1)	X (2)	X (1)	X (1)	
	SRUP2-1	SRUP2-comp	0-1'	8/18/04	1500	X (1)	X (2)	X (1)	X (1)	5 pt composite for each
	SRUP2-2		1-2'	8/18/04	1530	X (1)	X (2)	X (1)	X (1)	
	SRUP2-3		0-1'	8/18/04	1536	X (1)	X (2)	X (1)	X (1)	
	SRUP2-4		1-2'	8/18/04	1530	X (1)	X (2)	X (1)	X (1)	
	SRUP2-5		0-1'	8/18/04	1530	X (1)	X (2)	X (1)	X (1)	
	SRUP3-1	SRUP3-comp	0-1'	8/18/04	1310	X (1)				5 pt composite for each
SRUP3-2	1-2'		8/18/04	1305	X (1)					
SRUP3-3	0-1'		8/18/04	1300	X (1)					
SRUP3-4	1-2'		8/18/04	1240	X (1)					
SRUP3-5	0-1'		8/18/04	1240	X (1)					
* optional	SRUP-61	0-1'	8/18/04	1310	X (1)					
	SRUP-62	1-2'	8/18/04	1305	X (1)					
* optional	SRUP-63	0-1'	8/18/04	1300	X (1)					
	SRUP-64	1-2'	8/18/04	1240	X (1)					

28 10 12 = 48

Location	Sample ID	Depth	Date	Time	Grain Size / Frost Susc. / Moisture Content	(# jars)			Notes	
						Total Metals #10 sieve	SPLP #18 in sieve	TUAP #25 in sieve		
Island complex / Upland Path	ICUP-1 comp 1-1, 1-2, 1-3, 1-4, 1-5	0-0.5'	8/17/04	1057		X(2)			5 pt comp. for each field QC	
	ICUP-1 comp 2-1, 2-2, 2-3, 2-4, 2-5	0-0.5'	8/17/04	1115		X(2)				
	ICUP-2 comp 1-1, 1-2, 1-3, 1-4, 1-5	0-0.5'	8/17/04	1015		X(2)				
Island complex / Little Bank Separation	ICUP-2 comp 2-1, 2-2, 2-3, 2-4, 2-5	0-0.5'	8/17/04	0939		X(2)			5 pt composite	
	ICUP-3 comp 1-1, 1-2, 1-3, 1-4, 1-5	0-0.5'	8/17/04	0939		X(2)				
	ICUP-3 comp 2-1, 2-2, 2-3, 2-4, 2-5	0-0.5'	8/17/04	0939		X(2)				
Island complex / Bar Deposit	ICB-1a	0-1'	8/17/04	1140	X(1)	X(2)	X(1)	X(1)	used 64 oz jars for moisture content samples 1a & 1b + MS/MSD 2 total metals, 2 MS, 2 MSD jars	
	ICB-1b	1-2'	8/17/04	1505	X(1)	X(2)	X(1)	X(1)		
	ICB-2a	0-1'	8/17/04	1667	X(1)	X(2)	X(1)	X(1)		
	ICB-2b	1-2'	8/17/04	1614	X(1)	X(2)	X(1)	X(1)		
	ICB-3a	0-1'	8/17/04	1414	X(1)	X(2)	X(1)	X(1)		
	ICB-3b	1-2'	8/17/04	1431	X(1)	X(2)	X(1)	X(1)		
	ICB-4a	0-1'	8/17/04	1338	X(1)	X(2)	X(1)	X(1)		
	ICB-4b	1-2'	8/17/04	1353	X(1)	X(2)	X(1)	X(1)		
	ICB-5a	0-1'	8/17/04	1246	X(1)	X(2)	X(1)	X(1)		
	ICB-5b	1-2'	8/17/04	1307	X(1)	X(2)	X(1)	X(1)		
	ICB-6a	0-1'	8/17/04	1522	X(1)	X(2)	X(1)	X(1)		
	ICB-6b	1-2'	8/17/04	1534	X(1)	X(2)	X(1)	X(1)		
	ICB-6 comp 1-1, 1-2, 1-3, 1-4, 1-5	0-1'	8/18/04	0900	0915	X(1)				5 pt composite
	ICB-6 comp 2-1, 2-2, 2-3, 2-4, 2-5	1-2'	8/18/04	0915	0915	X(1)				
	ICB-6 comp 2-a, 2-b, 2-c, 2-d, 2-e	0-1'	8/18/04	0945	0945	X(1)				
ICB-6 comp 2-f	1-2'	8/18/04	0930	0930	X(1)					
ICB-6 comp 2-g	1-2'	8/18/04	0930	0930	X(1)					
Island complex / Fine Sand Beach	ICSB-1 comp 1-1, 1-2, 1-3	0-1'	8/17/04	1646		X(2)	X(1)	X(1)	3 pt composite Depth of Sand Layer = (No deeper than 3')	
	ICSB-2	0-1'	8/17/04	1655		X(2)	X(1)	X(1)		
	ICSB-3	0-1'	8/17/04	1703		X(2)	X(1)	X(1)		

Grain Size Analysis - Amount to collect

Nominal Diameter of largest particle in. (mm)	Minimum mass (g) (lbs)
3/8 inches	1.1 pounds
3/4	2.2
1	4.4
1 1/2	6.6
2	8.8
3	11

Total Metals

sufficient fines - 2 8oz jars
 Little/few fines - 3 8oz jars

SPLP + TCLP

Dry, no standing liquid - 1 8oz jar
 wet - 2 8oz jars

Moisture Content

material \leq 3/4 inch - 1 32 oz container
 material = 1 1/2 inch - 1 64 oz container
 material \geq 1 1/2 inch - 2 64 oz containers
 Saturated - Do not collect sample -
 Note saturation

Washington Recreation Sites

Field Notes

8/16/04

personnel - Marlene Dawag, Sarah Bates

Drove to the site from Seattle. Left Seattle

at 0800, Arrived at site about 1330.

Staked Locations at Island Complex. AT ~~2:00~~ 1500

went to River Road + Starr Road to meet

utility locate people, waited there for 30 minutes

No one came called AT&T and comcast,

electric Light wave, Kootenai electric coop

Quest local network had marked cable (orange)

at the site. Also called following companies

to verify that the area was free of

utilities (They were):

Referenced

AT&T - 1-800-252-1133

Ticket number

comcast

4257006

Electric Light wave

509-924-7980

Kootenai Electric COOP

Quest Local network

Avista - 509-495-4152

Community Cable Service - 509-624-4140

Consolidated Irrigation District - 509-924-3655

Liberty Lake Sewer and water - 509-922-5443

Spokane County Engineer Roads Dept - 509-477-3600

Touch America - 206-275-6772

Washington State Dept of Transportation - 509-324-6555

Area is utility cleared.

1100 - Left site for Hotel

8/17/04

0800 - Arrived on-site, waiting for backhoe operator.

will begin at Island complex.

