CERCLA

NON-TIME CRITICAL REMOVAL ACTION MEMORANDUM
RED DEVIL MINE SITE
RED DEVIL, ALASKA

June 13, 2014

BUREAU OF LAND MANAGEMENT
ALASKA STATE OFFICE
222 West 7th Avenue, #13
Anchorage, Alaska 99513

I. PURPOSE

This Action Memorandum documents the basis for the Bureau of Land Management's (BLM) decision to conduct a non-time critical removal action in response to releases and threatened releases of hazardous substances at the Red Devil Mine (RDM) site. This action is being taken pursuant to the BLM's authority under Section 104(a) of the Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA), 42 U.S.C. 9606 and Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan, (NCP), 40 C.F.R. Part 300.

The BLM has determined it is necessary to take a CERCLA non-time critical removal action to abate threats posed by the migration of tailings into the Kuskokwim River via Red Devil Creek associated with tailings that contain of mercury and arsenic concentrations above risk-based levels.

II. SITE CONDITIONS AND BACKGROUND

A. Site Conditions and Location

The RDM is an abandoned mercury mine and ore processing facility located on public lands managed by BLM. Tailings generated by historical mining and ore processing operations dominate the central area of the site (known as the Main Processing Area) and have been identified as the primary source of mercury, arsenic, and antimony being released to the environment. Tailings are currently migrating into the Kuskokwim River via Red Devil Creek.

Previous investigations and/or removal actions have identified impacts through the mining operations and waste sources in the following general areas:

- The Main Processing Area.
- Red Devil Creek, extending from a reservoir south of the site to the creek's delta at its confluence with the Kuskokwim River.
- The area west of the Main Processing Area where historical surface exploration and mining occurred, referred to as the Surface Mined Area. The Surface Mined Area is underlain by the area of underground mine workings. The "Dolly Sluice" and "Rice Sluice" and their respective deltas on the banks of the Kuskokwim River are associated with the Surface Mined Area.
- Sediments in the Kuskokwim River.

The Main Processing Area contains most of the former site structures and is where ore beneficiation and mineral processing were conducted. The area is split by Red Devil Creek. Underground mine openings (shafts and adits) and ore processing and mine support facilities (housing, warehousing, and so forth) were located on the west side of Red Devil Creek until 1955. After 1955, all ore processing was conducted at structures and facilities on the east side of Red Devil Creek.

Investigations and cleanup actions have been performed at the site since the 1970s. Removal/cleanup actions involving selective waste removal, building demolition, debris segregation and on-site burial, and contaminated soil stockpiling were conducted between 1998 and 2002.

The RDM is approximately 250 air miles west and 1,500 marine/river barge miles from Anchorage, Alaska. The mine site was established on the southwest bank of the Kuskokwim River approximately 2 miles from the village of Red Devil, and approximately 8 miles from the village of Sleetmute. The legal description of the RMD site is defined by US Survey No. 14428. The site is generally located on the Kuskokwim River in Township 19 North, Range 44 West, within the southwest quarter of Section 5, southeast quarter of Section 6, northeast quarter section 7 and northwest quarter of section 8, Sleetmute D-4, Seward Meridian.

Approximately 25 full time residents inhabit the village of Red Devil. Many villagers in the vicinity of the site utilize the Kuskokwim River as a subsistence fishery. The village of Red Devil contains an airstrip and RDM can be accessed from the village using all-terrain vehicles.

1. NPL Status

The RDM site is not listed on the CERCLA National Priorities List (NPL). The site has not been formally proposed for listing on the NPL by EPA; however, BLM is implementing a Remedial Investigation/Feasibility Study (RI/FS) at the Red Devil mine site pursuant to its delegated CERCLA authority. Presently, a Feasibility Study is being prepared to evaluate the long-term site-wide remedy.

2. Maps, pictures, and other graphic representations

Attachment B provides maps and graphic representations. Figure 1 is a site location map. Figure 2 depicts sediment sample locations and associated results for Red Devil Creek, and Figure 3 show the extent of the proposed creek excavation and the location of the sediment trap, as well as, other pertinent site features.

B. Background

1. Actions Taken

Removal/cleanup actions involving selective waste removal, building demolition, debris segregation and on-site burial, and contaminated soil stockpiling were conducted between 1998 and 2002. These actions included off-site disposal of hazardous waste and materials and on-site consolidation of mine structural debris. In some areas, the tailings also contain fuel released from large storage tanks while the mine was in operation, which have been subsequently addressed under a previous removal action.

Site investigation was initiated in 1988, and groundwater monitoring was the primary focus of site activity between 2003 and 2009. To date, the mine structures have been demolished and three debris burial areas (monofills) have been constructed. A more complete history of environmental sampling and monitoring at the RDM site is described in the draft final RI report.

1988 BLM Sampling Event. The BLM collected six surface water and 10 sediment and soil samples from Red Devil Creek, the settling ponds, and other areas around the RDM site. The results of the sampling indicated the presence of mercury in Red Devil Creek water from 0.2 to 5.5 µg/L and in Red Devil Creek sediments from 41 to 967 milligrams per kilogram (mg/kg). A tailings pile near Settling Pond #1 contained 649 mg/kg mercury. Four background soil samples were collected, which indicated 0.2 to 8.0 mg/kg mercury.

1989 Site Inspection. The BLM performed a CERCLA site inspection (SI) at the RDM site during the 1988 field season. The objective of the SI was to characterize conditions for the completion of a Hazard Ranking System score for the site. The SI involved collection of samples from tailings, surface water, and sediment in Red Devil Creek and sediment in the settling ponds. Soil, sediment, and surface water samples were analyzed for a combination of analytes, including arsenic, barium, cadmium, chromium, mercury, lead, antimony, selenium, and silver. Dielectric fluid in the transformers and oil-stained soil was sampled for polychlorinated biphenyls (PCBs) using field test kits. Antimony, arsenic, and mercury were detected in Red Devil Creek surface water and sediment, as well as in the settling ponds and tailing samples. It was estimated that approximately 51,600 cubic yards of tailings were present at the mine and mill area, and an unknown quantity of tailings had been deposited in Red Devil Creek.

1999 Limited Waste Removal Action. The BLM conducted an off-site waste removal and a pre-remediation sampling investigation. This project included collection of background soil samples and sampling of known contaminant source areas in the Main Processing Area, Red Devil Creek, and the Kuskokwim River.

Contaminants were detected above Alaska soil cleanup standards (Method 2, Table B1) in samples from multiple locations around sources in the area that has been defined as the Main Processing Area as part of the RI. Benzene was also detected in soil at the Gravel Pad. Surface water and sediment samples collected from Red Devil Creek detected indicated concentrations of metals including arsenic, antimony, and mercury above background concentrations. Sediment samples collected from the Kuskokwim

River indicated concentrations of arsenic, antimony, and mercury above background concentrations.

2001 Source Area Removal and Investigation. The BLM conducted asbestos abatement, demolition of structures, plugging of mine shafts, off-site waste removal, and environmental sampling in the Main Processing Area and the AST area. Soil borings and monitoring wells were installed in the Main Processing Area. Nine subsurface borings were drilled and sampled; five were completed as monitoring wells. In addition, an extensive subsurface soil investigation was conducted around the slab of the Post-1955 Retort Building.

Surface and near-surface soil samples collected from soil borings indicated antimony, arsenic, and mercury at levels exceeding background concentrations, consistent with results of previous investigations. Concentrations of these metals were observed to decrease significantly with depth.

The soils investigation around the Post-1955 Retort Building slab indicated the presence of relatively high concentrations of arsenic and mercury in surface and subsurface soils using x-ray fluorescence (XRF) field screening and fixed laboratory methods. Elemental mercury was observed in samples from five soil borings on the west side of the slab at depths between 2 and 6 feet below ground surface (bgs).

Groundwater samples collected after well installation contained concentrations of antimony, arsenic, lead, and zinc above federal Maximum Contaminant Levels (MCLs).

2002 Debris Consolidation and Disposal Project. The BLM performed further building demolition, debris segregation, and debris burial. This project involved construction of Monofill #1 and Monofill #2. No environmental sampling was performed during this project.

2003 Historic Source Area Investigation. The BLM conducted a literature review, interviews of local persons knowledgeable about the mine history, and a sampling investigation of the Pre-1955 Retort Building, the Pre-1955 Rotary Furnace, the Pre-1955 Rotary Furnace Stack, and a "burnt ore" (tailings) disposal pile located southeast of the Pre-1955 Retort Building.

Pre-1955 Retort Building. Nine surface soil samples were collected in and around the historical structures footprint. Samples were analyzed for mercury and arsenic. Mercury speciation analysis was also performed. Arsenic was detected at concentrations from 89 to 1,250 mg/kg. Mercury was detected at concentrations from 2.9 to 32.0 mg/kg. Mercury specia-

tion indicated methylmercury concentrations from 0.357 to 1.688 micrograms per kilogram (µg/kg).

Pre-1955 Rotary Furnace. Eleven soil samples were collected around the historical footprint of the structure. The samples were collected from the surface to 2.7 feet bgs. Samples were analyzed for mercury and arsenic. Mercury speciation analysis was also performed. Arsenic was detected at concentrations from 38 to 2,000 mg/kg. Mercury was detected at concentrations from 2.5 to 140 mg/kg. Mercury speciation indicated methylmercury concentrations from 0.186 to 0.563 µg/kg.

Pre-1955 Rotary Furnace Stack. One surface soil sample was collected and analyzed for mercury and arsenic, as well as mercury speciation at the site of the historical rotary furnace stack. Arsenic was detected at a concentration of 118 mg/kg.

Mercury was detected at a concentration of 3.4 mg/kg. Mercury speciation indicated a methylmercury concentration of 0.050 µg/kg.

Pre-1955 Retort "Burnt Ore" Stockpile. One surface soil sample was collected and analyzed for mercury, arsenic, and mercury speciation at the site of the "burnt ore" (tailings) disposal pile southeast of the Pre-1955 Retort Building. Arsenic was detected at 1,390 mg/kg. Mercury was detected at 940 mg/kg. Mercury speciation indicated a methylmercury concentration of 0.445 µg/kg.

2004 Aboveground Storage Tank (AST)/Ore Hopper Demolition and Petroleum Release Investigation. The BLM demolished and disposed of the ASTs and ore hopper. This project involved construction of Monofill #3. Environmental sampling, including installation of 12 soil borings, was conducted to characterize the AST area, and the existing monitoring wells were sampled.

Soils investigations at the AST area detected petroleum hydrocarbons (diesel-range organics [DRO]) above ADEC cleanup levels in excavations and soil borings. Groundwater samples collected from the existing monitoring wells contained antimony, arsenic, and mercury at concentrations above ADEC cleanup levels; DRO and residual-range organics (RRO) were detected in groundwater samples below ADEC cleanup levels.

2005/2006 AST Soil Stockpiling and Debris Removal. The BLM excavated petroleum-contaminated soil in the AST area and sampled the excavated soil prior to placing the material in covered stockpiles. Environmental sampling was not conducted except for the annual sampling of the five monitoring wells. Antimony, arsenic, and mercury were detected in the groundwater samples above ADEC cleanup levels (Wilder/URS 2007).

2010 U.S. Geological Survey (USGS) Geophysical Investigation. In August 2010, in cooperation with the BLM and in conjunction with the RI/FS, the USGS conducted a geophysical investigation at the RDM using surface-based direct-current resistivity and electromagnetic induction methods (Burton and Ball 2011). Eight two-dimensional cross-sections, one three-dimensional grid of direct-current resistivity data, and 5.7 kilometers of electromagnetic induction data were obtained along Red Devil Creek valley, from the Main Processing Area to Red Devil Creek's confluence with the Kuskokwim River. Results of the geophysical investigation indicated no significant contrast in resistivity between the tailings, waste rock, and bedrock at the site. However, based on correlation with existing monitoring wells, a water table was interpreted on the direct-current resistivity cross-sections.

Several anomalies were also identified in the direct-current resistivity profiles and the three-dimensional grid. Downhole geophysical logs and analysis of soil and rock samples to determine how water content affects the bulk resistivity values were recommended.

2010-2012 RDM Remedial Investigation. Most recently, the RDM was characterized through a CERCLA RI performed from 2010-2012. Data collected during the RI were used to define the site physical setting, the nature and extent of contamination, and the fate and transport of contaminants. The RI results were used to assess risk to human health and the environment due to exposure to site contaminants.

2. 2013 Engineering Evaluation/Cost Analysis

BLM conducted an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate alternatives for this non-time critical removal. The EE/CA serves as the basis for selecting the preferred alternative that is documented by this CERCLA action memorandum AM. The draft EE/CA was initially presented to the public at a technical session of the Alaska Forum on the Environment, held in Anchorage, AK on February 3, 2014. The BLM conducted a series of public meetings that were attended in the State of Alaska during the period of February 25, 2014 through March 18, 2014. The purpose of the meetings was to consult with interested communities about the early action and to hear comments, questions and concerns regarding the proposed alternatives. The public meetings were held in the following villages:

- Georgetown Tribal Council — February 1, 2014
- Akiak — February 25, 2014
- Bethel — February 26, 2014
- Red Devil — March 4, 2014
- Sleetmule — March 5, 2014

- Chuathbulak March 6, 2014
- Upper Kalskag March 12, 2014
- Lower Kalskag March 13, 2014
- Crooked Creek March 18, 2014

Community members expressed concern regarding a wide range of issues, including: potential impacts of flooding and winter weather on the structures to be constructed as part of early action. Community members also expressed concern that the work to be completed in 2014 represented the full extent of remedial action BLM is planning at the Red Devil Mine. BLM presenters addressed each of these concerns through detailed discussion of the early action design and by describing the process for addressing all site risks. All nine tribes/communities expressed support for BLM's preferred alternative along and encouraged further action on the entire site.

3. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The nature and extent of contamination was defined for the RDM using field screening data and field observations, and confirmed using analytical data. Analytical results for all media investigated are available in the draft final Remedial Investigation ("RI") Report (January 2013). Analytical summary tables for sediment and surface water results from Red Devil Creek were summarized from the 2013 draft final RI report, and are included in Attachment A.

Only analytical results for surface water and sediment are discussed further as part of this AM. The nature and extent of contamination for soil, groundwater, and vegetation are less significant for the early action, and therefore sediment and surface water are summarized below and presented in greater detail in the RI.

a) Surface water

Seventeen inorganic elements (including both total and dissolved analysis) and methylmercury were detected at concentrations above background values from samples collected from the surface water of Red Devil Creek. In addition, semivolatile organic compounds (SVOCs) were detected in several surface water samples but at concentrations below any applicable comparison criteria including those identified in the Risk Assessment. See Attachment A for surface water analytical results.

The highest concentrations of inorganics included antimony, arsenic, and mercury. These contaminants of concern (COCs) were selected based on the Streamlined Risk Assessment evaluation and a comparison of total concentrations against background

values collected at the RDM. Total and dissolved concentrations of antimony, arsenic, and mercury were observed to be significantly elevated above background in samples collected at several locations extending from just up gradient of the Main Processing Area to the mouth of Red Devil Creek. Methylmercury was detected at below comparison criteria at all sample locations within Red Devil Creek (including near the reservoir dam) and was observed to be significantly elevated above background within the Main Processing Area, particularly at the location of a seep that daylights adjacent to Red Devil Creek. Surface water will not be addressed under this non-time critical removal action because ambient water flowing in Red Devil Creek does not contain contaminant concentrations above Alaska surface water quality criteria.

b) Sediments

Seventeen inorganic elements, as well as methylmercury, were detected above background values in the Red Devil Creek sediment samples. SVOCs were detected in several sediment samples but at concentrations below any applicable comparison criteria.

Antimony, arsenic, and mercury compounds were detected at the greatest concentrations relative to background. All three metals are significantly elevated in the creek section extending from the Main Processing Area to the Red Devil Creek delta. Elevated concentrations of these same three metals were detected in Kuskokwim River sediment downstream of the mouth of Red Devil Creek.

This non-time critical removal action is designed to minimize active erosion of tailings into Red Devil Creek and subsequent migration to the Kuskokwim River.

4. State and Local Authorities' role

The BLM is applying the CERCLA process at RDM in coordination with the Alaska Department of Environmental Conservation (ADEC), U.S. Environmental Protection Agency (EPA) Region 10, the Alaska Department of Health and Social Services (DHSS), Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Natural Resources (ADNR).

Throughout the RI/FS and EE/CA report development, the BLM has solicited, received and incorporated comments received from the agencies listed above. ADEC is planning on providing a letter of concurrence for this removal action. Additionally, other agencies are in support, as well.

On behalf of the BLM, the United States Army Corp of Engineers – Alaska District is preparing design documents for a contractor to implement the removal action identified and selected by this AM. Contractor procurement is anticipated to occur prior to June 2014.

Throughout the construction phase and post removal site care (PRSC) period, BLM will provide the above agencies with a status report.

III. THREATS TO PUBLIC HEALTH OR WELFARE OF THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

A Human Health Risk Assessment (HHRA) was prepared as part of the RI, and concluded that tailings/waste rock, soil, and Red Devil Creek sediment pose potential risks to human and ecological receptors. The RI documented that tailings/waste rock are being transported through erosion into Red Devil Creek, and ultimately into the Kuskokwim River. Sediments in the Kuskokwim River off-shore and downstream of the mouth of Red Devil Creek were documented to contain site-related contaminants at concentrations above background levels. The HHRA identified arsenic, antimony, and mercury as the major contaminants of concern (COCs) for sediment. Human receptors at most risk from these COCs include potential future on-site residents and local populations that utilize the Kuskokwim River for subsistence harvesting.

As part of the RI, a Baseline Risk Assessment (BERA) was also conducted for the RDM in accordance with Alaska state and EPA ecological risk assessment guidance. Exceedances of sediment remedial goals were observed to be the greatest within the Main Processing Area, and arsenic, antimony, and mercury were subsequently identified as COCs. The ecological receptors at most risk from these COCs include fish and other aquatic biota in Red Devil Creek and the Kuskokwim River.

Based on the site conditions documented in the RI, BLM, in consultation with ADEC and EPA, determined that an early action is warranted to control or eliminate ongoing erosion of tailings/waste rock material into the Kuskokwim River.

IV. ENDANGERMENT DETERMINATION

As previously stated in Section III, the HHRA and BERA prepared for the RDM have documented that contaminated sediments are present at concentrations that pose an unacceptable risk to human health and the environment. The on-going release of contaminated sediments from the Red Devil Creek to the Kuskokwim River may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

For this non-time critical removal action, an EE/CA was prepared, and the following alternatives were developed and evaluated:

- No Action.
- Channelization and Line Red Devil Creek with Solidifying Concrete Cloth.
- Line Red Devil Creek with a Culvert, and

- Excavate Red Devil Creek Sediments.

The EE/CA concluded that excavating red devil creek sediments was the most viable alternative based on the three broad evaluation criteria of effectiveness, implementability, and cost.

A. Proposed Actions

1. Proposed action description

For the removal action, approximately 5,000 cubic yards of tailings and sediment would be excavated along the south side of Red Devil Creek and transported to a designated temporary storage area on site. A section of Red Devil Creek would be realigned and a sediment trap constructed downstream of the tailings piles. Depths and distances for excavation are based on sampling results provided in the draft final RI Report, and observed geologic characteristics in the vicinity of Red Devil Creek.

The excavation is proposed to extend along Red Devil Creek for approximately 200 feet within the Main Processing Area. The excavation will be limited to the south side of the stream within the area of concern (see Figure 3). Excavation will begin at the existing centerline of Red Devil Creek below the processing area and proceed in a straight upstream direction, realigning the creek and maintaining its natural slope. The excavation will then terminate upstream of the processing area and rejoin the existing creek. The excavation will be 12 feet wide at the bottom and extend up at a 3:1 slope (horizontal to vertical) on the south side. The slope on the north side of the creek will vary between a 4:1 (horizontal to vertical) to a 6:1 slope (horizontal to vertical) on the north side. Excavation on the north side will terminate when the slope reaches the existing creek's north edge. The realigned channel sidewalls will be lined on each side with 3-foot gabion baskets to maintain the constructed alignment. The fill rock specified for gabion protection will be obtained from an offsite borrow source that will be identified prior to commencement of construction

No excavation is proposed to occur along the north bank of Red Devil Creek as part of the early action because the existing northern bank is well armored and does not contribute tailings to Red Devil Creek.

A vertical gabion drop structure is proposed to be installed just upstream of the excavated area to act as a transition between the gradient of the excavated channel and the longitudinal gradient in the upstream section of Red Devil Creek. The drop structure will also slow water velocities during larger storm events, and mitigate potential channel erosion. The drop structure will consist of side wall gabions and four gabion steps on the channel bottom, each of which will provide a 2-foot drop over a total stream length of approximately 28 feet (for total vertical drop of approximately 8 feet).

A sediment trap will be installed downstream of the realigned channel, immediately upstream of an existing bridge near the mouth of Red Devil Creek as shown on Figure 3. This sediment trap will be sized to allow settling of medium-sized sand (0.50 millimeters) and greater, but not allow re-suspension of material. However, there is still the potential for some fine-grain sand to pass through the trap. Once operational, a determination can be made as to the frequency that sediment will be excavated from the trap and hauled to the on-site sediment stockpile.

Dry dredging methods are proposed for sediment excavation along Red Devil Creek and the installation of the sediment trap. This will require isolating the sediment from the creek through dewatering, or diverting Red Devil Creek around the excavation area. Dry dredging will reduce the potential for re-suspension and releases of contaminants into the surface water.

Standard construction equipment will be used to remove sediment and load the material for transport to the temporary stockpile. Side slopes of the temporary stockpile would have a maximum slope of 2:1 (horizontal to vertical). To minimize stormwater infiltration into the sediment stockpile and prevent mobilization of fugitive dust, the stockpile will be covered with a 12-mil, UV-resistant, reinforced polyethylene geomembrane liner with tear-resistant polyester scrim. The liner will be inspected by BLM on an annual basis during the interim period before site-wide remediation is implemented. A soil or vegetation cover will not be required as the stockpile is anticipated to be temporary. Erosion and sediment control measures will be installed in the vicinity of the stockpiles as needed to prevent erosion of the excavated sediment. Additionally, a Stormwater Pollution Prevention Plan will be developed and submitted to the ADEC for review prior to beginning site work and will document Best Management Practices that are to be applied during construction activities.

Restoration of the stream in the area of excavation is not part of the proposed action for interim sediment excavation activities. Once the excavation is complete, the stream will be directed into the realigned channel in the vicinity of the tailings pile, and then allowed to flow through the current channel down-stream of the Main Process Area before entering the sediment trap.

2. Contribution to remedial performance

The removal action was developed for the site to minimize those tailings within Red Devil Creek identified as containing the highest concentrations of antimony, arsenic, and mercury, and reducing their potential to migrate into the Kuskokwim River. This removal action will aid in mitigating further on-site and off-site exposure of humans and ecological receptors to

contamination from the site until the final full-scale remedial action has been implemented.

Contamination at the RDM is complex, varied and wide-spread. A feasibility study is currently being developed to address full-scale remediation of contaminated site soils, tailings, and buried/encapsulated waste areas (monofills). While from an aerial extent, most of the site does not contribute contaminants to Red Devil Creek, reducing the contaminant loading to the Kuskokwim River as outlined in this AM will provide an immediate reduction in the threat to human health and the environment associated with exposure to antimony, arsenic, and mercury laden sediments.

The removal of contaminated sediments from Red Devil Creek as outlined in this AM is consistent with all full-scale remedies that would be implemented at the site. Red Devil Creek is the main transfer mechanism for contaminant loading to the Kuskokwim River. The excavation/removal of contaminated sediments in conjunction with installation of sediment basins will provide an immediate reduction in contaminant loading to the river. With the principal transfer mechanism abated, the site-wide remedial effort, once selected, can then be implemented. Field construction of the activities described in Section V.A.1 will be accomplished in 2014.

3. Applicable or relevant and appropriate requirements (ARARs)

As part of the EE/CA development process, ARARs were identified. Working with ADEC, EPA Region 10, DHSS, ADF&G, and the ADNR, a comprehensive list of ARARs for this removal action was developed and is provided as Attachment C to this AM. With concurrence from the agencies listed, chemical-specific ARARs were not addressed in the EE/CA because the removal action alternatives are relatively limited in scope and are intended to mitigate ongoing transport of tailings/waste rock material into the Kuskokwim River, and therefore chemical-specific ARARs are not an effective criterion for evaluating the removal options.

4. Project Schedule

Based on the scope of the planned action, it is estimated that this alternative would require approximately 2 months to complete, not including mobilization and demobilization, which require barge transport of equipment and material between Anchorage, AK and the site. It is anticipated that construction will be performed in July-August 2015.

B. Estimated Costs

In the final EE/CA, a detailed cost estimate for the proposed removal action was developed. The major cost items (rounded to the nearest $10,000) associated with the cost estimate are as follows:

- Total Direct Cost: $1,330,000

- Total Indirect Capital Costs: $ 294,000
- Contingency Allowance (20%): $ 325,000

Total: $1,950,000

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Should action be delayed or not taken, tailings and waste rock material from the Main Processing Area would continue to migrate through erosion and transport in Red Devil Creek into the Kuskokwim River. This removal action would reduce mobility of contaminants, not through treatment, but by placing the excavated material in a secure storage area and provide increased protection to aquatic resources in the Kuskokwim River until the final remedy is implemented.

VII. OUTSTANDING POLICY ISSUES

None.

VIII. RECOMMENDATION

This decision document provides the basis for and memorializes the decision to select the non-time critical removal action at the RDM. It was developed in accordance with CERCLA non-time critical removal action objectives and is consistent with the NCP. This decision is based on the administrative Record for the RDM. The selected removal actions will prevent or significantly reduce human and ecological exposure to elevated levels of mercury and arsenic in the tailings, will reduce arsenic and mercury accumulation in the food chain and reduce or eliminate the continued migration of tailings containing hazardous substances from the RDM. The selected action is also the most consistent with the potential final remedial actions at the site.

