Quality Assurance Project Plan
Salt Chuck Mine Remedial Investigation
Tongass National Forest, Alaska

Prepared for

U.S. Environmental Protection Agency
Region 10

May 14, 2013

Prepared by

CH2MHILL

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Title and Approval Sheet
Quality Assurance Project Plan
Salt Chuck Mine Remedial Investigation

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Acronyms and Abbreviations

%C	percent completeness
%R	percent recovery
AES	Architect and Engineering Services
AST	above-ground storage tank
ASTM	American Society of Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COC	chain of custody
CSM	conceptual site model
CY	cubic yard
DO	dissolved oxygen
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
ESAT	Environmental Services Assistance Team
ESU	Environmental Services Unit
FASTAC	Field and Analytical Services Teaming Advisory Committee
FP	Field Procedures
FS	Feasibility Study
FTL	Field Team Leader
GPS	Geographic Positioning System
HSP	Health and Safety Plan
IAG	Interagency Agreement
IDW	Investigation-Derived Waste
µg/L	milligram per liter
µm	micrometer
MDL	Method Detection Limit
MEL	Manchester Environmental Laboratory
mg/L	milligram per liter
MRL	Method Reporting Limit
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NPL	National Priorities List

NTCRA	non-time critical removal action
ORP	Oxidation Reduction Potential
PAHs	polycyclic aromatic hydrocarbons
PM	Project Manager
ppm	parts per million
PO	Project Officer
PPE	personal protective equipment
PSQ	principal study questions
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
R10	EPA Region 10
RI	Remedial Investigation
RPD	relative percent difference
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
RS&T	Research, Science and Technology
RTL	Review Team Leader
S2BVE	Stage 2B electronic validation
S4VEM	Stage 4 electronic and manual data validation
SDG	Sample Delivery Group
SMO	Sample Management Office
SOP	standard operating procedure
SRM	standard reference material
TOPO	Task Order Project Officer
TR	Traffic Report
WQX	Water Quality Exchange - EPA’s electronic data warehouse

SECTION 1

Introduction

This Quality Assurance Project Plan (QAPP) presents the policies, organizations, objectives, and functional activities and procedures for the Salt Chuck Mine remedial investigation/feasibility study (RI/FS) being conducted by the U.S. Environmental Protection Agency (EPA) in Tongass National Forest, Alaska. The purpose of the proposed sampling is to collect data to characterize the nature and extent of contamination and assess risk to human health and the environment in support the RI/FS. The QAPP and its supporting documents, found in Appendix A (Systematic Planning/Data Quality Objectives), Appendix B (Field Procedures [FP]), and Appendix C (Health and Safety Plan) have been developed to document the type and quality of data needed for environmental decisions, and the associated documentation to support the QAPP procedures.

The QAPP follows EPA guidelines contained in *EPA Guidance for Quality Assurance Project Plans* (EPA, 2002a), and *EPA Requirements for Quality Assurance Project Plans* (EPA, 2001, reissued 2006). The contents of the QAPP also meet the *Uniform Federal Policy for Quality Assurance Project Plans* (EPA, 2005). The development, review, approval, and implementation of the QAPP is part of EPA's mandatory quality system, which requires all organizations to develop and operate management structures and processes in order to ensure that data used in agency decisions are of the type and quality needed for their intended use. This document structure correlates with the subtitles found in the EPA guidelines (EPA, 2001, 2006), consistent with *Uniform Federal Policy for Quality Assurance Project Plans* (EPA, 2005.)

This document is organized as follows:

- **Section 1—Introduction.** Provides the purpose and organization of this report.
- **Section 2—Project Management (EPA Group A).** Provides a summary-level description of the project and task organization; background and problem definition; work tasks and project schedule; quality and objectives criteria; special training and certifications; and documents and records.
- **Section 3—Data Generation and Acquisition (EPA Group B).** Describes the sampling design; sampling methods; sample handling and custody; analytical methods; quality control; instrument/equipment testing, inspection and maintenance; instrument/equipment calibration and frequency, inspection/acceptance of supplies and consumables; nondirect measurements; and data management.
- **Section 4—Assessment and Oversight (EPA Group C).** Describes assessment, oversight, and reports to management.
- **Section 5—Data Validation and Usability (EPA Group D).** Introduces the concepts of data review, verification, and validation; describes verification and validation methods; and explains reconciliation with user requirements.
- **Section 6—References.** Provides a list of references used in this document.

In addition to the sections summarized above, this QAPP contains the following appended materials:

- **Appendix A—Systematic Planning/Data Quality Objectives**
- **Appendix B—Field Procedures**
- **Appendix C – Health and Safety Plan**

SECTION 2

Project Management (EPA Group A)

2.1 Project/Task Organization (A4)

The task order for this project was issued pursuant to EPA Architect and Engineering Services (AES) Contract No. 68-S7-04-01. The task order is managed by CH2M HILL's Project Manager (PM), who works directly with the EPA Task Order Project Officer (TOPO) to accomplish the task order. The PM manages the financial, scheduling, and technical aspects of the task order. The key people involved in interfacing with the PM are the EPA TOPO and the CH2M HILL Quality Assurance Officer (QAO), Review Team Leader (RTL), Task Leader, and Field Team Leader (FTL).

The project organization and lines of authority for CH2M HILL staff are illustrated on Figure 2-1. The data flow is shown on Figure 2-2. The data for this task order include both field measurements and laboratory analyses. Figure 2-1 shows the EPA and CH2M HILL technical and quality assurance personnel. The organizational functions shown are consistent with the overall AES 10 Program Plan (*EPA Management Plans and Standard Operating Procedures for Region 10 Architect Engineering Services*, *Contract Solicitation No. PR-R7-02-10217* [EPA, 2003a and updates]). The AES 10 Program Plan provides additional details for these organizational functions.

The following additional organizational guidelines apply:

- The review team (led by the RTL) and the QAO will review project planning documents, data evaluation, and deliverables. The primary responsibility for project quality rests with the PM, and independent quality control is provided by the RTL and QAO.
- The field team will implement the QAPP and Health and Safety Plan (HSP). The site safety coordinator is responsible for adherence to the HSP and field decontamination procedures. The entire field effort is directed by the FTL. Field team responsibilities are further described in Appendix B.
- The subcontract administrator will procure subcontracts for EPA's AES projects under Federal Acquisition Regulations and provides the interface with subcontractors. Subcontractors may be used on this task order for laboratory analyses depending on EPA regional laboratory availability.
- Where quality assurance problems or deficiencies requiring special action are uncovered, the PM, RTL, and QAO will identify the appropriate corrective action to be initiated by the FTL.
- EPA Region 10 (R10) adheres to a national EPA Field and Analytical Services Teaming Advisory Committee (FASTAC) strategy for procurement of all Superfund analytical services. FASTAC consists of EPA Headquarters, Regional Superfund Program staff, and Research, Science and Technology (RS&T) managers. The Field and Analytical Services Teaming Advisory Committee (FASTAC) developed a 'Decision Tree' analytical strategy in 1998 which has been implemented in every EPA Region. According to the Region 10 (R10) *Quality Management Plan* (EPA, 2009a), analytical services requests are funneled through the Regional Sample Control Center (RSCC) Coordinator who selects the analytical vehicle according to the following order:
  - Tier 1—EPA Regional Laboratory and Environmental Services Assistance Team (ESAT) Contract
  - Tier 2—National Analytical Services Contracts (Contract Laboratory Program [CLP])[1]
  - Tier 3—Region Specific Analytical Services Contracts
  - Tier 4—Analytical Services Interagency Agreements (IAGs) and Field Contracts/Subcontracts

[1] Information about the EPA Contract Laboratory Program may be found on the CLP Web site: http://www.epa.gov/superfund/programs/clp.

FIGURE 2-1
Project Organization and Lines of Authority

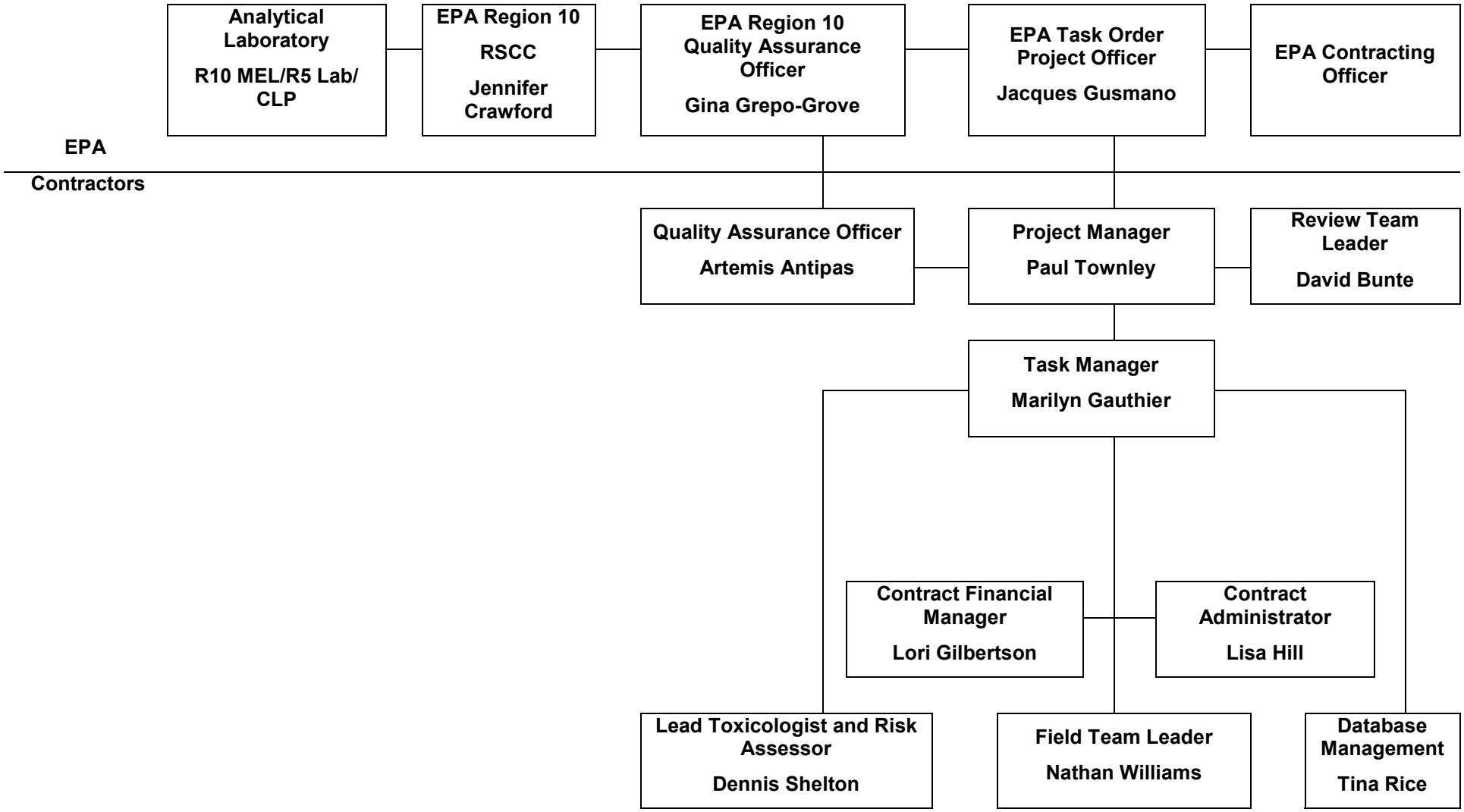
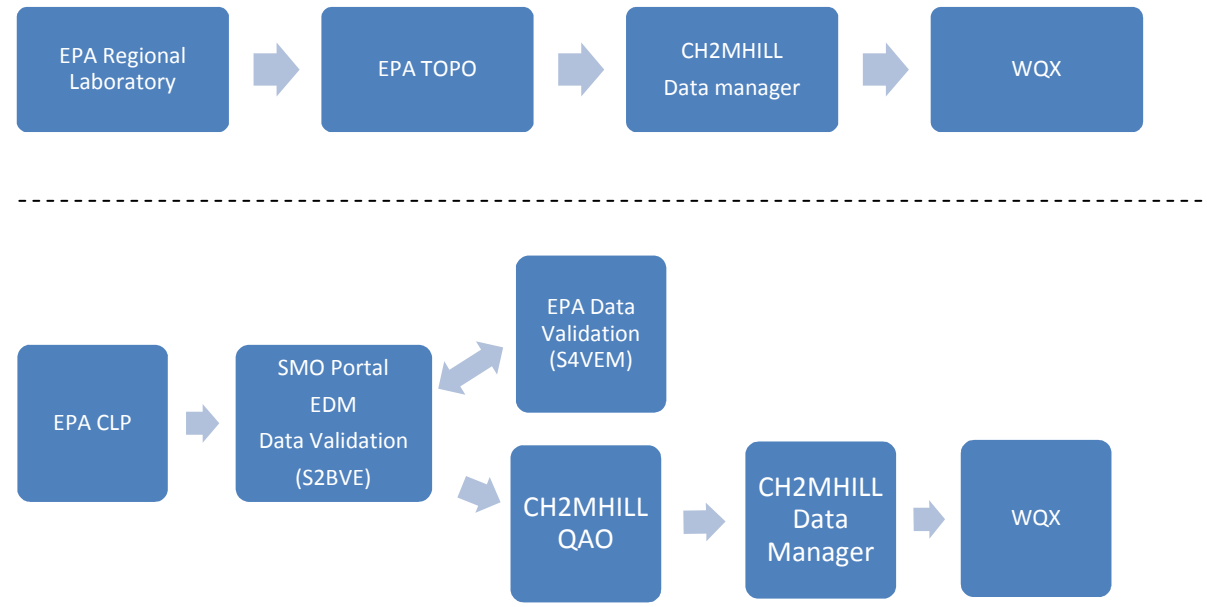
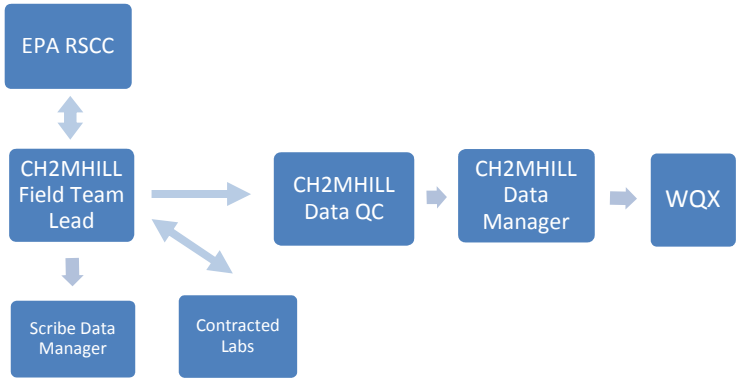


FIGURE 2-2
Data Flow

LABORATORY DATA



FIELD DATA



A QAPP and R10 Analytical Services Request Form are required for the RSCC to begin laboratory coordination. The R10 laboratory is offered first right of refusal before proceeding to Tier 2. RSCC lab coordination occurs after QAPP development. Therefore, laboratory and analytical specifics throughout the QAPP must be applicable to either the EPA R10 Manchester Environmental Laboratory (MEL) or a laboratory within the EPA CLP, as laboratory assignment is unknown during the planning process. Laboratories are required to meet the analytical requirements set forth in this QAPP for methodology, reporting limits, quality control, and data management. The laboratory data flow is presented in Figure 2-2.

- The EPA RSCC is responsible for both CLP and EPA MEL coordination. The RSCC works with the EPA Regional Quality Assurance Manager, the region's CLP Project Officer (PO), and the project's PMs in resolving laboratory and field quality assurance (QA) issues and laboratory scheduling. The RSCC provides the regional sample tracking numbers, sample tags, custody seals, and other CLP-required chain-of-custody documentation.

2.2 Background and Problem Definition (A5)

2.2.1 Background

Salt Chuck Mine (Site) was added to the EPA National Priorities List on March 4, 2010. The Site is located approximately 4½ miles south-southwest of Thorne Bay, Alaska, at the northern end of Kasaan Bay, on Prince of Wales Island. The mine is located in the Tongass National Forest, Outer Ketchikan County, within Township 72 South, Range 84 East, Sections 16 and 17, Copper River Meridian, Alaska. Salt Chuck Bay, from which the mine takes its name, is a shallow, restricted water body bordering the mine site to the south and forms the northernmost arm of Kasaan Bay (Figure 2-3).

The upper portion of the Site (Upland Area) covers approximately 45 acres and includes the Salt Chuck mine and former mill site. The Upland Area is drained by a small unnamed stream (hereafter "Unnamed Stream") that originates northeast of the site at Power Lake, cuts across the mine site, and discharges into Lake Ellen Creek just below the shoreline at Salt Chuck Bay, near the former mill site. At high tide, seawater from Salt Chuck Bay inundates the lower portions of Lake Ellen Creek and Unnamed Stream. The Intertidal Area is defined by the area below mean high tide but above mean low tide, and encompasses approximately 80 acres south of the mill site and extends around an unnamed island (hereafter "Unnamed Island") in the middle of Salt Chuck Bay.

Previous site investigations in the intertidal area of Salt Chuck Mine were conducted between 1995 and 2006, and the results are summarized in the 2007 Draft Engineering Evaluation/Cost Analysis (EE/CA) (URS 2007). In 2011, the former mill was the subject of a non-time critical removal action (NTCRA) conducted by the Forest Service. Mill structures, tanks, and fuel drum cache were removed and exposed contaminated soil, tailings, and waste rock were excavated to bedrock during the NTCRA. The excavated areas were then backfilled, graded, covered and revegetated (North Wind, 2012). A pre-RI investigation was conducted in the intertidal area in August 2011 and the results are summarized in the *Preliminary Findings for Pre-RI 2011 Field Sampling Activities Technical Memorandum* (CH2M HILL 2012). Additional RI sampling was conducted in July and August 2012 and the results are summarized in the *Salt Chuck Mine – Preliminary Findings for 2012 Remedial Investigation Field Sampling Activities Technical Memorandum* (CH2M HILL, 2013). Evaluation of the previously collected data identified data gaps relative to completion of the nature and extent of contamination evaluation and the risk assessment. Data gaps related to development of remedial alternatives were also identified. The nature and extent, risk assessment, and remedial alternatives development data gaps will be filled by data collected in 2013.

More information about the Site, including the conceptual site model and data needed to fill data gaps is provided in Appendix A (Systematic Planning/Data Quality Objectives).

2.2.2 Purpose

The purpose of the proposed field and laboratory effort is to present the policies, organizations, objectives, and functional activities/procedures to conduct additional data for sediment/ tailings, surface water, porewater, groundwater, and biota at Salt Chuck Mine to support the RI/FS. The data collected will be used to characterize

the nature and extent of contamination associated with releases from the Site, assess risks to human health and the environment, and develop remedial alternatives.

2.2.3 Problem Definition

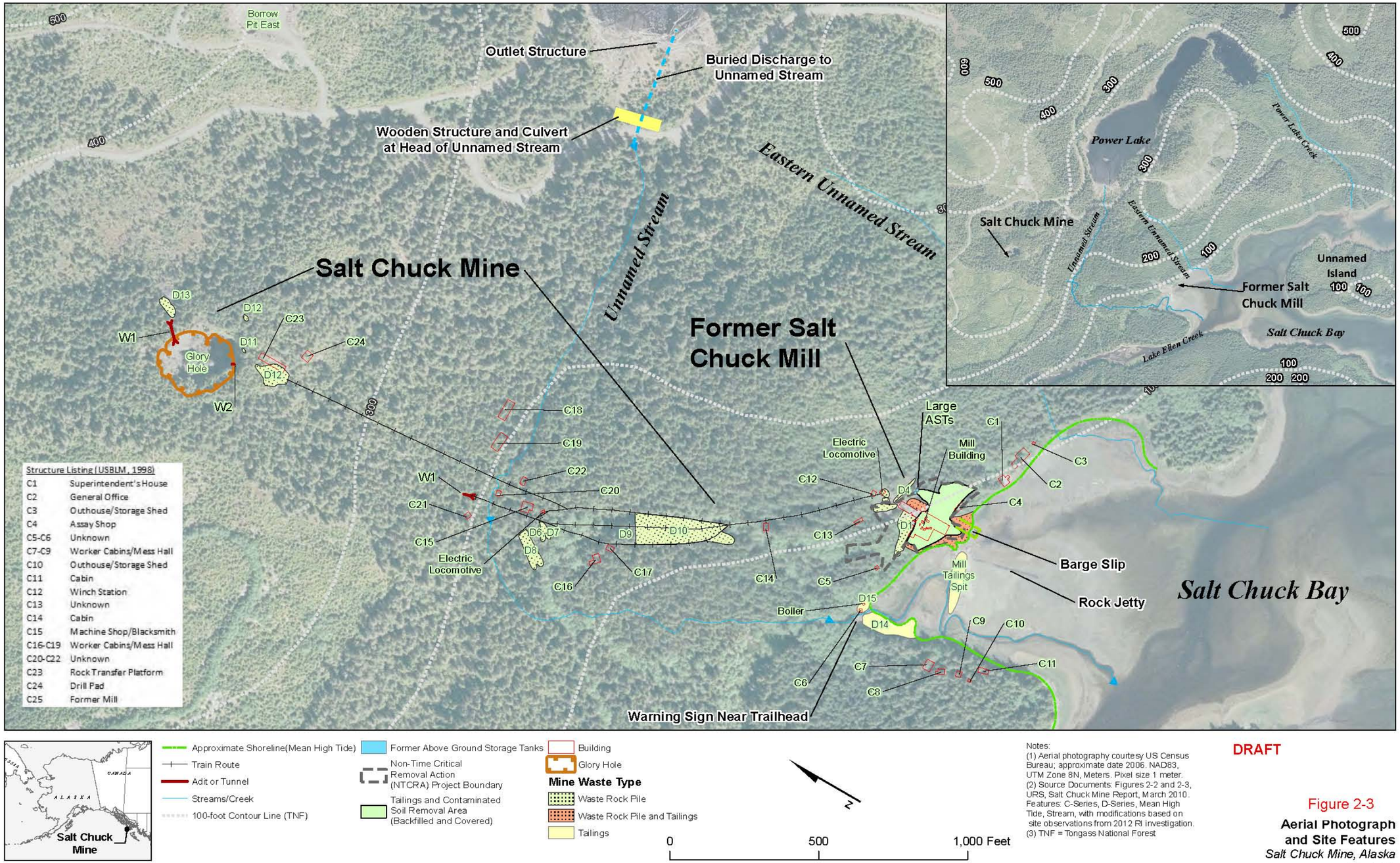
The systematic planning process and DQOs for the 2013 investigation is documented in Appendix A (Systematic Planning/Data Quality Objectives). The overall objectives and associated problem statements are listed below:

- **Objective 1 - Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk:**
  - Problem Statement 1-1: The extent of contamination along the distal (southern) segment of the thalweg of Lake Ellen Creek on the west side of Unnamed Island is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-2: Existing RI data suggest that seeps are releasing soluble copper and other metal discharges into surface water within Lake Ellen Creek during low tide, potentially impacting aquatic life. The extent to which these releases originate from tailings present within the intertidal areas near the former mill area and/or from upland groundwater sources is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-3: Existing RI data suggest that tailings in the cove east of the barge slip may exhibit anomalous toxicity, bioaccumulation, and/or leaching characteristics. The importance or impact of these differences is not fully understood to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-4: Total chromium has been detected in tailings/sediment and may be mine related. However, it is unknown what portion of the total chromium occurs in the more toxic hexavalent form. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-5: The Organized Village of Kasaan has expressed concern about contamination within the intertidal lands, particularly with subsistence concerns. Potential impacts on the beneficial use of crab and shrimp harvesting are of particular concern, both from past releases and from potential releases from any proposed remedial actions. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-6: Existing RI data indicate that groundwater in the former mill area is affected by releases of petroleum and by metals in tailings. The extent of groundwater contamination is unknown and contaminant concentrations appear to have changed over time. More information is needed to assess trends and understand potential discharges to nearby surface water in the intertidal areas. This is needed to adequately characterize potential risks to the environment and/or to support a remedial decision.
- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives:**
  - Problem Statement 2-1: The thickness and vertical profile of tailings within the intertidal areas are uncertain. This information is needed to adequately support evaluation of remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.
  - Problem Statement 2-2: Existing RI data indicate that surface sediment from the peninsula that is circumvented by Lake Ellen Creek (at low tide) within Salt Chuck Bay contains relatively lower concentrations of mine-related metals. However, it is unknown whether this is due to historic deposition of cleaner sediment from Lake Ellen Creek onto deeper contamination, or whether the peninsula itself represents an erosional feature. If deeper contaminated sediment exists at this location, the potential for future mobilization into the bay should be evaluated.
  - Problem Statement 2-3: The thickness and vertical and lateral profile of tailings within the tailing piles along Unnamed Stream are uncertain. This information is needed to adequately support evaluation of

remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.