0815 - met backhoe operator - Steve

0922 - Began excavating sample holes w/ ICUP-3 comp

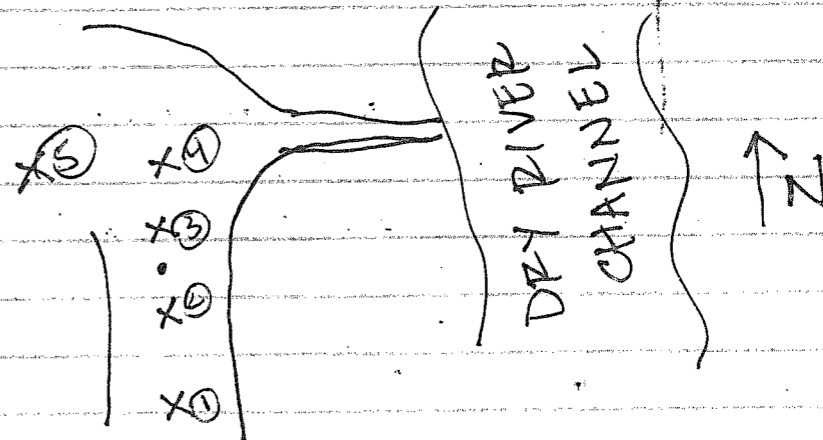
Surface of path

- mix of river rocks

Cobbles

Gravel

grasses on sides of path



X → sample locations for ICUP-3 comp

burnt log

soil in sample holes

large river rock

cobbles

Gravel

finer

gravelly sand w/ cobbles (largest size 6")

0930 - began sampling holes used sufficient fines collected 2 jars - holes filled after sampling

(•) → coordinates: N 47° 41' 31.6" W 117° 3' 46.62"

Datum: WGS 84

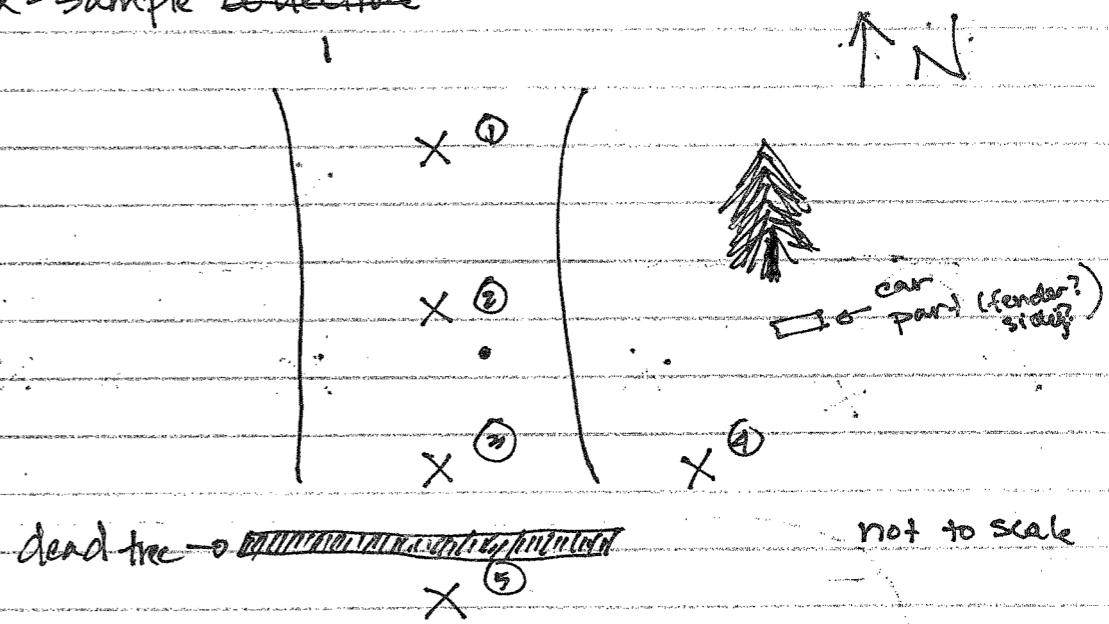
GPS

Sample #	Way Pts
ICUP-3comp	045
ICUP-2comp	046
ICUP-1comp	047
HSBS-1comp	048
ICB-5	049
ICB-4	050
ICB-3	051
ICB-1	052
ICB-6	053
ICB-2	054
ISB-3	055
ISB-2	056
ISB-1comp	059

8/17/04

ICUP - 2 comp - 5 pt composite

X-sample location collection



- holes
- ① sandy gravel w/ cobbles (max size 6")
 - ② gravelly sand w/ cobbles
 - ④ gravelly sand w/ cobbles
 - ③ ④ gravelly sand w/ lots of cobbles (avg size 1-2")
 - ⑤ gravelly sand w/ cobbles (max size 6")

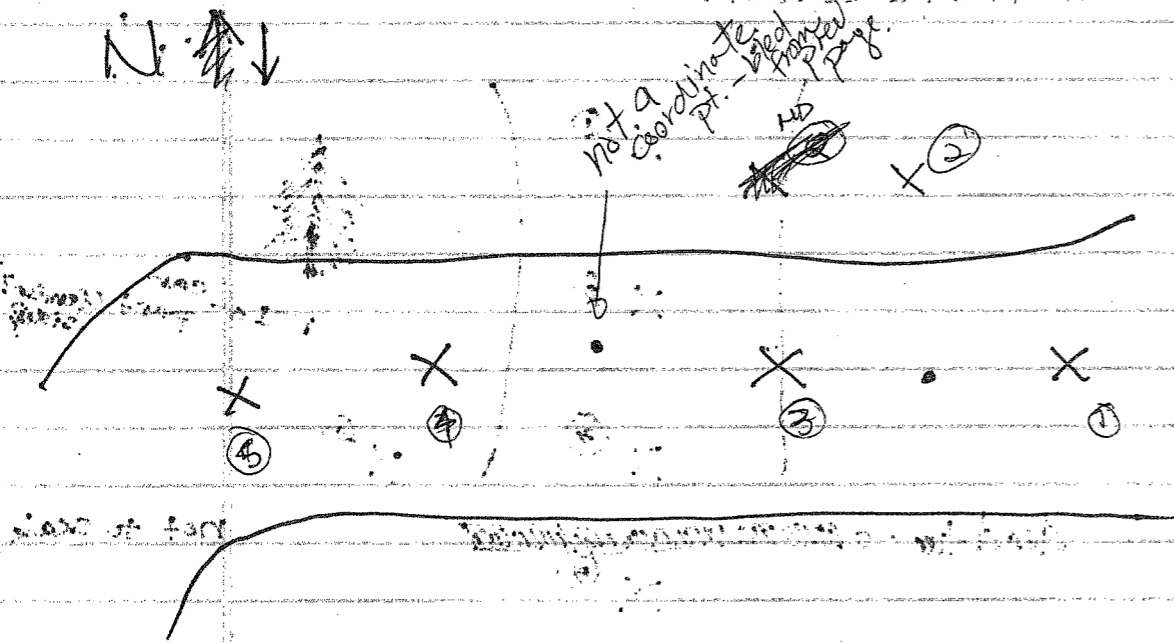
(•) Coordinates N 47° 41' 30.6"
W 117° 03' 46.2"