This CERCLA non-time critical removal action at the RDM described in this Action Memorandum is hereby approved:

Steven A. Ellis Date
Deputy Director of Operations
Bureau of Land Management

Attachment A

ANALYTICAL DATA RESULTS

Table A-1 Background Red Devil Creek Surface Water and Sediment Results

Analyte	RD01 10RD01SW	RD01 11RD01SW	RD01 10RD01SD
Total Inorganic Elements (SW=µg/L, SD=mg/kg)			
Aluminum	80	30.5 J	10800
Antimony	1.4	1.52 J	0.54 UJ
Arsenic	0.8	1.1	65
Barium	26.4	23.8	159
Beryllium	0.027 U	0.006 U	0.5
Cadmium	0.022 U	0.005 U	0.3
Calcium	18400	17500	2380
Chromium	0.053 U	0.43	20.4
Cobalt	0.007 U	0.066	12.3
Copper	0.232 U	0.37	21.7
Iron	110	138	32100
Lead	0.2 U	0.021	8
Magnesium	9680	9460	2990
Manganese	10.2	17.5	579
Mercury			0.18
Nickel	0.081 U	0.44	32
Potassium	69.1 U	218 J	1200
Selenium	0.125 U	0.5 J	0.78 U
Silver	0.009 U	0.004 U	0.053 U
Sodium	1580	1470	19.9 U
Thallium	0.003 U	0.005 U	0.33 U
Vanadium	0.3	0.16 J	35.4
Zinc	0.81 U	0.5 J	80
Total Low Level Mercury (SW=ng/L)			
Mercury, Total	3.17	6.37	
Dissolved Inorganic Elements (SW=µg/L)			
Aluminum, Dissolved	14.8 U	11.9 J	
Antimony, Dissolved	1.3	1.4 J	
Arsenic, Dissolved	0.6	0.9	
Barium, Dissolved	24	23	
Beryllium, Dissolved	0.027 U	0.006 U	
Cadmium, Dissolved	0.022 U	0.005 U	
Calcium, Dissolved	19200	17300	
Chromium, Dissolved	0.053 U	0.23	
Cobalt, Dissolved	0.007 U	0.056	
Copper, Dissolved	0.232 U	0.27	
Iron, Dissolved	7.2 U	100	
Lead, Dissolved	0.2 U	0.005 U	
Magnesium, Dissolved	10200	9340	
Manganese, Dissolved	7.2	15.9	
Nickel, Dissolved	0.081 U	0.35	
Potassium, Dissolved	69.1 U	220 J	
Selenium, Dissolved	0.125 U	0.5 J	
Silicon, Dissolved	3.3	3680	
Silver, Dissolved	0.009 U	0.004 U	
Sodium, Dissolved	1610	1450	
Thallium, Dissolved	0.003 U	0.005 U	
Vanadium, Dissolved	0.026 U	0.13 J	
Zinc, Dissolved	0.81 U	0.2 U	
Dissolved Low Level Mercury (SW=ng/L)			
Mercury, Dissolved	1.95	2.63	

Table A-1 Background Red Devil Creek Surface Water and Sediment Results

Analyte	RD01 10RD01SW	RD01 11RD01SW	RD01 10RD01SD
Arsenic Speciation (SW=µg/L, SD=mg/kg)			
Arsenate	0.578	0.774 J	48.7 J
Arsenite	0.102	0.089 J	4.13 J
Inorganic Arsenic	0.68	0.863 J	52.8 J
Mercury Selective Sequential Extraction (sd=ng/g)			
Hg(F0)		3.36 U	
Hg(F1)		1.19 J	
Hg(F2)		0.25 U	
Hg(F3)		57.3 J	
Hg(F4)		17.3 J	
Hg(F5)		24.7	
Hg(F6)		4.98 J	
Methlymercury (SW=ng/L, SD=ng/g)			
Methylmercury	0.074	0.08 J	0.177
Semi-Volatile Organic Compounds (SW=ng/L)			
2-Methylnaphthalene			
Naphthalene			
1-Methylnaphthalene			
2-Methylnaphthalene			
Unknown Hydrocarbon			
Gasoline, Diesel, and Residual Range Organics (SW=mg/L)			
Gasoline Range Organics			
Diesel Range Organics			
Residual Range Organics			
Total Organic Carbon (SD=%)			
Carbon, Total Organic (TOC)		1.47	
General Chemistry (SW=mg/L)			
Bicarbonate	81	74.1	
Carbonate	1 U	3 U	
Hydroxide	1 U		
Hydroxide			
Total Dissolved Solids		74	
Total Suspended Solids		5 U	
Total Dissolved Solids	102		
Total Suspended Solids	2		
Chloride	0.4	0.35 J	
Fluoride	0.022 U	0.05 J	
Sulfate	11.2	9.58	
Nitrate+Nitrite as Nitrogen	0.166	0.208	

Key

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.
µg/L = micrograms per liter mg/kg = milligrams per kilogram mg/L = milligrams per liter
ng/g = nanograms per gram ng/L = nanograms per liter
% = percent
SD = sediment
SW = surface water
U = Analyte was analyzed for but not detected. Value provided is reporting limit.
UJ = Indicates the compound of analyte was analyzed for but not detected. The sample detection limit is an estimated value.

Table A-2 Background Statistics for Red Devil Creek Sediment and Surface Water Samples

Analyte	Sediment					Surface Water - Total					
	10RD01SD Conc.(mg/kg)	Sample Size	Number Detections	Recommended Background Level (mg/kg)	Background Rationale	10RD01SW Conc. (µg/L)	11RD01SW Conc. (µg/L)	Sample Size	Number Detections	Recommended Background Level (µg/L)	Background Rationale
Aluminum	10800	1	1	10800	Single Result	80	30.5 J	2	2	80	Maximum Detection
Antimony	ND	1	0	ND	Single Result	1.4	1.52 J	2	2	1.52 J	Maximum Detection
Arsenic	65	1	1	65	Single Result	0.8	1.1	2	2	1.1	Maximum Detection
Inorganic Arsenic	NA	0	0	NA	Single Result	0.68	0.863	2	2	0.863	Maximum Detection
Barium	159	1	1	159	Single Result	26.4	23.8	2	2	26.4	Maximum Detection
Beryllium	0.5	1	1	0.5	Single Result	ND	ND	2	0	ND	Maximum Detection
Cadmium	0.3	1	1	0.3	Single Result	ND	ND	2	0	ND	Maximum Detection
Calcium	2380	1	1	2380	Single Result	18400	17500	2	2	18400	Maximum Detection
Chromium	20.4	1	1	20.4	Single Result	ND	0.43	2	1	0.43	Maximum Detection
Cobalt	12.3	1	1	12.3	Single Result	ND	0.066	2	1	0.066	Maximum Detection
Copper	21.7	1	1	21.7	Single Result	ND	0.37	2	1	0.37	Maximum Detection
Iron	32100	1	1	32100	Single Result	110	138	2	2	138	Maximum Detection
Lead	8	1	1	8	Single Result	ND	0.021	2	1	0.021	Maximum Detection
Magnesium	2990	1	1	2990	Single Result	9680	9460	2	2	9680	Maximum Detection
Manganese	579	1	1	579	Single Result	10.2	17.5	2	2	17.5	Maximum Detection
Methylmercury	0.000177	1	1	0.000177	Single Result	0.000074	0.00008 J	2	2	0.00008 J	Maximum Detection
Mercury	0.18	1	1	0.18	Single Result	0.00195	0.00263	2	2	0.00263	Maximum Detection
Nickel	32	1	1	32	Single Result	ND	0.44	2	1	0.44	Maximum Detection
Potassium	1200	1	1	1200	Single Result	ND	218 J	2	1	218 J	Maximum Detection
Selenium	ND	1	0	ND	Single Result	ND	0.5 J	2	1	0.5 J	Maximum Detection
Silver	ND	1	0	ND	Single Result	ND	ND	2	0	ND	Maximum Detection
Sodium	ND	1	0	ND	Single Result	1580	1470	2	2	1580	Maximum Detection
Thallium	ND	1	0	ND	Single Result	ND	ND	2	0	ND	Maximum Detection
Vanadium	35.4	1	1	35.4	Single Result	0.3	0.16 J	2	2	0.3	Maximum Detection
Zinc	80	1	1	80	Single Result	ND	0.5 J	2	1	0.5 J	Maximum Detection

Table A-2 Background Statistics for Red Devil Creek Sediment and Surface Water Samples

Analyte	Surface Water - Dissolved					
	10RD01SW Conc. (µg/L)	11RD01SW Conc. (µg/L)	Sample Size	Number Detections	Recommended Background Level (µg/L)	Background Rationale
Aluminum	ND	11.9 J	2	1	11.9 J	Maximum Detection
Antimony	1.3	1.4 J	2	2	1.4 J	Maximum Detection
Arsenic	0.6	0.9	2	2	0.9	Maximum Detection
Inorganic Arsenic	NA	NA	0	0	NA	Maximum Detection
Barium	24	23	2	2	24	Maximum Detection
Beryllium	ND	ND	2	0	ND	Maximum Detection
Cadmium	ND	ND	2	0	ND	Maximum Detection
Calcium	19200	17300	2	2	19200	Maximum Detection
Chromium	ND	0.23	2	1	0.23	Maximum Detection
Cobalt	ND	0.056	2	1	0.056	Maximum Detection
Copper	ND	0.27	2	1	0.27	Maximum Detection
Iron	ND	100	2	1	100	Maximum Detection
Lead	ND	ND	2	0	ND	Maximum Detection
Magnesium	10200	9340	2	2	10200	Maximum Detection
Manganese	7.2	15.9	2	2	15.9	Maximum Detection
Methylmercury	NA	NA	0	0	NA	Maximum Detection
Mercury	0.00317	0.00637	2	2	0.00637	Maximum Detection
Nickel	ND	0.35	2	1	0.35	Maximum Detection
Potassium	ND	220 J	2	1	220 J	Maximum Detection
Selenium	ND	0.5 J	2	1	0.5 J	Maximum Detection
Silver	ND	ND	2	0	ND	Maximum Detection
Sodium	1610	1450	2	2	1610	Maximum Detection
Thallium	ND	ND	2	0	ND	Maximum Detection
Vanadium	ND	0.13 J	2	1	0.13 J	Maximum Detection
Zinc	ND	ND	2	0	ND	Maximum Detection

Key:
µg/L = micrograms per liter
J = Analyte detectedAnalyte detected but relative percent difference was outside control limits; there mg/kg = milligrams per kilogram
NA = Not Available, not analyzed
ND = Not Detected

Table A-3 Red Devil Creek Sediment Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD01 10RD01SD	RD02 10RD02SD	RD03 10RD03SD	RD11 11RD11SD	RD10 11RD10SD	RD04 10RD04SD
Total Inorganic Elements									
Aluminum	10800	SW6010B-Total	mg/kg	**10800**	**14700**	**9340**	**9930**	**7290**	**9350**
Antimony	ND	SW6010B-Total	mg/kg	0.54 UJ	1.2 UJ	1.2 UJ			**2510 J**
Antimony	ND	SW6020A-Total	mg/kg				**7.39 J**	**5.71 J**	
Arsenic	65	SW6010B-Total	mg/kg	**65**	**50**	**60**			**2290**
Arsenic	65	SW6020A-Total	mg/kg				**32.5**	**62**	
Barium	159	SW6010B-Total	mg/kg	**159**	**278**	**146**			**401**
Barium	159	SW6020A-Total	mg/kg				**130 J**	**119**	
Beryllium	0.5	SW6010B-Total	mg/kg	**0.5**	**0.4**	**0.6**			**0.9**
Beryllium	0.5	SW6020A-Total	mg/kg				**0.311**	**0.417**	
Cadmium	0.3	SW6010B-Total	mg/kg	**0.3**	0.059 U	0.06 U			0.062 U
Cadmium	0.3	SW6020A-Total	mg/kg				**0.163 J**	**0.232**	
Calcium	2380	SW6010B-Total	mg/kg	**2380**	**6170**	**1960**	**2070 J**	**1660 J**	**5530**
Chromium	20.4	SW6010B-Total	mg/kg	**20.4**	**25**	**19**			**29**
Chromium	20.4	SW6020A-Total	mg/kg				**14.9 J**	**11.8 J**	
Cobalt	12.3	SW6010B-Total	mg/kg	**12.3**	**13.7**	**16.5**			**17.8**
Cobalt	12.3	SW6020A-Total	mg/kg				**8.69**	**11.9**	
Copper	21.7	SW6010B-Total	mg/kg	**21.7**	**23.4**	**24.4**			**45.7**
Copper	21.7	SW6020A-Total	mg/kg				**13.2 J**	**14.9 J**	
Iron	32100	SW6010B-Total	mg/kg	**32100**	**29200**	**38300**	**33200**	**36100**	**52000**
Lead	8	SW6010B-Total	mg/kg	**8**	**7**	**8**			**14**
Lead	8	SW6020A-Total	mg/kg				**6.22 J**	**7.99 J**	
Magnesium	2990	SW6010B-Total	mg/kg	**2990**	**4110**	**2710**	**3250 J**	**2780 J**	**8690**
Manganese	579	SW6010B-Total	mg/kg	**579**	**2610**	**1310**	**854**	**1480**	**1350**
Mercury	0.18	SW7471A-Total	mg/kg	**0.18**	**0.55**	**0.42**	**1.57 J**	**0.232 J**	**36**
Nickel	32	SW6010B-Total	mg/kg	**32**	**30**	**38**			**67**
Nickel	32	SW6020A-Total	mg/kg				**22 J**	**26 J**	
Potassium	1200	SW6010B-Total	mg/kg	**1200**	**1300**	**900**	**636 J**	**510 J**	**2660**
Selenium	ND	SW6010B-Total	mg/kg	0.78 U	1.7 U	1.8 U			1.8 U
Selenium	ND	SW7742-Total	mg/kg				**0.39**	**0.33**	
Silver	ND	SW6010B-Total	mg/kg	0.053 U	0.117 U	0.12 U			0.124 U
Silver	ND	SW6020A-Total	mg/kg				**0.062 J**	**0.04**	
Sodium	ND	SW6010B-Total	mg/kg	19.9 U	44.3 U	45.4 U	**39.6**	**21.1**	**240**
Thallium	ND	SW6010B-Total	mg/kg	0.33 U	0.7 U	0.8 U			0.8 U
Thallium	ND	SW6020A-Total	mg/kg				**0.055**	**0.043**	
Vanadium	35.4	SW6010B-Total	mg/kg	**35.4**	**39.3**	**37.9**			**32.2**
Vanadium	35.4	SW6020A-Total	mg/kg				**24.7**	**25.9**	
Zinc	80	SW6010B-Total	mg/kg	**80**	**78**	**91**			**106**
Zinc	80	SW6020A-Total	mg/kg				**51.1 J**	**58.6**	
Arsenic Speciation									
Arsenate		EPA 1632-As-Cryo-S-Speciation	mg/kg	**48.7 J**	**50.4 J**	**53.7 J**		**53.9**	**2480 J**
Arsenite		EPA 1632-As3-CRYO-T	mg/kg	**4.13 J**	**4.39 J**	**1.34 J**		**1.7**	**57.8 J**
Inorganic Arsenic		EPA 1632-Total Inorganic As - Solid	mg/kg	**52.8 J**	**54.8 J**	**55 J**		**55.6**	**2540 J**