- Problem Statement 2-4: The agronomic characteristics of intertidal sediment are unknown. This information is needed to support evaluation of remedial alternatives.

- **Objective 3** - Implementation of the monitoring activities related to the principal study question will result in the generation of investigation-derived waste (IDW). Therefore, additional question related to disposal of these wastes are also included:
  - Problem Statement 3-1**:** Determine whether the types of IDW generated require characterization, and if so, characterize appropriately for disposal purposes.



Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Stream, with modifications based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest

DRAFT

Figure 2-3
Aerial Photograph and Site Features
Salt Chuck Mine, Alaska

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2.2.4 Description of Work Tasks

The work activities intended to be covered under this QAPP include the following:

- Collect samples of intertidal surface sediment, intertidal and upland surface and subsurface tailings, surface water, porewater, groundwater, and biota) from judgmental sample locations in the vicinity of the former mill and in Salt Chuck Bay. Analyze the samples for Site-related contaminants and other characterization parameters to better define the nature and extent of contamination, assess risk, and evaluate remedial alternatives.
- Conduct sediment toxicity tests as one line of evidence in support of the ecological risk assessment.
- Collect biota and surface water samples in Browns Bay to characterize naturally occurring levels to support the evaluation of Site-related contamination.
- Install new and replacement groundwater wells, describe subsurface lithology, and measure depth to groundwater in new and existing monitoring wells in the vicinity of the former mill to support characterization of groundwater conditions and potential effects on intertidal surface water and sediment.
- Measure intertidal and upland tailings thicknesses and describe subsurface lithology in the vicinity of the former mill and in Salt Chuck Bay to better define the nature and extent of contamination, assess risk, and develop remedial alternatives.
- Conduct field measurements including turbidity, pH, conductivity, oxidation reduction potential (ORP), temperature, salinity, and dissolved oxygen (DO) in water samples (groundwater, surface water, and porewater) to support nature and extent, risk, and remedial alternatives evaluation .

2.2.5 Project Schedule

'Activities listed in this QAPP are expected from May 22 through June 3, 2013, where most intertidal sampling need to take place during the period of extreme low tides from May 22 through 31, 2013. Samples will not be collected or shipped Friday May 24 due to EPA RSCC furlough day. Drilling activities will take place in August 2013 during implementation of a treatability study at the site.

2.3 Quality Objectives and Criteria (A7)

2.3.1 Project Quality Objectives

Project-specific technical systematic planning has been carried out through the DQO process/planning tool (EPA, 2006) to meet decision-maker and data user needs for each activity. Appendix A presents the DQO process findings.

The data needs as determined through the DQO process are presented in Table 2-1 (located at the end of this section). This table lists the specific analytes, data uses, data users, and needed detection levels. There are no regulatory or risk-based action limits associated with this investigation. The selected analytical methodology and associated laboratory and field analytical reporting limits are shown in Table 2-2 (located at the end of this section).

The project-required limits/action levels (Tables 2-1A through 2-1D) and the analytical reporting limits (Tables 2-2A through 2-2D) are compared in Appendix A. The target analytical limits are consistent with the needed limits. The selected methods are state-of-the-art and what are appropriate for this study. For most analytess, laboratory-specific method detection limits (MDL) are expected to be below target reporting levels listed in Tables 2-1A through 2-1D. Where sample-specific reporting limits are higher than needed limits, the project team will use MDLs, as needed and available, for project decisions.

2.3.2 Measurement Performance Criteria

The QA objective of this plan is to identify procedures and criteria that will provide data of known and appropriate quality for the needs identified in Section 2.3.1. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. These parameters, the applicable procedures, and level-of-effort are described in the following paragraphs.

The applicable quality control (QC) procedures, quantitative target limits, and level-of-effort for assessing data quality are dictated by the intended use of the data and nature of the analytical methods. Analytical parameters, analytical methods, applicable detection levels, analytical precision, accuracy, and completeness in alignment with needs identified in Section 2.3.1 are presented in Table 2-2A through 2-2D. Analytical methods and quality control procedures are further detailed in Section 3.

Reporting detection levels/target detection limits listed in Tables 2-2A through 2-2D are laboratory method reporting limits (MRLs), equivalent to MEL Reporting Limits or EPA CLP contract-required levels. “Target” implies that final sample detection levels might be higher because of sample matrix effects. Sample reporting limits will be elevated as a function of sample moisture since concentrations are reported on a dry weight basis. Detection levels for the individual samples will be reported in the final data. As described in Section 2.3.1, some of the reporting levels might be higher than needed limits because of matrix effect, dilutions, preparation/digestion weight (solids) or because no practicable methodology for lower detection is available. Laboratory-specific MDLs are significantly below reporting levels. Where reporting limits are higher than regulatory limits, the project team will use MDLs, as needed, for project decisions. Values below the reporting are an estimate and will be qualified for proper use.

Following are definitions and levels of effort for the data assessment parameters.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the chemical compounds in the matrix samples. Sampling plan design, sampling techniques, and sample-handing protocols (e.g., for storage, preservation, and transportation) have been developed and are discussed in Appendices A and B. The proposed documentation will establish that protocols have been followed and sample identification and integrity ensured.

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using defined procedures and the use of consistent methods and consistent units. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

Accuracy is an assessment of the closeness of the measured value to the true value. For samples, accuracy of chemical test results is assessed by spiking samples and blanks with known standards and establishing the average recovery. For a matrix spike, known amounts of a standard compound identical to the compounds being measured are added to the sample. A quantitative definition of average recovery accuracy is given in Section 5.3. Accuracy is a combination of random error (precision) and systematic error (bias), introduced during sampling and analytical operations. Bias is the systematic distortion of a measurement process that causes errors in one direction, so that the expected sample measurement is always greater or lesser to the same degree than the sample’s true value. The accuracy of measurement data will be determined by calculating the recoveries from the analysis of standard reference materials and laboratory and laboratory fortified samples (matrix spikes).Accuracy measurements will be carried out with a minimum frequency of 1 in 20 samples analyzed.

Precision of the data is a measure of the data spread, when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference; a quantitative definition is given in Section 5.3. The level of effort for precision measurements will be a minimum of 1 in 20 samples.

Completeness is a measure of the amount of valid data obtained from the analytical measurement system and the complete implementation of defined field procedures. The quantitative definition of completeness is given in Section 5.3. The target completeness objective will be 90 percent; the actual completeness might vary depending on the intrinsic nature of the samples and the ability to assess sample locations and collect field samples. The completeness of the data will be assessed during QC reviews.

2.4 Special Training/Certification (A8)

All project staff working on the site will be trained in health and safety and follow requirements specified in the project's HSP (Appendix C). The HSP describes the specialized training required for personnel on this project and the documentation and tracking of this training is included in Appendix C.

2.5 Documents and Records (A9)

Project systematic planning through the DQO is documented in Appendix A of this QAPP.

Required field documentation and records are described in Appendix B.

Laboratory documentation will be provided in accordance with methods and QA protocols listed in Sections 3.4 and 3.5 of this QAPP and with EPA Regional Laboratory-specific standard operating procedure (SOPs).

Overall project documentation will be prepared in accordance with the EPA Region 10 AES Program Plan (EPA, 2003a and b and updates).

Table 2-1A
Sediment and Tailings Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Data Uses	Users	Marine Benchmarks[a]		Lowest Action/Screening Level [c]
					ERL	ERM	
Metals	Aluminum	mg/Kg	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NE	NE	NE
Metals	Antimony	mg/Kg			NE	NE	NE
Metals	Arsenic	mg/Kg			8.2	70	8.2
Metals	Barium	mg/Kg			NE	NE	NE
Metals	Beryllium	mg/Kg			NE	NE	NE
Metals	Cadmium	mg/Kg			1.2	9.6	1.2
Metals	Calcium	mg/Kg			NE	NE	NE
Metals	Chromium (total)	mg/Kg			81	370	81
Metals	Chromium (VI)	mg/Kg			NE	NE	0.29[b]
Metals	Cobalt	mg/Kg			NE	NE	NE
Metals	Copper	mg/Kg			34	270	34
Metals	Iron	mg/Kg			NE	NE	NE
Metals	Lead	mg/Kg			46.7	218	47
Metals	Magnesium	mg/Kg			NE	NE	NE
Metals	Manganese	mg/Kg			NE	NE	NE
Metals	Mercury	mg/Kg			0.15	0.71	0.15
Metals	Nickel	mg/Kg			20.9	51.6	20.9
Metals	Potassium	mg/Kg			NE	NE	NE
Metals	Selenium	mg/Kg			NE	NE	NE
Metals	Silver	mg/Kg			1	3.7	1
Metals	Sodium	mg/Kg			NE	NE	NE
Metals	Thallium	mg/Kg			NE	NE	NE
Metals	Vanadium	mg/Kg			NE	NE	NE
Metals	Zinc	mg/Kg			150	410	150
HPAH	2-Methylnaphthalene	ug/Kg	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NE	NE	NE
HPAH	Benz(a)anthracene	ug/Kg			261	1,600	261
HPAH	Benzo(a)pyrene	ug/Kg			430	1,600	430
HPAH	Benzo(b)fluoranthene	ug/Kg			NE	NE	NE
HPAH	Benzo(ghi)perylene	ug/Kg			NE	NE	NE
HPAH	Benzo(k)fluoranthene	ug/Kg			NE	NE	NE
HPAH	Chrysene	ug/Kg			384	2,800	384
HPAH	Dibenz[a,h]anthracene	ug/Kg			63.4	260	63.4

Table 2-1A
Sediment and Tailings Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Data Uses	Users	Marine Benchmarks[a]		Lowest Action/Screening Level [c]
					ERL	ERM	
HPAH	Indeno[1,2,3-cd]pyrene	ug/Kg			NE	NE	NE
HPAH	Pyrene	ug/Kg			665	2,600	665
HPAH	Total HPAH	ug/Kg			1,700	9,600	1,700
LPAH	Acenaphthene	ug/Kg			16	500	16
LPAH	Acenaphthylene	ug/Kg			44	640	44
LPAH	Anthracene	ug/Kg			85.3	1,100	85.3
LPAH	Fluoranthene	ug/Kg			600	5,100	600
LPAH	Fluorene	ug/Kg			NE	NE	NE
LPAH	Naphthalene	ug/Kg			160	2,100	160
LPAH	Phenanthrene	ug/Kg			240	1,500	240
LPAH	Total LPAH	ug/Kg			552	3,160	552
PAH	Total PAH	ug/Kg			4,022	44,792	4,022
SPLP Metals	Modified SPLP metals (see Table 2-1b for analyte list)	NA	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	See Table 2-1B		
AVS/SEM Metals	AVS/SEM metals (cadimum, copper, lead, zinc)	umol/g	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA	NA	NA

Table 2-1A
Sediment and Tailings Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Data Uses	Users	Marine Benchmarks[a]		Lowest Action/Screening Level [c]
					ERL	ERM	
Bioassay	Bioassay (polychaete and bivalve)	Variable	Characterize nature and extent of contamination, assess risk and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA	NA	NA
Agronomic	S10C, complete with recommendations [d, e]	Variable	Support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA	NA	NA
Agronomic	Soil Texture (%sand, %silt, % clay)	NA					
Agronomic	Nitrogen, Ammonia	mg/kg					
Physical Parameter	Moisture	Percent	Characterize nature and extent of contamination, assess risk and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA	NA	NA
Physical Parameter	TOC	mg/kg			NA	NA	NA
Physical Parameter	Grain Size	Percent			NA	NA	NA
Physical Parameter	Bulk Density	g/cm^3			NA	NA	NA

Table 2-1A
Sediment and Tailings Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Data Uses	Users	Marine Benchmarks[a]		Lowest Action/Screening Level [c]
					ERL	ERM	

Notes:
* Action/screening levels are used solely to provide a perspective for identifying the nature and extent of contamination. They are not intended to infer the existence of unacceptable risk. The risk assessment to be conducted as part of the RI will provide site-specific estimates of risk intended for management decision making.

ASTM = American Society for testing and materials
AVS/SEM = Acid Volatile Sulfide and Simultaneously Extracted Metals
ERL = Effects range low
ERM = Effects range medium
NE = not established
NOAA = National Oceanic and Atmospheric Administration
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
PSEP = Puget Sound Estuary Program
SIM = selective ion monitoring
SPLP = Synthetic Precipitation Leaching Procedure
TOC = total organic carbon
TPH = total petroleum hydrocarbons
USEPA = U.S. Environmental Protection Agency
ug/Kg = micrograms per kilogram
umol/g = micromoles per gram
g/cm^3 = grams per cubic centimeter
mg/Kg = milligrams per kilogram

a = ERL/ERM NOAA marine benchmarks (Long et al., 1995: Buchman, 2008)
b = Resident Soil RSL (USEPA, 2012)
c = Action/screening levels are used solely to provide a perspective for identifying the nature and extent of contamination. They are not intended to infer the existence of unacceptable risk. The risk assessment to be conducted as part of the RI will provide site-specific estimates of risk intended for management decision making.
d = S3C (Complete Analysis): Organic Matter, Estimated Nitrogen Release, Phosphorus (Weak Bray and Sodium Bicarbonate-P), Extractable Cations (Potassium. Magnesium, Calcium, Sodium), Hydrogen, Sulfate-S, pH, Cation Exchange Capacity and percent cation saturation (computed), Soluble Salts and Excess Lime, Nitrate-Nitrogen
e = S10 (Soil Salinity Package): Saturation Percentage, Soluble Salts, Sodium, Calcium, Magnesium, Chloride, Boron, Carbonate, Bicarbonate, pH, SAR and ESP

Table 2-1B
Marine Surface Water, Porewater, and SPLP Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[f] (ug/L)
Metals, Total and Dissolved	Aluminum	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NE
Metals, Total and Dissolved	Antimony			500 [a]
Metals, Total and Dissolved	Arsenic			36 [a]
Metals, Total and Dissolved	Barium			200 [a]
Metals, Total and Dissolved	Beryllium			100 [a]
Metals, Total and Dissolved	Cadmium			8.8 [a]
Metals, Total and Dissolved	Calcium			NE
Metals, Total and Dissolved	Chromium (total)			27.4 [a]
Metals, Total and Dissolved	Cobalt			1 [a]
Metals, Total and Dissolved	Copper			3.1 [a]
Metals, Total and Dissolved	Iron			50 [a]
Metals, Total and Dissolved	Lead			8.1 [a]
Metals, Total and Dissolved	Magnesium			NE
Metals, Total and Dissolved	Manganese			100 [a]
Metals, Total and Dissolved	Mercury			0.94 [a]
Metals, Total and Dissolved	Nickel			8.2 [a]
Metals, Total and Dissolved	Potassium			NE
Metals, Total and Dissolved	Selenium			71 [a]
Metals, Total and Dissolved	Silver			0.95 [b]
Metals, Total and Dissolved	Sodium			NE
Metals, Total and Dissolved	Thallium			17 [a]
Metals, Total and Dissolved	Vanadium			50 [a]
Metals, Total and Dissolved	Zinc			81 [a]
HPAH[c]	2-Methylnaphthalene	Characterize nature and extent of contamination, assess risk, and support remedial alternatives	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	300 [b]
HPAH[c]	Benz(a)anthracene			300 [b]
HPAH[c]	Benzo(a)pyrene			300 [b]
HPAH[c]	Benzo(b)fluoranthene			300 [b]

Table 2-1B
Marine Surface Water, Porewater, and SPLP Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[f] (ug/L)
HPAH[c]	Benzo(ghi)perylene	evaluation		300 [b]
HPAH[c]	Benzo(k)fluoranthene			300 [b]
HPAH[c]	Chrysene			300 [b]
HPAH[c]	Dibenz[a,h]anthracene			300 [b]
HPAH[c]	Indeno[1,2,3-cd]pyrene			300 [b]
HPAH[c]	Pyrene			300 [b]
LPAH[c]	Acenaphthene			40 [a]
LPAH[c]	Acenaphthylene			300 [b]
LPAH[c]	Anthracene			300 [b]
LPAH[c]	Fluoranthene			11 [a]
LPAH[c]	Fluorene			300 [b]
LPAH[c]	Naphthalene			1.4 [a]
LPAH[c]	Phenanthrene			4.6 [a]
Total aquatic hydrocarbons (calculated)[e]				15 [d]
FIELD PARAMETERS[e]				
Field Parameter	Turbidity (NTU)	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA
Field Parameter	pH			NA
Field Parameter	Conductivity (uS/cm)			NA
Field Parameter	ORP (mV)			NA
Field Parameter	Dissolved oxygen (mg/L)			NA
Field Parameter	Salinity (ppt)			NA
Field Parameter	Temperature (^{o}C)			NA

Table 2-1B
Marine Surface Water, Porewater, and SPLP Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[f] (ug/L)

Notes:
µg/L = micrograms per liter
°C = Degree Celsius
NTU = Nephelometric Turbidity Units
µS/cm = micro Siemens per centimeter
mV = millivolt
ORP = Oxidation Reduction Potential
mg/L = miligrams per liter
NA = not applicable
ppt = parts per trillion
NE = not established

Screening Level Basis:
a = NOAA SQuiRT Table (marine chronic)
b = NOAA SQuiRT Table (marine acute)
c = analyze for surface and drivepoint porewater only
d = 18 AAC 70 Water Quality Standards

e = TAqH computed using PAH results. BTEX will not be included in calculation because gasoline has not been identified as a source at Site
f = Action/screening levels are used solely to provide a perspective for identifying the nature and extent of contamination. They are not intended to infer the existence of unacceptable risk. The risk assessment to be conducted as part of the RI will provide site-specific estimates of risk intended for management decision making.

NOAA = National Oceanic and Atmospheric Administration
SQuiRT = Screening Quick Reference Table. Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response

Table 2-1C
Biota (Crab and Shrimp) Data Needs and Uses
Salt Chuck Mine, Alaska

Analyte	Data Uses	Users	Action/Screening Level[a,b] (mg/kg)
Moisture	Calculate wet weight concentration	Risk Assessors	NA
Aluminum	Characterize nature and extent of contamination and assess risk	Risk assessors and regulatory specialists	1400
Antimony			0.54
Arsenic			0.0033
Barium			270
Beryllium			NE
Cadmium			0.49
Chromium			NE
Cobalt			NE
Copper			54
Iron			NE
Lead			0.8
Magnesium			NE
Manganese			190
Methylmercury			14
Mercury			0.049
Nickel			27
Selenium			2457
Silver			6.8
Thallium			0.014
Vanadium			6.8
Zinc			410
Arsenic Speciation	Characterize nature and extent of contamination and assess risk	Risk assessors and regulatory specialists	NA

Table 2-1C
Biota (Crab and Shrimp) Data Needs and Uses
Salt Chuck Mine, Alaska

Analyte	Data Uses	Users	Action/Screening Level[a,b] (mg/kg)

Notes:
[a]Lower of the two (carcinogenic vs. noncancer) fish tissue screening levels (USEPA 2011).
[b] Action/screening levels are used solely to provide a perspective for identifying the nature and extent of contamination. They are not intended to infer the existence of unacceptable risk. The risk assessment to be conducted as part of the RI will provide site-specific estimates of risk intended for management decision making.

mg/Kg = milligrams per kilogram - wet weight
NA = not applicable
NE = not established
USEPA = U.S. Environmental Protection Agency

Table 2-1D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[g] (ug/L)
Metals, Total and Dissolved	Aluminum	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	16,000 [a]
Metals, Total and Dissolved	Antimony			6 [b]
Metals, Total and Dissolved	Arsenic			10 [b]
Metals, Total and Dissolved	Barium			200 [c]
Metals, Total and Dissolved	Beryllium			16 [b]
Metals, Total and Dissolved	Cadmium			6.9 [b]
Metals, Total and Dissolved	Calcium			NE
Metals, Total and Dissolved	Chromium			27.4 [c]
Metals, Total and Dissolved	Cobalt			1 [c]
Metals, Total and Dissolved	Copper			3.1 [c]
Metals, Total and Dissolved	Iron			50 [c]
Metals, Total and Dissolved	Lead			8.1 [c]
Metals, Total and Dissolved	Magnesium			NE
Metals, Total and Dissolved	Manganese			100 [c]
Metals, Total and Dissolved	Mercury			0.94 [d]
Metals, Total and Dissolved	Nickel			8.2 [c]
Metals, Total and Dissolved	Potassium			NE
Metals, Total and Dissolved	Selenium			71 [c]
Metals, Total and Dissolved	Silver			0.95 [c]
Metals, Total and Dissolved	Sodium			NE
Metals, Total and Dissolved	Thallium			2 [b]
Metals, Total and Dissolved	Vanadium			50 [c]
Metals, Total and Dissolved	Zinc			81 [c]
HPAH	2-Methylnaphthalene	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NE
HPAH	Benz(a)anthracene			0.2 [e]
HPAH	Benzo(a)pyrene			0.2 [b]
HPAH	Benzo(b)fluoranthene			0.2 [e]
HPAH	Benzo(ghi)perylene			1,100 [f]
HPAH	Benzo(k)fluoranthene			0.29 [a]

Table 2-1D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[g] (ug/L)
HPAH	Chrysene			2.9 [a]
HPAH	Dibenz[a,h]anthracene			0.2 [e]
HPAH	Indeno[1,2,3-cd]pyrene			0.2 [e]
HPAH	Pyrene			87 [a]
LPAH	Acenaphthene			40 [c]
LPAH	Acenaphthylene			2,200 [f]
LPAH	Anthracene			300 [d]
LPAH	Fluoranthene			11 [c]
LPAH	Fluorene			220 [a]
LPAH	Naphthalene			0.2 [e]
LPAH	Phenanthrene			0.4 [f]
TPH	Diesel range organics	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	1,500 [f]
TPH	Residual range organics			1,100 [f]
Field Parameter	Turbidity (NTU)	Characterize nature and extent of contamination, assess risk, and support remedial alternatives evaluation	Hydrologists, risk assessors, remedial design engineers, and regulatory specialists	NA
Field Parameter	pH			NA
Field Parameter	Conductivity (uS/cm)			NA
Field Parameter	ORP (mV)			NA
Field Parameter	Dissolved oxygen (mg/L)			NA
Field Parameter	Salinity (ppt)			NA
Field Parameter	Temperature (^{o}C)			NA
Field Parameter	Depth to groundwater (ft)			NA
Field Parameter	Purge rate (gal/min)			NA
Field Parameter	Purge volume (gal)			NA

Table 2-1D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Data Uses	Users	Action/Screening Level[g] (ug/L)

Notes:
PAH = polycyclic aromatic hydrocarbons
AAC = Alaska Adminstrative Code
HPAH = heavy molecular weight PAH
BAP = benzo(a)pyrene
LPAH = low molecular weight PAH
ft = feet
TPH = total petroleum hydrocarbon
gal = gallon
MCL = Maximum Contaminant Level
NA = not applicable
NE = not established
NOAA = National Oceanic and Atmospheric Administration
ORP = Oxidation Reduction Potential
ppt = parts per trillion
RSL = Regional Screening Levels

ug/L = micrograms per liter
µS/cm = micro Siemens per centimeter
mV = millivolt
gal/min = gallon per minute

a = Tapwater RSL
b = MCL
c = NOAA SQuiRT Table (marine chronic)
d = NOAA SQuiRT Table (marine acute)
e = MCL for BAP
f = 18 AAC 75 Table C

SQuiRT = Screening Quick Background Table. Buchman, M. F., 2008.
NOAA Screening Quick Background Tables, NOAA OR&R Report
08-1, Seattle WA, Office of Response and Restoration Division,
National Oceanic and Atmospheric Administration, 34 pages.

g = Action/screening levels are used solely to provide a perspective for identifying the nature and extent of contamination. They are not intended to infer the existence of unacceptable risk. The risk assessment to be conducted as part of the RI will provide site-specific estimates of risk intended for management decision making.