10/11/12

ICUR-1 Comp & ICUR-4 Comp (QC)
 X - v sample location

N ↓

not a coordinate pt. -
 red X
 HD



- ① mostly gravel w/ fines some sand, organic layer on top
- ② mostly gravel w/ sand & cobbles, large organic layer on top
- ③ mostly gravel w/ sand, organic layer on top
- ④ mostly gravel w/ cobbles, some sand
- ⑤ mostly gravel w/ cobbles, some sand

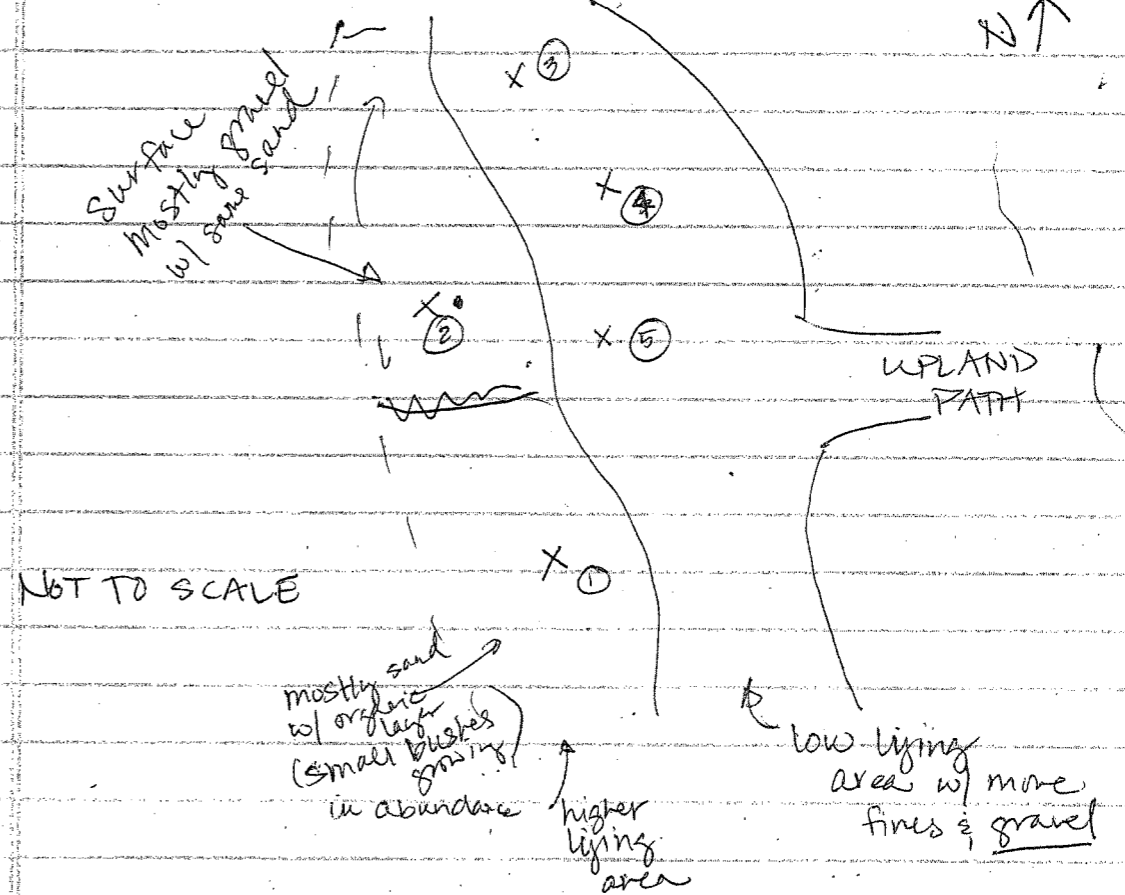
at this location, sand in low spots of path w/ more cobbles/gravel on high spots

(.) Coordinates N 47° 41' 29.2"
 W 117° 03' 48.3"

ILBS - 1 Comp

X - v sample locations

N ↑



NOT TO SCALE

- ① mostly sand w/ fines or organic layer on top
- ② mostly gravel w/ sand, occasional cobble (max size 3")
- ③ mostly gravel w/ sand & fines some cobble (max size 1")
- ④ mostly gravel w/ cobbles & sand organic layer some
- ⑤ mostly gravel w/ sand occasional cobble (max size 3")

some organics shot # 67
 shot # 68

(.) Coordinates N 47° 41' 28.7"
 W 117° 03' 51.3"

8/17/04

Sample ICB-5a (0-1') ~~org~~
 5b (1-2') ← approximate location noted on map

0-1' organic layer (lots of plant roots)
 w/ sandy gravel w/ cobbles (max size 3")

1-2' Same as 0-1' but no organic layer

Coordinates N 47° 41' 29.2"
 W 117° 03' 53.7"

Sample ICB-4a (0-1')
 4b (1-2')

Soil in hole
 gravely sand w/ ~~some~~ few cobbles (max 3")
 (thin-out depth)

Coordinates N 47° 41' 27.8"
 W 117° 03' 55.9"

Sample ICB-3a (0-1')
 3b (1-2')

Soil in hole
 0-1' - gravely sand w/ few cobbles (max 3")
 1-2' - gravely sand w/ cobbles (max 6")

Coordinates N 47° 41' 27.4"
 W 117° 03' 54.7"

8/17/04

C

Sample ICB 1A (0-1')
 1B (1-2')

Pics #71 & #72
 0-1' Cobble w/ ^{same} sandy gravel ~~at top~~ (max cobbles 12")
 1-2' mostly cobbles w/ gravelly sand
 ↳ w/ large rocks > 12"

Coordinates N 47° 41' 26.5"
 W 117° 03' 56.5"

Sample ICB 6A (0-1')
 6B (1-2')

Pics #73 & 74
 0-1' mostly gravel w/ cobbles (max size cobbles 3")
 1-2' mostly gravel w/ cobbles (max size cobbles 5")

Coordinates N 47° 41' 25.6"
 W 117° 03' 57.5"

Sample ICB 2A (0-1')
 2B (1-2')

0-1' sandy gravel w/ some organics
 1-2' mostly gravel w/ some sand & few cobbles (max cobbles size 3")

Pics #75
 Coordinates N 47° 41' 26.7"
 W 117° 03' 54.7"

8/17/04

8/17/04

Sample ICSB-3 (0-1')

Soil in hole mostly sandy w/ gravel
some cobbles (max size 3")

1720 left site toward car.