Table A-3 Red Devil Creek Sediment Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD01 10RD01SD	RD02 10RD02SD	RD03 10RD03SD	RD11 11RD11SD	RD10 11RD10SD	RD04 10RD04SD
Mercury Selective Sequential Extraction									
Hg(F0)		EPA 1631	ng/g	3.36 U		2.48 U		**297**	2.92 U
Hg(F1)		BRL SOP No. BR-0013	ng/g	**1.19 J**		**2.55 J**		**3**	**529 J**
Hg(F2)		BRL SOP No. BR-0013	ng/g	0.25 U		**0.39 J**		**1.14 J**	**107 J**
Hg(F3)		BRL SOP No. BR-0013	ng/g	**57.3 J**		**212 J**		**194 J**	**3840 J**
Hg(F4)		BRL SOP No. BR-0013	ng/g	**17.3 J**		**146 J**		**37.3**	**23700 J**
Hg(F5)		BRL SOP No. BR-0013	ng/g	**24.7**		**643**		**166**	**969000**
Hg(F6)		BRL SOP No. BR-0013	ng/g	**4.98 J**		**25.9 J**			**22.9 J**
Methylmercury									
Methylmercury	0.000177	CAS SOP	ng/g					**0.1 J**	
Methylmercury	0.000177	EPA 1630	ng/g	**0.177**	**7.02**	**0.218**			**0.766**
Semi-volatile Organic Compounds									
.gamma.-Sitosterol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**390 J**	**230 J**	
Benzo(b)fluoranthene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**1.5 J**	1.2 U	
Benzoic Acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**220**	96 U	
Benzyl Alcohol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**3.1 J**	2.1 U	
Diethyl Phthalate		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**1.7 J**	1.3 U	
Di-n-butyl Phthalate		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**9 J**	7.9 U	
Docosanoic acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**710 J**	**190 J**	
Heptacosane		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg					**270 J**	
Pentachlorophenol (PCP)		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**22 J**	20 U	
Phenanthrene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**1.9 J**	**2.1 J**	
Phenol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**4.1 J**	2 U	
Unknown		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**700 J**	**180 J**	
Unknown Alkane		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg					**99 J**	
Unknown Alkene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg					**240 J**	
Unknown Carboxylic Acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg				**370 J**	**130 J**	
Total Organic Carbon									
Carbon, Total Organic (TOC)		SW9060M-Total Organic Carbon, Modified for Matrix	%	**1.47**	**8.33**	**0.951**	**1.3**	**0.501**	**1.02**

Key

Bold = detection

Gray shading = exceedance of background

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.

µg/kg = micrograms per kilogram mg/kg = milligrams per kilogram ND = not detected

ng/g = nanograms per gram

% = percent

U = Analyte was analyzed for but not detected. Value provided is reporting limit.

UJ = Indicates the compound of analyte was analyzed for but not detected. The sample detection limit is an estimated value.

Table A-3 Red Devil Creek Sediment Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD05 10RD05SD	RD12 11RD12SD	RD09 10RD09SD	RD06 10RD06SD	RD07 10RD07SD	RD08 10RD08SD
Total Inorganic Elements									
Aluminum	10800	SW6010B-Total	mg/kg	**910**	**10600**	**11900**	**10200**	**9620**	**8440**
Antimony	ND	SW6010B-Total	mg/kg	**1590 J**	**6360 J**	**3600 J**	**4060 J**	**3430 J**	**1900 J**
Antimony	ND	SW6020A-Total	mg/kg						
Arsenic	65	SW6010B-Total	mg/kg	**130000**	**3610 J**	**2920**	**2950**	**2370**	**1890**
Arsenic	65	SW6020A-Total	mg/kg						
Barium	159	SW6010B-Total	mg/kg	**1990**		**521**	**459**	**542**	**379**
Barium	159	SW6020A-Total	mg/kg		**985 J**				
Beryllium	0.5	SW6010B-Total	mg/kg	1.39 U		**0.9**	**0.8**	**0.8**	**0.7**
Beryllium	0.5	SW6020A-Total	mg/kg		**0.705**				
Cadmium	0.3	SW6010B-Total	mg/kg	1.4 U		0.057 U	0.059 U	0.06 U	0.057 U
Cadmium	0.3	SW6020A-Total	mg/kg		**0.317 J**				
Calcium	2380	SW6010B-Total	mg/kg	**23400**	**3450 J**	**4080**	**3910**	**5000**	**4190**
Chromium	20.4	SW6010B-Total	mg/kg	18.1 U		**29**	**31**	**32**	**25**
Chromium	20.4	SW6020A-Total	mg/kg		**47.4 J**				
Cobalt	12.3	SW6010B-Total	mg/kg	**50**		**20.5**	**21.5**	**22.3**	**14.7**
Cobalt	12.3	SW6020A-Total	mg/kg		**12.5**				
Copper	21.7	SW6010B-Total	mg/kg	**30 J**		**55.6 J**	**58.2 J**	**55.5 J**	**39.9 J**
Copper	21.7	SW6020A-Total	mg/kg		**45.7 J**				
Iron	32100	SW6010B-Total	mg/kg	**344000**	**28900**	**35200**	**39200**	**34000**	**31000**
Lead	8	SW6010B-Total	mg/kg	12.5 U		**12**	**11**	**13**	**7**
Lead	8	SW6020A-Total	mg/kg		**1.72 J**				
Magnesium	2990	SW6010B-Total	mg/kg	**6440**	**5200 J**	**5440**	**5530**	**7700**	**4960**
Manganese	579	SW6010B-Total	mg/kg	**986**	**552**	**1250**	**1560**	**1690**	**784**
Mercury	0.18	SW7471A-Total	mg/kg	**8.6 J**	**77 J**	**46 J**	**63 J**	**60 J**	**79 J**
Nickel	32	SW6010B-Total	mg/kg	**240**		**64**	**61**	**62**	**49**
Nickel	32	SW6020A-Total	mg/kg		**47.2 J**				
Potassium	1200	SW6010B-Total	mg/kg	814 U	**2870 J**	**2850**	**2810**	**2770**	**2320**
Selenium	ND	SW6010B-Total	mg/kg	41 U		1.7 U	1.7 U	1.8 U	1.7 U
Selenium	ND	SW7742-Total	mg/kg		**0.62**				
Silver	ND	SW6010B-Total	mg/kg	2.8 U		0.113 U	0.117 U	0.12 U	0.113 U
Silver	ND	SW6020A-Total	mg/kg		**0.135 J**				
Sodium	ND	SW6010B-Total	mg/kg	1050 U	**225**	**270**	**250**	**230**	**210**
Thallium	ND	SW6010B-Total	mg/kg	17.4 U		0.7 U	0.7 U	0.7 U	0.7 U
Thallium	ND	SW6020A-Total	mg/kg		**0.297**				
Vanadium	35.4	SW6010B-Total	mg/kg	4.2 U		**26.8**	**25**	**27.6**	**25.1**
Vanadium	35.4	SW6020A-Total	mg/kg		**22.8**				
Zinc	80	SW6010B-Total	mg/kg	**120**		**96**	**100**	**91**	**83**
Zinc	80	SW6020A-Total	mg/kg		**65.7 J**				
Arsenic Speciation									
Arsenate		EPA 1632-As-Cryo-S-Speciation	mg/kg	**182000 J**	**2160**	**2930 J**	**4180 J**	**3680 J**	**2330 J**
Arsenite		EPA 1632-As3-CRYO-T	mg/kg	**5960 J**	**333**	**104 J**	**155 J**	**88.2 J**	**63.2 J**
Inorganic Arsenic		EPA 1632-Total Inorganic As - Solid	mg/kg	**188000 J**	**2490**	**3030 J**	**4340 J**	**3770 J**	**2390 J**

Table A-3 Red Devil Creek Sediment Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD05 10RD05SD	RD12 11RD12SD	RD09 10RD09SD	RD06 10RD06SD	RD07 10RD07SD	RD08 10RD08SD
Mercury Selective Sequential Extraction									
Hg(F0)		EPA 1631	ng/g	13.2 U	**41500**		2.36 U		**18.5**
Hg(F1)		BRL SOP No. BR-0013	ng/g	**7.24 J**	**79.4 J**		**640 J**		**1180 J**
Hg(F2)		BRL SOP No. BR-0013	ng/g	**7.09 J**	**4.94 J**		**166 J**		**27.6 J**
Hg(F3)		BRL SOP No. BR-0013	ng/g	**6580 J**	**1890 J**		**5090 J**		**1360 J**
Hg(F4)		BRL SOP No. BR-0013	ng/g	**1280 J**	**4090 J**		**21900 J**		**17700 J**
Hg(F5)		BRL SOP No. BR-0013	ng/g	**2550 M**	**17200 J**		**100000**		**142000**
Hg(F6)		BRL SOP No. BR-0013	ng/g	**63000 J**			**3040 J**		**7550 J**
Methylmercury									
Methylmercury	0.000177	CAS SOP	ng/g		**0.4 J**				
Methylmercury	0.000177	EPA 1630	ng/g	**12.7**		**0.69**	**0.993**	**0.578**	**1**
Semi-volatile Organic Compounds									
.gamma.-Sitosterol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Benzo(b)fluoranthene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Benzoic Acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Benzyl Alcohol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Diethyl Phthalate		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Di-n-butyl Phthalate		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Docosanoic acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Heptacosane		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Pentachlorophenol (PCP)		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Phenanthrene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Phenol		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Unknown		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Unknown Alkane		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Unknown Alkene		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Unknown Carboxylic Acid		SW8270C-Low Level Semivolatile Organics using LVI	µg/kg						
Total Organic Carbon									
Carbon, Total Organic (TOC)		SW9060M-Total Organic Carbon, Modified for Matrix	%	**2.28**	**0.476**	**0.882**	**0.868**	**0.827**	**0.94**

Key

Bold = detection

Gray shading = exceedance of background

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.

µg/kg = micrograms per kilogram mg/kg = milligrams per kilogram ND = not detected

ng/g = nanograms per gram

% = percent

U = Analyte was analyzed for but not detected. Value provided is reporting limit.

UJ = Indicates the compound of analyte was analyzed for but not detected. The sample detection limit is an estimated value.