Table 2-2A
Sediment and Tailings Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Method	Lowest Screening Level	Target Quantitation Limit*	Accuracy	Precision	Completeness
Metals	Aluminum	mg/Kg	6010/6020 or CLP	NE	20	CLP	CLP	90%
Metals	Antimony	mg/Kg		NE	1			
Metals	Arsenic	mg/Kg		8.2	0.5			
Metals	Barium	mg/Kg		NE	5			
Metals	Beryllium	mg/Kg		NE	0.5			
Metals	Cadmium	mg/Kg		1.2	0.5			
Metals	Calcium	mg/Kg		NE	500			
Metals	Chromium	mg/Kg		81	1			
Metals	Chromium (VI)	mg/Kg	7196	0.29	1.5	CLP	CLP	90%
Metals	Cobalt	mg/Kg	6010/6020 or CLP	NE	0.5	CLP	CLP	90%
Metals	Copper	mg/Kg		34	1			
Metals	Iron	mg/Kg		NE	10			
Metals	Lead	mg/Kg		47	0.5			
Metals	Magnesium	mg/Kg		NE	500			
Metals	Manganese	mg/Kg		NE	0.5			
Metals	Mercury	mg/Kg	7471A or CLP	0.2	0.1	CLP	CLP	90%
Metals	Nickel	mg/Kg	6010/6020 or CLP	20.9	0.5	CLP	CLP	90%
Metals	Potassium	mg/Kg		NE	500			
Metals	Selenium	mg/Kg		NE	2.5			
Metals	Silver	mg/Kg		1	0.5			
Metals	Sodium	mg/Kg		NE	500			
Metals	Thallium	mg/Kg		NE	0.5			
Metals	Vanadium	mg/Kg		NE	2.5			
Metals	Zinc	mg/Kg		150	1			
HPAH	2-Methylnaphthalene	ug/Kg	8270SIM or CLP	NE	3.3	CLP	CLP	90%
HPAH	Benz(a)anthracene	ug/Kg		261	3.3			
HPAH	Benzo(a)pyrene	ug/Kg		430	3.3			
HPAH	Benzo(b)fluoranthene	ug/Kg		NE	3.3			
HPAH	Benzo(ghi)perylene	ug/Kg		NE	3.3			
HPAH	Benzo(k)fluoranthene	ug/Kg		NE	3.3			

Table 2-2A
Sediment and Tailings Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Method	Lowest Screening Level	Target Quantitation Limit*	Accuracy	Precision	Completeness
HPAH	Chrysene	ug/Kg		384	3.3			
HPAH	Dibenz[a,h]anthracene	ug/Kg		63.4	3.3			
HPAH	Indeno[1,2,3-cd]pyrene	ug/Kg		NE	3.3			
HPAH	Pyrene	ug/Kg		665	3.3			
HPAH	Total HPAH	ug/Kg		1,700	NA (calculated)			
LPAH	Acenaphthene	ug/Kg		16	3.3	CLP	CLP	90%
LPAH	Acenaphthylene	ug/Kg		44	3.3			
LPAH	Anthracene	ug/Kg		85.3	3.3			
LPAH	Fluoranthene	ug/Kg		600	3.3			
LPAH	Fluorene	ug/Kg		NE	3.3			
LPAH	Naphthalene	ug/Kg		160	3.3			
LPAH	Phenanthrene	ug/Kg		240	3.3			
LPAH	Total LPAH	ug/Kg		552	NA (calculated)			
PAH	Total PAH	ug/Kg		4,022	NA (calculated)	CLP	CLP	90%
SPLP Metals	Modified SPLP metals (all metals listed above, except Cr VI)	NA	SW 1312 followed by above methods, with EPA 245.1 for Mercury	NA	see Metals listing above	CLP	CLP	90%
AVS/SEM Metals	AVS/SEM metals (cadmium, copper, nickel, lead, zinc)	umol/g	PSEP	NA	CLP (as above)	70-130%	30%	90%
Bioassay	Bioassay (polychaete and bivalve)	Variable	Screening: ASTM E-1611/PSEP (polychaete), and EPA-823-B-004 (bivalve)	NA	NA	NA	NA	90%
Agronomic	S10C, complete with recommendations [a, b]	Variable	Western States Proficiency Testing	NA	NA	NA	NA	90%
Agronomic	Soil Texture (% sand, % silt, % clay)	NA	Western States Proficiency Testing	NA	NA	NA	NA	90%
Agronomic	Nitrogen, Ammonia	mg/kg	Western States Proficiency Testing	NA	TBD	TBD	TBD	90%
Physical Parameter	Percent solids	Percent		NA	NA	NA	NA	90%

Table 2-2A
Sediment and Tailings Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Method	Lowest Screening Level	Target Quantitation Limit*	Accuracy	Precision	Completeness
Physical Parameter	TOC	mg/kg	PSEP	NA	TBD	NA	±30%	90%
Physical Parameter	Grain Size	Percent	ASTM D422	NA	NA	NA	NA	90%
Physical Parameter	Bulk Density	g/cm^3	ASTM D6683	NA	NA	NA	NA	90%

Notes:
* Where target quantitation limit is higher as explained in Section 2.3 lab specific MDL will be used. The proposed methodology is what is state of the art and practicable, these limitations have been taken into consideration for final evaluations.

a = S3C (Complete Analysis): Organic Matter, Estimated Nitrogen Release, Phosphorus (Weak Bray and Sodium Bicarbonate-P), Extractable Cations (Potassium. Magnesium, Calcium, Sodium), Hydrogen, Sulfate-S, pH, Cation Exchange Capacity and percent cation saturation (computed), Soluble Salts and Excess Lime, Nitrate-Nitrogen
b = S10 (Soil Salinity Package): Saturation Percentage, Soluble Salts, Sodium, Calcium, Magnesium, Chloride, Boron, Carbonate, Bicarbonate, pH, SAR and ESP

PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
ASTM = American Society for testing and materials
AVS/SEM = Acid Volatile Sulfide and Simultaneously Extracted Metals
CLP = Contract Laboratory Program
DRO = diesel range organics
NE = not established
PSEP = Puget Sound Estuary Program
RRO = residual range organics
SIM = selective ion monitoring
SPLP = Synthetic Precipitation Leaching Procedure
TOC = total organic carbon
TBD = to be determined, lab specific
TPH = total petroleum hydrocarbons

ug/Kg = micrograms per kilogram
umol/g = micromoles per gram
g/cm^3 = grams per cubic centimeter
mg/Kg = milligrams per kilogram

Table 2-2B
Marine Surface Water, Pore Water, and SPLP Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte (Dissolved)	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness
Metals, Total and Dissolved	Aluminum	SW6010/6020 or CLP	NE	20	CLP	CLP	90%
Metals, Total and Dissolved	Antimony		500	2			
Metals, Total and Dissolved	Arsenic		36	1			
Metals, Total and Dissolved	Barium		200	10			
Metals, Total and Dissolved	Beryllium		100	1			
Metals, Total and Dissolved	Cadmium		8.8	1			
Metals, Total and Dissolved	Calcium		NE	500			
Metals, Total and Dissolved	Chromium (total)		27.4	2			
Metals, Total and Dissolved	Cobalt		1	1			
Metals, Total and Dissolved	Copper		3.1	2			
Metals, Total and Dissolved	Iron		50	200			
Metals, Total and Dissolved	Lead		8.1	1			
Metals, Total and Dissolved	Magnesium		NE	500			
Metals, Total and Dissolved	Manganese		100	1			
Metals, Total and Dissolved	Mercury	SW7470A or EPA 245.1 or CLP	0.94	0.2	CLP	CLP	90%
Metals, Total and Dissolved	Nickel	SW6010/6020 or CLP	8.2	1	CLP	CLP	90%
Metals, Total and Dissolved	Potassium		NE	500			
Metals, Total and Dissolved	Selenium		71	5			
Metals, Total and Dissolved	Silver		0.95	1			
Metals, Total and Dissolved	Sodium		NE	500			
Metals, Total and Dissolved	Thallium		17	1			
Metals, Total and Dissolved	Vanadium		50	5			
Metals, Total and Dissolved	Zinc		81	2			
PAH[a]	2-Methylnaphthalene	8270-SIM or CLP	300	0.1	CLP	CLP	90%
PAH[a]	Benz(a)anthracene		300	0.1			
PAH[a]	Benzo(a)pyrene		300	0.1			
PAH[a]	Benzo(b)fluoranthene		300	0.1			

Table 2-2B
Marine Surface Water, Pore Water, and SPLP Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte (Dissolved)	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness
PAH[a]	Benzo(ghi)perylene		300	0.1			
PAH[a]	Benzo(k)fluoranthene		300	0.1			
PAH[a]	Chrysene		300	0.1			
PAH[a]	Dibenz[a,h]anthracene		300	0.1			
PAH[a]	Indeno[1,2,3-cd]pyrene		300	0.1			
PAH[a]	Pyrene		300	0.1			
PAH[a]	Acenaphthene		40	0.1			
PAH[a]	Acenaphthylene		300	0.1			
PAH[a]	Anthracene		300	0.1			
PAH[a]	Fluoranthene		11	0.1			
PAH[a]	Fluorene		300	0.1			
PAH[a]	Naphthalene		1.4	0.1			
PAH[a]	Phenanthrene		4.6	0.1			
Total aquatic hydrocarbons (calculated)			15	NA (calculated)			
Field Parameter[b]	Turbidity (NTU)	Instrument manufacturer manual	NA	NA	NA	20%	90%
Field Parameter[b]	pH						
Field Parameter[b]	Conductivity (uS/cm)						
Field Parameter[b]	ORP (mV)						
Field Parameter[b]	Dissolved oxygen (mg/L)						
Field Parameter[b]	Salinity (ppt)						
Field Parameter[b]	Temperature (^{o}C)					±0.2deg	

Table 2-2B
Marine Surface Water, Pore Water, and SPLP Performance Measurement Criteria
Salt Chuck Mine, Alaska

ChemGroup	Analyte (Dissolved)	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness

Notes:
* Where target quantitation limit is higher as explained in Section 2.3 lab specific MDL will be used. The proposed methodology is what is state of the art and practicable, these limitations have been taken into consideration for final evaluations.

a = analyze for surface water and drive-point porewater only
b = analyze for surface and drive-point porewater only

ug/L = micrograms per liter
µS/cm = micro Siemens per centimeter
mg/L = miligrams per liter

CLP = Contract Laboratory Program
mV = millivolt
NA = not applicable
NE = not established
NTU = Nephelometric Turbidity Units
^{o}C = Degree Celsius
ORP = Oxidation Reduction Potential
ppt = parts per trillion

Table 2-2C
Biota (Crab and Shrimp) Data Needs and Uses
Salt Chuck Mine, Alaska

Analyte	Method	Lowest Screening Level (mg/kg)	Target Quantitation Limit*	Accuracy	Precision	Completeness
Aluminum	6010/6020 or CLP	1400	TBD	CLP	CLP	90%
Antimony		0.54	TBD			
Arsenic		0.0033	TBD (0,01 mg/kg for MEL)			
Barium		270	TBD			
Beryllium		NE	TBD			
Cadmium		0.49	TBD			
Chromium		NE	TBD			
Cobalt		NE	TBD			
Copper		54	TBD			
Iron		NE	TBD			
Lead		0.8	TBD			
Magnesium		NE	TBD			
Manganese		190	TBD			
Methylmercury	1630 mod	14	TBD	CLP	CLP	90%
Mercury	7000 series or 245.1 or CLP	0.049	TBD	CLP	CLP	90%
Nickel	6010/6020 or CLP	27	TBD	CLP	CLP	90%
Selenium		2457	TBD			
Silver		6.8	TBD			
Thallium		0.014	TBD (0.025 mg/kg for MEL)			
Vanadium		6.8	TBD			
Zinc		410	TBD			
Arsenic Speciation	3100 for extraction, 6870 for analysis	NA	TBD	70-130	±30	90%

Table 2-2C
Biota (Crab and Shrimp) Data Needs and Uses
Salt Chuck Mine, Alaska

Analyte	Method	Lowest Screening Level (mg/kg)	Target Quantitation Limit*	Accuracy	Precision	Completeness

Notes:
* Where target quantitation limit is higher as explained in Section 2.3 lab specific MDL will be used. The proposed methodology is what is state of the art and practicable, these limitations have been taken into consideration for final evaluations.
mg/Kg = milligrams per kilogram - wet weight
NA = not applicable
NE = not established
TBD = To be determined, lab specific
CLP = Contract Laboratory Program

Table 2-2D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness
Metals, Total and Dissolved	Aluminum	6010/6020 or CLP	16,000	20	CLP	CLP	90%
Metals, Total and Dissolved	Antimony		6	2			
Metals, Total and Dissolved	Arsenic		10	1			
Metals, Total and Dissolved	Barium		200	10			
Metals, Total and Dissolved	Beryllium		16	1			
Metals, Total and Dissolved	Cadmium		6.9	1			
Metals, Total and Dissolved	Calcium		NE	500			
Metals, Total and Dissolved	Chromium		27.4	2			
Metals, Total and Dissolved	Cobalt		1	1			
Metals, Total and Dissolved	Copper		3.1	2			
Metals, Total and Dissolved	Iron		50	200			
Metals, Total and Dissolved	Lead		8.1	1			
Metals, Total and Dissolved	Magnesium		NE	500			
Metals, Total and Dissolved	Manganese		100	1			
Metals, Total and Dissolved	Mercury	7470A or 245.1 or CLP	0.94	0.2			
Metals, Total and Dissolved	Nickel	6010/6020 or CLP	8.2	1			
Metals, Total and Dissolved	Potassium		NE	500			
Metals, Total and Dissolved	Selenium		71	5			
Metals, Total and Dissolved	Silver		0.95	1			
Metals, Total and Dissolved	Sodium		NE	500			
Metals, Total and Dissolved	Thallium		2	1			
Metals, Total and Dissolved	Vanadium		50	5			
Metals, Total and Dissolved	Zinc		81	2			
HPAH	2-Methylnaphthalene	8270-SIM or CLP	NE	0.1	CLP	CLP	90%
HPAH	Benz(a)anthracene		0.2	0.1			
HPAH	Benzo(a)pyrene		0.2	0.1			
HPAH	Benzo(b)fluoranthene		0.2	0.1			
HPAH	Benzo(ghi)perylene		1,100	0.1			
HPAH	Benzo(k)fluoranthene		0.29	0.1			
HPAH	Chrysene		2.9	0.1			

Table 2-2D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness
HPAH	Dibenz[a,h]anthracene		0.2	0.1			
HPAH	Indeno[1,2,3-cd]pyrene		0.2	0.1			
HPAH	Pyrene		87	0.1			
LPAH	Acenaphthene		40	0.1			
LPAH	Acenaphthylene		2,200	0.1			
LPAH	Anthracene		300	0.1			
LPAH	Fluoranthene		11	0.1			
LPAH	Fluorene		220	0.1			
LPAH	Naphthalene		0.2	0.1			
LPAH	Phenanthrene		0.4	0.1			
TPH	Diesel range organics	AK 102	1,500	10 mg/l	70-130	70-130	90%
TPH	Residual range organics	AK 103	1,100	10 mg/l			
Field Parameter	Turbidity (NTU)	Instrument manufacturer manual	NA	NA	NA	NA	90%
Field Parameter	pH						
Field Parameter	Conductivity (uS/cm)						
Field Parameter	ORP (mV)						
Field Parameter	Dissolved oxygen (mg/L)						
Field Parameter	Salinity (ppt)						
Field Parameter	Temperature (^{o}C)						
Field Parameter	Depth to groundwater (ft)						
Field Parameter	Purge rate (gal/min)						
Field Parameter	Purge volume (gal)						

Table 2-2D
Groundwater Data Needs and Uses
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Method	Lowest Screening Level (ug/L)	Target Quantitation Limit*	Accuracy	Precision	Completeness

Notes:
* Where target quantitation limit is higher as explained in Section 2.3 lab specific MDL will be used. The proposed methodology is what is state of the art and practicable, these limitations have been taken into consideration for final evaluations.

BAP = benzo(a)pyrene
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
TPH = total petroleum hydrocarbon
CLP = Contract Laboratory Program
ft = feet
gal = gallon
mV = millivolt
NA = not applicable
NE = not established
NTU = Nephelometric Turbidity Units
^{o}C = Degree Celsius
ORP = Oxidation Reduction Potential

ug/L = micrograms per liter
µS/cm = micro Siemens per centimeter
gal/min = gallon per minute
ppt = parts per trillion

SECTION 3

Data Generation and Acquisition (EPA Group B)

This section describes the sampling design; sampling methods; sampling handling and custody; analytical methods; quality control; instrument/equipment testing, inspection and maintenance; instrument/equipment calibration and frequency, inspection/acceptance of supplies and consumables; nondirect measurements; and data management.

3.1 Sampling Design (Experimental Design) (B1)

The rationale for and the design is described in step seven of the DQO process shown in Appendix A, Data Quality Objectives.

3.2 Sampling Methods (B2)

Methods and protocols are described in Appendix B, Field Procedures. Procedures follow EPA CLP guidance (2011 CLP Samplers Guide for requirements relating to containers, preservatives, and shipping. http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf).

3.3 Sample Handling and Custody (B3)

A sample is physical evidence collected from a potential hazardous waste site, the immediate environment, or another source. Because of the potential evidentiary nature of samples, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence. In addition to field notebooks, a number of documents are available for tracking sample custody.

Field documents including sample custody seals and chain-of-custody records will be obtained from the RSCC in EPA's Region 10 Quality Assurance Office. Chain-of-custody procedures will be used to maintain and document sample collection and possession. After sample packaging, the appropriate chain-of-custody form will be completed. Scribe software will be used for project data management and completing chain-of-custody documentation.

Copies of the TR-COC, Scribe XML (*.xml) and Excel (*.xls) are submitted to CLP and the RSCC in accordance with the instructions for sample shipping and documentation per CLP/RSCC requirements. The laboratory copy is to be sent to the CLP and subcontracted labs, while the regional copy is to be sent to Manchester Environmental Laboratory (MEL). All Scribe project information, sample information, and documentation (labels/TR-COCs) must be completed according to the Region 10 RSCC sampling guidelines. A separate unique Traffic Report (TR)/chain-of-custody will be created for each cooler shipped, documenting the specific contents and location of the associated cooler.

The following subsections summarize each element of sample handling and custody. The sample management and documentation procedures are described in the program-specific field procedures (Appendix B).

3.3.1 Chain-of-Custody

Because samples collected during any investigation could be used as evidence, their possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. Chain-of-custody procedures are followed to document sample possession.

3.3.1.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- The sample is in a person's physical possession.
- The sample is in a person's view after being in his or her physical possession.
- The sample was in a person's physical possession and was then locked up or sealed to prevent tampering.
- The sample is kept in a designated secured area.

3.3.1.2 Field Custody

Only enough material to provide a good representation of the media being sampled will be collected. To the extent possible, the quantity and types of samples and sample locations are determined before the actual fieldwork is performed. As few people as possible should handle samples.

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.

The PM determines whether proper custody procedures were followed during the fieldwork, and decides whether additional samples are required.

3.3.1.3 Transfer of Custody and Shipment

Samples are accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving the samples sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the sample custodian at the laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate chain-of-custody record accompanying each shipping container (one for each field laboratory if being used and one for samples driven to the laboratory). Shipping containers will be sealed with custody seals for shipment to the laboratory. Courier names and other pertinent information are entered in the “Received by” section of the chain-of-custody record. The RSCC will be notified of shipment and the Scribe .xml file will be uploaded to the CLP Sample Management Office (SMO) Portal Web site on the day of shipment.

All shipments are accompanied by the chain-of-custody record identifying its contents. The original record and one copy accompany the shipment to the laboratory, and a second copy is retained by the PM. The Scribe .xml file is also emailed to the RSCC along with the R10 template custom view .xls file export.

A separate unique TR/COC and Airbill will be created for each cooler shipped, documenting the specific contents and location of the associated cooler. Freight bills, postal service receipts, and bills of lading are retained as part of the permanent documentation.

3.3.1.4 Laboratory Custody Procedures

A designated sample custodian accepts custody of the shipped samples and verifies that the sample numbers match those on the chain-of-custody records. Pertinent information about shipment, pickup, and courier is entered in the “Remarks” section. The custodian then enters the sample numbers into lab records. The laboratory custodian uses the sample identification number or assigns a unique laboratory number to each sample, and is responsible for ensuring that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted or returned to the custodian. The data from sample analyses are recorded on the laboratory report form.

When sample analyses and necessary QC checks have been completed in the laboratory, the unused portion of the sample will be disposed of properly. All identifying sample tie tags, data sheets, and laboratory records are retained as part of the documentation. Sample containers and remaining samples are disposed of by the laboratory in compliance with all federal, state, and local regulatory requirements.

3.3.2 Custody Seals

Custody seals will be placed on coolers during transport of samples to the laboratory. The seals will be placed on two sides of the lid (one in front, and one on the side) and covered with tape to prevent inadvertent breaking of the seals. To prevent the opening of coolers during shipment and to ensure that the samples remain sealed under custody until arrival at the laboratory additional large liner bag (drum liner type) inside around entire contents of cooler (ice and samples), tied tightly closed and secured with additional custody seal will also be used.

3.3.3 Field Notebooks

A bound field notebook will be maintained by each sampling FTL to provide a daily record of significant events, observations, and measurements during field investigations. All entries will be signed and dated. The notebook will be retained by each agency as a permanent record, and copies of field notes from each sampling event will be submitted to EPA.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project, and to refresh the memory of the field personnel, if required. Field data collected in field notebooks will be entered electronically for upload and final storage.

3.3.4 Corrections to Documentation

All original data recorded in field notebooks and field data forms will be written in black waterproof ink, unless prohibited by weather conditions. Field notebooks and data forms are not to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a correction.

If an error is made on an accountable document, the FTL may make corrections simply by drawing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All corrections must be initialed and dated.

3.4 Analytical Methods (B4)

Project analytes, methods and target laboratory detection limits are listed in Table 2-2.

Where applicable, samples will be analyzed through EPA Contract Laboratory Program (CLP) and the associated statements of work along with CLP QA/QC requirements. Depending on availability, these analyses may also be carried out through the EPA regional laboratory, MEL, per MEL SOPs and QA/QC procedures. Where CLP is not applicable samples will be analyzed by the EPA regional laboratory (MEL) per MEL SOPs and QA/QC procedures.

3.5 Quality Control (B5)

3.5.1 Field Quality Control Procedures

QC requirements related to the sample collection process (i.e., sample design, sampling procedures, and field QC samples) are described in Appendix B. The QC samples will be collected immediately following collection of normal samples and using the same procedures as the collection of the normal sample.

The field QC samples are also described in the Field Procedures (Appendix B).

3.5.2 Laboratory Quality Control Procedures

Laboratory QC procedures will include the following:

- Analytical methodology and QC according to the methods listed in Table 2-2 and the laboratory's appropriate scope of work or SOP
- Instrument calibration and standards as defined in the methods listed in Table 2-2 and CLP or laboratory-specific SOPs
- Laboratory blank measurements at a minimum of 5 percent or 1-per-batch frequency
- Accuracy and precision measurements at a minimum of 1 in 20, 1 per set
- Data reduction and reporting according to the methods listed in Table 2-2
- Laboratory documentation equivalent to the CLP scope of work or appropriate MEL SOP

3.6 Instrument/Equipment Testing, Inspection, and Maintenance (B6)

Field instrument testing, inspection and maintenance will be recorded in field notebooks. Preventative maintenance is performed according to the procedures described in the manufacturer's instrument manuals, if applicable, including lubrication, cleaning, and the frequency of such maintenance. Instrument downtime is minimized by keeping adequate supplies of all expendable items, where expendable means an expected lifetime of less than 1 year. These items include batteries, oil, and cables. Preventative maintenance for field equipment (e.g., water level meter, pressure transducers, and the water quality meter) will be conducted in accordance with procedures and schedules outlined in the particular model's operation and maintenance handbook.