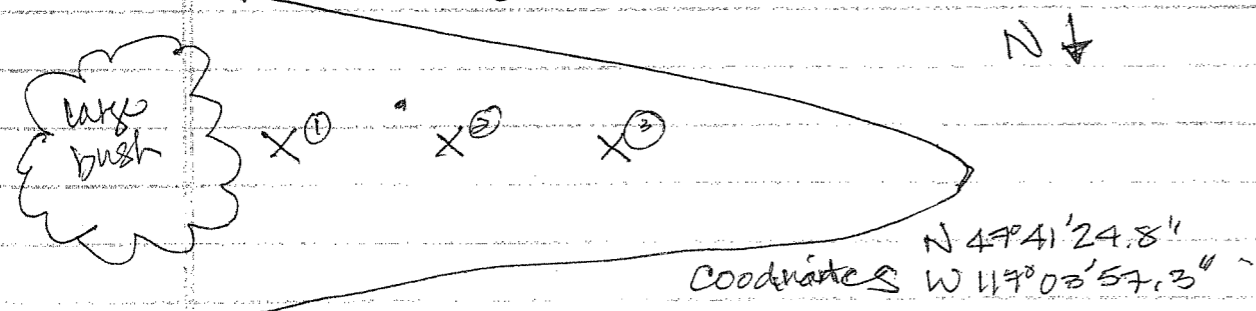
1730 Steve (backhoe operator) off-clock

pic # 76 Coordinates N 47° 41' 26.1"
W 117° 03' 53.7"

Sample ICSB-2 (0-1')
mostly cobbles w/ gravel some sand
cobble max size 5"

pic # 77 Coordinates N 47° 41' 25.3"
W 117° 03' 55.5"

sample ICSB-1 comp 0-1' X = sample point



pic # 78 ① dug down to 3' → sandy layer 0-1.5'

pic # 79 ② mostly ~~gravel~~ sandy gravel

pic # 80 ③ mostly gravelly sand w/ some cobbles (max 3")

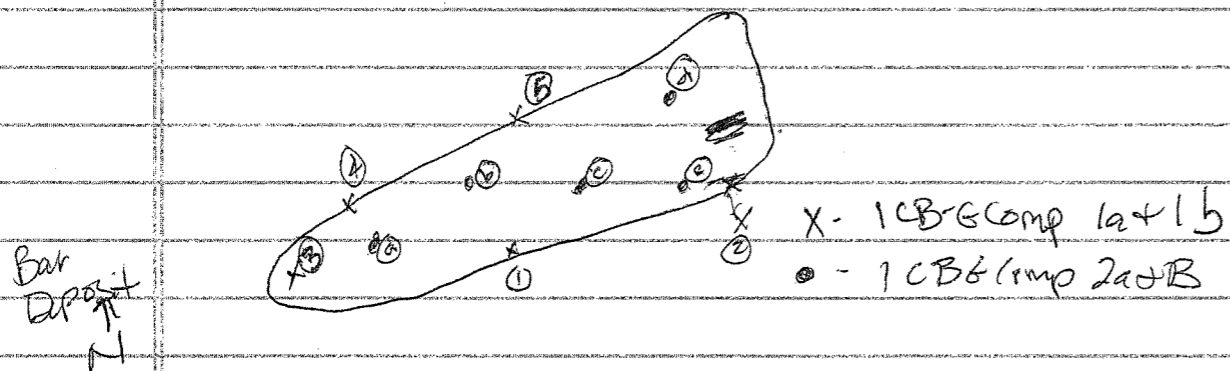
8/18/04
Field Notes

0800 Arrive at site - Steve (backhoe) not here yet

0820 - Steve Arrived

0852 marked GS sample locations

charged approach. 1 5-pt camp will be collected from points on perimeter of bar deposit one will be collected from points in middle of bar deposit.



① gravelly sand largest size 2" pic #81

~~WP60~~ coordinates N 47° 41' 26.4" W 117° 3' 54.7" WP60

② sandy gravel ~~gravelly sand~~ largest size 4" pic #82

coordinates N 47° 41' 26.9" W 117° 3' 53" WP61

③ ~~sandy gravel~~ gravelly sand w/ cobbles largest 6" pic #83

coordinates N 47° 41' 25.8" W 117° 3' 56.9" WP62

④ river rocks w/ some gravelly sand pic #84

removed 1', 6" & 4" river rock from samples 0-1'

removed 3-6" & 3-4" river rock from sample 1-2'

WP63 coord: N 47° 41' 26.5" W 117° 3' 56.5"

⑤ ~~gravelly sand~~ sandy gravel largest 1" pic #85

coordinates: N 47° 41' 28.1" W 117° 3' 55.1" WP64

⑥ sandy gravel largest size 3" pic #86

coordinates N 47° 41' 26.8" W 117° 3' 54.3" WP65

⑦ sandy gravel pic #87

removed 5" rock from 1-2' sample

coordinates N 47° 41' 26.8" W 117° 3' 55.3" WP66

⑧ sandy gravel largest 2" pic #88

coordinates N 47° 41' 27.1" W 117° 3' 55.1" WP67

⑨ sandy gravel largest 2" pic #89

coordinates N 47° 41' 27.3" W 117° 3' 53.7" ~~WP68~~ WP68

⑩ sandy gravel largest 1" pic #90

coordinates N 47° 41' 28.4" W 117° 3' 53.8" ~~WP69~~ WP69

1000 Left Island Complex Site

1045 Arrived at Starr Rd noted that gated didn't have a combo lock but horse shoe ^{clamps} ~~both~~ cables.

Starr Rd T

8/18/04

1100 went to store to buy wrenches to open gate
1200 returned and opened gate to Starr Rd

Grain size samples

SRGB-G1 & G2 (0-1 & 1-2) pic#91
gravelly sand max size <1"

Coordinates N 47° 41' 25.5" WP71
W 117° 04' 11.5"

SRGB-G3 (0-1) Pic#92
sandy gravel & some moisture

Coordinates N 47° 41' 25.5" WP70
W 117° 04' 13.1"

SRUP G3 & G4 (0-1 & 1-2) pic#93
cobbles w/ gravelly sand
largest size 6"

Coordinates N 47° 41' 25.4" WP72
W 117° 04' 08.8"

SRUP G1 & G2 (0-1 & 1-2) Pic#94
sandy gravel w/ cobbles largest size 3"
Coordinates N 47° 41' 26.5" WP73
W 117° 04' 08.5"
some moisture

pic#95 SRUP SRBB-G1 & G2 (0-1 & 1-2)
gravelly sand w/ some cobbles largest size 3"
Coordinates N 47° 41' 27.0" WP74
W 117° 04' 10.7"

sample SRGB1 (0-1')
-2 (1-2')
0-1 gravel w/ some sand
1-2 gravel w/ sand & some cobbles (max size 4")
slight moisture
Coordinates N 47° 41' 24.8" WP75
W 117° 04' 12.5"