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD02 10RD02SW	RD02 11RD02SW	RD03 10RD03SW	RD03 11RD03SW	RD11 11RD11SW	RD10 11RD10SW	RD04 10RD04SW
Total Inorganic Elements										
Aluminum	80	SW6010B-Total	µg/L	14.8 U	**16.6 J**	14.8 U	**18.4 J**	**30.9 J**	**20.1 J**	14.8 U
Antimony	1.52	SW6020A-Total	µg/L	**1.3**	**1.42 J**	**1.5**	**1.51**	**8.81**	**1.95**	**11**
Arsenic	1.1	SW6020A-Total	µg/L	**1**	**1**	**0.9**	**0.8**	**6.7**	**1**	**8.2**
Barium	26.4	SW6020A-Total	µg/L	**25.2**	**21.6**	**23.4**	**21.2**	**32.1**	**22.3**	**24**
Beryllium	ND	SW6020A-Total	µg/L	0.027 U	0.006 U	0.027 U	0.006 U	0.006 U	0.006 U	0.027 U
Cadmium	ND	SW6020A-Total	µg/L	0.022 U	0.005 U	0.022 U	**0.006 J**	0.005 U	0.005 U	0.022 U
Calcium	18400	SW6010B-Total	µg/L	**18500**	**17300**	**18400**	**16800**	**8580**	**17200**	**18600**
Chromium	0.43	SW6020A-Total	µg/L	0.053 U	**0.22**	0.053 U	**0.23**	**0.22**	**0.37**	0.053 U
Cobalt	0.066	SW6020A-Total	µg/L	0.007 U	**0.061**	0.007 U	**0.046**	**0.677**	**0.06**	0.007 U
Copper	0.37	SW6020A-Total	µg/L	0.232 U	**0.29**	0.232 U	**0.28**	**0.71**	**0.35**	0.232 U
Iron	138	SW6010B-Total	µg/L	**190**	**131**	**140**	**118**	**2470**	**128**	**190**
Iron	138	SW6020A-Total	µg/L							
Lead	0.021	SW6020A-Total	µg/L	0.2 U	**0.008 J**	0.2 U	**0.013 J**	**0.021**	**0.018 J**	0.2 U
Magnesium	9680	SW6010B-Total	µg/L	**9660**	**9370**	**9690**	**9070**	**4460**	**9410**	**9870**
Manganese	17.5	SW6020A-Total	µg/L	**29.5**	**19.1**	**11.8**	**11.8**	**86.4**	**13.3**	**15.4**
Nickel	0.44	SW6020A-Total	µg/L	0.081 U	**0.36**	0.081 U	**0.39**	**1.38**	**0.46**	0.081 U
Potassium	218 J	SW6010B-Total	µg/L	69.1 U	**233 J**	69.1 U	**239 J**	50 U	**214 J**	69.1 U
Selenium	0.5 J	SW6020A-Total	µg/L	0.125 U	**0.5 J**	0.125 U	**0.4 J**	0.3 U	0.3 U	0.125 U
Silver	ND	SW6020A-Total	µg/L	0.009 U	0.004 U	0.009 U	**0.012 J**	0.004 U	0.004 U	0.009 U
Sodium	1580	SW6010B-Total	µg/L	**1700**	**1460**	**1730**	**1440**	**2370**	**1740**	**1820**
Thallium	ND	SW6020A-Total	µg/L	0.003 U	0.005 U	0.003 U	**0.007 J**	0.005 U	0.005 U	0.003 U
Vanadium	0.3	SW6020A-Total	µg/L	0.026 U	**0.1 J**	0.026 U	**0.16 J**	**0.22**	**0.15 J**	0.026 U
Zinc	0.5 J	SW6020A-Total	µg/L	0.81 U	0.2 U	0.81 U	0.2 U	**2.1**	**0.4 J**	0.81 U
Total Low Level Mercury										
Mercury, Total	2.63	EPA 1631-Total	ng/L	**2.83**	**3.94**	**2.33**	**4.5**		**4.27**	**15.8**
Dissolved Inorganic Elements										
Aluminum, Dissolved	11.9 J	SW6010B-Diss	µg/L	14.8 U	**8.7 J**	14.8 U			**10.2 J**	14.8 U
Antimony, Dissolved	1.4 J	SW6020A-Diss	µg/L	**1.2**	**1.41 J**	**1.4**	**1.5**		**1.57**	**10.4**
Arsenic, Dissolved	0.9	SW6020A-Diss	µg/L	**0.9**	**1**	**0.8**	**0.9**		**0.8**	**7.8**
Barium, Dissolved	24	SW6020A-Diss	µg/L	**24.3**	**21**	**22.8**	**21.2**		**20.7**	**23.6**
Beryllium, Dissolved	ND	SW6020A-Diss	µg/L	0.027 U	0.006 U	0.027 U	0.006 U		0.006 U	0.027 U
Cadmium, Dissolved	ND	SW6020A-Diss	µg/L	0.022 U	0.005 U	0.022 U	0.005 U		0.005 U	0.022 U
Calcium, Dissolved	19200	SW6010B-Diss	µg/L	**19000**	**17200**	**18600**			**16800**	**18600**
Chromium, Dissolved	0.23	SW6020A-Diss	µg/L	0.053 U	**0.2**	0.053 U	**0.21**		**0.3**	0.053 U
Cobalt, Dissolved	0.056	SW6020A-Diss	µg/L	0.007 U	**0.058**	0.007 U	**0.042**		**0.044**	0.007 U
Copper, Dissolved	0.27	SW6020A-Diss	µg/L	0.232 U	**0.36**	0.232 U	**0.26**		**0.29**	0.232 U
Iron, Dissolved	100	SW6010B-Diss	µg/L	**150**	**105**	**100**			**88.8**	**140**
Lead, Dissolved	ND	SW6020A-Diss	µg/L	0.2 U	**0.014 J**	0.2 U	0.005 U		0.005 U	0.2 U
Magnesium, Dissolved	10200	SW6010B-Diss	µg/L	**9990**	**9280**	**9870**			**9440**	**9930**
Manganese, Dissolved	15.9	SW6020A-Diss	µg/L	**24.9**	**18.5**	**8.2**	**8.49**		**9.41**	**13.6**
Nickel, Dissolved	0.35	SW6020A-Diss	µg/L	0.081 U	**0.58**	0.081 U	**0.32**		**0.37**	0.081 U
Potassium, Dissolved	220 J	SW6010B-Diss	µg/L	69.1 U	**256 J**	69.1 U			**215 J**	69.1 U
Selenium, Dissolved	0.5 J	SW6020A-Diss	µg/L	0.125 U	**0.6 J**	0.125 U	**0.3 J**		0.3 U	0.125 U
Silver, Dissolved	ND	SW6020A-Diss	µg/L	0.009 U	0.004 U	0.009 U	0.004 U		0.004 U	0.009 U
Sodium, Dissolved	1610	SW6010B-Diss	µg/L	**1680**	**1450**	**1690**			**1760**	**1770**
Thallium, Dissolved	ND	SW6020A-Diss	µg/L	0.003 U	0.005 U	0.003 U	0.005 U		0.005 U	0.003 U
Vanadium, Dissolved	0.13 J	SW6020A-Diss	µg/L	0.026 U	**0.11 J**	0.026 U	**0.11 J**		**0.12 J**	0.026 U
Zinc, Dissolved	ND	SW6020A-Diss	µg/L	0.81 U	0.2 U	0.81 U	0.2 U		0.2 U	0.81 U
Dissolved Low Level Mercury										
Mercury, Dissolved	6.37	EPA 1631-Diss	ng/L	**2.23**	**2.13**	**1.92**	**3.02**		**3.53**	**5.6**
Arsenic Speciation										
Arsenate		EPA 1632 As-Cryo-W-Speciation	µg/L	**0.862**	**0.828 J**				**0.595**	**1.58**
Arsenite		EPA 1632 As3-CRYO-W	µg/L	**0.122**	**0.089 J**	**1**			**0.227**	**0.342**
Inorganic Arsenic		EPA 1632 Total Inorganic As - Water	µg/L	**0.984**	**0.917 J**				**0.822**	**1.92**

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD02 10RD02SW	RD02 11RD02SW	RD03 10RD03SW	RD03 11RD03SW	RD11 11RD11SW	RD10 11RD10SW	RD04 10RD04SW
Methlymercury										
Methylmercury	0.08 J	EPA 1630	ng/L	**0.101**	**0.08 J**	**0.091**	**0.09 J**		**0.08 J**	**0.115**
Semi-Volatile Organic Compounds										
1-Methylnaphthalene		SW8270D	µg/L			0.48 U				0.48 U
2-Methylnaphthalene		SW8270C Base Neutral/Acid Semivolatile Organic compounds	µg/L				0.24 U	0.24 U	0.24 U	
2-Methylnaphthalene		SW8270D	µg/L			0.48 U				0.48 U
Naphthalene		SW8270C Base Neutral/Acid Semivolatile Organic compounds	µg/L				0.37 U	0.37 U	0.37 U	
Unknown Hydrocarbon		SW8270D	µg/L			**2 J**				0 U
Gasoline, Diesel and Residual Range Organics										
Gasoline Range Organics		AK 101	mg/L							
Diesel Range Organics		AK 102	mg/L							
Residual Range Organics		AK 103	mg/L							
General Chemistry										
Bicarbonate		A2320 General Chemistry Parameters	mg/L	**79.5**	**74.2**	**78.9**	**74**		**73.1**	**77.3**
Carbonate		A2320 General Chemistry Parameters	mg/L	1 U	3 U	1 U	1 U		3 U	1 U
Hydroxide		A2320 General Chemistry Parameters	mg/L	1 U		1 U				1 U
Hydroxide		SM 2320	mg/L							
Total Dissolved Solids		A2540C General Chemistry Parameters	mg/L		**76**		**51**		**71**	
Total Suspended Solids		A2540D General Chemistry Parameters	mg/L		5 U		5 U		5 U	
Total Dissolved Solids		EPA 160.1	mg/L	**84**		**81.5**				**87.5**
Total Suspended Solids		EPA 160.2	mg/L	1 U		1.1 U				1.1 U
Chloride		EPA 300.0 General Chemistry Parameters	mg/L	**0.4**	**0.36 J**	**0.5**	**0.39 J**		**0.38 J**	**0.5**
Fluoride		EPA 300.0 General Chemistry Parameters	mg/L	0.022 U	**0.05 J**	0.022 U	**0.08 J**		**0.06 J**	0.022 U
Sulfate			mg/L	**10.8**	**9.55**	**10.1**	**8.63**		**8.69**	**10.3**
Nitrate+Nitrite as Nitrogen		EPA 353.2 Nitrogen, Total Nitrate-Nitrite (Colorimetric, Automated, Cadmium	mg/L	**0.14**	**0.192**	**0.145**	**0.178**		**0.169**	**0.148**
Field Parameters										
Temperature		Field Test	°C	5.84	6.69	5.95	6.38	5.75	5.13	5.66
pH		Field Test	N/A	7.45	7.66	7.39	7.58	7.06	7.08	7.34
ORP		Field Test	mV	101	114	87	94	-26	68	42
Conductance		Field Test	mS/cm	0.194	0.163	0.190	0.161	0.091	0.160	0.190
Turbidity		Field Test	NTU	0.79	0.00	0.00	0.00	60.60	0.00	0.77
Dissolved Oxygen		Field Test	mg/L	14.1	12.11	13.13	10.06	18.68	11.50	16.32
Total Dissolved Solids		Field Test	g/L	0.1	0.106	0.123	0.104	0.059	0.104	0.124

Key

Bold = detection

°C = Degrees Celsius g/L = grams per liter

Gray shading = exceedance of background

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.

µg/L = micrograms per liter mg/L = milligrams per liter

mS/cm = Millisiemens per Centimeter mV = Millivolt

N/A = not applicable

ng/L = nanograms per liter

NTU = Nephelometric Turbidity Unit

ORP = Oxidation reduction potential

U = Analyte was analyzed for but not detected. Value provided is reporting limit.

UJ = Indicates the compound of analyte was analyzed for but not detected. The sample detection limit is an estimated value.

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD04 11RD04SW	RD05 10RD05SW	RD05 11RD05SW	RD12 11RD12SW	RD09 10RD09SW	RD09 11RD09SW	RD06 10RD06SW
Total Inorganic Elements										
Aluminum	80	SW6010B-Total	µg/L	**14.1 J**	14.8 U	**6.5 J**	**18.7 J**	14.8 U	**22.6 J**	14.8 U
Antimony	1.52	SW6020A-Total	µg/L	**17.3**	**26.7**	**32.6**	**61.6**	**108**	**126 J**	**141**
Arsenic	1.1	SW6020A-Total	µg/L	**11.3 J**	**903**	**1030**	**22.5**	**73.1**	**73.1**	**79.6**
Barium	26.4	SW6020A-Total	µg/L	**22**	**102**	**103**	**22.8**	**29.2**	**25.5**	**29.5**
Beryllium	ND	SW6020A-Total	µg/L	0.006 U	0.027 U	**0.009 J**	0.006 U	0.027 U	0.006 U	0.027 U
Cadmium	ND	SW6020A-Total	µg/L	0.005 U	0.022 U	0.005 U	0.005 U	0.022 U	0.005 U	0.022 U
Calcium	18400	SW6010B-Total	µg/L	**16600**	**34400**	**36000**	**17400**	**18700**	**17500**	**19600**
Chromium	0.43	SW6020A-Total	µg/L	**0.28**	0.053 U	**0.15 J**	**0.25**	0.053 U	**0.57**	0.053 U
Cobalt	0.066	SW6020A-Total	µg/L	**0.059**	**5.3**	**5.24**	**0.058**	**0.3**	**0.244**	**0.3**
Copper	0.37	SW6020A-Total	µg/L	**0.33**	0.232 U	**0.45**	**0.38**	0.232 U	**0.47**	0.232 U
Iron	138	SW6010B-Total	µg/L	**147**	**2160**	**2390**	**137**	**190**	**205**	**180**
Iron	138	SW6020A-Total	µg/L							
Lead	0.021	SW6020A-Total	µg/L	**0.012 J**	0.2 U	**0.079**	**0.013 J**	0.2 U	**0.024**	0.2 U
Magnesium	9680	SW6010B-Total	µg/L	**9010**	**33700**	**37100**	**9800**	**10900**	**10500**	**11600**
Manganese	17.5	SW6020A-Total	µg/L	**14.6**	**379**	**354**	**13.3**	**26.5**	**26.4**	**30.5**
Nickel	0.44	SW6020A-Total	µg/L	**0.43**	**19.2**	**17.1**	**0.45**	**1.1**	**1.25**	**1.1**
Potassium	218 J	SW6010B-Total	µg/L	**254 J**	**1130**	**1210**	**225 J**	69.1 U	**312 J**	69.1 U
Selenium	0.5 J	SW6020A-Total	µg/L	**0.4 J**	0.125 U	0.2 U	**0.5 J**	0.125 U	**0.4 J**	0.125 U
Silver	ND	SW6020A-Total	µg/L	0.004 U	0.009 U	0.004 U	0.004 U	0.009 U	0.004 U	0.009 U
Sodium	1580	SW6010B-Total	µg/L	**1530**	**12800**	**12900**	**1810**	**2320**	**2050**	**2580**
Thallium	ND	SW6020A-Total	µg/L	0.005 U	0.003 U	0.005 U	0.005 U	0.003 U	0.005 U	0.003 U
Vanadium	0.3	SW6020A-Total	µg/L	**0.12 J**	0.026 U	**0.1 J**	**0.15 J**	0.026 U	**0.14 J**	0.026 U
Zinc	0.5 J	SW6020A-Total	µg/L	0.2 U	0.81 U	**1.7**	**0.3 J**	0.81 U	**0.5**	0.81 U
Total Low Level Mercury										
Mercury, Total	2.63	EPA 1631-Total	ng/L	**20.4**	**43.4**	**63**	**71.1**	**183**	**312**	**208**
Dissolved Inorganic Elements										
Aluminum, Dissolved	11.9 J	SW6010B-Diss	µg/L	**7 J**	14.8 U	**3.5 J**	**7 J**	14.8 U	**11.1 J**	14.8 U
Antimony, Dissolved	1.4 J	SW6020A-Diss	µg/L	**17.4**	**3.2**	**1.37**	**60.1**	**101**	**124 J**	**130**
Arsenic, Dissolved	0.9	SW6020A-Diss	µg/L	**10.6**	**857**	**856**	**21.8**	**67.8**	**69.8**	**74.2**
Barium, Dissolved	24	SW6020A-Diss	µg/L	**21.8**	**98.7**	**99.5**	**22.3**	**28.2**	**25.2**	**28.6**
Beryllium, Dissolved	ND	SW6020A-Diss	µg/L	0.006 U	0.027 U	**0.012 J**	0.006 U	0.027 U	0.006 U	0.027 U
Cadmium, Dissolved	ND	SW6020A-Diss	µg/L	0.005 U	0.022 U	0.005 U	0.005 U	0.022 U	0.005 U	0.022 U
Calcium, Dissolved	19200	SW6010B-Diss	µg/L	**16700**	**35000**	**36000**	**16900**	**19400**	**17700**	**19200**
Chromium, Dissolved	0.23	SW6020A-Diss	µg/L	**0.28**	0.053 U	**0.16 J**	**0.21**	0.053 U	**0.18 J**	0.053 U
Cobalt, Dissolved	0.056	SW6020A-Diss	µg/L	**0.049**	**4.9**	**4.35**	**0.049**	**0.2**	**0.21**	**0.2**
Copper, Dissolved	0.27	SW6020A-Diss	µg/L	**0.34**	0.232 U	**0.15**	**0.35**	0.232 U	**0.35**	0.232 U
Iron, Dissolved	100	SW6010B-Diss	µg/L	**111**	**2020**	**2180**	**89.7**	**130**	**149**	**110**
Lead, Dissolved	ND	SW6020A-Diss	µg/L	**0.006 J**	0.2 U	**0.005 J**	0.005 U	0.2 U	**0.008 J**	0.2 U
Magnesium, Dissolved	10200	SW6010B-Diss	µg/L	**8930**	**34800**	**36400**	**9460**	**11400**	**10600**	**11500**
Manganese, Dissolved	15.9	SW6020A-Diss	µg/L	**12.1**	**380**	**345**	**10.8**	**24.9**	**23.6**	**28.8**
Nickel, Dissolved	0.35	SW6020A-Diss	µg/L	**0.44**	**17**	**10.9**	**0.43**	**0.8**	**0.92**	**1**
Potassium, Dissolved	220 J	SW6010B-Diss	µg/L	**267 J**	**1130**	**1170**	**230 J**	69.1 U	**293 J**	69.1 U
Selenium, Dissolved	0.5 J	SW6020A-Diss	µg/L	**0.4 J**	0.125 U	0.2 U	**0.4 J**	0.125 U	**0.3 J**	0.125 U
Silver, Dissolved	ND	SW6020A-Diss	µg/L	0.004 U	0.009 U	0.004 U	0.004 U	0.009 U	0.004 U	0.009 U
Sodium, Dissolved	1610	SW6010B-Diss	µg/L	**1500**	**13000**	**12500 J**	**1720**	**2300**	**2060**	**2430**
Thallium, Dissolved	ND	SW6020A-Diss	µg/L	0.005 U	0.003 U	0.005 U	0.005 U	0.003 U	0.005 U	0.003 U
Vanadium, Dissolved	0.13 J	SW6020A-Diss	µg/L	**0.1 J**	0.026 U	**0.07 J**	**0.14 J**	0.026 U	**0.13 J**	0.026 U
Zinc, Dissolved	ND	SW6020A-Diss	µg/L	0.2 U	0.81 U	0.2 U	**0.3 J**	0.81 U	**0.5 J**	0.81 U
Dissolved Low Level Mercury										
Mercury, Dissolved	6.37	EPA 1631-Diss	ng/L	**6.81**	**3.04**	**2.42**	**13.9**	**14.1**	**10.9**	**15.4**
Arsenic Speciation										
Arsenate		EPA 1632 As-Cryo-W-Speciation	µg/L	**8.36 J**	**70**	**234**	**21.3**			**51.5**
Arsenite		EPA 1632 As3-CRYO-W	µg/L	**0.961 J**	**667**	**510**	**0.714**			**14.7**
Inorganic Arsenic		EPA 1632 Total Inorganic As - Water	µg/L	**9.32 J**	**737**	**745**	**22**			**66.2**