3.7 Instrument/Equipment Calibration and Frequency (B7)

3.7.1 Field Calibration Procedures

Planned instruments used in the field include geographic positioning system (GPS) and a multi-parameter water quality meter. The GPS is calibrated and/ or checked by the manufacturer and should not require any adjustment or calibration in the field; however calibration checks will be carried out by the field team as needed. The multi-parameter water quality meter will be calibrated each day, prior to use and be verified at the end of each day's use. Any instrument deviations from the calibration solution should be recorded in the field notebook. Instrument adjustments will be in accordance with procedures and schedules outlined in the particular instrument's operations and maintenance manual.

Scheduled periodic calibration, if any, of testing equipment does not relieve field personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, the device must be removed from service and tagged so that it is not inadvertently used, and appropriate personnel notified so that a recalibration can be performed or a substitute piece of equipment can be obtained. Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use or tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented, and the PM and data users will be notified.

3.7.2 Laboratory Calibration Procedures

Laboratory calibration procedures are specified in the methods referenced in Table 2-2 and in the laboratory's SOP.

3.8 Inspection and Acceptance of Supplies and Consumables (B8)

Supplies and consumables will be acquired and inspected in accordance with acquisition specifications upon receipt.

3.9 Nondirect Measurements (B9)

As described in Step 3 of the DQO process (Appendix A), data collected during the 2013 investigation will be augmented with existing data summarized in the *2012 Remedial Investigation Technical Memorand*um (CH2M HILL 2013), *Preliminary Findings for Pre-RI 2011 Field Sampling Activities Technical Memorandum* (CH2M HILL 2012), as well as data collected during previous investigations, as appropriate based on temporal representativeness, adequacy of detection limits, validation status, and reproducibility of results. The historical data evaluated for usability during planning for the 2011 and 2012 field investigations and were found to be usable for general sample location planning and CSM development purposes, but not found to be usable for risk assessment purposes. The RI Report will further document the usability of the historical data sets and describe

how they may or may not be used in making decisions about nature and extent of contamination and remedial action. The RI Report will also provide validation reports for the 2011, 2012, and 2013 RI data.

3.10 Data Management (B10)

Data obtained will undergo two levels of review and validation: (1) in the field and (2) laboratory data review and verification. Data management is discussed further in Section 5 (EPA Group D) of this QAPP. Following receipt of reviewed and validated data, data will be uploaded to EPA's electronic data warehouse (WQX) to facilitate data access, queries, and report preparation. Data management practices are detailed in the Project Data Management Plan (CH2MHILL, 2011d). Scribe software will be used to document and manage sample custody, location information, and field data measurements associated with any samples submitted for chemical analysis.

SECTION 4

Assessment and Oversight (EPA Group C)

This section describes assessment, oversight, and reports to management.

4.1 Assessments and Oversight (C1)

The QAO, RTL, and PM will monitor the performance of the QA procedures. If problems arise or the EPA TOPO directs the PM accordingly, the QAO will conduct field audits. Field audits may be scheduled to evaluate the following:

- Execution of field measurements
- Whether field information gathering procedures were properly implemented
- Execution of sample identification, chain-of-custody procedures, field notebooks, sampling procedures, and field measurements
- Whether trained personnel staffed the sample event
- Whether equipment was in proper working order
- Availability of proper sampling equipment
- Whether appropriate sample containers, sample preservatives, and techniques were used
- Whether sample packaging and shipment were appropriate
- Whether QC samples were properly collected

Chemical analyses will be carried out at EPA MEL or an EPA CLP laboratory. Analyses, if needed, may also be carried out at subcontract labs as directed by RSCC. The distribution of analyses to the laboratories will be determined according to laboratory capability and capacity and the sampling schedule. The distribution of analyses may change at the time of analysis depending on capacity and implementation of specific procedures at the Regional Laboratory. The RSCC, residing at EPA's Environmental Services Unit (ESU), will be responsible for coordinating and scheduling analytical services from the CLPs and MEL. The data quality and laboratory performance of CLP laboratories are monitored by the Analytical Services Branch in EPA Headquarters and the region's Quality Staff, including the CLP PO and RSCC. For MEL, QA oversight is provided by the laboratory's QA Coordinator. In addition, onsite audits or performance evaluation samples will be administered by the CH2M HILL QAO and EPA Regional QAO, as necessary. Audits will be followed up with an audit report prepared by the reviewer. The auditor will also debrief the laboratory or the field team at the end of the audit and request that the laboratory or field team comply with the corrective action request.

If QC audits result in detection of unacceptable conditions or data, the PM will be responsible for developing and initiating corrective action. The TOPO will be notified if non-conformance is of program significance or requires special expertise not normally available to the project team. In such cases, the PM will decide whether any corrective action should be pursued. Corrective action could include the following:

- Recollecting field data if practicable
- Evaluating and amending field data collection procedures
- Reanalyzing samples if holding time criteria permit
- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data acknowledging a level of uncertainty

All corrective actions will be documented in a field logbook.

4.2 Reports to Management (C2)

The PM or TOPO may request that a QA report be made to the TOPO on the performance of sample collection and data quality. The report will include the following:

- Assessment of measurement data accuracy, precision, and completeness
- Results of performance audits
- Results of systems audits
- Significant QA problems and recommended solutions

Progress reports, prepared as needed, will summarize overall project activities and any problems encountered. QA reports generated on sample collection and data quality will focus on specific problems encountered and solutions implemented. Alternatively, in lieu of a separate QA report, sampling and field measurement data quality information may be summarized and included in the final reports. The objectives, activities performed, overall results, sampling, and field measurement data quality information for the project will be summarized and included in the final reports along with any QA reports.

A field sampling report listing the dates of field activities, information collected, samples collected, sample locations, field duplicates, and dates of sample collection and shipment will also be generated to support the data validation activities. Field data will be presented in a final report to EPA as a separate deliverable because the data will be used qualitatively.

SECTION 5

Data Validation and Usability (EPA Group D)

This section introduces the concepts of data review, verification, and validation; describes verification and validation methods; and explains reconciliation with user requirements.

5.1 Data Review, Verification, and Validation (D1)

Data for all parameters (except MEL data) will undergo two levels of review and validation: (1) at the laboratory data review and verification, and (2) outside the laboratory by third-party independent data verification and validation. CLP-generated data will be verified and validated by the Quality Staff in EPA's ESU prior to authorization of payment to the laboratory. The data generated by the regional EPA laboratory (MEL) is reviewed and verified internally at MEL and is not considered 'validation' although validation qualifiers are applied as needed. If needed, the EPA R10 QA unit may validate MEL data for unique circumstances where it is requested, such as for litigation support. All validated CLP laboratory data are downloaded directly by CH2M HILL in the SMO Portal and as needed emailed by EPA QA to CH2M HILL. The stage of validation assigned to each Sample Delivery Group (SDG) will determine when the data are final and appropriate for download and project use (see Section 5.2). The data generated by the subcontracted commercial laboratories will be validated by CH2M HILL or an independent third-party data reviewer. Stage of data validation as explained below will be included in the data validation report.

5.2 Verification and Validation Methods (D2)

Initial laboratory analytical data reduction, validation, and reporting at the laboratory will be performed as described in the laboratory-specific SOPs. Independent data validation by EPA or their designee and subcontracted laboratory data validation by CH2M HILL will follow EPA *Contract Laboratory Program National Functional Guidelines for Inorganic/Organic Data Review* (EPA, 2002b and 2010), as described above. CH2M HILL validation of subcontracted data for methods other than CLP or CLP equivalent (e.g., Method 6010) will follow EPA guidance as applicable to method QC parameters (e.g., ASTM methods). An equivalent level of effort as prescribed in the guidance will be implemented. The minimum level of effort for subcontracted data validation will be at 10% S2BVE and 90% S4VEM.

EPA validation of CLP data is labeled with a level-of-effort "Stage" identification in accordance with *Guidance for Labeling Externally Validated Laboratory* Analytical *Data for Superfund Use* (EPA, 2009b). Standardized terminology for identification of data validation is designed to help increase national consistency and improve communication and understanding about the nature of verification and validation conducted on laboratory analytical data for Superfund use. An in-depth definition of each data validation stage label can be found in Appendix A of the cited EPA guidance document.

Inorganic data is electronically validated at S2BVE; however organic data is automatically validated at S3VE through validation software prior to delivery at the SMO Portal. For this project, a full Stage 4 electronic and manual data validation (100 percent S4VEM) will be performed on all samples if QA resources and time are available (EPA, 2009b). If resources are constrained (particularly when there are multiple methods and matrices), the following reduced approach may be implemented:

- The first sample delivery groups of each matrix/analysis combination submitted by the laboratory (for multiple matrices and methods) or the first four delivery groups will undergo S4VEM.
- Provided that problems are not encountered with the data and there are EPA QA resource and time constraints, 30 percent of the rest of the data will undergo S4VEM validation and the remaining 70 percent will undergo standard S2BVE data validation.
- Given the large number of samples analyzed for this project, EPA R10 QA will likely need to follow the reduced validation approach presented: 30 percent S4VEM and 70 percent S2BVE.

All EDDs will be downloaded by the project staff/designated contractors from the CLP SMO Portal. EPA QA chemists will notify the project data managers with SMO Portal access when SDGs are designated for validation (30 percent). Those designated SDGs are not final until the EPA QA Data Validation Report has been sent out and the data reflect the "S4VEM" DV label. All other S2BVE (70 percent) of the project data may be downloaded after site upload has occurred. Validation report memorandums and qualified results will be prepared by the validator (EPA S4VEM or CLP SMO S2BVE) and submitted to the EPA PM and the contractor's PMs.

5.3 Reconciliation with User Requirements (D3)

Laboratory analytical data obtained will be reconciled with the requirements specified in Table 2-2. Assessment of data for precision, accuracy and completeness will be performed in accordance with the quantitative definitions in the following sections.

5.3.1 Precision

If calculated from duplicate measurements, use the following equation:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2} \quad (1)$$

Where:

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	smaller of the two observed values

If calculated from three or more replicates, use relative standard deviation (RSD) rather than the RPD, as follows:

$$RSD = (s / \bar{y}) \times 100\ \% \quad (2)$$

Where:

RSD	=	relative standard deviation
s	=	standard deviation
$\bar{y}$	=	mean of replicate analyses

Standard deviation, s, is defined as follows:

$$S = \sqrt{\sum_{i=1}^{n} \frac{(y_i / \bar{y})^2}{n-1}} \quad (3)$$

Where:

s	=	standard deviation
y_i	=	measured value of the ith replicate
$\bar{y}$	=	mean of replicate analyses
n	=	number of replicates

5.3.2 Accuracy

For measurements where matrix spikes are used, use the following:

$$\%R = 100\% \times \left[\frac{S - U}{C_{sa}}\right] \quad (4)$$

Where:

%R	=	percent recovery
S	=	measured concentration in spiked aliquot
U	=	measured concentration in unspiked aliquot

C_{sa} = actual concentration of spike added

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes, use the following:

$$\%R = 100\% \ x \left[\frac{C_m}{C_{sm}} \right] \tag{5}$$

Where:

%R = percent recovery
C_m = measured concentration of SRM
C_{sm} = actual concentration of SRM

5.3.3 Completeness (Statistical)

Defined as follows for all measurements:

$$\%C = 100\% \ x \left[\frac{V}{T} \right] \tag{6}$$

Where:

%C = percent completeness
V = number of measurements judged valid
T = total number of measurements

SECTION 6

References

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Appendix A Systematic Planning/Data Quality Objectives

APPENDIX A

Systematic Planning/Data Quality Objectives

This appendix presents a summary of the systematic planning process and resulting data quality objectives (DQOs) that were developed to support sampling and analysis activities to complete the remedial investigation (RI) for the Salt Chuck Mine site (Site) on Prince of Wales Island, Alaska. Data gathered during the 2013 investigation will be combined with results of previous investigations (as appropriate) and the 2011 pre-RI and 2012 RI data to characterize the nature and extent of contamination and assess risk to human health and the environment. The findings of the RI and risk assessments will then be incorporated into a Feasibility Study (FS), which will develop and evaluate remedial alternatives for mine and mill-related contamination at the Site.

A.1 Step 1 – State the Problem

A.1.1 Background Information

Salt Chuck Mine is located approximately 4½ miles south-southwest of Thorne Bay, Alaska, at the northern end of Kasaan Bay, on Prince of Wales Island. The mine is located in the Tongass National Forest, Outer Ketchikan County, within Township 72 South, Range 84 East, Sections 16 and 17, Copper River Meridian, Alaska. Salt Chuck Bay, from which the mine takes its name, is a shallow, restricted water body bordering the mine site to the south and forms the northernmost arm of Kasaan Bay (Figure 1). The Salt Chuck Mine site is accessible by water or by road, the last ½-mile of which is newly constructed and remains gated. Thorne Bay (population 471) is the closest year-around population, and is accessible from the site by road. The Organized Village of Kasaan (Kasaan, population 49) is the nearest community by water and is located 9 miles southeast of the site on the eastern side of Kasaan Bay.

The upland portion of the Site, managed by the United States Department of Agriculture, Forest Service (Forest Service), covers approximately 45 acres and includes the Salt Chuck mine and former mill site. The mine is uphill and approximately ½-mile north of the former mill.

The mine area includes the glory hole and adits where ore was removed, a former railway for transporting ore to the mill, a variety of dilapidated structures, and numerous waste rock piles. The mine area is relatively steep and heavily vegetated.

The former mill was the subject of a non-time critical removal action (NTCRA) conducted by the Forest Service in 2011. Prior to the NTCRA, the mill site contained a large roller mill, workshops, bunkhouses, above-ground storage tanks (ASTs) reportedly used to store fuel and possibly coal tar for use as floatation agent in ore processing, fuel drum caches, and other support facilities for the mining camp. The mill was constructed over and surrounded by tailings and waste rock piles. The structures, tanks, and fuel drum cache were removed and exposed contaminated soil, tailings, and waste rocks were excavated to bedrock during the NTCRA. The excavated areas were then backfilled, graded, covered and revegetated (North Wind, 2012).

The Upland Area is drained by a small unnamed stream (hereafter “Unnamed Stream”) that originates northeast of the site at Power Lake, cuts across the mine site, and discharges into Lake Ellen Creek just below the shoreline at Salt Chuck Bay, near the former mill site. At high tide, seawater from Salt Chuck Bay inundates the lower portions of Lake Ellen Creek and Unnamed Stream.

The Intertidal Area is defined by the area below mean high tide but above mean low tide, and encompasses approximately 80 acres south of the mill site and extends around an unnamed island (hereafter “Unnamed Island”) in the middle of Salt Chuck Bay. The intertidal zone is covered by fucus, gravel, mollusk shell fragments, and beach grasses, but areas closest to the former mill site consist of mud flats mixed with tailings, with little vegetation. There is an abundance of shellfish located in the intertidal area of Salt Chuck Bay. Example shellfish species include blue mussels, littleneck clams, butter clams, softshell clams, cockles, barnacles, snails, shrimp, starfish, and crabs.

The Intertidal Area adjacent to the former mill is dominated by a large spit composed of roughly 100,000 cubic yards (CY) of tailings from the mill. Accumulations of tailings are also evident along the shoreline where Unnamed Stream joins Lake Ellen Creek. The saturated intertidal tailings are not contained in a manner that prevents contaminants within the tailings from migrating into the waters of Salt Chuck Bay. The tailings, outlying sediment, and intertidal portion of Lake Ellen Creek are exposed at low tide.

A.1.2 Conceptual Site Model

A conceptual site model (CSM) provides a framework for understanding site-specific features and physical processes that influence the distribution of contaminants and the potential for risk to potential human and ecological receptors. The development of the CSM is a dynamic process that is based on currently available site information and existing levels of contamination, the latest understanding of reasonably anticipated future land and water uses, and reasonably anticipated future exposure scenarios. As additional data and understanding are gained, the CSM is updated accordingly. The CSM is summarized as follows:

- **Sources of Contamination** – Mine operations, waste rock, mill tailings, mill operations (fuel and process materials), and assay shop operations.
- **Contaminants Associated with Sources** – Metals (especially copper), petroleum for power production and lubrication, coal tar (used as floatation agent in mill)
- **Release Mechanisms** – Direct discharge to impoundments and waste piles, surface runoff, leaching to soil, sediment, and groundwater, and subsequent migration/discharge to surface water and other media
- **Potential Exposure Routes (Human)** – Incidental ingestion, dermal contact, dust inhalation, uptake into wild plants, uptake into wild game and shellfish.
- **Potential Exposure Routes (Ecological) –** Incidental ingestion, dermal contact, direct uptake, and bioaccumulation into food web,

The CSMs for human and ecological exposure at the Site are shown in Figures A-1 and A2 and discussed in detail in the *Risk Assessment Work Plan* (CH2M HILL, 2013).

A.1.3 Systematic Planning Process

A systematic planning process was used to develop the DQOs and sampling design for the 2013 field investigation. Table A-1 lists the members and affiliations of the planning team.

Table A-1
Planning Team

Name	Name
Jacques Gusmano/EPA Project Manager	Paul Townley/CH2MHILL Project Manager
Debbie Yamamoto/EPA Unit Manager	Marilyn Gauthier/CH2MHILL Task Manager
Lisa Castanon/EPA Project Attorney	Dennis Shelton/CH2MHILL Lead Toxicologist and Risk Assessor
Lon Kissinger/EPA Human Health Risk Assessor	David Bunte/CH2MHILL Subject Matter Expert (Mining)
Joe Goulet/EPA Ecological Risk Assessor	Hans Ehlert/CH2MHILL Subject Matter Expert (Treatability Studies)
Earl Liverman/EPA Removal Group	Mark Minnillo/ADFG (Habitat Biologist)
Michael Wilcox/USFS Project Manager	Deborah Rudis/USFWS
Annemarie Palmieri/ADEC Project Manager	Ali Hamade/Alaska Public Health
Ted Wu/ADEC Risk Assessor	Stacy Cooper/Alaska Public Health
Anne Johnson/DNR (State Land Manager)	Artemis Antipas/AES 10 Program Chemist

Three meetings were held as part of systematic planning for the 2013 sampling activities. Table A-2 provides a summary of attendees and topics.

Table A-2
Planning Meetings

Date	Attendees	Topics
February 4, 2013 Seattle, WA	Paul Townley, Dennis Shelton, Lon Kissinger, Joe Goulet, Jacques Gusmano	Human health and ecological risk assessment data needs.
February 12 and 13, 2013 Anchorage, AK	Personnel listed in Table A-1	Summary of information gathered to date, identification of site characterization and risk assessment data gaps, risk assessment approach, summary of treatability study data needs, summary of removal action data needs.
March 6. 2013	Paul Townley, Dennis Shelton, Marilyn Gauthier, Jacques Gusmano	Data quality objectives and sampling design

Key decision makers for conduct of the study and evaluation of results are listed in Table A-3.

Table A-3
Key Decision Makers

Name	Role
Jacques Gusmano	EPA Project Manager
Paul Townley	CH2MHILL Project Manager

The documents and data sets listed in Table A-4 were used to develop the CSM for the Salt Chuck Mine.

Table A-4
Relevant Documents and Data Sets

Title	Date	Author
Report of Investigation – Salt Chuck Mine	August 1948	US Bureau of Mines
Final Report – Removal Preliminary Assessment Salt Chuck Mine, Thorne Bay Ranger District, Tongass National Forest	April 1998	Bureau of Land Management
Final Investigation of Third Party Liability Salt Chuck Mine	December 1999	Montgomery Watson for USFS
Final Work Plan Engineering Evaluation/Cost Analysis for Salt Chuck Mine, Tongass National Forest	July 2002	URS for USFS
Final Work Plan Addendum Engineering Evaluation/Cost Analysis for Salt Chuck Mine, Tongass National Forest	September 2006	URS for USFS
Draft Engineering Evaluation/Cost Analysis Report – Salt Chuck Mine, Tongass National Forest, Alaska	March 2007	URS for USFS
Final Engineering Evaluation/Cost Analysis Report – Salt Chuck Mine, Tongass National Forest, Alaska	April 2010	URS for USFS
Final Completion Report Non-Time Critical Removal Action Salt Chuck Mine Mill Prince of Wales Island, Alaska.	May 2012	Northwind for USFS
Salt Chuck Mine – Preliminary Findings for Pre-Remedial Investigation 2011 Field Sampling Activities	May 2012	CH2MHILL for EPA
Salt Chuck Mine Remedial Investigation Quality Assurance Project Plan	June 2012	CH2MHILL for EPA
Salt Chuck Mine – Treatability Study Concepts to Stabilize Eroding Intertidal Tailings Deposits	November 2012	CH2MHILL for EPA
Salt Chuck Mine Risk Assessment Work Plan (Draft)	February 2013	CH2MHILL for EPA
Salt Chuck Mine – Preliminary Findings for 2012 Remedial Investigation Field Sampling Activities (Draft)	February 2013	CH2MHILL for EPA

Table A-4
Relevant Documents and Data Sets

Title	Date	Author
Salt Chuck Mine chemical database (2011 and 2012 analytical and field data)		CH2MHILL and Critigen
Salt Chuck Mine spatial database (GIS)		CH2MHLL and ProWest

A.1.3.1 Overall Objectives

The overall objectives of the RI are to characterize the nature and extent of contamination associated with releases from the Site, assess risks to human health and the environment, and obtain data to support development of remedial alternatives. The findings of the RI and risk assessments will then be incorporated into a FS, which will develop and evaluate remedial alternatives for mine and mill-related contamination at the Site.

The results of the 2011 Pre-RI and 2012 RI were evaluated to identify remaining data gaps to be addressed during 2013 sampling. The following problem statements were developed based on these objectives and review of existing field and analytical data for the Site.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk:**
  - Problem Statement 1-1: The extent of contamination along the distal (southern) segment of the thalweg of Lake Ellen Creek on the west side of Unnamed Island is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-2: Existing RI data suggest that seeps are releasing soluble copper and other metal discharges into surface water within the intertidal portion of Lake Ellen Creek during low tide, potentially impacting aquatic life. The extent to which these releases originate from tailings present within the intertidal areas near the former mill area and/or from upland groundwater sources is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-3: Existing RI data suggest that tailings in the cove east of the barge slip may exhibit anomalous toxicity, bioaccumulation, and/or leaching characteristics. The importance or impact of these differences is not fully understood to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-4: Total chromium has been detected in tailings/sediment and may be mine related. However, it is unknown what portion of the total chromium occurs in the more toxic hexavalent form. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-5: The Organized Village of Kasaan has expressed concern about contamination within the intertidal lands, particularly with subsistence concerns. Potential impacts on the beneficial use of crab and shrimp harvesting are of particular concern, both from past releases and from potential releases from any proposed remedial actions. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-6: Existing RI data indicate that groundwater in the former mill area is affected by releases of petroleum and by metals in tailings. The extent of groundwater contamination is unknown and contaminant concentrations appear to have changed over time. More information is needed to assess trends and understand potential discharges to nearby surface water in the intertidal areas. This is needed to adequately characterize potential risks to the environment and/or to support a remedial decision.
- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**

- Problem Statement 2-1: The thickness and vertical profile of tailings within the intertidal areas are uncertain. This information is needed to adequately support evaluation of remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.
- Problem Statement 2-2: Existing RI data indicate that surface sediment from the peninsula that is circumvented by Lake Ellen Creek (at low tide) within Salt Chuck Bay contains relatively lower concentrations of mine-related metals. However, it is unknown whether this is due to historic deposition of cleaner sediment from Lake Ellen Creek onto deeper contamination, or whether the peninsula itself represents an erosional feature. If deeper contaminated sediment exists at this location, the potential for future mobilization into the bay should be evaluated.
- Problem Statement 2-3: The thickness and vertical and lateral profile of tailings within the tailing piles along Unnamed Stream are uncertain. This information is needed to adequately support evaluation of remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.
- Problem Statement 2-4: The agronomic characteristics of intertidal sediment are unknown. This information is needed to support evaluation of remedial alternatives.