@ 1328 Very, very hot! slight breeze from E

sample SRUP-3 (0-1') time sampled ~~1330~~ 1345
-4 (1-2') 1330
0-1 cobbles w/ sand & gravel photo #96
1-2 "
Coordinates N 47° 41' 26.5" WP76
W 117° 04' 08.1"

sample SRUP1-1 Comp
1-2 Comp
Coordinates taken

8/18/04

SRBB-1 (0-1')

-2' (1-2')

Photo # 97

0-1 gravel w/ organics/sand

1-2 gravel

Coordinates N 47° 41' 27.1" WP77

W 117° 04' 10.8"

SRUP-1 (0-1')

Photo # 98

-2' (1-2')

0-1 gravel w/ sand

1-2 gravel & cobbles max size 3"

Coordinates N 47° 41' 27.1" WP78

W 117° 04' 07.0"

SRUP1-1 comp (0-1') mostly gravelly sand unless noted below

1-2 comp (1-2')

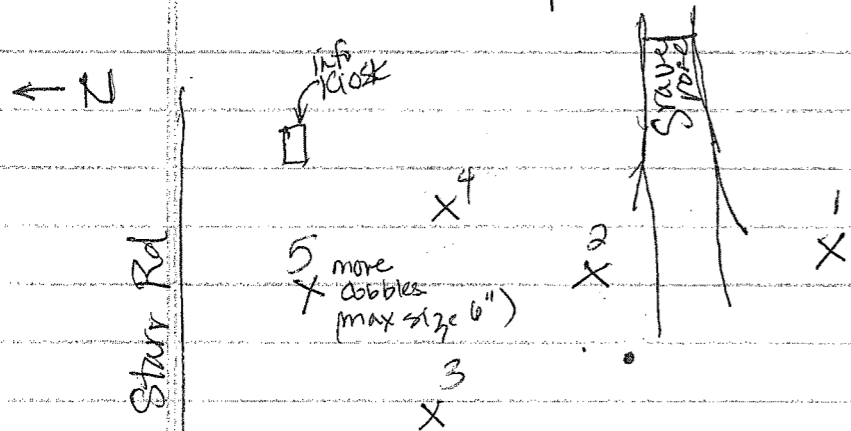


Photo # 99

X - sample locations (~20' apart)

• - coordinates N 47° 41' 27.0" WP79

W 117° 04' 07.0"

8/18/04

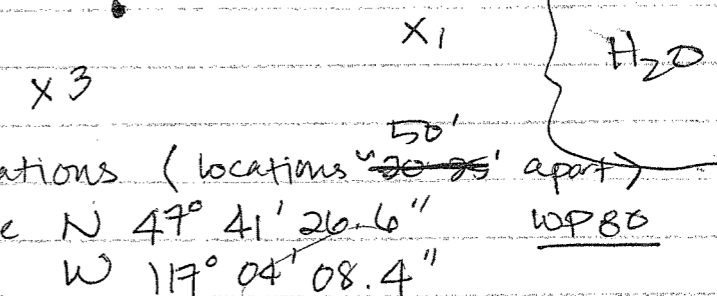
SRUP2-1 comp (0-1')

2-2 comp (1-2)

mostly gravelly sandy gravel unless noted below

5 sandy gravel w/ cobbles (max 4")
 X 4 more gravel w/ some cobbles (max 3")
 X 2 sand from 6"-2"

N ↓



X - sample locations (locations ~20-25' apart)

• - coordinate N 47° 41' 26.6" WP80

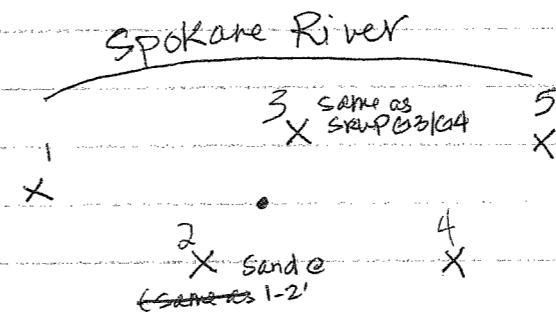
W 117° 04' 08.4"

SRUP3-1 comp (0-1')

3-2 comp (1-2)

most holes gravelly sand unless noted

N ↓



X - sample locations (locations ~20-25' apart)

• - coordinate N 47° 41' 25.5" WP81

W 117° 04' 08.5"

1630 - Backhoe operator left
We sieved sample + prepped containers
1830 - finished ~~sample~~ containerizing samples,
cleaned up, packed + leaving site.



**USEPA Contract Laboratory Program
Generic Chain of Custody**

Reference Case:

R

Client No:

Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex O Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Relinquished By (Date / Time) Received By (Date / Time) 1 <i>Sarah Bauer</i> 8/20/04 10:29 <i>Sarah Bauer</i> 8/20/04 10:30 2 3 4	Sampler Signature: <i>Sarah Bauer</i>
--	---	---	--

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		QC Type
04344300	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	ICB-1A	S: 8/17/2004	14:49	--
04344301	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(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 Complete? <i>NY</i>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
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**

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EPA USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case:

R

Client No:

Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex OI Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Sampler Signature: <i>Sarah Bates</i> <table border="1"> <tr> <th>Relinquished By</th> <th>(Date / Time)</th> <th>Received By</th> <th>(Date / Time)</th> </tr> <tr> <td>1 <i>Sarah Bates</i></td> <td><i>8/20/04 02:00</i></td> <td><i>Dave [unclear]</i></td> <td><i>8/20/04 10:30</i></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </table>	Relinquished By	(Date / Time)	Received By	(Date / Time)	1 <i>Sarah Bates</i>	<i>8/20/04 02:00</i>	<i>Dave [unclear]</i>	<i>8/20/04 10:30</i>	2				3				4			
Relinquished By	(Date / Time)	Received By	(Date / Time)																			
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2																						
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4																						

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		QC Type
04344307	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(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 Complete? <i>NY</i>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
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**

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Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex O Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Relinquished By (Date / Time) Received By (Date / Time) 1 <i>Shah Bate</i> 8/20/04 10:30 <i>Shah Bate</i> 8/20/04 10:30 2 3 4	Sampler Signature: <i>Shah Bate</i>
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SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	QC Type
04344315	Surface Soil (0"-12")/ Bates, Dawag	/G	TCLP-Met (21), Total Meta (21)	(Not preserved) (3)	ICSB-3	S: 8/17/2004 17:03	--
04344316	Surface Soil (0"-12")/ Bates, Dawag	/C	Total Meta (21)	(Not preserved) (2)	ICUP-1Comp	S: 8/17/2004 10:57	--
04344317	Surface Soil (0"-12")/ Bates, Dawag	/C	Total Meta (21)	(Not preserved) (2)	ICUP-2Comp	S: 8/17/2004 10:15	--
04344318	Surface Soil (0"-12")/ Bates, Dawag	/C	Total Meta (21)	(Not preserved) (2)	ICUP-3Comp	S: 8/17/2004 9:39	--
04344319	Surface Soil (0"-12")/ Bates, Dawag	/C	Total Meta (21)	(Not preserved) (2)	ICUP-4Comp	S: 8/17/2004 11:15	Field Duplicate
04344320	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (6)	ILBS-1Comp	S: 8/17/2004 11:40	--
04344321	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp1A	S: 8/18/2004 9:00	--
04344322	Subsurface Soil (>12")/ Bates, Dawag	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp1B	S: 8/18/2004 9:15	--
04344323	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp2A	S: 8/18/2004 9:45	--