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD04 11RD04SW	RD05 10RD05SW	RD05 11RD05SW	RD12 11RD12SW	RD09 10RD09SW	RD09 11RD09SW	RD06 10RD06SW
Methlymercury										
Methylmercury	0.08 J	EPA 1630	ng/L	**0.08 J**	**0.491**	**0.62**	**0.09 J**	**0.144**	**0.13**	**0.141**
Semi-Volatile Organic Compounds										
1-Methylnaphthalene		SW8270D	µg/L		**1.5**			0.48 U		0.48 U
2-Methylnaphthalene		SW8270C Base Neutral/Acid Semivolatile	µg/L	0.24 U		**1.2 J**	0.24 U		0.24 U	
2-Methylnaphthalene		SW8270D	µg/L		**1.5**			0.48 U		0.48 U
Naphthalene		SW8270C Base Neutral/Acid Semivolatile	µg/L	0.37 U		**0.68 J**	0.37 U		0.37 U	
Unknown Hydrocarbon		SW8270D	µg/L		0 U			**3 J**		0 U
Gasoline, Diesel and Residual Range Organics										
Gasoline Range Organics		AK 101	mg/L							
Diesel Range Organics		AK 102	mg/L							
Residual Range Organics		AK 103	mg/L							
General Chemistry										
Bicarbonate		A2320 General Chemistry Parameters	mg/L	**72.4**	**229**	**243**	**73.3**	**85.4**	**80.3**	**87.8**
Carbonate		A2320 General Chemistry Parameters	mg/L	3 U	1 U	3 U	3 U	1 U	3 U	1 U
Hydroxide		A2320 General Chemistry Parameters	mg/L		1 U			1 U		1 U
Hydroxide		SM 2320	mg/L							
Total Dissolved Solids		A2540C General Chemistry Parameters	mg/L	**82**		**244**	**72**		**81**	
Total Suspended Solids		A2540D General Chemistry Parameters	mg/L	5 U		5 U	5 U		5 U	
Total Dissolved Solids		EPA 160.1	mg/L		**110**			**116**		**83**
Total Suspended Solids		EPA 160.2	mg/L		**3.6**			1.1 U		1.1 U
Chloride		EPA 300.0 General Chemistry Parameters	mg/L	**0.38 J**	**0.6**	**0.46**	**0.35 J**	**0.5**	**0.36 J**	**0.5**
Fluoride		EPA 300.0 General Chemistry Parameters	mg/L	**0.07 J**	**0.1**	**0.13 J**	**0.07 J**	0.022 U	**0.05 J**	0.022 U
Sulfate		EPA 300.0 General Chemistry Parameters	mg/L	**9.1**	**28.5**	**27.7**	**9.07**	**13**	**11.9**	**13.2**
Nitrate+Nitrite as Nitrogen		EPA 353.2 Nitrogen, Total Nitrate-Nitrite (Colorimetric, Automated, Cadmium	mg/L	**0.185**	0.001 U	0.009 U	**0.156**	**0.116**	**0.192**	**0.127**
Field Parameters										
Temperature		Field Test	°C	5.00	3.79	6.77	5.09	4.84	6.77	4.43
pH		Field Test	N/A	6.66	6.11	5.37	5.97	7.16	7.71	6.98
ORP		Field Test	mV	15	-143	-38	71	57	9	113
Conductance		Field Test	mS/cm	0.162	0.524	0.387	0.177	0.215	0.166	0.072
Turbidity		Field Test	NTU	0.00	2.19	4.63	0.00	0.98	0.00	4.06
Dissolved Oxygen		Field Test	mg/L	16.00	16.29	9.00	13.61	14.55	15.61	15.06
Total Dissolved Solids		Field Test	g/L	0.106	0.335	0.251	0.115	0.14	0.108	0.046

Key

Bold = detection

°C = Degrees Celsius g/L = grams per liter

Gray shading = exceedance of background

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.

µg/L = micrograms per liter mg/L = milligrams per liter

mS/cm = Millisiemens per Centimeter mV = Millivolt

N/A = not applicable

ng/L = nanograms per liter

NTU = Nephelometric Turbidity Unit

ORP = Oxidation reduction potential

U = Analyte was analyzed for but not detected. Value provided is reporting limit.

UJ = Indicates the compound of analyte was analyzed for but not detected. The sample detection limit is an estimated value.

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD06 11RD06SW	RD07 10RD07SW	RD07 11RD07SW	RD08 10RD08SW	RD08 11RD08SW
Total Inorganic Elements								
Aluminum	80	SW6010B-Total	µg/L	**20.1 J**	14.8 U	**19.3 J**	14.8 U	**19.4 J**
Antimony	1.52	SW6020A-Total	µg/L	**162 J**	**158**	**167 J**	**170**	**184**
Arsenic	1.1	SW6020A-Total	µg/L	**85.3**	**80.5**	**80**	**85.6**	**78.1**
Barium	26.4	SW6020A-Total	µg/L	**28.3**	**29.8**	**26.5**	**30.8**	**26.2**
Beryllium	ND	SW6020A-Total	µg/L	0.006 U	0.027 U	0.006 U	0.027 U	0.006 U
Cadmium	ND	SW6020A-Total	µg/L	0.005 U	0.022 U	**0.005 J**	0.022 U	0.005 U
Calcium	18400	SW6010B-Total	µg/L	**17800**	**18900**	**18000**	**19600**	**17900**
Chromium	0.43	SW6020A-Total	µg/L	**0.27**	0.053 U	**0.28**	0.053 U	**0.52**
Cobalt	0.066	SW6020A-Total	µg/L	**0.274**	**0.2**	**0.23**	**0.2**	**0.23**
Copper	0.37	SW6020A-Total	µg/L	**0.45**	0.232 U	**0.53**	**0.5**	**0.48 J**
Iron	138	SW6010B-Total	µg/L	**199**	**150**	**186**	**140**	**189**
Iron	138	SW6020A-Total	µg/L					
Lead	0.021	SW6020A-Total	µg/L	**0.02 J**	0.2 U	**0.026**	0.2 U	**0.029 J**
Magnesium	9680	SW6010B-Total	µg/L	**10600**	**11300**	**10700**	**11600**	**11000**
Manganese	17.5	SW6020A-Total	µg/L	**32.7**	**27.6**	**28.2**	**24.5**	**32**
Nickel	0.44	SW6020A-Total	µg/L	**1.18**	**1**	**1.13**	**1**	**1.23**
Potassium	218 J	SW6010B-Total	µg/L	**299 J**	69.1 U	**292 J**	69.1 U	**312 J**
Selenium	0.5 J	SW6020A-Total	µg/L	**0.3 J**	0.125 U	**0.4 J**	0.125 U	**0.5 J**
Silver	ND	SW6020A-Total	µg/L	0.004 U	0.009 U	0.004 U	0.009 U	**0.008 J**
Sodium	1580	SW6010B-Total	µg/L	**2130**	**2440**	**2150**	**2590**	**2430**
Thallium	ND	SW6020A-Total	µg/L	0.005 U	0.003 U	0.005 U	0.003 U	0.005 U
Vanadium	0.3	SW6020A-Total	µg/L	**0.15 J**	0.026 U	**0.12 J**	0.026 U	**0.14 J**
Zinc	0.5 J	SW6020A-Total	µg/L	**0.3 J**	0.81 U	**0.3 J**	0.81 U	**0.5 J**
Total Low Level Mercury								
Mercury, Total	2.63	EPA 1631-Total	ng/L	**214**	**233**	**200**	**385**	**239**
Dissolved Inorganic Elements								
Aluminum, Dissolved	11.9 J	SW6010B-Diss	µg/L	**15 J**	14.8 U	**11.1 J**	14.8 U	**19.7 J**
Antimony, Dissolved	1.4 J	SW6020A-Diss	µg/L	**148 J**	**143**	**163 J**	**158**	**184**
Arsenic, Dissolved	0.9	SW6020A-Diss	µg/L	**74.7**	**73.7**	**73.1**	**75.4**	**80.9**
Barium, Dissolved	24	SW6020A-Diss	µg/L	**25.9**	**28.5**	**26.2**	**29.5**	**27.3**
Beryllium, Dissolved	ND	SW6020A-Diss	µg/L	0.006 U	0.027 U	0.006 U	0.027 U	0.006 U
Cadmium, Dissolved	ND	SW6020A-Diss	µg/L	0.005 U	0.022 U	0.005 U	0.022 U	0.005 U
Calcium, Dissolved	19200	SW6010B-Diss	µg/L	**17900**	**19100**	**17800**	**19400**	**17900**
Chromium, Dissolved	0.23	SW6020A-Diss	µg/L	**0.11 J**	0.053 U	**0.33**	0.053 U	**0.39**
Cobalt, Dissolved	0.056	SW6020A-Diss	µg/L	**0.229**	0.007 U	**0.197**	0.007 U	**0.236**
Copper, Dissolved	0.27	SW6020A-Diss	µg/L	**0.32**	0.232 U	**0.32**	0.232 U	**0.5**
Iron, Dissolved	100	SW6010B-Diss	µg/L	**140**	**90**	**104**	**70**	**176**
Lead, Dissolved	ND	SW6020A-Diss	µg/L	0.005 U	0.2 U	0.005 U	0.2 U	**0.037**
Magnesium, Dissolved	10200	SW6010B-Diss	µg/L	**10900**	**11500**	**11000**	**11600**	**11000**
Manganese, Dissolved	15.9	SW6020A-Diss	µg/L	**27.5**	**24.6**	**24.3**	**20.1**	**27.5**
Nickel, Dissolved	0.35	SW6020A-Diss	µg/L	**0.99**	**0.9**	**1**	**0.8**	**1.26**
Potassium, Dissolved	220 J	SW6010B-Diss	µg/L	**287 J**	69.1 U	**286 J**	69.1 U	**382 J**
Selenium, Dissolved	0.5 J	SW6020A-Diss	µg/L	**0.3 J**	0.125 U	**0.3 J**	0.125 U	0.3 U
Silver, Dissolved	ND	SW6020A-Diss	µg/L	0.004 U	0.009 U	0.004 U	0.009 U	**0.009 J**
Sodium, Dissolved	1610	SW6010B-Diss	µg/L	**2180**	**2460**	**2190**	**2490**	**2430**
Thallium, Dissolved	ND	SW6020A-Diss	µg/L	0.005 U	0.003 U	0.005 U	0.003 U	0.005 U
Vanadium, Dissolved	0.13 J	SW6020A-Diss	µg/L	**0.09 J**	0.026 U	**0.09 J**	0.026 U	**0.13 J**
Zinc, Dissolved	ND	SW6020A-Diss	µg/L	0.2 U	0.81 U	0.2 U	0.81 U	**1**
Dissolved Low Level Mercury								
Mercury, Dissolved	6.37	EPA 1631-Diss	ng/L	**13.3**	**16.4**	**13.5**	**15.5**	**12.4**
Arsenic Speciation								
Arsenate		EPA 1632 As-Cryo-W-Speciation	µg/L	**55.7**			**83**	**76.9 J**
Arsenite		EPA 1632 As3-CRYO-W	µg/L	**19.5 J**			**3.76**	**10.2**
Inorganic Arsenic		EPA 1632 Total Inorganic As - Water	µg/L	**75.1**			**86.8**	**87.1 J**