- **Objective 3 – Characterization of IDW**
  - Problem Statement 3-1: IDW must be characterized for disposal.

A.2 Step 2 – Identify the Decision/Principal Study Questions

The purpose of DQO Step 2 is to define the principal study questions (PSQs) to be resolved using new or existing measurements. Alternative actions are identified that could result from resolution of the PSQs, and the consequences of each of the alternative actions are evaluated in this step.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk**

  Key Questions/Decisions:

  - Decide whether the nature and extent of contamination (based on existing and newly collected data) is sufficiently well defined to support evaluation and design of the available remedial options.

  Possible Outcomes:

  1) Site is sufficiently delineated and no additional delineation is required to support remedial decisions.
  2) Site is not sufficiently delineated and additional delineation will be required.

- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**

  Key Questions/Decisions:

  - Decide whether the nature and extent of contamination (based on existing and newly collected data) is sufficiently well defined to support evaluation and design of the available remedial options.

  Possible Outcomes:

  1) Site is sufficiently delineated and no additional delineation is required to support remedial decisions.
  2) Site is not sufficiently delineated and additional delineation will be required.

- **Objective 3 – Characterization of IDW**

  Key Questions/Decisions:

  - Determine whether the types of IDW generated require characterization, and if so, characterize appropriately for disposal purposes.

Possible Outcomes:

1) Generated IDW will be limited to PPE, disposable sampling equipment, and site-generated decontamination and development water therefore no characterization is required

A.3 Step 3 – Identify Inputs to the Decision

The purpose of DQO Step 3 is to identify the informational inputs that will be required to resolve PSQs and determine which inputs require environmental measurements, model computations, and/or sampling. Data needed to inform each of the key questions for the study are listed in the subsections that follow.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area**

  Needed information:

  - Existing historical records on site uses, processes, and releases
  - Site geologic information
  - Conceptual site model (see Section A.2.1)
  - Site reconnaissance records
  - Existing and new analytical data for sediment, tailings, surface water, porewater, and biota (see Tables A-5 through A-8 for analyte lists) from Salt Chuck Bay, and upland tailings and groundwater from the former mill area
  - Action/screening levels for tailings/sediment, water, biota, and groundwater (see Tables A-5, A-6, A-7, and A-8)
  - Background concentrations (see data tables in Attachment A-1)

  Source of information:

  - Past data, as summarized in Attachment A-1, and new data to be collected as described in Step 7.

  Action/Screening Levels:

  - See Table A-5 (sediment and tailings), Table A-6 (surface water, porewater, and SPLP), Table A-7 (biota), and Table A-8 (groundwater).
  - Risk criteria as defined under CERCLA.

  Methods:

  - Appropriate methods available and shown in Tables A-9 (sediment and tailings), A-10 (surface water, and porewater), A-11 (biota), and A-12 (groundwater).

- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**

  Needed information:

  - Conceptual site model (see Section A.2.1)
  - Existing and new analytical data for sediment, tailings, surface water, porewater, and biota (see Tables A-5 through A-8 for analyte lists) from Salt Chuck Bay, and upland tailings and groundwater from the former mill area
  - Lateral and vertical extent of mine-related concentrations contributing to an unacceptable risk, or that contribute to non-attainment of ARARs
  - Sediment characteristics, such as grain size distribution, organic carbon content, moisture content, bulk density, and agronomic parameters.

- Feasible remedial technologies and institutional controls.

Source of information:

- Past data as summarized in Attachment A-1 and new data to be collected as described in Step 7.

Action/Screening Levels:

- See Table A-5 (sediment and tailings), Table A-6 (surface water, porewater, and SPLP), Table A-7 (biota), and Table A-8 (groundwater).
- Risk criteria as defined under CERCLA.

Methods:

- Appropriate methods available and shown in Tables A-9 (sediment and tailings), A-10 (surface water, and porewater), A-11 (biota), and A-12 (groundwater).

- **Objective 3 – Characterization of IDW**
  - Characterization information for used personal protective equipment (PPE) and IDW from previous investigations.
  - Site definition under CERCLA.

A.4 Step 4 – Define the Boundaries of the Study

The primary objective of DQO Step 4 is for the DQO Team to identify the spatial, temporal, and practical constraints on the sampling design and consider the consequences. This objective (in terms of the spatial, temporal, and practical constraints) is to ensure that the sampling design results in the collection of data that accurately reflect the true condition of the site and/or populations being studied.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk**

Populations of interest:

- Sediment, tailings, surface water, porewater, groundwater, and biota

Spatial Boundaries - Lateral extent:

- Sediment samples for Problem Statement 1-1 will be collected as grabs from intertidal area west of Unnamed Island (see Figure A-1).
- Sediment/tailings samples for Problem Statement 2-1 will be collected from locations across areas with observed tailings deposits (see Figure A-3).
- Surface water samples for Problem Statements 1-2 and 1-3 will be collected as grabs from intertidal portions of Lake Ellen Creek and Unnamed Stream. Surface water samples for characterization of background concentrations will be collected as grabs from Browns Bay.
- Porewater samples for Problem Statements 1-2 and 1-3 will be collected as grabs across areas with observed tailings deposits.
- Crabs and shrimp for Problem Statement 1-5 will be collected at locations and water depths where the biota are available in Salt Chuck Bay. Crab and shrimp samples for characterization of background concentrations will be collected as grabs from Browns Bay.
- Groundwater samples for Problem Statements 1-2 and 1-6 will be collected from upland areas where groundwater is present and may be impacted by metals and/or petroleum and coal tar.

Spatial Boundaries - Vertical Extent:

- Problem Statement 1-1 -Surface sediment (top 6 inches) samples only

- Problem Statements 1-2 and 1-3 -Sediment and tailings - Surface sediment and tailings will be collected from the top 6 inches where wildlife and human exposure is most likely. Deeper sediment and tailings samples will be collected in one-foot increments to confirm thickness of tailings and associated contamination. Vertical extent depends on visual observations, and comparison of concentrations to screening levels.
- Problem Statements 1-2 and 1-3 - Porewater samples will be collected from saturated interval at similar depth within observed tailings deposits.
- Problem Statements 1-2 and 1-6 - Groundwater samples will be collected from first encountered groundwater interval.

Temporal Boundaries:

- Most sampling will take place during the period of extreme low tides in May 2013. Direct-push sampling in the Intertidal Area will take place in August 2013.
- The 2011, 2012, and 2013 RI sampling results will be the primary focus of the nature and extent evaluation and risk assessments. These data will be supplemented with historical data where appropriate.
- Chemicals of highest interest (metals) are relatively persistent.
- Decisions linked to this objective will hold until remedial decisions are made.

Potential obstacles to obtaining information:

- Adverse weather condition may delay schedule.
- Boat transportation to the study area will be required.
- Tide cycle conditions will need to be optimized for sample collection. Sediment cores can only be obtained during low tide conditions.
- Locating adequate sample volume of biota.

- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**

Populations of interest:

- Sediment and tailings in intertidal and upland areas near the former mill.

Spatial Boundaries - Lateral extent:

- Borings for Problem Statement 2-1 will be advanced across three areas with observed tailings deposits including the southeast tailings cove (EE/CA Area D) (see Figure A-3).
- Borings for Problem Statement 2-2 will be advanced in the sediment deposit/peninsula south of the former mill and opposite the discharge of Lake Ellen Creek (see Figure A-3).
- Borings for Problem Statement 2-3 will be advanced in upland tailings piles (Tailings piles D14 and D15) located along Unnamed Stream (see Figure A-3).

Spatial Boundaries - Vertical Extent:

- Problem Statements 2-1, 2-2 and 2-3 – Borings will extend to base of tailings (determined by visual observation) or to limit of equipment being employed.

Temporal Boundaries:

- Most sampling will take place during the period of extreme low tides in May 2013. Direct-push sampling in the Intertidal Area will take place in August 2013.
- The 2011, 2012, and 2013 RI sampling results will be the primary focus of the nature and extent evaluation and risk assessments. These data will be supplemented with historical data where appropriate.

- Chemicals of highest interest (metals) are relatively persistent.
- Decisions linked to this objective will hold until remedial decisions are made.

Potential obstacles to obtaining information:

- Adverse weather condition may delay schedule.
- Boat transportation to the study area will be required.
- Tide cycle conditions will need to be optimized for sample collection. Sediment cores can only be obtained during low tide conditions.
- Refusal may be encounter during coring.
- Tailings may extend beyond maximum reach of boring equipment.

- **Objective 3 – Characterization of IDW**

Populations of interest:

- PPE and IDW generated during 2013 investigation.

Spatial Boundaries:

- Containers holding PPE and IDW.

Temporal Boundaries:

- Indefinite.

Potential obstacles to obtaining information:

- None.

A.5 Step 5 –Decision/Analytical Process

The purpose of DQO Step 5 is to define the parameter of interest (e.g., mean), specify the action level, and integrate outputs from the previous DQO steps into a single statement that describes a logical basis for choosing among alternative actions.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk**

Decision Rule for Nature and Extent Evaluation:

- If tailing/sediment, water, and biota samples indicate concentrations of target analytes that are consistent with background and/or screening levels, then the lateral and vertical extent of contamination has been determined. Otherwise, additional samples are required to define extent.

Statistical Parameter of Interest for Nature and Extent Evaluation:

- Individual concentrations

Action/Screening Levels for Nature and Extent Evaluation:

- Identified in Step 3

Analytical Process:

The nature and extent of contamination will be determined using the following process:

- Screen investigation results against action levels to determine if there are concentrations above action levels.
- Prepare maps and cross-sections depicting the locations and depths where contaminant concentrations exceed screening levels.

- Determine lateral and vertical boundaries for each contaminated medium.

Decision/Analytical Process for Risk Assessment

The decision/analytical process for characterizing risks to human and ecological receptors is described in the *Risk Assessment Work Plan* (CH2M HILL, 2013).

- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**

Decision/Analytical Process:

- If the lateral and vertical extent of contamination potentially posing an unacceptable risk are sufficiently well defined to support evaluation and design of the available remedial options, and there is sufficient information on key parameters to evaluate the feasibility of certain remedial measures, no further investigation is required to evaluate remedial options to address potential risks. Otherwise additional samples or assumptions are required to evaluate remedial options.

- **Objective 3 – Characterization of IDW**
  - *Decision/Analytical Process:* If PPE and IDW are similar to wastes generated during previous investigations, then the wastes will be disposed in the same manner as previous investigations (PPE disposed as solid waste, IDW discharged within Site boundaries).

A.6 Step 6 – Specify Tolerable Limits on Decision Errors

The purpose of DQO Step 6 is to develop tolerable error limits. The probability of making an erroneous decision will be acceptable if it is within these limits. The error limits established in this step will be used to estimate the number of samples and to establish performance goals for the newly collected data. One of the primary objectives that must be accomplished in DQO Step 6 is to choose between a statistical or judgmental sample design. Sampling designs may be based on statistics or professional judgment; neither approach is deemed to be absolutely correct. The choice between the two designs depends on the project task objectives, existing data, actions to be taken, and the severity of the consequences of making decision errors.

- **Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk**
  - The sampling design is judgmental, based on historical and recent (2011 and 2012) sample results.
  - Analytical data will meet USEPA specifications for PARCC.
- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives**
  - The sampling design is judgmental, based on historical and recent (2011 and 2012) sample results.
  - Analytical data will meet USEPA specifications for PARCC.
  - Sampling design will provide sufficient representative data for evaluating remedial options.
- **Objective 3 – Characterization of IDW**
  - Not applicable – no samples will be collected.

A.7 Step 7 – Optimize the Design

The purpose of DQO Step 7 is to identify the most resource-effective design while not exceeding the tolerable false-positive and false-negative decision error rates, while maintaining the desired degree of precision and accuracy.

The elements of the sampling design for each aspect of the study are listed in the subsections below. The operational details for sample collection and documentation are provided in Appendix B (Field Procedures).

Objective 1 – Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk

- Sample sediment west of Unnamed Island from 8 locations as shown in Figure A-3; analyze all samples for metals. For 4 samples (including 1 from Browns Bay) analyze for grain size, AVS/SEM, and conduct the following screening bioassays:
    - 20-day static solid-phase tests using polychaetes conducted following procedures described in ASTM E-1611 and/or PSEP protocols (PSEP, 1995).
    - Embryo-larval development water column test of sediment elutriate (*Mytilus sp., Crossostrea, Dendraster, or Strongylocentrotus*) (EPA-823-B-98-004).
- Sample porewater from intertidal tailings areas, as shown in Figure A-4:
    - Most porewater samples will be collected by suction method which involves burying an aquarium air stone under the sediment and applying suction with a hand-operated syringe. Analyze samples for dissolved metals (excluding mercury due to volume limitations)
    - Drive-point wells will be used to collect porewater samples from intertidal tailings nearest the former mill and collapsed buildings east of the former mill where PAHs and petroleum hydrocarbons were found in soil and groundwater. A peristaltic pump and tubing will be used to collect the porewater samples from the temporary wells. Analyze samples for PAHs and dissolved mercury. Use of drive points will allow for collection of deeper samples and additional sample volume in areas where groundwater may be discharging to surface water.
- Sample surface water from intertidal tailings areas within Unnamed Creek, Lake Ellen Creek, and seepage inputs to Lake Ellen Creek, at 17 locations (including 5 from Browns Bay) as shown in Figures A-4; analyze all samples for dissolved metals; analyze samples from SW-104, SW-105, and SW-106 for total metals; analyze samples from 5 locations located down gradient of the former mill where PAHs and petroleum hydrocarbons were found in soil and groundwater (SW-015, SW-029, SW075, SW-099, and SW-084) for PAHs. At Lake Ellen Creek location immediately downstream from tailings areas (Location SW-105), collect time series grab samples hourly for two high tide cycles; analyze for dissolved metals.
- Sample intertidal tailings in the cove east of the barge slip from multiple depths at 7 locations as shown in Figure A-5; analyze all samples for metals, PAHs, SPLP metals, TOC, grain size, and bulk density. These samples will be co-located with some of the borings used to address Objective 2.
- Sample intertidal and upland tailings (at the surface) distributed throughout known tailings areas from 8 randomly selected locations as shown in Figure A-5; analyze all samples for hexavalent chromium. These samples will be co-located with some of the borings used to address Objective 2, at locations where total chromium is also analyzed.
- Sample crabs and shrimp from 10 locations in Salt Chuck Bay and at 5 locations in Browns Bay (Figure A-7); analyze tissue samples for metals (including methylmercury and speciated arsenic). Targeted species will be identified in the field, as available. At least 3 to 5 crab or shrimp will be composited for each sample, as available.
- Decommission the damaged monitoring well (GW-05) and install and develop replacement well (GW-05R). Install and develop 2 new monitoring wells (GW-07 and GW-08) immediately west of the former mill site and east of GW-01 (Figure A-6).
- Sample groundwater from the 8 monitoring wells; analyze all samples for metals (total and dissolved), DRO, RRO, and PAHs.

Objective 2 – Sample Collection for Evaluation of Remedial Alternatives

- Advance borings in intertidal and upland tailings at approximately 104 locations. The majority of the borings (up to 90) in the intertidal area will be advanced using a hand-held portable 2-inch diameter short coring device which can obtain 3 to 4 feet cores. A direct-push drilling rig will be used in the upland tailings piles and in the tailings spit area where tailings are expected to be thicker (up to 15 feet). The short-core and

direct-push and borings will be spaced at 75 to 150 feet and distributed throughout known tailings areas as shown in Figure A-5. Collect continuous cores from the surface to the base of tailings for visual documentation of tailings thickness. At 22 short-core and 6 direct-push locations (see red-highlighted boring locations on Figure A-5), collect samples at regular intervals (0 to 0.5 ft, 0.5 to 1.0 ft, 1,0 to 1.5 ft, 1.5 ft to 2.5 ft, and so on) for metals analysis. At selected intervals in 12 of these borings collect additional volumes for grain size distribution, organic carbon content, and bulk density analyses.

- At selected locations across upland tailings area near former mill conduct visual documentation of extent of tailings by hand-digging holes with shovel. The area of exploration is shown on Figure A-5, the actual number and locations of these upland excavations will be determined in the field based on site conditions. Up to 5 surface soil samples will be collected in areas where tailings are found and where samples have not been collected previously.
- At selected intertidal locations, collect surface sediment samples for agronomic analysis. The actual number and locations of these intertidal sample locations will be determined in the field based on site conditions. Up to 10 samples will be collected.

Objective 3 – Characterization of IDW

The 2013 investigation is not expected to generate wastes that are different from those previously generated at the site. Consequently, no samples will be collected to characterize PPE or IDW and no sample design is needed.

Appendix A Tables

Table A-5
Intertidal Sediment and Tailings Action/Screening Levels
Salt Chuck Mine, Alaska

			Action/Screening Levels[a]	
ChemGroup	**Analyte**	**Unit**	**ERL**	**ERM**
Metals	Aluminum	mg/Kg	NE	NE
Metals	Antimony	mg/Kg	NE	NE
Metals	Arsenic	mg/Kg	8.2	70
Metals	Barium	mg/Kg	NE	NE
Metals	Beryllium	mg/Kg	NE	NE
Metals	Cadmium	mg/Kg	1.2	9.6
Metals	Calcium	mg/Kg	NE	NE
Metals	Chromium (Total)	mg/Kg	81	370
Metals	Chromium (VI)	mg/Kg	NE[b]	NE[b]
Metals	Cobalt	mg/Kg	NE	NE
Metals	Copper	mg/Kg	34	270
Metals	Iron	mg/Kg	NE	NE
Metals	Lead	mg/Kg	46.7	218
Metals	Magnesium	mg/Kg	NE	NE
Metals	Manganese	mg/Kg	NE	NE
Metals	Mercury	mg/Kg	0.15	0.71
Metals	Nickel	mg/Kg	20.9	51.6
Metals	Potassium	mg/Kg	NE	NE
Metals	Selenium	mg/Kg	NE	NE
Metals	Silver	mg/Kg	1	3.7
Metals	Sodium	mg/Kg	NE	NE
Metals	Thallium	mg/Kg	NE	NE
Metals	Vanadium	mg/Kg	NE	NE
Metals	Zinc	mg/Kg	150	410
HPAH	2-Methylnaphthalene	ug/Kg	NE	NE
HPAH	Benz(a)anthracene	ug/Kg	261	1,600
HPAH	Benzo(a)pyrene	ug/Kg	430	1,600
HPAH	Benzo(b)fluoranthene	ug/Kg	NE	NE
HPAH	Benzo(ghi)perylene	ug/Kg	NE	NE
HPAH	Benzo(k)fluoranthene	ug/Kg	NE	NE
HPAH	Chrysene	ug/Kg	384	2,800
HPAH	Dibenz[a,h]anthracene	ug/Kg	63.4	260
HPAH	Indeno[1,2,3-cd]pyrene	ug/Kg	NE	NE
HPAH	Pyrene	ug/Kg	665	2,600
HPAH	Total HPAH	ug/Kg	1,700	9,600
LPAH	Acenaphthene	ug/Kg	16	500
LPAH	Acenaphthylene	ug/Kg	44	640
LPAH	Anthracene	ug/Kg	85.3	1,100
LPAH	Fluoranthene	ug/Kg	600	5,100
LPAH	Fluorene	ug/Kg	NE	NE
LPAH	Naphthalene	ug/Kg	160	2,100
LPAH	Phenanthrene	ug/Kg	240	1,500
LPAH	Total LPAH	ug/Kg	552	3,160
PAH	Total PAH	ug/Kg	4,022	44,792

Table A-5
Intertidal Sediment and Tailings Action/Screening Levels
Salt Chuck Mine, Alaska

			Action/Screening Levels[a]	
ChemGroup	**Analyte**	**Unit**	**ERL**	**ERM**

Notes:
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
ug/Kg = micrograms per kilogram
mg/Kg = milligrams per kilogram
[a] ERL/ERM NOAA marine benchmarks (Long et al., 1995: Buchman, 2008)
[b] EPA Residential soil RSL of 0.29 mg/kg will be used
NE = not established
ERL = Effects range low
ERM = Effects range medium
NOAA = National Oceanic and Atmospheric Administration

Table A-6
Marine Surface Water and SPLP Action/Screening Levels
Salt Chuck Mine, Alaska

Chem Name	Unit	Action/ Screening Level	
Aluminum	ug/L	NE	
Antimony	ug/L	500	a
Arsenic	ug/L	36	a
Barium	ug/L	200	a
Beryllium	ug/L	100	a
Cadmium	ug/L	8.8	a
Calcium	ug/L	NE	
Chromium (total)	ug/L	27.4	a
Cobalt	ug/L	1	a
Copper	ug/L	3.1	a
Iron	ug/L	50	a
Lead	ug/L	8.1	a
Magnesium	ug/L	NE	
Manganese	ug/L	100	a
Mercury	ug/L	0.94	a
Nickel	ug/L	8.2	a
Potassium	ug/L	NE	
Selenium	ug/L	71	a
Silver	ug/L	0.95	b
Sodium	ug/L	NE	
Thallium	ug/L	17	a
Vanadium	ug/L	50	a
Zinc	ug/L	81	a
2-Methylnaphthalene	ug/L	300	a
Benz(a)anthracene	ug/L	300	a
Benzo(a)pyrene	ug/L	300	a
Benzo(b)fluoranthene	ug/L	300	a
Benzo(ghi)perylene	ug/L	300	a
Benzo(k)fluoranthene	ug/L	300	a
Chrysene	ug/L	300	a
Dibenz[a,h]anthracene	ug/L	300	a
Indeno[1,2,3-cd]pyrene	ug/L	300	a
Pyrene	ug/L	300	a
Acenaphthene	ug/L	40	a
Acenaphthylene	ug/L	300	a
Anthracene	ug/L	300	a
Fluoranthene	ug/L	11	a
Fluorene	ug/L	300	a
Naphthalene	ug/L	1.4	a
Phenanthrene	ug/L	4.6	a
Total aquatic hydrocarbons (calculated)[d]	ug/L	15	c

Table A-6
Marine Surface Water and SPLP Action/Screening Levels
Salt Chuck Mine, Alaska

Chem Name	Unit	Action/ Screening Level

Notes:
ug/L = micrograms per liter
Screening Level Basis:
a = NOAA SQuiRT Table (marine chronic)
b = NOAA SQuiRT Table (marine acute)
c = 18 AAC 70 Water Quality Standards
d = TAqH computed using PAH results. BTEX will not be included in calculation because gasoline has not been identified as a source at Site
NE = not established

Table A-7
Crab and Shrimp Action/Screening Levels
Salt Chuck Mine

Analyte Name:	Units:	Action/Screening Level[a]
Aluminum	mg/Kg	1400
Antimony	mg/Kg	0.54
Arsenic	mg/Kg	0.0033
Barium	mg/Kg	270
Beryllium	mg/Kg	NE
Cadmium	mg/Kg	0.49
Chromium	mg/Kg	NE
Cobalt	mg/Kg	NE
Copper	mg/Kg	54
Iron	mg/Kg	NE
Lead	mg/Kg	0.8
Magnesium	mg/Kg	NE
Manganese	mg/Kg	190
Methyl mercury	mg/Kg	14
Mercury	mg/Kg	0.049
Nickel	mg/Kg	27
Selenium	mg/Kg	2457
Silver	mg/Kg	6.8
Thallium	mg/Kg	0.014
Vanadium	mg/Kg	6.8
Zinc	mg/Kg	410

Notes:
mg/Kg = milligrams per kilogram - wet weight
[a]Lower of the two (carcinogenic vs. noncancer) fish tissue screening levels (USEPA 2011).
NE = not established
USEPA = U.S. Environmental Protection Agency