Shipment for Case Complete <i>NY</i>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
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

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**USEPA Contract Laboratory Program
Generic Chain of Custody**

Reference Case:

R

Client No:

Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex OI Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Sampler Signature: <i>Donna W. Bates</i> <table border="1"> <tr> <th>Relinquished By</th> <th>(Date / Time)</th> <th>Received By</th> <th>(Date / Time)</th> </tr> <tr> <td>1 <i>Donna W. Bates</i></td> <td><i>8/20/04 6:24</i></td> <td><i>Donna W. Bates</i></td> <td><i>8/20/04 10:50</i></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </table>	Relinquished By	(Date / Time)	Received By	(Date / Time)	1 <i>Donna W. Bates</i>	<i>8/20/04 6:24</i>	<i>Donna W. Bates</i>	<i>8/20/04 10:50</i>	2				3				4			
Relinquished By	(Date / Time)	Received By	(Date / Time)																			
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SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		QC Type
04344324	Subsurface Soil (>12")/ Bates, Dawag	/C	ASTM 4222 (21)	(Not preserved) (1)	ICB-GComp2B	S: 8/18/2004	9:30	-
04344325	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRGB-1	S: 8/18/2004	13:23	-
04344326	Subsurface Soil (>12")/ Bates, Dawag	/G	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	-
04344328	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G1	S: 8/18/2004	12:50	-
04344329	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G2	S: 8/18/2004	12:30	-
04344330	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRGB-G3	S: 8/18/2004	12:45	-
04344331	Surface Soil (0"-12")/ Bates, Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-1	S: 8/18/2004	14:11	-
04344332	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRUP1-1Comp	S: 8/18/2004	14:33	-

Shipment for Case Complete? <i>NY</i>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
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**

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**USEPA Contract Laboratory Program
Generic Chain of Custody**

Reference Case:

R

Client No:

Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex O Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Sampler Signature: <i>Janah Bates</i> <table border="1"> <thead> <tr> <th>Relinquished By</th> <th>(Date / Time)</th> <th>Received By</th> <th>(Date / Time)</th> </tr> </thead> <tbody> <tr> <td>1 <i>Janah Bates</i></td> <td><i>8/20/2004</i></td> <td><i>Donnelly</i></td> <td><i>8/20/04 10:30</i></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Relinquished By	(Date / Time)	Received By	(Date / Time)	1 <i>Janah Bates</i>	<i>8/20/2004</i>	<i>Donnelly</i>	<i>8/20/04 10:30</i>	2				3				4			
Relinquished By	(Date / Time)	Received By	(Date / Time)																			
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SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		QC Type
04344333	Subsurface Soil (>12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21)	(Not preserved) (3)	SRUP1-2Comp	S: 8/18/2004	14:25	--
04344334	Subsurface Soil (>12")/ Bates, Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-2	S: 8/18/2004	14:06	--
04344335	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRUP2-1Comp	S: 8/18/2004	14:51	--
04344336	Subsurface Soil (>12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21)	(Not preserved) (3)	SRUP2-2Comp	S: 8/18/2004	15:00	--
04344337	Surface Soil (0"-12")/ Bates, Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-3	S: 8/18/2004	13:50	--
04344338	Surface Soil (0"-12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRUP3-1Comp	S: 8/18/2004	15:36	--
04344339	Subsurface Soil (>12")/ Bates, Dawag	/C	ASTM D 221 (21), S-Metals (21), TCLP-Met (21)	(Not preserved) (3)	SRUP3-2Comp	S: 8/18/2004	15:30	--
04344340	Subsurface Soil (>12")/ Bates, Dawag	/G	Total Meta (21)	(Not preserved) (2)	SRUP-4	S: 8/18/2004	13:52	--
04344341	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRUP-G1	S: 8/18/2004	13:10	--

Shipment for Case Complete? <i>NY</i>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
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**

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EPA USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case: **R**
 Client No:

Region: 10 Project Code: TEC-618V Account Code: 04T10P302DD2C102QLA00 CERCLIS ID: Spill ID: Site Name/State: CDA BH Mining & Metallurgical Complex OI Project Leader: Ravi Sanga Action: Remedial Investigation Sampling Co: USACE	Date Shipped: 8/20/2004 Carrier Name: Hand Delivery Airbill: Shipped to: EPA Manchester Laboratory 7411 Beach Drive East Port Orchard WA 98366 (360) 871-8728	Chain of Custody Record Sampler Signature: <i>[Signature]</i> <table border="1"> <tr> <th>Relinquished By</th> <th>(Date / Time)</th> <th>Received By</th> <th>(Date / Time)</th> </tr> <tr> <td>1 <i>[Signature]</i></td> <td>8/20/04 10:50</td> <td><i>[Signature]</i></td> <td>8/20/04 10:50</td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> </table>	Relinquished By	(Date / Time)	Received By	(Date / Time)	1 <i>[Signature]</i>	8/20/04 10:50	<i>[Signature]</i>	8/20/04 10:50	2				3				4			
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SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	QC Type
04344342	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRUP-G2	S: 8/18/2004 13:05	--
04344343	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRUP-G3	S: 8/18/2004 13:00	--
04344344	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRUP-G4	S: 8/18/2004 12:40	--
04344345	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (9)	SRBB-1	S: 8/18/2004 13:55	--
04344346	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM D 221 (21), S-Metals (21), TCLP-Met (21), Total Meta (21)	(Not preserved) (5)	SRBB-2	S: 8/18/2004 13:49	--
04344347	Surface Soil (0"-12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRBB-G1	S: 8/18/2004 12:15	--
04344348	Subsurface Soil (>12")/ Bates, Dawag	/G	ASTM 4222 (21)	(Not preserved) (1)	SRBB-G2	S: 8/18/2004 12:10	--

Shipment for Case Complete? <input checked="" type="checkbox"/>	Sample(s) to be used for laboratory QC: 04344304, 04344345	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key: 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	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____

TR Number: 10-533326683-081904-0001

REGION COPY

SOILS CHECK LIST

1. Guide for Written Soils Description

- a. Classification
 - b. Plasticity (Record PI, when available)
 - c. Relative Density or Consistency
 - d. Moisture (Record %, when available)
 - e. Color
- Example: SP-SM, gravelly sand (fine)
w/silt, cobbles (8"), NP,
Medium, Wet, Gray

2. Representation of Minor Constituents

- a. Less than 5% by weight - Not Recorded
- b. Between 5% and 12% by weight - Classification with (w/) Minority
- c. Greater than 12% by weight - Predominate Minority precedes classification

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 Occasional (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)
 - Loose - Sand and/or gravel which can be excavated with a shovel
 - 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)

5. Moisture

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

I. Dilatancy:

a. After removing particles larger than No. 40 sieve size, prepare a pat of moist soil 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.