Table A-4 Surface Water Results

Analyte	Background Screening Criteria	Station ID / Sample ID / Method	Units	RD06 11RD06SW	RD07 10RD07SW	RD07 11RD07SW	RD08 10RD08SW	RD08 11RD08SW
Methlymercury								
Methylmercury	0.08 J	EPA 1630	ng/L	**0.14**	**0.123**	**0.14**	**0.129**	**0.12**
Semi-Volatile Organic Compounds								
1-Methylnaphthalene		SW8270D	µg/L		0.48 U		0.48 U	
2-Methylnaphthalene		SW8270C Base Neutral/Acid Semivolatile Organic compounds	µg/L	0.24 U		0.24 U		0.24 U
2-Methylnaphthalene		SW8270D	µg/L		0.48 U		0.48 U	
Naphthalene		SW8270C Base Neutral/Acid Semivolatile Organic compounds	µg/L	0.37 U		0.37 U		0.37 U
Unknown Hydrocarbon		SW8270D	µg/L		0 U		0 U	
Gasoline, Diesel and Residual Range Organics								
Gasoline Range Organics		AK 101	mg/L					
Diesel Range Organics		AK 102	mg/L					
Residual Range Organics		AK 103	mg/L					
General Chemistry								
Bicarbonate		A2320 General Chemistry Parameters	mg/L	**81.2**	**87.8**	**81.3**	**87**	**81.9**
Carbonate		A2320 General Chemistry Parameters	mg/L	3 U	1 U	3 U	1 U	3 U
Hydroxide		A2320 General Chemistry Parameters	mg/L		1 U		1 U	
Hydroxide		SM 2320	mg/L					
Total Dissolved Solids		A2540C General Chemistry Parameters	mg/L	**78**		**84**		**89**
Total Suspended Solids		A2540D General Chemistry Parameters	mg/L	5 U		5 U		5 U
Total Dissolved Solids		EPA 160.1	mg/L		**115**		**220**	
Total Suspended Solids		EPA 160.2	mg/L		1.1 U		1.1 U	
Chloride		EPA 300.0 General Chemistry Parameters	mg/L	**0.37 J**	**0.5**	**0.45**	**0.5**	**0.37 J**
Fluoride		EPA 300.0 General Chemistry Parameters	mg/L	**0.04 J**	0.022 U	**0.09 J**	0.022 U	**0.06 J**
Sulfate		EPA 300.0 General Chemistry Parameters	mg/L	**12.2**	**13.2**	**11.9**	**13.1**	**12.1**
Nitrate+Nitrite as Nitrogen		EPA 353.2 Nitrogen, Total Nitrate-Nitrite (Colorimetric, Automated, Cadmium	mg/L	**0.182**	**0.143**	**0.173**	**0.115**	**0.169**
Field Parameters								
Temperature		Field Test	°C	6.59	4.22	6.31	4.40	5.60
pH		Field Test	N/A	7.62	6.56	7.57	6.27	7.49
ORP		Field Test	mV	86	177	80	2.53	36
Conductance		Field Test	mS/cm	0.168	0.220	0.170	0.229	0.120
Turbidity		Field Test	NTU	0.00	0.21	0.00	0.59	0.00
Dissolved Oxygen		Field Test	mg/L	9.77	16.96	10.75	13.9	11.66
Total Dissolved Solids		Field Test	g/L	0.109	0.143	0.11	0.149	0.077

Key

Bold = detection

°C = Degrees Celsius g/L = grams per liter

Gray shading = exceedance of background

J = Analyte detected but relative percent difference was outside control limits; therefore, concentration is estimated.

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N/A = not applicable

ng/L = nanograms per liter

NTU = Nephelometric Turbidity Unit

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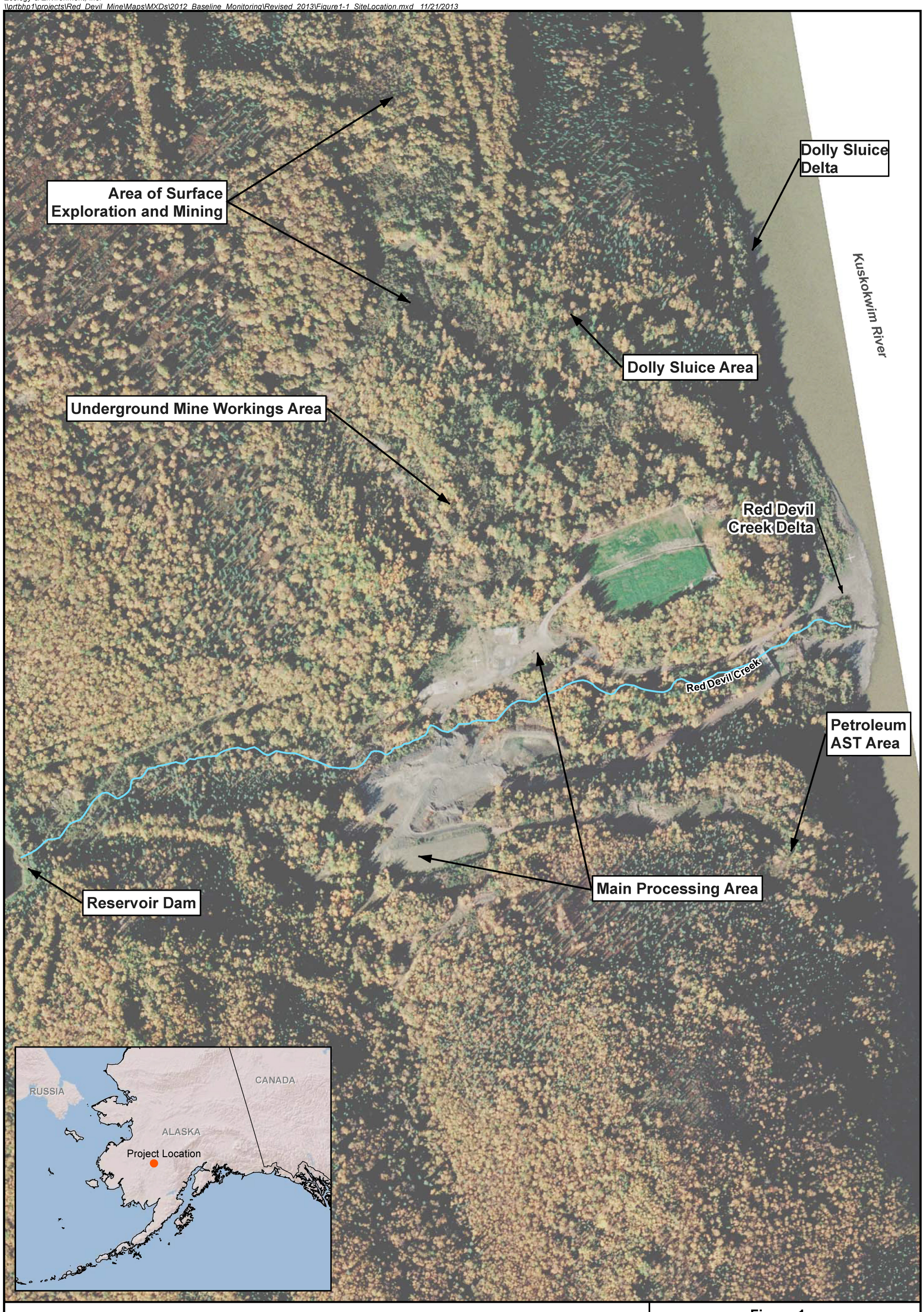
Attachment B

MAPS

Ecology & Environment, Inc.
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Revised_2013\Figure1-1_SiteLocation.mxd 11/21/2013



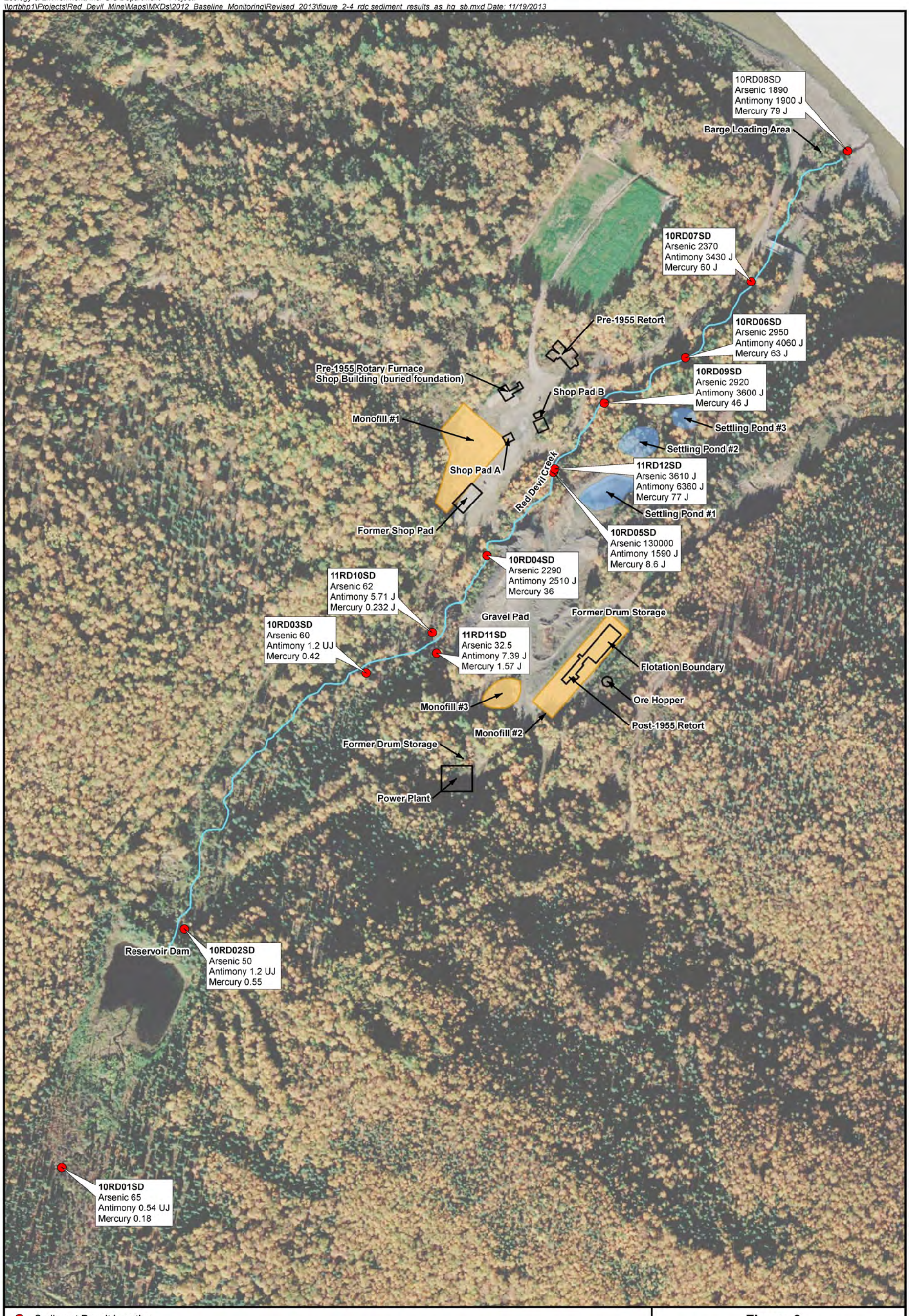
RED DEVIL MINE

Red Devil, Alaska

Figure 1
Site Location Map

0 50 100 200 300 400 500
Feet
0 20 40 80 120
Meters
Scale 1:2,800

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\Projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Revised_2013\figure_2-4_rdc_sediment_results_as_hg_sb.mxd Date: 11/19/2013