Table A-8
Groundwater Action/Screening Levels
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Action/ Screening Level	
Metals, Total and Dissolved	Aluminum	ug/L	16,000	a
Metals, Total and Dissolved	Antimony	ug/L	6	b
Metals, Total and Dissolved	Arsenic	ug/L	10	b
Metals, Total and Dissolved	Barium	ug/L	200	c
Metals, Total and Dissolved	Beryllium	ug/L	16	b
Metals, Total and Dissolved	Cadmium	ug/L	6.9	b
Metals, Total and Dissolved	Calcium	ug/L	NE	
Metals, Total and Dissolved	Chromium	ug/L	27.4	c
Metals, Total and Dissolved	Cobalt	ug/L	1	c
Metals, Total and Dissolved	Copper	ug/L	3.1	c
Metals, Total and Dissolved	Iron	ug/L	50	c
Metals, Total and Dissolved	Lead	ug/L	8.1	c
Metals, Total and Dissolved	Magnesium	ug/L	NE	
Metals, Total and Dissolved	Manganese	ug/L	100	c
Metals, Total and Dissolved	Mercury	ug/L	0.94	d
Metals, Total and Dissolved	Nickel	ug/L	8.2	c
Metals, Total and Dissolved	Potassium	ug/L	NE	
Metals, Total and Dissolved	Selenium	ug/L	71	c
Metals, Total and Dissolved	Silver	ug/L	0.95	c
Metals, Total and Dissolved	Sodium	ug/L	NE	
Metals, Total and Dissolved	Thallium	ug/L	2	b
Metals, Total and Dissolved	Vanadium	ug/L	50	c
Metals, Total and Dissolved	Zinc	ug/L	81	c
HPAH	2-Methylnaphthalene	ug/L	NE	
HPAH	Benz(a)anthracene	ug/L	0.2	e
HPAH	Benzo(a)pyrene	ug/L	0.2	b
HPAH	Benzo(b)fluoranthene	ug/L	0.2	e
HPAH	Benzo(ghi)perylene	ug/L	1,100	f
HPAH	Benzo(k)fluoranthene	ug/L	0.29	a
HPAH	Chrysene	ug/L	2.9	a
HPAH	Dibenz[a,h]anthracene	ug/L	0.2	e
HPAH	Indeno[1,2,3-cd]pyrene	ug/L	0.2	e
HPAH	Pyrene	ug/L	87	a
LPAH	Acenaphthene	ug/L	40	c
LPAH	Acenaphthylene	ug/L	2,200	f
LPAH	Anthracene	ug/L	300	d
LPAH	Fluoranthene	ug/L	11	c
LPAH	Fluorene	ug/L	220	a
LPAH	Naphthalene	ug/L	0.2	e
LPAH	Phenanthrene	ug/L	0.4	f
TPH	Diesel range organics	ug/L	1,500	f
TPH	Gasoline range organics	ug/L	2,200	f
TPH	Oil Range Organics	ug/L	1,100	f

Table A-8
Groundwater Action/Screening Levels
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Action/ Screening Level

Notes:
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
TPH = total petroleum hydrocarbon
ug/L = micrograms per liter
a = Tapwater RSL
b = MCL
c = NOAA SQuiRT Table (marine chronic)
d = NOAA SQuiRT Table (marine acute)
e = MCL for BAP
f = 18 AAC 75 Table C

Table A-9
Analytical Methods for Sediment and Tailings Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Method	Lowest Action/Screening Level
Metals	Aluminum	mg/Kg	6010/6020 or CLP	NE
Metals	Antimony	mg/Kg		NE
Metals	Arsenic	mg/Kg		8.2
Metals	Barium	mg/Kg		NE
Metals	Beryllium	mg/Kg		NE
Metals	Cadmium	mg/Kg		1.2
Metals	Calcium	mg/Kg		NE
Metals	Chromium	mg/Kg		81
Metals	Chromium (VI)	mg/Kg	7196	0.29
Metals	Cobalt	mg/Kg	6010/6020 or CLP	NE
Metals	Copper	mg/Kg		34
Metals	Iron	mg/Kg		NE
Metals	Lead	mg/Kg		47
Metals	Magnesium	mg/Kg		NE
Metals	Manganese	mg/Kg		NE
Metals	Mercury	mg/Kg	7471A or CLP	0.2
Metals	Nickel	mg/Kg	6010/6020 or CLP	20.9
Metals	Potassium	mg/Kg		NE
Metals	Selenium	mg/Kg		NE
Metals	Silver	mg/Kg		1
Metals	Sodium	mg/Kg		NE
Metals	Thallium	mg/Kg		NE
Metals	Vanadium	mg/Kg		NE
Metals	Zinc	mg/Kg		150
HPAH	2-Methylnaphthalene	ug/Kg	8270SIM or CLP	NE
HPAH	Benz(a)anthracene	ug/Kg		261
HPAH	Benzo(a)pyrene	ug/Kg		430
HPAH	Benzo(b)fluoranthene	ug/Kg		NE
HPAH	Benzo(ghi)perylene	ug/Kg		NE
HPAH	Benzo(k)fluoranthene	ug/Kg		NE
HPAH	Chrysene	ug/Kg		384
HPAH	Dibenz[a,h]anthracene	ug/Kg		63.4
HPAH	Indeno[1,2,3-cd]pyrene	ug/Kg		NE
HPAH	Pyrene	ug/Kg		665
HPAH	Total HPAH	ug/Kg		1,700
LPAH	Acenaphthene	ug/Kg		16
LPAH	Acenaphthylene	ug/Kg		44
LPAH	Anthracene	ug/Kg		85.3
LPAH	Fluoranthene	ug/Kg		600
LPAH	Fluorene	ug/Kg		NE
LPAH	Naphthalene	ug/Kg		160
LPAH	Phenanthrene	ug/Kg		240
LPAH	Total LPAH	ug/Kg		552
PAH	Total PAH	ug/Kg		4,022

Table A-9
Analytical Methods for Sediment and Tailings Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Unit	Method	Lowest Action/Screening Level
SPLP Metals	Modified SPLP metals (all metals listed above, except Cr VI)	NA	SW 1312	NA
AVS/SEM Metals	AVS/SEM metals (cadmium, copper, nickel, lead, zinc)	umol/g	PSEP	NA
Bioassay	Bioassay (polychaete and bivalve)	Variable	Screening: ASTM E-1611/PSEP (polychaete), and EPA-823-B-004 (bivalve)	NA
Agronomic	S10C, complete with recommendations [a, b]	Variable	Western States Proficiency Testing	NA
	Soil Texture (%sand, % silt, % clay)	NA	Western States Proficiency Testing	NA
	Nitrogen, Ammonia	mg/kg	Western States Proficiency Testing	N
Physical Parameter	Percent Moisture	Percent		NA
Physical Parameter	TOC	mg/kg	PSEP	NA
Physical Parameter	Grain Size	Percent	ASTM D422	NA
Physical Parameter	Bulk Density	g/cm^3	ASTM D6683	NA

Notes:
a = S3C (Complete Analysis): Organic Matter, Estimated Nitrogen Release, Phosphorus (Weak Bray and Sodium Bicarbonate-P), Extractable Cations (Potassium. Magnesium, Calcium, Sodium), Hydrogen, Sulfate-S, pH, Cation Exchange Capacity and percent cation saturation (computed), Soluble Salts and Excess Lime, Nitrate-Nitrogen
b = S10 (Soil Salinity Package): Saturation Percentage, Soluble Salts, Sodium, Calcium, Magnesium, Chloride, Boron, Carbonate, Bicarbonate, pH, SAR and ESP
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
ug/Kg = micrograms per kilogram
umol/g = micromoles per gram
g/cm^3 = grams per cubic centimeter
mg/Kg = milligrams per kilogram
ASTM = American Society for testing and materials
AVS/SEM = Acid Volatile Sulfide and Simultaneously Extracted Metals
CLP = Contract Laboratory Program
NE = not established
PSEP = Puget Sound Estuary Program
SIM = selective ion monitoring
SPLP = Synthetic Precipitation Leaching Procedure
TOC = total organic carbon

Table A-10
Analytical Methods for Marine Surface Water, Porewater, and SPLP Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte (Dissolved)	Method	Lowest Action/Screening Level (ug/L)
Metals, Total and Dissolved	Aluminum	SW6010/6020 or CLP	NE
Metals, Total and Dissolved	Antimony		500
Metals, Total and Dissolved	Arsenic		36
Metals, Total and Dissolved	Barium		200
Metals, Total and Dissolved	Beryllium		100
Metals, Total and Dissolved	Cadmium		8.8
Metals, Total and Dissolved	Calcium		NE
Metals, Total and Dissolved	Chromium (total)		27.4
Metals, Total and Dissolved	Cobalt		1
Metals, Total and Dissolved	Copper		3.1
Metals, Total and Dissolved	Iron		50
Metals, Total and Dissolved	Lead		8.1
Metals, Total and Dissolved	Magnesium		NE
Metals, Total and Dissolved	Manganese		100
Metals, Total and Dissolved	Mercury	SW7470A or CLP	0.94
Metals, Total and Dissolved	Nickel	SW6010/6020 or CLP	8.2
Metals, Total and Dissolved	Potassium		NE
Metals, Total and Dissolved	Selenium		71
Metals, Total and Dissolved	Silver		0.95
Metals, Total and Dissolved	Sodium		NE
Metals, Total and Dissolved	Thallium		17
Metals, Total and Dissolved	Vanadium		50
Metals, Total and Dissolved	Zinc		81
HPAH[a]	2-Methylnaphthalene	8270-SIM or CLP	300
HPAH[a]	Benz(a)anthracene		300
HPAH[a]	Benzo(a)pyrene		300
HPAH[a]	Benzo(b)fluoranthene		300
HPAH[a]	Benzo(ghi)perylene		300
HPAH[a]	Benzo(k)fluoranthene		300
HPAH[a]	Chrysene		300
HPAH[a]	Dibenz[a,h]anthracene		300
HPAH[a]	Indeno[1,2,3-cd]pyrene		300
HPAH[a]	Pyrene		300
LPAH[a]	Acenaphthene		40
LPAH[a]	Acenaphthylene		300
LPAH[a]	Anthracene		300
LPAH[a]	Fluoranthene		11
LPAH[a]	Fluorene		300
LPAH[a]	Naphthalene		1.4
LPAH[a]	Phenanthrene		4.6

Table A-10
Analytical Methods for Marine Surface Water, Porewater, and SPLP Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte (Dissolved)	Method	Lowest Action/Screening Level (ug/L)
Field Parameter[b]	Turbidity (NTU)	Instrument manufacturer manual	NA
Field Parameter[b]	pH		
Field Parameter[b]	Conductivity (uS/cm)		
Field Parameter[b]	ORP (mV)		
Field Parameter[b]	Dissolved oxygen (mg/L)		
Field Parameter[b]	Salinity (ppt)		
Field Parameter[b]	Temperature (^{o}C)		

Notes:
ug/L = micrograms per liter
µS/cm = micro Siemens per centimeter
mg/L = miligrams per liter
a = analyze for surface water only
b = analyze for surface and porewater only
CLP = Contract Laboratory Program
mV = millivolt
NA = not applicable
NE = not established
NTU = Nephelometric Turbidity Units
^{o}C = Degree Celsius
ORP = Oxidation Reduction Potential
ppt = parts per trillion

Table A-11
Analytical Methods for Biota (Crab and Shrimp) Samples
Salt Chuck Mine, Alaska

Analyte	Method	Lowest Action/Screening Level (mg/kg)
Aluminum	6010/6020 or CLP	1400
Antimony		0.54
Arsenic		0.0033
Barium		270
Beryllium		NE
Cadmium		0.49
Chromium		NE
Cobalt		NE
Copper		54
Iron		NE
Lead		0.8
Magnesium		NE
Manganese		190
Methylmercury	1630 mod	14
Mercury	7000 series or CLP	0.049
Nickel	6010/6020 or CLP	27
Selenium		2457
Silver		6.8
Thallium		0.014
Vanadium		6.8
Zinc		410
Arsenic Speciation	3100 for extraction, 6870 for analysis	NA

Notes:
mg/Kg = milligrams per kilogram - wet weight
NA = not applicable
NE = not established
CLP = Contract Laboratory Program

Table A-12
Analytical Methods for Groundwater Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Method	Lowest Action/ Screening Level (ug/L)
Metals, Total and Dissolved	Aluminum	6010/6020 or CLP	16,000
Metals, Total and Dissolved	Antimony		6
Metals, Total and Dissolved	Arsenic		10
Metals, Total and Dissolved	Barium		200
Metals, Total and Dissolved	Beryllium		16
Metals, Total and Dissolved	Cadmium		6.9
Metals, Total and Dissolved	Calcium		NE
Metals, Total and Dissolved	Chromium		27.4
Metals, Total and Dissolved	Cobalt		1
Metals, Total and Dissolved	Copper		3.1
Metals, Total and Dissolved	Iron		50
Metals, Total and Dissolved	Lead		8.1
Metals, Total and Dissolved	Magnesium		NE
Metals, Total and Dissolved	Manganese		100
Metals, Total and Dissolved	Mercury	7470A or CLP	0.94
Metals, Total and Dissolved	Nickel	6010/6020 or CLP	8.2
Metals, Total and Dissolved	Potassium		NE
Metals, Total and Dissolved	Selenium		71
Metals, Total and Dissolved	Silver		0.95
Metals, Total and Dissolved	Sodium		NE
Metals, Total and Dissolved	Thallium		2
Metals, Total and Dissolved	Vanadium		50
Metals, Total and Dissolved	Zinc		81
HPAH	2-Methylnaphthalene	8270-SIM or CLP	NE
HPAH	Benz(a)anthracene		0.2
HPAH	Benzo(a)pyrene		0.2
HPAH	Benzo(b)fluoranthene		0.2
HPAH	Benzo(ghi)perylene		1,100
HPAH	Benzo(k)fluoranthene		0.29
HPAH	Chrysene		2.9
HPAH	Dibenz[a,h]anthracene		0.2
HPAH	Indeno[1,2,3-cd]pyrene		0.2
HPAH	Pyrene		87
LPAH	Acenaphthene		40
LPAH	Acenaphthylene		2,200
LPAH	Anthracene		300
LPAH	Fluoranthene		11
LPAH	Fluorene		220
LPAH	Naphthalene		0.2
LPAH	Phenanthrene		0.4
TPH	Diesel range organics	AK 102	1,500
TPH	Residual range organics	AK 103	1,100
Field Parameter	Turbidity (NTU)	Instrument manufacturer manual	NA
Field Parameter	pH		
Field Parameter	Conductivity (uS/cm)		

Table A-12
Analytical Methods for Groundwater Samples
Salt Chuck Mine, Alaska

ChemGroup	Analyte	Method	Lowest Action/ Screening Level (ug/L)
Field Parameter	ORP (mV)		
Field Parameter	Dissolved oxygen (mg/L)		
Field Parameter	Salinity (ppt)		
Field Parameter	Temperature (^{o}C)		
Field Parameter	Depth to groundwater (ft)		
Field Parameter	Purge rate (gal/min)		
Field Parameter	Purge volume (gal)		

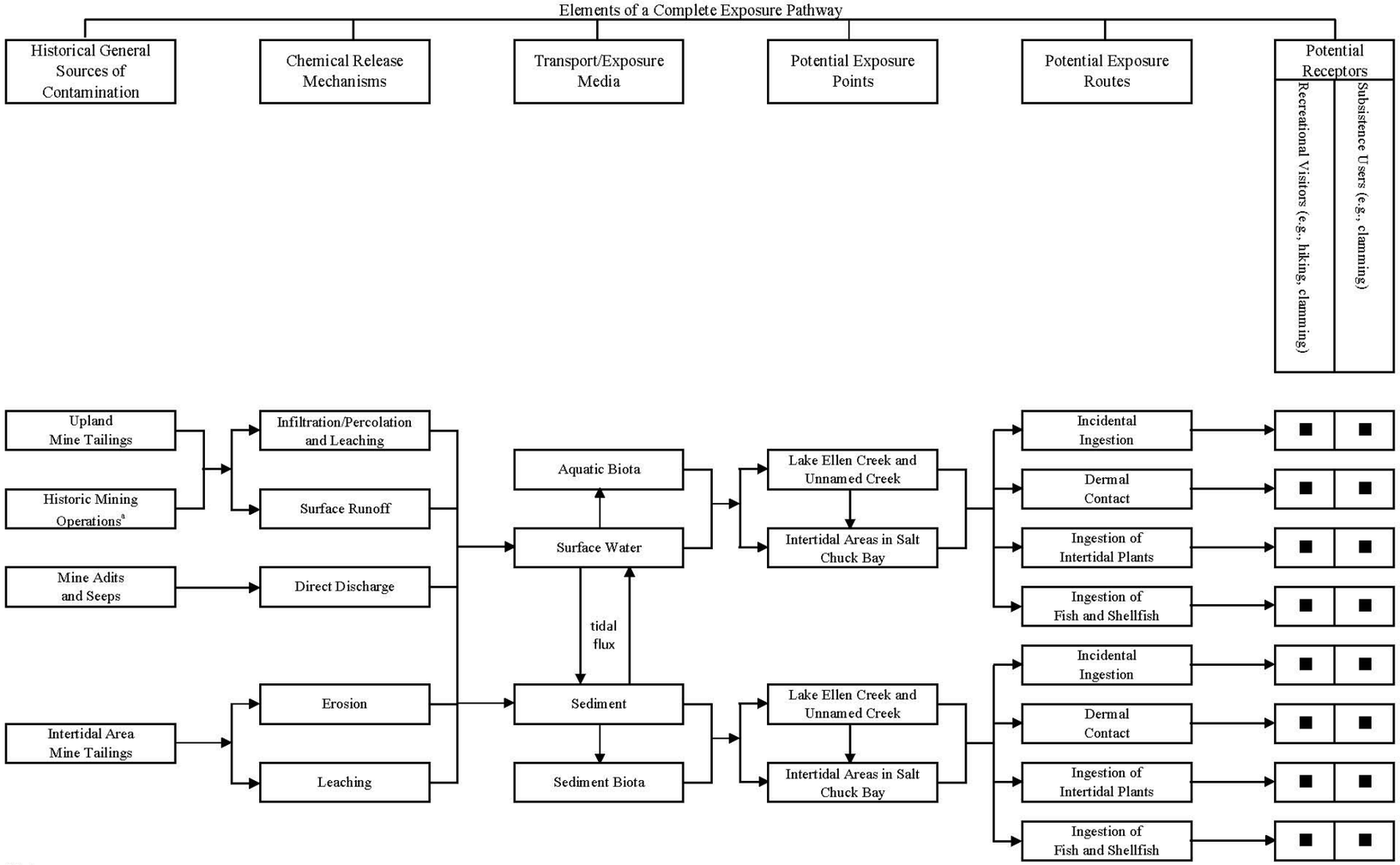
Notes:
BAP = benzo(a)pyrene
PAH = polycyclic aromatic hydrocarbons
HPAH = heavy molecular weight PAH
LPAH = low molecular weight PAH
TPH = total petroleum hydrocarbon
ug/L = micrograms per liter
µS/cm = micro Siemens per centimeter
gal/min = gallon per minute
ppt = parts per trillion
CLP = Contract Laboratory Program
ft = feet
gal = gallon
mV = millivolt
NA = not applicable
NE = not established
NTU = Nephelometric Turbidity Units
^{o}C = Degree Celsius
ORP = Oxidation Reduction Potential

Appendix A Figures

FIGURE A-1

Conceptual Site Model for Potential Human Exposures for the Intertidal Areas

2013 Salt Chuck QAPP



Notes:
■ = Potentially complete pathway
□ = Pathway considered minor

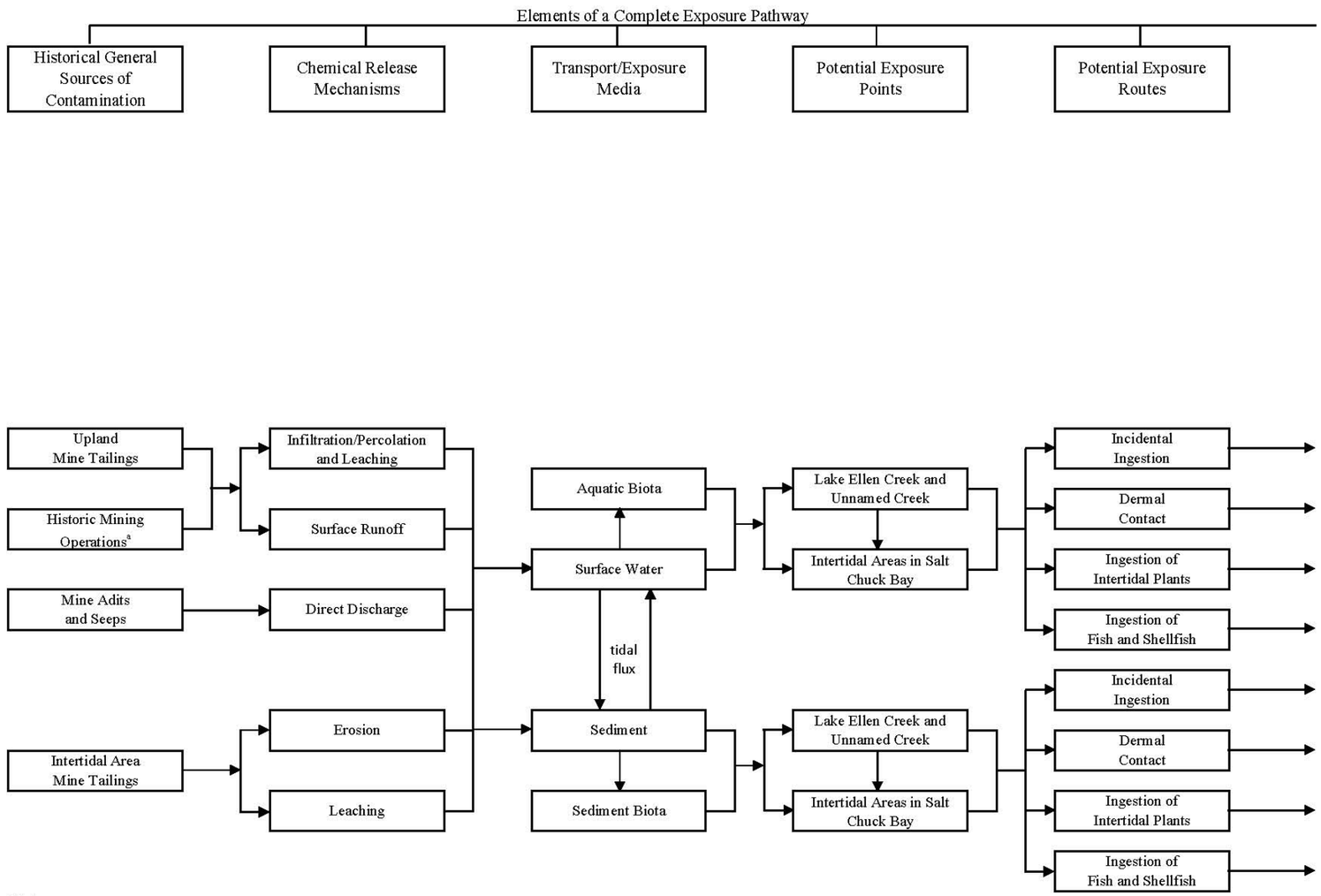
Blank = Incomplete pathway

a. Includes aboveground fuel storage tanks, battery banks, and other upland sources associated with historic mining operations.