II. 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 possesses 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 lose 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	04344301	04344302	04344303	04344304	04344305
	04344306	04344307	04344308	04344309	04344310	04344311
	04344312	04344313	04344314	04344315	04344316	04344317
	04344318	04344319				
Set #2	04344320	04344325	04344326	04344327	04344331	04344332
	04344334	04344335	04344337	04344338	04344340	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 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 biased high. 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 biased low. 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

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	Type:	Reg sample
Station Description:	ICB-1A		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	22	mg/Kg	
	7440439	6.22	mg/Kg	
	7439921	438	mg/Kg	
	7440666	1980	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:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-1B		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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

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
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-2A		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	18 mg/Kg
	7440439	Cadmium	8.92 mg/Kg
	7439921	Lead	550 mg/Kg
	7440666	Zinc	1980 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:	04344303
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-2B		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
Prep Method	: 3050B			
Analytes(s):	7440382	18	mg/Kg	
	7440439	10.9	mg/Kg	
	7439921	468	mg/Kg	
	7440666	2320	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:	04344304
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-3A		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	11	mg/Kg	
	7440439	4.00	mg/Kg	
	7439921	228	mg/Kg	
	7440666	1070	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	Type:	Duplicate
Station Description:			

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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	Type:	Matrix Spike
Station Description:			

	Result	Units	Qlfr
MET			
Parameter : Metals, ICP-SAS			
Method : 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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	Type:	Matrix Spike Dupl
Station Description:			

	Result	Units	Qlfr
MET			
Parameter : Metals, ICP-SAS			
Method : 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method : 3050B			
Analytes(s): 7440666	Zinc		NA
Surrogate(s): 7440382	Arsenic	99	%Rec
7440439	Cadmium	96	%Rec
7439921	Lead	89	%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:	04344305
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-3B		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	14	mg/Kg	
	7440439	5.18	mg/Kg	
	7439921	352	mg/Kg	
	7440666	1260	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:	04344306
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-4A		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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	Type:	Reg sample
Station Description:	ICB-4B		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
Prep Method	: 3050B			
Analytes(s):	7440382	14	mg/Kg	
	7440439	4.99	mg/Kg	
	7439921	287	mg/Kg	
	7440666	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	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344308
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-5A		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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

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	Type:	Reg sample
Station Description:	ICB-5B		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	23.8 mg/Kg
	7440439	Cadmium	8.84 mg/Kg
	7439921	Lead	580 mg/Kg
	7440666	Zinc	1580 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:	04344310
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-6A		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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:	TEC-618V	Collected:	8/17/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344311
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-6B		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	24.3	mg/Kg	
	7440439	4.57	mg/Kg	
	7439921	366	mg/Kg	
	7440666	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	Type:	Reg sample
Station Description:	ICB-7B		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	14	mg/Kg	
	7440439	4.69	mg/Kg	
	7439921	274	mg/Kg	
	7440666	1490	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:	04344313
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICSB-1Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	11 mg/Kg
	7440439	Cadmium	3.39 mg/Kg
	7439921	Lead	206 mg/Kg
	7440666	Zinc	988 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	Type:	Reg sample
Station Description:	ICSB-2		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	20	mg/Kg	
	7440439	7.12	mg/Kg	
	7439921	520	mg/Kg	
	7440666	1330	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:	04344315
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICSB-3		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	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:	TEC-618V	Collected:	8/17/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344316
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICUP-1Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	18 mg/Kg
	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

Project Code:	TEC-618V	Collected:	8/17/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344317
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICUP-2Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	25.9 mg/Kg
	7440439	Cadmium	10.1 mg/Kg
	7439921	Lead	710 mg/Kg
	7440666	Zinc	2350 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:	04344318
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICUP-3Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	22 mg/Kg
	7440439	Cadmium	10.5 mg/Kg
	7439921	Lead	619 mg/Kg
	7440666	Zinc	2050 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:	04344319
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICUP-4Comp		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
Prep Method	: 3050B			
Analytes(s):	7440382	19	mg/Kg	
	7440439	11.6	mg/Kg	
	7439921	847	mg/Kg	
	7440666	1890	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:	04344320
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ILBS-1Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(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
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRGB-1		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	18 mg/Kg
	7440439	Cadmium	5.69 mg/Kg
	7439921	Lead	365 mg/Kg
	7440666	Zinc	1660 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:	04344326
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRGB-2		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	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

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
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRGB-3		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	19	mg/Kg	
	7440439	5.74	mg/Kg	
	7439921	374	mg/Kg	
	7440666	1670	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:	04344331
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP-1		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	35.5	mg/Kg	
	7440439	16.0	mg/Kg	
	7439921	1760	mg/Kg	
	7440666	3020	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:	04344332
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP1-1Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	39.3 mg/Kg
	7440439	Cadmium	16.6 mg/Kg
	7439921	Lead	1830 mg/Kg
	7440666	Zinc	3510 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:	04344334
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP-2		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344335
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP2-1Comp		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	38.4	mg/Kg	
	7440439	18.8	mg/Kg	
	7439921	1820	mg/Kg	
	7440666	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	Type:	Reg sample
Station Description:	SRUP3		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	38.8
	7440439	Cadmium	16.2
	7439921	Lead	1390
	7440666	Zinc	4460
			mg/Kg
			mg/Kg
			mg/Kg
			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:	04344338
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP3-1Comp		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	22 mg/Kg
	7440439	Cadmium	8.90 mg/Kg
	7439921	Lead	661 mg/Kg
	7440666	Zinc	2040 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:	04344340
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRUP-4		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	32.7	mg/Kg	
	7440439	14.5	mg/Kg	
	7439921	630	mg/Kg	
	7440666	3690	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:	04344345
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRBB-1		

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method :	3050B		
Analytes(s):	7440382	Arsenic	62.4 mg/Kg
	7440439	Cadmium	29.1 mg/Kg
	7439921	Lead	2520 mg/Kg
	7440666	Zinc	3410 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	Type:	Duplicate
Station Description:			

	Result	Units	Qlfr
MET			
Parameter :	Metals, ICP-SAS		
Method :	200.7 ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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	Type:	Matrix Spike
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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:	TEC-618V	Collected:	8/18/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344346
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	SRBB-2		

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
Prep Method	: 3050B			
Analytes(s):	7440382	14	mg/Kg	
	7440439	24.5	mg/Kg	
	7439921	399	mg/Kg	
	7440666	2090	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:	MXS040913A
Account Code:	04T10P302DD2C102QLA00	Type:	Blank
Station Description:			

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-SAS				
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
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:	MXS040913A
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (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	Type:	Blank
Station Description:			

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-SAS				
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)			
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	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-SAS			
Method	: 200.7	ICP Inductively Coupled Plasma-Atomic Emission Spectroscopy (22 elements)		
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.