Sediment Result Location
Settling Pond
Monofill
Historical Structure

Results are displayed in mg/Kg units

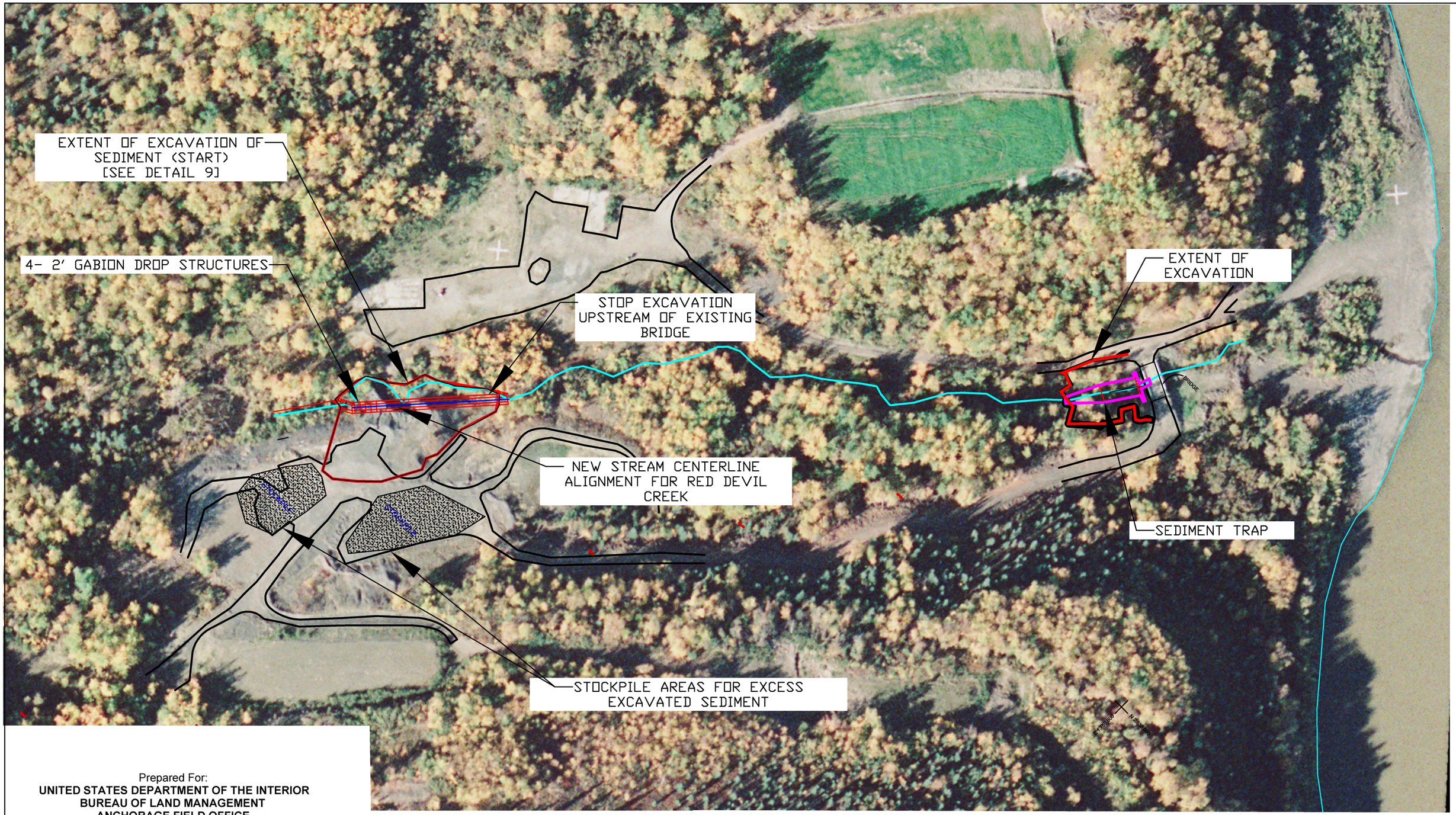
RED DEVIL MINE

Red Devil, Alaska

Figure 2
Red Devil Creek
Arsenic, Antimony, and Mercury
Sediment Sample Results

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters
Scale 1:2,400

Image Source: Aero-Metric, Inc. 2010a



Prepared For:
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ANCHORAGE FIELD OFFICE
4700 BLM Road
Anchorage, AK 99507

Prepared By:
Ecology and Environment, Inc.
720 Third Ave., Suite 1700
Seattle, WA 98104

SCALE IN FEET: 1"= 100'

0 100 200 300

NO.	DATE	DWN	APP'D	DESCRIPTION

REVISIONS

Ecology and environment, inc.

DESIGNED BY: J. JENKINS
CHECKED BY: N. BROWN P.E.
DRAWN BY: V. GEE

DRAFT

DRAFT

RED DEVIL MINE EECA RED DEVIL, ALASKA
FIGURE 3 PLAN VIEW

ALTERNATIVE 4 - EXCAVATION OF CONTAMINATED SEDIMENT NEAR TAILING PILE

SCALE	DATE ISSUED	CAD FILE NO.	DRAWING NO.
NOTED	11-25-13	CHICAGO\PROJECT\START\RED DEVIL\EECA\CAD	3 OF 7

Attachment C

ARARS

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential ARAR or TBC	Alternative Compliance with ARARs
Location-Specific				
Federal				
Archaeological and Historic Preservation Act of 1974	16 USC 469 40 CFR 6.301(c)	Provides for the preservation of historical and archaeological data that might otherwise be lost as a result of terrain alterations. If any remedial action could cause irreparable loss to significant scientific, pre-historical, or archaeological data, the act requires the agency undertaking the project to preserve the data or request the U.S. Department on the Interior to do so.	Applicable to all Alternatives	Alternative can be imple-mented to be compliant.
Historic Sites, Buildings and Antiques Act, Executive Order 11593	16 USC 461 et seq. 36 CFR 62.1 36 CFR 63 40 CFR Part 6.301(a)	Requires federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts to such landmarks. This Executive Order provides for the inventory and nomination of historical and archaeological sites. There are no buildings remaining at RDM; therefore, this requirement is not an ARAR.	Not applicable, no structures to be addressed.	Alternative can be imple-mented to be compliant.
National Historic Preservation Act	16 USC 470 et seq. 36 CFR 63 and 800 40 CFR 6.301(b)	Requires federal agencies to take into account the effect of any action on any district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. Regulates inventory, assessment, and consultation on project impacts and protection measures for cultural properties on federal lands. There are no buildings remaining at RDM; therefore, this requirement is not an ARAR.	Not applicable, no structures to be addressed.	Alternative can be imple-mented to be compliant.
Archaeological Resources Protection Act of 1979	16 USC 470aa-mm 43 CFR Part 7	Requires permits for excavation of archaeological resources on public or tribal lands.	Applicable only to Alternative 4.	Alternative can be imple-mented to be compliant.
Native American Graves Protection and Reparation Act	25 USC 3001-3013 43 CFR 10	Regulations that pertain to the identification, protection, and appropriate disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony.	Applicable to all alternatives.	Alternative can be imple-mented to be compliant.
Protection of Wetlands, Executive Order 11990	40 CFR 6	Requires federal agencies to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction, and to preserve the values of wetlands.	Appropriate to all alternatives.	Alternative can be imple-mented to be compliant.

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential ARAR or TBC	Alternative Compliance with ARARs
Flood Plain Management, Executive Order 11988	40 CFR 6	Requires federal agencies to avoid, to the extent practicable, the long- and short-term adverse impacts associated with the occupancy and modification of flood plains, and to avoid direct and indirect support of flood plain development wherever there is a practicable alternative.	Applicable to all alternatives.	Alternative can be imple-mented to be compliant.
Fish and Wildlife Coordination Act	16 USC 1251 661 et seq. 40 CFR 6.302(g)	Requires consultation with the U.S. Fish and Wildlife Service for the protection of fish and wildlife when a proposed action may result in modifications to stream, river, or other surface water of the US.	Applicable	Alternative can be imple-mented to be compliant.
Endangered Species Act	16 USC 1531 40 CFR 6.302(b) 50 CFR 17, 402	Provides for the protection of fish, wildlife, and plants that are threatened with extinction. Federal agencies are required under Section 7 of the ESA to ensure that their actions will not jeopardize the continued existence of a listed species or result in destruction of or adverse modification to its critical habitat. If the proposed action may affect the listed species or its critical habitat, consultation with the U.S. Fish and Wildlife Service may be required.	While appli-cable, no endangered species have been identified within project area.	Alternative can be imple-mented to be compliant.
Bald and Golden Eagles Protection Act	16 USC 668	Provides for the protection of bald and golden eagles.	Applicable to all alternatives	Alternative can be imple-mented to be compliant.
Magnuson-Stevens Fishery Conservation and Management Act	16 USC 1801-1884	Provides for protection of Essential Fish Habitat.	Applicable	Allternative can be implemented to be compliant.
State				
Alaska Department of Fish and Game Anadromous Fish Act	AS 16.05.871- .901	Provides for the protection of fish and game habitats in the State of Alaska. Consultation with the Alaska Department of Fish and Game is required for any activities that could impede fish passage or that could divert, obstruct, pollute, or change the natural flow or bed of an anadromous water body. Tidelands (to mean low water at the mouth) are included.	Applicable, action will reduce con-taminant loading to Kuskokwim River.	Alternative can be imple-mented to be compliant.

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential ARAR or TBC	Alternative Compliance with ARARs
Action-Specific				
Federal				
Clean Water Act – National Pollutant Discharge Elimination System	40 CFR 122-125 and 403	Establishes discharge limits and monitoring requirements for direct discharges of treated effluent and stormwater runoff to surface waters of the US. EPA gives states the authority to implement the National Pollutant Discharge Elimination System program.	Applicable as Early Action does address surface water.	Alternative can be imple-mented to be compliant.
Clean Water Act, Section 404	33 USC 1344 40 CFR 230 33 CFR 320-330	Restricts discharge of dredged or fill material into surface waters of the US, including wetlands. Requires that if there is no practicable alternative to impacting navigable waters of the US, then the impact must be minimized and unavoidable loss must be compensated for through mitigation on-site or off-site.	Applicable to all alternatives.	Alternative can be imple-mented to be compliant.
Clean Water Act – Water Quality Standards	40 CFR 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health. States are given the responsibility of establishing and revising the standards, and the authority to develop standards more stringent than required by Clean Water Act.	Applicable for all alternatives.	Alternative can be imple-mented to be compliant.
Resource Conservation and Recovery Act – Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR 257 42 USC 6944	Provides criteria by which solid waste disposal facilities and processes must operate to prevent adverse effects on human health or the environment. Facilities failing to meet these criteria are classified as open dumps, which are prohibited. Any remedial alternative that includes construction of a solid waste disposal facility would have to meet these requirements.	Applicable for all alternatives provided material is removed from the site.	Allternative can be imple-mented to be compliant.
Resource Conservation and Recovery Act – Hazardous Waste Management	40 CFR 260 42 USC 6921	Specifies hazardous waste management requirements. Waste at RDM would be classified as hazardous if moved off the site Area of Contamination.	Relevant and Appropriate for waste removal from site.	Alternative can be imple-mented to be compliant.
Resource Conservation and Recovery Act – Generator Standards	40 CFR 262 42 USC 6922	Establishes standards for generators of hazardous waste. Waste at RDM would be classified as hazardous if moved off the site Area of Contamination.	Applicable for all alternatives provided material is removed from the site.	Alternative can be imple-mented to be compliant.

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential ARAR or TBC	Alternative Compliance with ARARs
Resource Conservation and Recovery Act – Treatment, Storage, and Disposal Facility Requirements	40 CFR 264 42 USC 6924	Provides requirements for the generation, transportation, storage, and disposal of hazardous waste, including design and operating standards for hazardous waste treatment, storage, and disposal units. Waste at RDM would be classified as hazardous if moved off the site Area of Contamination.	Relevant and Appropriate provided material is removed from the site.	Alternative can be imple-mented to be compliant.
Resource Conservation and Recovery Act – Standards Applicable to Transporters of Hazardous Waste	40 CFR 263 42 USC 6923	Establishes standards for the transportation of hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR Part 262.	Applicable (if offsite disposal included in the remedial action)	Alternative can be imple-mented to be compliant.
Hazardous Materials Transportation Act	49 USC 1801-1813 40 CFR 107, 171-173, and 177	Regulates the transportation of hazardous waste on public roads.	Applicable (only if offsite disposal included in the remedial action)	Alternative can be imple-mented to be compliant.
Invasive Species, Executive Order 13112		Prevents the introduction of invasive species and provides guidance for their control.	Applicable, but no restoration is planned for this site.	Alternative can be imple-mented to be compliant.
State				
Alaska Anti-Degradation Water Quality Standards	18 AAC 70.015	Specifies that actions may not degrade water that is higher in quality than Ambient Water Quality Criteria unless approval is received from the Alaska Department of Environmental Conservation.	Applicable.	Alternative can be imple-mented to be compliant.
Alaska Wastewater Disposal Regulations	18 AAC 72.600(c) and (e)	Governs nondomestic wastewater discharges.	Applicable (if wastewater is generated as part of the remedial action), for all alternatives	Alternative can be imple-mented to be compliant.

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential ARAR or TBC	Alternative Compliance with ARARs
Alaska Oil and Other Hazardous Substances Pollution Control	18 AAC 75.355(b),(c) and (d) 18 AAC 75.360(2),(3),(4)(c),(6),(7),(8) 18 AAC 75.370	Provides operation and reporting requirements for the cleanup of oil or other hazardous substance releases, including standards and guidance for site characterization, cleanup levels, and risk assessment.	Applicable to all alternatives.	Alternative can be implemented to be compliant.
Alaska Pollutant Discharge Elimination System Program	18 AAC 83	Establishes a program for controlling stormwater discharges from inactive mine sites.	Applicable for all alternatives during construction activities.	Alternative can be implemented to be compliant.

Key:
AAC = Alaska Administrative Code.
ADEC = Alaska Department of Environmental Conservation.
ARAR = Applicable or Relevant and Appropriate Requirements.
AS = Alaska Statutes.
ATSDR Agency for Toxic Substances and Disease Registry.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
RCRA = Resource Conservation and Recovery Act.
RDM = Red Devil Mine.
TBC = To Be Considered.
USC = United States Code.