FIGURE A-2

Conceptual Site Model for Potential Ecological Exposures for the Intertidal Areas

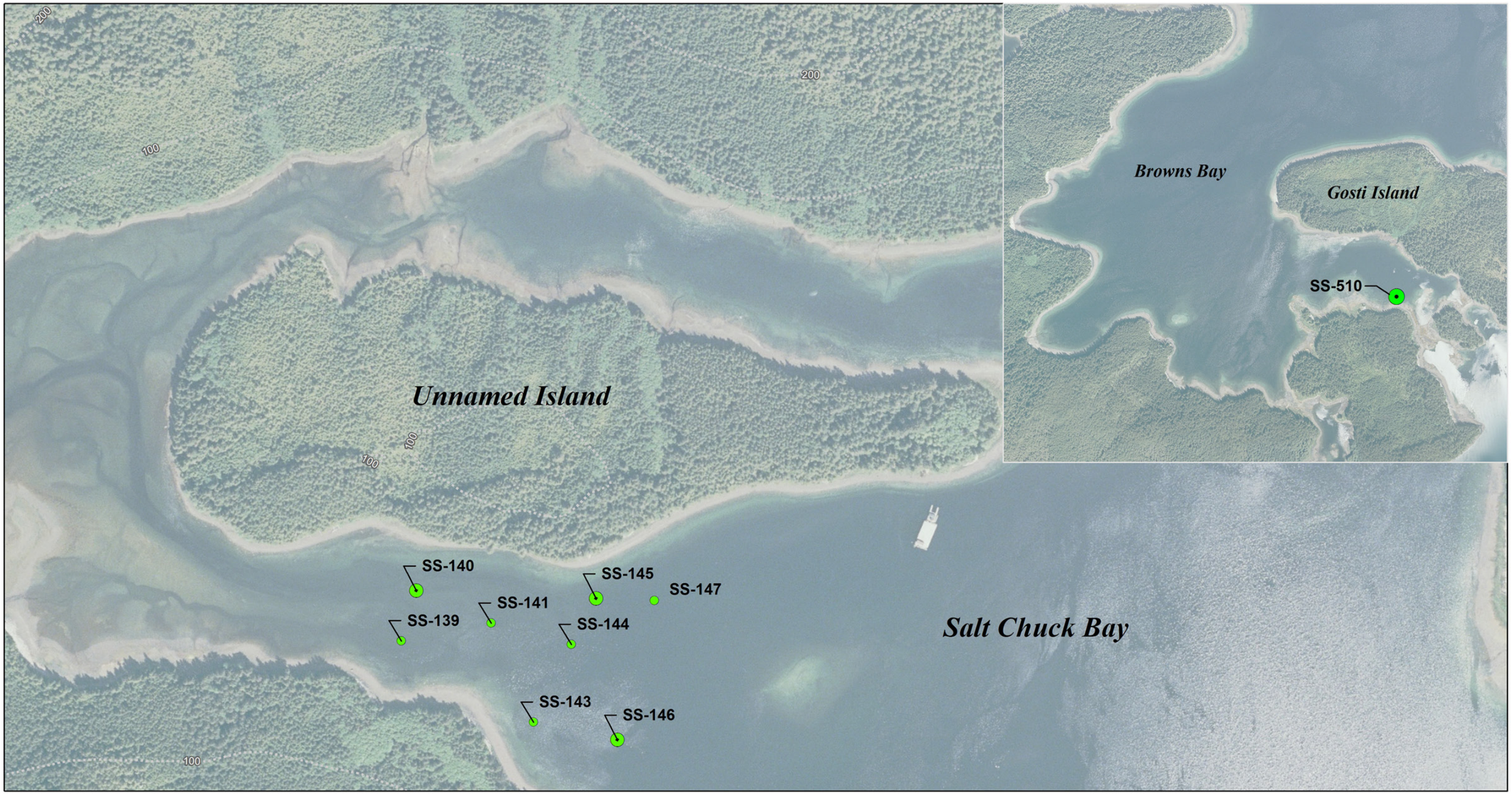
2013 Salt Chuck QAPP



Notes:
■ = Potentially complete pathway
□ = Pathway considered minor

Blank = Incomplete pathway
a. Includes aboveground fuel storage tanks, battery banks, and other upland sources associated with historic mining operations.

SEA130490001/ES012813224512SEA



Surface Sediment Sample Location
Surface Sediment Sample Location with Bioassay
100-foot Contour Line (TNF)

N

0 375 750 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Stream, with modifications based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest

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Figure A-3
Proposed 2013 Thalweg and Background Sediment Sample Locations
Salt Chuck Mine, Alaska

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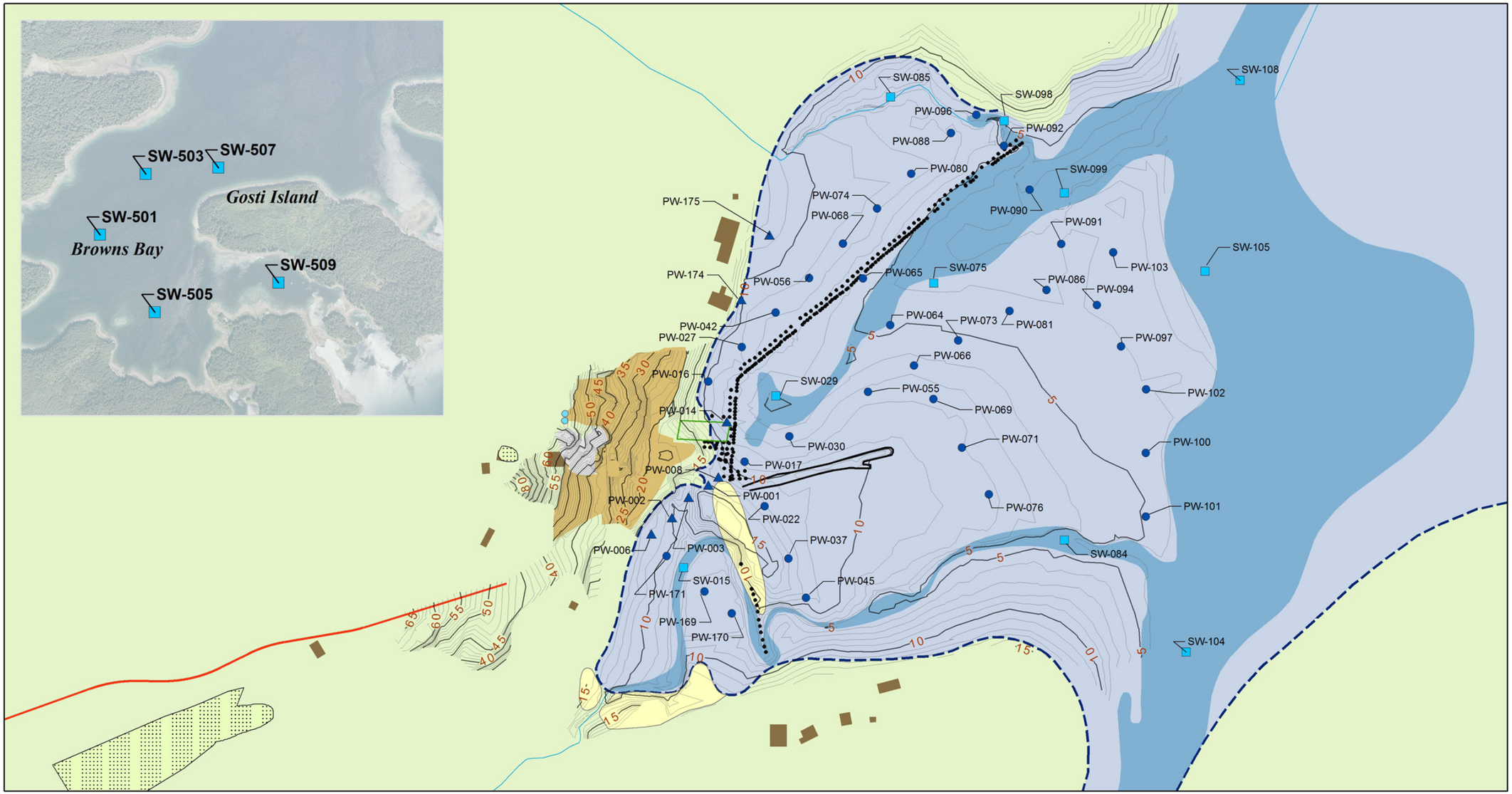

- Porewater
- Surface Water
- Drive-Point Porewater
- Major Elevation Contour (feet NAVD88)
- Minor Elevation Contour (feet NAVD88)
- Approximate Shoreline(Mean High Tide)
- SEAK Hydro
- Access Road
- Rock Jetty
- Barge
- Piling Structure
- Former Above Ground Storage Tanks
- Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
- Building
- Water Course
- Intertidal Area
- Rock Out Crop
- Waste Rock Pile
- Tailings

N

0 200 400 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

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Figure A-4
Proposed 2013 Surface Water and Porewater Sample Locations
Salt Chuck Mine, Alaska

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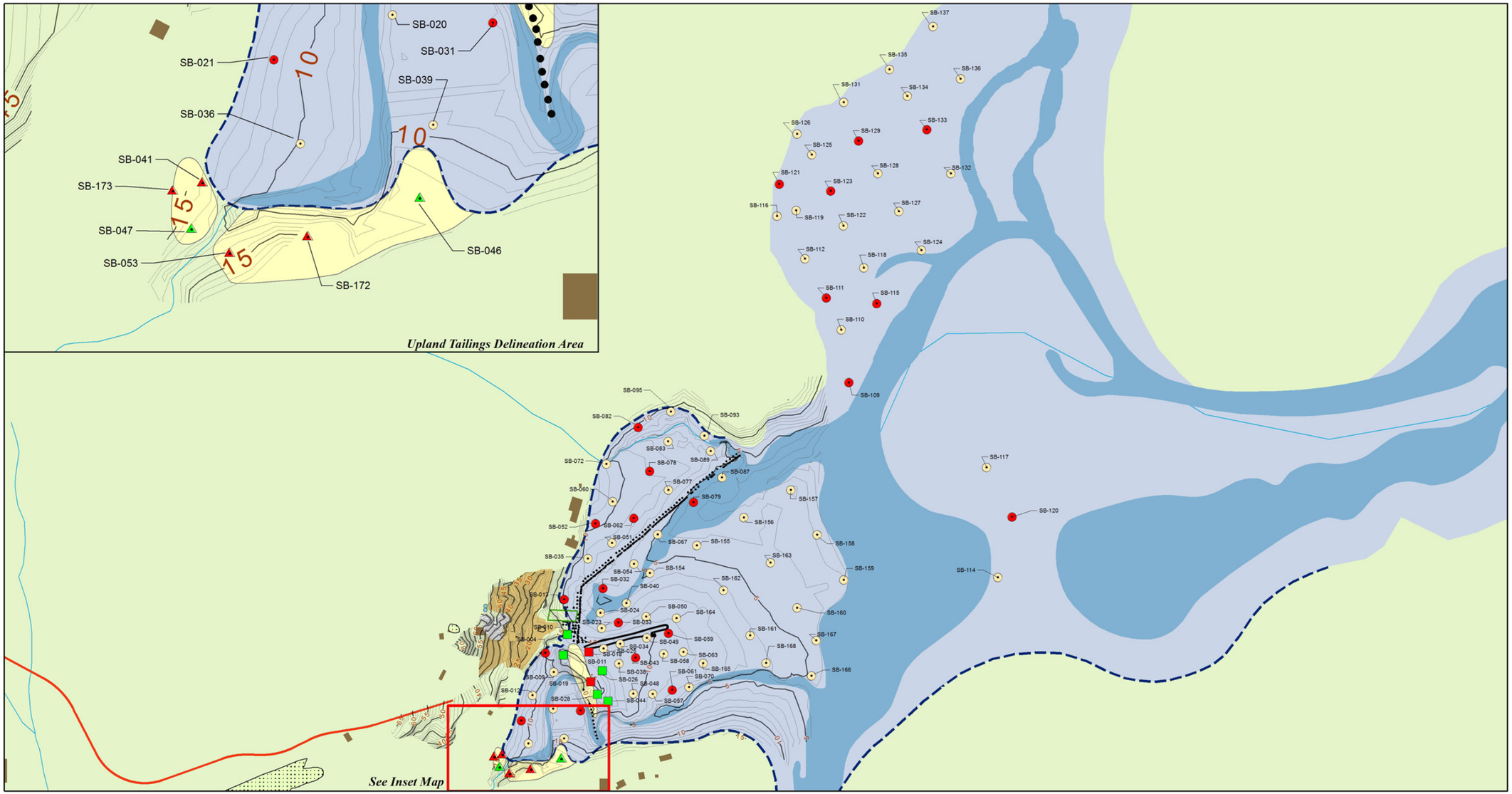

Short Core Intertidal Tailings Location Thickness
Direct Push Intertidal Tailings Location Thickness
Direct Push Upland Tailings Location Thickness
Short Core Intertidal Location Thickness and Samples
Direct Push Intertidal Tailings Location Thickness and Samples
Direct Push Upland Tailings Location Thickness and Samples

Major Elevation Contour (feet NAVD88)
Minor Elevation Contour (feet NAVD88)
Approximate Shoreline(Mean High Tide)
SEAK Hydro
Access Road
Rock Jetty
Barge
Piling Structure
Former Above Ground Storage Tanks

Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
Building
Water Course
Intertidal Area
Rock Out Crop
Waste Rock Pile
Tailings

N

0 200 400 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

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Figure A-5
Proposed 2013 Tailings Thickness and Core Sample Locations
Salt Chuck Mine, Alaska

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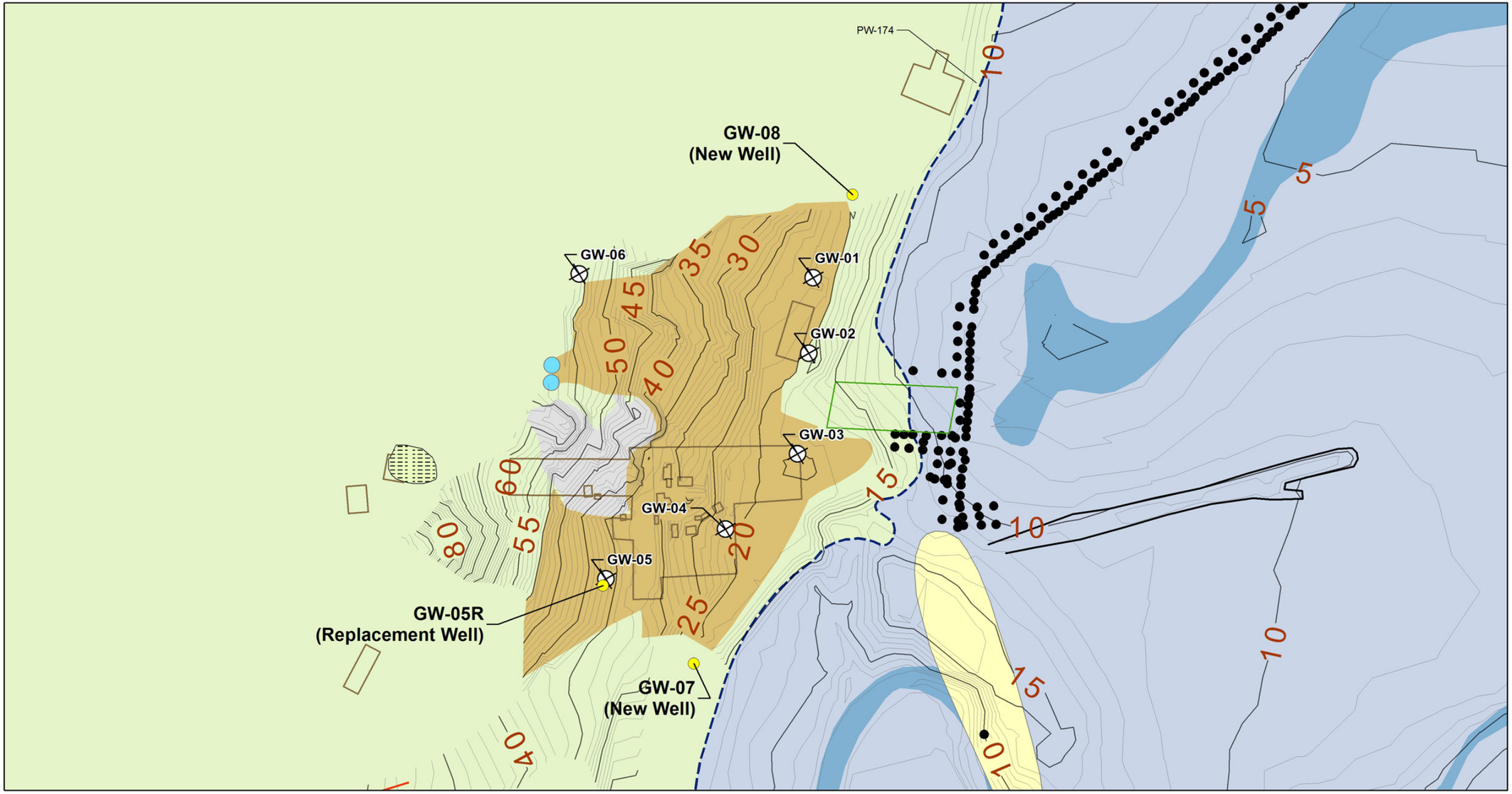

Proposed New or Replacement Monitoring Well
Existing Monitoring Well
Major Elevation Contour (feet NAVD88)
Minor Elevation Contour (feet NAVD88)
Access Road
Rock Jetty
Barge
SEAK Hydro
Approximate Shoreline(Mean High Tide)
Piling Structure
Former Above Ground Storage Tanks
Waste Rock Pile
Tailings
Water Course
Intertidal Area
Building
Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
Rock Out Crop

N

0 100 200 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

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Figure A-6
Proposed 2013 Groundwater Sample Locations
Salt Chuck Mine, Alaska

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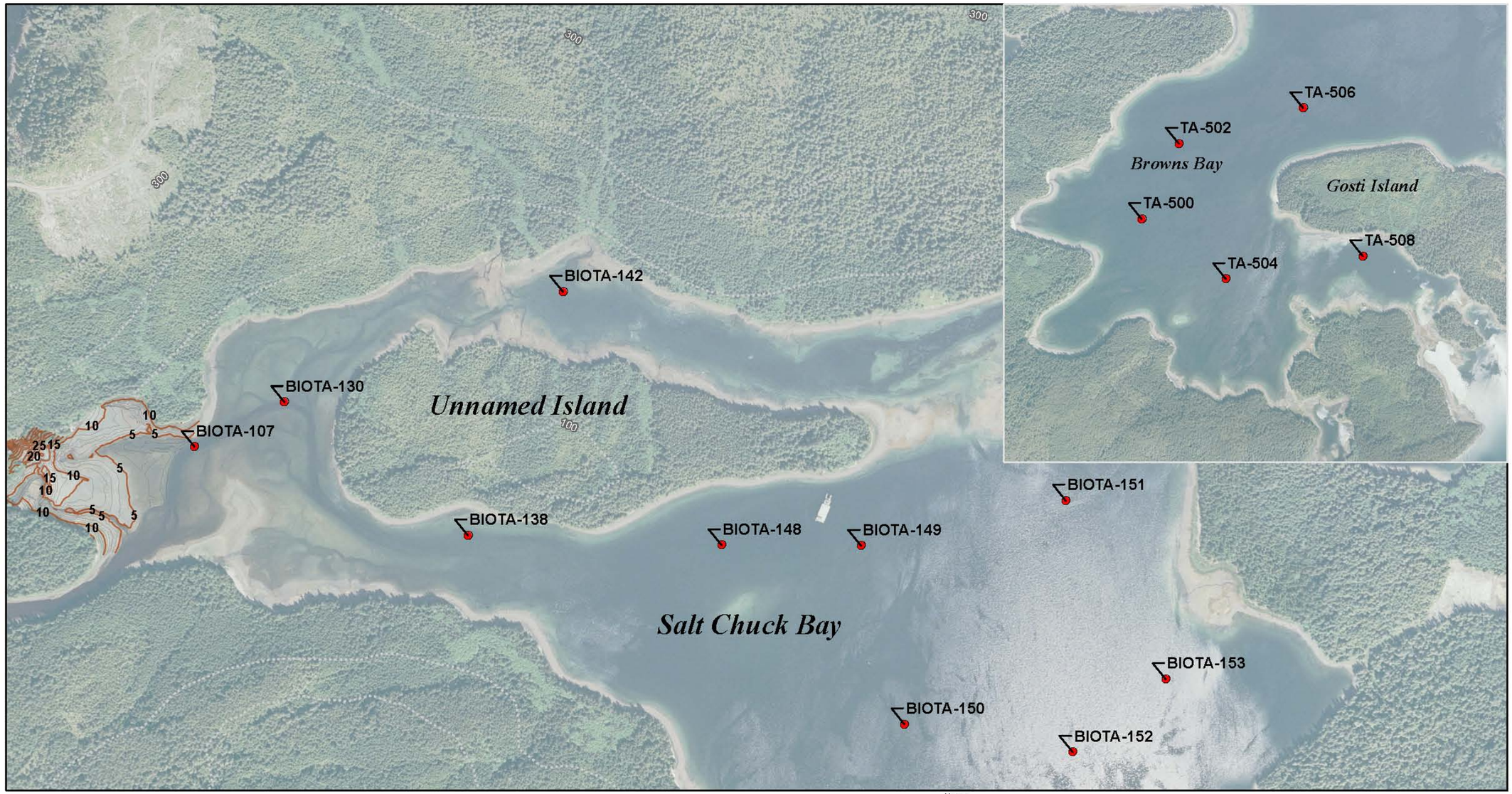

- Biota (Crab and Shrimp) Locations
- Major Elevation Contour (feet NGVD 88)
- Minor Elevation Contour (feet NGVD 88)
- 100-foot Contour Line (TNF)

0 375 750 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Stream, with modifications based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4)1 - foot contours surveyed Febuary 2013.

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Figure A-7
Proposed 2013 Biota (Crab and Shrimp) Sample Locations
Salt Chuck Mine, Alaska

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Attachment 1
Salt Chuck Mine – Preliminary Findings for 2012 Remedial Investigation Field Sampling Activities Technical Memorandum (Draft)

Appendix B Field Procedures

APPENDIX B

Field Procedures

This appendix provides detailed field procedures for completion of sampling and data gathering activities during the 2013 investigation at the Salt Chuck Mine Site in the Tongass National Forest, Alaska. The purpose of the 2013 investigation is to collect additional data to support completion of the Remedial Investigation/Feasibility Study (RI/FS) for the Site. The rationale for the 2013 field investigation approach is summarized in the overall Quality Assurance Project Plan (QAPP) and detailed in Appendix A (Systematic Planning/Data Quality Objectives) of the QAPP.

B.1 Site Description

The Salt Chuck Mine is located approximately 4½ miles south-southwest of Thorne Bay, Alaska, at the northern end of Kasaan Bay, on Prince of Wales Island. The mine is located in the Tongass National Forest, Outer Ketchikan County, within Township 72 South, Range 84 East, Sections 16 and 17, Copper River Meridian, Alaska. Salt Chuck Bay, from which the mine takes its name, is a shallow, restricted water body bordering the mine site to the south and forms the northernmost arm of Kasaan Bay. The Site includes both an upland area where mining and milling activities took place and nearby intertidal areas where tailing were stored and/or released.

The upland portion of the Site covers approximately 45 acres encompassing the mine, mill, and associated structures. The mill area was the subject of a non-time critical removal action (NTCRA) conducted by the Forest Service in 2011. The mill building, petroleum storage tanks, and other facilities were demolished and contaminated soil, tailings, and waste rock around and beneath the structures were excavated as part of the NTCRA. The excavated areas were then backfilled, graded, covered and revegetated. The upland portion of the Site is drained by a small unnamed stream (hereafter “Unnamed Stream”) that originates northeast of the site at Power Lake, cuts across the mine site, and discharges into Lake Ellen Creek just below the shoreline at Salt Chuck Bay, near the former mill site. At high tide, seawater from Salt Chuck Bay inundates the lower portions of Lake Ellen Creek and Unnamed Stream.

The intertidal portion of the Site is defined by the area below mean high tide but above mean low tide, and encompasses approximately 80 acres south of the mill site and extends around an unnamed island (hereafter “Unnamed Island”) in the middle of Salt Chuck Bay.

The 2013 investigation activities focus on the Intertidal Area and portions of the upland area adjacent to the former mill and Unnamed Stream.