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 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 biased high. 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 biased low. 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

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	Type:	Reg sample
Station Description:	ICB-3A		

		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	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			
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	Type:	Post Spike
Station Description:			

	Result	Units	Qlfr
MET			
Parameter : Metals, ICP-TCLP			
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	Type:	Matrix Spike
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-TCLP			
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-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Surrogate(s):	7440439	Cadmium	104	%Rec
	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	Type:	Matrix Spike Dupl
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-TCLP			
Method	: 1311	TCLP Extraction-Metals		
Prep Method	: 1311			
Surrogate(s):	7440382	Arsenic	106	%Rec
	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-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Surrogate(s):	7440439	Cadmium	106	%Rec
	7440508	Copper	113	%Rec
	7439921	Lead	110	%Rec
	7440666	Zinc	94	%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:	04344320
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ILBS-1Comp		

		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	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 Spectrometry, 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

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

		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	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 Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1312			
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	Type:	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	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-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1312			
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

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

		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	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-Atomic Emission Spectrometry, 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

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

		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	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 Emission Spectrometry, SW-846 (22 elements)			
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	Type:	Reg sample
Station Description:	SRUP1-2Comp		

		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	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, SW-846 (22 elements)			
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	Type:	Reg sample
Station Description:	SRUP2-1Comp		

		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	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-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1312				
Analytes(s):	7440439	Cadmium	36.2	ug/L	
	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	Type:	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	Type:	Reg sample
Station Description:	SRUP2-2Comp		

		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	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 Spectrometry, SW-846 (22 elements)				
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	Type:	Reg sample
Station Description:	SRUP3-1Comp		

		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	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-Atomic Emission Spectrometry, SW-846 (22 elements)				
Prep Method	: 1312				
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	Type:	Reg sample
Station Description:	SRUP3-2Comp		

		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	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-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1312				
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	Type:	Reg sample
Station Description:	SRBB-1		

		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	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-Atomic Emission Spectrometry, 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	Type:	Reg sample
Station Description:	SRBB-2		

		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	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-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1312			
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	Type:	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	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: Metals, ICP-TCLP			
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	Type:	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

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

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:	MXE040913A
Account Code:	04T10P302DD2C102QLA00	Type:	Blank
Station Description:			

		Result	Units	Qlfr	
MET					
Parameter	: SPLP-ICP				
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, 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	46.9	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:	MXE040913A
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-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

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

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Liquid
Project Officer:	RAVI SANGA	Sample Number:	MXW040915B
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
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			
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 Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Analytes(s):	7440439	3.00	ug/L	U
	7440508	5.00	ug/L	U
	7439921	25	ug/L	U
	7440666	5.0	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:	MXW040916
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, 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	Type:	Blank
Station Description:			

	Result	Units	Qlfr
MET			
Parameter : Metals, ICP-TCLP			
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	Type:	Spike Blank
Station Description:			

	Result	Units	Qlfr
MET			
Parameter : Metals, ICP-TCLP			
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.

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 biased high. 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 biased low. 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

Project Code:	TEC-618V	Collected:	8/17/04
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-1B		

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-TCLP				
Method	: 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)				
Prep Method	: 1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	632	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

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:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	Duplicate
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				
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

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:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	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			
Surrogate(s): 7440224	Silver	95	%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:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	Matrix 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			
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

Project Code:	TEC-618V	Collected:	
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344301
Account Code:	04T10P302DD2C102QLA00	Type:	Matrix Spike Dupl
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			
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
Project Name:	CDA BH MINING & METALLURGICAL	Matrix:	Solid
Project Officer:	RAVI SANGA	Sample Number:	04344302
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-2A		

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-TCLP				
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1311				
Analytes(s):	7440382	Arsenic	230	ug/L	U
	7440393	Barium	430	ug/L	
	7440439	Cadmium	41.5	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 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	
	7440666	Zinc	679	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:	04344302
Account Code:	04T10P302DD2C102QLA00	Type:	Duplicate
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Analytes(s):	7440439	Cadmium	7.80	ug/L
	7440508	Copper	5.00	ug/L U
	7439921	Lead	32.4	ug/L
	7440666	Zinc	691	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:	04344302
Account Code:	04T10P302DD2C102QLA00	Type:	Matrix Spike
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Surrogate(s):	7440439	109	%Rec	
	7440508	104	%Rec	
	7439921	107	%Rec	
	7440666	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	Type:	Matrix Spike Dupl
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
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
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-5B		

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-TCLP				
Method	: 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)				
Prep Method	: 1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	335	ug/L	
	7440439	Cadmium	23.0	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 Emission Spectrometry, SW-846 (22 elements)				
Prep Method	: 1312				
Analytes(s):	7440439	Cadmium	7.50	ug/L	
	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	767	ug/L	

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	Type:	Reg sample
Station Description:	ICB-6A		

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-TCLP				
Method	: 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)				
Prep Method	: 1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	503	ug/L	
	7440439	Cadmium	18.5	ug/L	
	7440473	Chromium	50.0	ug/L	U
	7439921	Lead	125	ug/L	U
	7782492	Selenium	250	ug/L	U
	7440224	Silver	50.0	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	5.40	ug/L	
	7440508	Copper	5.00	ug/L	U
	7439921	Lead	25.0	ug/L	U
	7440666	Zinc	1040	ug/L	

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:	04344311
Account Code:	04T10P302DD2C102QLA00	Type:	Reg sample
Station Description:	ICB-6B		

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Analytes(s):	7440439	Cadmium	6.20	ug/L
	7440508	Copper	5.00	ug/L U
	7439921	Lead	25.0	ug/L U
	7440666	Zinc	1020	ug/L

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	Type:	Reg sample
Station Description:	ICSB-2		

		Result	Units	Qlfr	
MET					
Parameter	: Metals, ICP-TCLP				
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)			
Prep Method	: 1311				
Analytes(s):	7440382	Arsenic	225	ug/L	U
	7440393	Barium	262	ug/L	
	7440439	Cadmium	15.0	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

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	Type:	Blank
Station Description:			

		Result	Units	Qlfr	
MET					
Parameter	: SPLP-ICP				
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, 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

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

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-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

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

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

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

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Analytes(s):	7440439	3.00	ug/L	U
	7440508	5.0	ug/L	U
	7439921	25.0	ug/L	U
	7440666	5.00	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:	MXW041007
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
Station Description:			

		Result	Units	Qlfr
MET				
Parameter	: SPLP-ICP			
Method	: 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846 (22 elements)		
Prep Method	: 1312			
Surrogate(s):	7440439	Cadmium	115	%Rec
	7440508	Copper	108	%Rec
	7439921	Lead	113	%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:	Solid
Project Officer:	RAVI SANGA	Sample Number:	MXW041008
Account Code:	04T10P302DD2C102QLA00	Type:	Blank
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				
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

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:	MXW041008
Account Code:	04T10P302DD2C102QLA00	Type:	Spike Blank
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			
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