B.2 Project Overview

B.2.1 Objectives

The systematic planning process and generation of DQOs for the 2013 investigation is documented in Appendix A (Systematic Planning/Data Quality Objectives). The overall objectives and associated problem statements for the investigation are listed below:

- **Objective 1 - Refine Evaluation of Nature and Extent of Contamination Within, or Releases to, the Intertidal Area and Assess Risk:**
  - Problem Statement 1-1: The extent of contamination along the distal (southern) segment of the thalweg of Lake Ellen Creek on the west side of Unnamed Island is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.
  - Problem Statement 1-2: Existing RI data suggest that seeps are releasing soluble copper and other metal discharges into surface water within Lake Ellen Creek during low tide, potentially impacting aquatic life. The extent to which these releases originate from tailings present within the intertidal areas near the

former mill area and/or from upland groundwater sources is not adequately defined to characterize potential risks to human health or the environment and/or to support a remedial decision.

- Problem Statement 1-3: Existing RI data suggest that tailings in the cove east of the barge slip may exhibit anomalous toxicity, bioaccumulation, and/or leaching characteristics. The importance or impact of these differences is not fully understood to characterize potential risks to human health or the environment and/or to support a remedial decision.
- Problem Statement 1-4: Total chromium has been detected in tailings/sediment and may be mine related. However, it is unknown what portion of the total chromium occurs in the more toxic hexavalent form. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
- Problem Statement 1-5: The Organized Village of Kasaan has expressed concern about contamination within the intertidal lands, particularly with subsistence concerns. Potential impacts on the beneficial use of crab and shrimp harvesting are of particular concern, both from past releases and from potential releases from any proposed remedial actions. This is needed to adequately characterize potential risks to human health or the environment and/or to support a remedial decision.
- Problem Statement 1-6: Existing RI data indicate that groundwater in the former mill area is affected by releases of petroleum and by metals in tailings. The extent of groundwater contamination is unknown and contaminant concentrations appear to have changed over time. More information is needed to assess trends and understand potential discharges to nearby surface water in the intertidal areas. This is needed to adequately characterize potential risks to the environment and/or to support a remedial decision.

- **Objective 2 – Sample Collection for Evaluation of Remedial Alternatives:**
  - Problem Statement 2-1: The thickness and vertical profile of tailings within the intertidal areas are uncertain. This information is needed to adequately support evaluation of remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.
  - Problem Statement 2-2: Existing RI data indicate that surface sediment from the peninsula that is circumvented by Lake Ellen Creek (at low tide) within Salt Chuck Bay contains relatively lower concentrations of mine-related metals. However, it is unknown whether this is due to historic deposition of cleaner sediment from Lake Ellen Creek onto deeper contamination, or whether the peninsula itself represents an erosional feature. If deeper contaminated sediment exists at this location, the potential for future mobilization into the bay should be evaluated.
  - Problem Statement 2-3: The thickness and vertical and lateral profile of tailings within the tailing piles along Unnamed Stream are uncertain. This information is needed to adequately support evaluation of remedial alternatives by providing volume estimates, and information regarding waste classification and disposal methods.
  - Problem Statement 2-4: The agronomic characteristics of intertidal sediment are unknown. This information is needed to support evaluation of remedial alternatives.

B.2.2 Field Investigation Approach

This section provides information regarding the design of the remedial investigation fieldwork.

B.2.2.1 General Overview

The 2013 field effort was designed to fill data gaps associated with the problem statements listed above and consist of the following activities:

- Collect surface sediment (0 to 0.5 ft) samples in Salt Chuck Bay west of Unnamed Island (thalweg samples) and at background location in Browns Bay.

- Collect porewater samples from intertidal tailings areas in Salt Chuck Bay by burying an aquarium air stone under the sediment and applying suction with a hand-operated syringe.
- Collect porewater/groundwater samples from drive-points installed in intertidal sediments at locations downgradient of the former mill and collapsed buildings.
- Collect grab surface water samples from intertidal tailings areas within Unnamed Creek, Lake Ellen Creek, and seepage inputs to Lake Ellen Creek within the intertidal portion of Salt Chuck Bay and from background locations in Browns Bay.
- Collect time-series grab samples hourly during the period bounded by two high tide cycles at Lake Ellen Creek location immediately downstream from tailings areas (Location SW-105).
- Collect crab and shrimp samples at locations in Salt Chuck Bay and Browns Bay.
- Collect continuous sediment cores from approximately 104 borings in the intertidal and upland tailing areas at and around the former mill site for visual documentation of tailings thickness. The majority of the borings (up to 90) in the intertidal area will be advanced using a hand-held portable short coring device. A direct-push drilling rig will be used in the upland tailings piles and in the tailings spit area where tailings are expected to be thicker (up to 15 feet). At 22 short-core and 6 direct-push locations, collect samples at regular intervals (0 to 0.5 ft, 0.5 to 1.0 ft, 1.0 ft to 2.0 ft, and so on) for analysis.
- Document lateral extent of upland tailings deposits by hand-digging holes with shovel. Collect up to 5 samples for chemical analysis.
- Collect 10 samples of intertidal sediment for agronomic analysis.
- Install one replacement and two new monitoring wells at the former mill site, collect continuous soil cores to characterize lithology.
- Measure depth to groundwater and collect groundwater samples from the existing, replacement, and new monitoring wells at the former mill site.

Most field activities will take place in May 2013. However, direct-push work to characterize tailings thickness and determine vertical extent of contamination in the tailings spit and upland tailings piles near Unnamed Stream will be conducted in August 2013.

B.2.2.2 Rationale for Sample Locations

Proposed sampling locations are shown in Figures B-1 through B-5 and listed in Table B-1 through B-7 (tables are located at the end of this appendix). Sample locations are judgmental based on review of existing data relative to RI/FS data needs described in Appendix A of the QAPP. The rationale for each boring location and sample is summarized in Tables B-1 through B-7.

B.2.2.3 Rationale for Analyte List

Lists of analytes for each medium to be sampled during the 2013 investigation are provided in Table 2-1A through 2-1D of the QAPP. These analytes are based on reviews of results from previous investigations, including the 2011 Pre-RI and 2012 RI field work, and data gaps associated with the problem statements identified in Appendix A.

B.3 Field Documentation

This section describes the methods that will be used to document data and sample collection during the 2013 investigation effort at the Salt Chuck Mine.

B.3.1 Project Communication

Daily progress reports will be submitted by the CH2M HILL Field Team Leaders (FTL) to the CH2M HILL Project Manager (PM). Daily progress reports will include the work performed, problems identified and associated corrective actions taken, and other appropriate, comments. To the extent possible, periodic progress reports will be submitted to EPA's Task Order Project Officer PM by CH2M HILL's PM during the field sampling event.

B.3.2 Sample Designation

A sample numbering scheme was developed that allows each sample to be uniquely identified and provides a means of tracking the sample from collection through analysis. The numbering scheme indicates the location and sample type and depth or species, if appropriate. The unique sample number will be entered in the field notebook, field tracking sheets, chain-of-custody forms, and other records documenting sampling activities. The following sample number convention will be used for normal and field duplicate samples:

Location Prefix – Medium - Location ID - Depth or Species

Explanation:

Location Prefix:	2013SC
Medium:	SW = surface water
	PW = porewater
	SS = surface sediment *(for thalweg and background samples only)*
	BIOTA = crab and shrimp
	SB = boring *(for short cores and direct push borings)*
	GW = groundwater
Location:	001 through 400 (Salt Chuck Bay locations, three digits)
	500 through 550 (Browns Bay Locations)
Depth:	Depth below top of sediment (top of interval, two digits)
Biota:	Crab or shrimp

Location numbers will be assigned by location, not by medium and location (there will be no duplicated location numbers, except for groundwater sample locations which are already assigned because of monitoring well designations [GW-01 through GW-08]). The location numbering sequence starts nearest former mill site and works outward until all locations are numbered. If locations are added, the location will receive the next unassigned number in sequence. Deleted locations will retain their numbers (i.e., no renumbering of subsequent locations after one is deleted). Field duplicates (FDs) will be assigned numbers that match the parent sample, except a “9” will be inserted at the beginning of the location number. Matrix spike/matrix spike duplicates (MS/MSDs) will be labeled with the same Sample ID as the parent sample, with MS or MSD added at the end of the number.

For example:

- *2013SC-PW-003* is a porewater sample collected near the former mill
- *2013SC-SS-511* is a surface sediment sample collected at Browns Bay
- *2013SC-SB-033-00* is a sediment sample collected from 0 to 0.5 ft in a boring south of the former mill
- *2013SC-SB-041-05* is a sediment sample collected from 5 to 6 ft in a boring in an upland tailings pile
- *2013SC-GW-01* is a groundwater sample collected at GW-01.
- *2013SC-SB-9079-00* is a field duplicate of *2013SC-SB-079-00*
- *2013SC-PW-003-MS* is a matrix spike volume associated with the porewater sample collected near the former mill

Sample identification numbers and planned coordinates for all proposed 2013 samples are listed in Table B-1 through B-7. The spatial coordinates of actual sample locations will be measured via a hand-held global positioning system (GPS) and recorded in the logbook at the time of sampling.

Sample identification for the equipment blanks and filter blanks will be as follows:

Location Prefix:	2013SC
Medium:	EB = equipment blank
	FB = filter blank
Date:	Date of collection (month, date, year [8 digits])

For example:

- *2013SC-EB-05302013* is an equipment blank collected on May 30, 2013.
- *2013SC-FB-05312013* is a filter blank collected on May 31, 2013.

B.3.3 Field Documentation

The following sections provide information regarding field documentation procedures.

B.3.3.1 Field Forms

All sampling and associated activities will be documented on activity-specific field logs, where present. Standardized field logs will be produced to measure and record sample location, subsurface lithology, monitoring well construction details, field parameter measurements, logging of digital photographs, and sample collection (see Attachment B-1 for field forms).

B.3.3.2 Field Logbook

Daily field activities will be documented through journal entries in a bound field logbook, which is dedicated to each field team for the remedial intertidal investigation sampling effort. Field logbook entry and custody procedures will follow National Enforcement Investigation Center policies and procedures of EPA. The field logbook will be water-resistant, and all entries will be made in indelible ink. The field logbook will contain all pertinent information about sampling activities, site conditions, field methods used, general observations, and other pertinent technical information. Language used will be objective, factual, and free of personal opinions. Hypotheses for observed phenomena may be recorded; however, they must be clearly identified as such and only relate to the subject of observation. Field logbooks will become part of the permanent project record. Examples of typical field logbook entries include the following:

- Personnel present
- Subcontractors' names and companies
- Time of arrival and departure at each site
- Daily temperature and other climatic conditions
- Field measurements, activities, and observations, including discussions resulting in pertinent field decisions
- Referenced sampling location description (in relation to a stationary landmark) and maps
- Sample collection methods and equipment
- Date and time of sample collection
- Types of sample containers used, sample identification and cross-referencing, sample types and preservatives used, and analytical parameters
- Quality control (QC) sample (duplicate or blank) sample location and sampling method
- Field instrument calibration information
- Documentation of equipment decontamination
- Site sketches and or reference to photographs taken
- Name, address, and telephone number of the contracted analytical laboratory
- Instrument calibration procedures and frequency
- Visitors to the site

The FTL or designee will be responsible for the daily maintenance of all field records. Each page of the field logbook will be sequentially numbered, dated, and signed by the person making the entry. Corrections to the field logbook will be made by using a single strike mark through the entry to be corrected, then recording and initialing the correct entry. For corrections made later, the date of the correction will be noted. Unused portions of the pages will be crossed out, signed, and dated at the end of each day.

B.3.3.3 Chain-of-Custody Procedures

Because samples collected during any investigation could be used as evidence, their possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. Chain-of-custody procedures should be followed to document sample possession as follows.

Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- The sample is in a person's physical possession
- The sample is in a person's view after being in his or her physical possession
- The sample was in a person's physical possession and was then locked up or sealed to prevent tampering
- The sample is kept in a designated secured area

Field Custody

To collect samples for evidence, only enough material to provide a good representation of the media being sampled will be collected. To the extent possible, the quantity and types of samples and sample locations are determined before the actual fieldwork. As few people as possible should handle samples.

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.

The PM will determine whether proper custody procedures were followed during the fieldwork, and will decide whether additional samples are required.

Transfer of Custody and Shipment

Samples should be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving the samples should sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the analyst at the laboratory.

Samples should be packaged properly for shipment and dispatched to the appropriate laboratory for analysis with a separate chain-of-custody record accompanying each shipping container (one for each field laboratory, and one for samples driven to the laboratory). Courier names and other pertinent information are entered in the "Received by" section of the chain-of-custody record.

All shipments should be accompanied by the chain-of-custody record identifying its contents. The original record and one copy should accompany the shipment to the laboratory, and a second copy will be retained by the PM.

Freight bills, postal service receipts, and bills of lading should be retained as part of the permanent documentation.

Laboratory Custody Procedures

A designated sample custodian should accept custody of the shipped samples and verify that the sample numbers match those on the chain-of-custody records. Pertinent information regarding shipment, pickup, and courier should be in the "Remarks" section. The custodian should enter the sample numbers into a bound notebook. The laboratory custodian will use the sample identification number or assign a unique laboratory number to each sample, and will be responsible for ensuring that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The custodian will distribute samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received, until the sample is exhausted or returned to the custodian. The data from sample analyses should be recorded on the laboratory report form.

When sample analyses and necessary QC checks have been completed in the laboratory, the unused portion of the sample will be disposed of properly. All identifying sample tie tags, data sheets, and laboratory records will be retained as part of the documentation. Sample containers and remaining samples should be disposed of by the laboratory in compliance with all federal, state, and local regulatory requirements.

B.3.4 Digital Pictures

Color digital pictures taken during sampling activities will be numbered to correspond to photo log entries. The name of the photographer, date, time, site location, and photograph number will be documented in the field logbook. Photo number and scene description will be entered sequentially in the photo log as photographs are taken. At a minimum, one digital photo will be taken of each sample location at the time of sampling. A dry-erase white board bearing the location identification, date, and time, will be held in the photograph by a field team member.

B.3.5 Sample Management

The following section discusses various sample management procedures that will be followed during the remedial investigation. Included in these sections are procedures for sample packaging and transportation, sample labeling, and sample documentation. Sample volume, container, preservative and holding time requirements are listed in Table B-8.

B.3.5.1 Sample Labeling and Containers

Each sample container will be labeled using labels generated with the Scribe software. One label will be attached to the sample container. The sample label will be completed using indelible ink and will include the following:

- Sample number
- Case number
- Analysis requested (including specific constituents requested)
- Preservative used (“NA” if not applicable)
- Date and time of sample collection
- Sampler’s initials

Sample labels will be affixed to the sample containers and covered with clear packaging tape, then placed in a resealable bag. All sample numbers and locations (including blanks and duplicates) will be recorded in the field notebook and on individual sample information forms.

B.3.5.2 Sample Containers

After sample collection into a properly preserved container, the sample containers will be placed in re-sealable bags and stored in an ice-filled cooler for temporary storage prior to, and during, shipment to the laboratory. All samples will be packaged and labeled for shipment in compliance with current regulations.

B.3.5.3 Preparation of Sample Coolers

Only plastic ice chests will be used for shipping samples. The following steps will be followed to prepare sample coolers:

- All previous labels will be removed from the cooler.
- All drain plugs will be sealed with tape (inside and outside).
- A cushioning layer of recyclable cornstarch popcorn or bubble wrap will be placed at the bottom of the cooler.
- If ice is used in the coolers for the laboratory, it will be placed in double, 1-gallon re-sealable bags.

B.3.5.4 Preparation of Sample Packing

The following steps will be followed for packing samples in coolers:

- The chain-of-custody form will be placed in a resealable plastic bag.
- Samples will be placed in an upright position in the cooler.
- The void space between samples will be filled with recyclable cornstarch popcorn (or equivalent), double-bagged ice, or bubble wrap.
- Ice will be placed on top of and between the samples.
- The remaining voids will be filled with recyclable cornstarch popcorn (or equivalent) or double-bagged ice.

B.3.5.5 Sealing the Cooler

Coolers will be filled with packing material surrounding the bottles to prevent breakage during transport. Ice will be sealed in plastic bags to prevent melt water from soaking the packing material and compromising sample labels and integrity. Sample documentation will be enclosed in sealed plastic bags taped to the underside of the cooler lid. Coolers will be secured with packing tape and custody seals as follows:

- The cooler lid will be secured with strapping tape, encircling the cooler several times.
- Custody seals will be placed on two sides of the lid (one in front, and one on the side) and covered with tape to prevent inadvertent breaking of the seals.
- Arrows indicating “This Side Up” will be placed on the sides of the cooler.
- The shipping air bill will be securely attached to the exterior of the cooler.

B.3.5.6 Shipping the Cooler

The coolers will be shipped to CH2M HILL personnel in Ketchikan, Alaska, where arrangements will be made to ship coolers to the appropriate laboratory by overnight courier. Ice will be replaced in the coolers, as needed by the CH2M HILL personnel in Ketchikan, Alaska. If possible, samples will be shipped on the day of sample collection. Samples collected late in the day may be shipped on the following day.

If laboratory services are arranged through the Region 10 Regional Sample Control Coordinator, he or she must be contacted within 24 hours of sample shipment and be provided the following information:

- Sampling contractor’s name
- Site name and/or case number
- Regional Project code
- Labs shipped to
- Turnaround time
- Samples designated for QC Required .xml and .xls export files
- Total number(s) by concentration and matrix of samples shipped to each laboratory
- Carrier, air bill number(s), method of shipment (priority next day)
- Shipment date and intended laboratory receipt date
- Irregularities or anticipated problems associated with the samples
- Whether the current shipment is the final shipment or if additional samples will be shipped under the same case number

For Friday shipments, the Regional Sample Control Coordinator or subcontract laboratory must be contacted prior to noon Friday to coordinate sample shipments that will arrive on Saturday. Samples will only be shipped on Friday if the laboratory provides assurance that analytical holding times will not be exceeded.

B.4 Sampling Equipment and Procedures

This section describes the required sampling equipment, procedures for equipment calibration, procedures for collection of surface samples, procedures for the collection of field parameters, and procedures for measuring surface-water discharge.

B.4.1 Field Equipment Calibration and Field Equipment Needs

The following equipment is expected to be used for collection of samples and sediment cores during the 2013 field investigation:

- Surface sediment samples – shovel or ponar grab sampler
- Airstone porewater samples – airstone, tubing, and hand-operated syringe or drive point and peristaltic pump; field parameters will be measured using a Horriba or similar device as feasible following collection of analytical sample volume.
- Drive-point porewater samples - peristaltic pump, water quality meter, 0.45 micron filters
- Surface water samples – grabs followed by filtration using hand-operated syringe and 0.45 micron filter; time-series grab samples may be collected using a peristaltic pump and tubing; field parameters will be measured using a water quality meter.
- Crab samples – crab traps or hand net
- Shrimp samples – shrimp traps or hand net
- Short sediment/tailings cores - portable generator and hand-held coring device (reciprocating hammer, 3 – 4 ft lexan tube with drive shoe)
- Deep sediment/tailings cores – small direct-push rig.
- Lateral extent of upland tailings deposits - shovel.
- Intertidal agronomic samples – shovel.
- Monitoring well installation – small direct-push rig and pre-packed well screens.
- Groundwater samples – water level indicator, peristaltic pump, water quality meter, 0.45 micron filters.
- Transportation – boats, sample cart (4 wheel cart)

Field measurements include GPS readings, depth to groundwater, and water quality readings (dissolved oxygen, temperature, pH, conductivity, salinity, oxygen reduction potential [ORP]).

Scheduled periodic calibration of testing equipment does not relieve field personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, the device must be removed from service and tagged so that it is not inadvertently used, and appropriate personnel notified so that a recalibration can be performed or a substitute piece of equipment can be obtained.

Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use or tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented, and the PM and data users will be notified.

The following are detailed calibration procedures and frequencies for the field equipment:

- **GPS.** No manual calibration is required for the GPS unit; self-testing is performed automatically each time the unit is turned on.
- **Water Level Meter.** The water level meter will be rented for use on the project and no manual calibration is required for the water level meter.
- **Water Quality Meter.** The water meter (e.g., Horiba and YSI) used to obtain these measurements will be rented for use on the project, and contain manufacturer-supplied calibration solution that will calibrate the meter over the full instrument range of pH, conductivity, and salinity. Prior to field mobilization, the

range of previous field measurements for these parameters will be discussed with the manufacturer/ equipment rental firm to ensure that the calibration solution reflects the field situations likely to be encountered. The meters will be maintained, calibrated, and operated per manufacturer instructions. Manufacturer instructions will be kept within each meter case and brought with the equipment to the sites. Calibration solutions will be checked prior to the field investigation to ensure sufficient fluid is available onsite.

The meter will be zeroed, if applicable, before the start of work according to the instrument manual. Any instrument "drift" from prior zeroing should be recorded in the field notebook. Instrument zeroing will be in accordance with procedures and schedules outlined in the particular instrument's operations and maintenance manual.

B.4.2 Surface Sediment Sampling

This section summarizes the field methods and procedures applicable to collection of surface sediment in the thalweg and in Browns Bay. These sample locations are listed on Table B-1 and shown on Figure B-1. The surface sediment samples will be collected from the surface (0 to 0.5 feet). Bulk surface sediment grab samples will be collected using either a Petite Ponar dredge sampler or a sampling spoon, depending on the depth of the water at the time of sampling. The sample locations will be accessed by wading or by a small water craft such as a zodiac, depending on site access and the depth of water at the sample location.

If the sediments have no overlying water, the samples will be collected with a stainless steel sampling spoon as described below:

1. Locate the geographic position using GPS and record this and other parameters identified in the Surface Sediment Sample Collection Sheet (see Attachment B-1). Photograph and describe each location in the Photograph Log (see Attachment B-1).
2. Line stainless steel bowl with aluminum foil and arrange sample containers and sampling equipment and exercise caution not to step on, or otherwise contaminate the sample surface.
3. Label each sample container properly and fill out appropriate chain of custody information.
4. Using a new stainless steel spoon (or equivalent device), remove the organic layer on the surface of the selected sampling point, if present. Insert the spoon into the sediment at the selected sampling point and slowly remove the sample.
5. Slowly decant excess water, if appropriate and necessary.
6. For locations requiring AVS/SEM, transfer the sample into the appropriate container using a stainless steel spoon (or equivalent device). The AVS/SEM container should be filled with sediment leaving no air space. Wipe outside of containers with paper towel and place in iced cooler.
7. Deposit the sample remaining after collection of undisturbed AVS/SEM aliquot into a stainless steel bowl lined with clean foil. Collect additional volume as needed for bioassay sample locations, FDs, and MS/MSDs. Remove large organisms and pieces of debris and record sample description on the Surface Sediment Sample Collection Sheet (Attachment B-1).
8. Homogenize the sample in the foil-lined bowl using a stainless steel spoon (or equivalent device) prior to placement into sample containers. Transfer the sample into the appropriate containers using a stainless steel spoon (or equivalent device). Wipe outside of containers with paper towel and place in iced cooler.
9. Carefully remove used foil from the stainless steel bowl and dispose the used stainless steel spoon and foil in a garbage bag prior to moving to the next location to avoid need for decontamination.

In deeper water conditions and/or where it is not safe to wade, surface sediment samples will be collected with a stainless steel Petite Ponar dredge grab sampler. A Ponar grab sampler has a jaw-type mechanism that is tripped from above in order to close the jaws and collect the sample. The dredge is lowered slowly through the water to the sediment with the jaws in the open position. As the dredge is retrieved, the jaws close and the isolated

sediment is brought to the surface. Surface sediment samples with overlying water will be collected using a stainless steel Petite Ponar dredge grab sampler as described below:

1. Locate the geographic position using GPS and record this and other parameters identified in the Surface Sediment Sample Collection Sheet in Attachment B-1. Photograph and describe each location in the Photograph Log (see Attachment B-1).
2. Line stainless steel bowl with aluminum foil and arrange sample containers and sampling equipment and exercise caution not to step on, or otherwise contaminate the sample surface.
3. Label each sample container properly and fill out appropriate chain of custody information.
4. Slowly lower the stainless steel Petite Ponar dredge grab sampler through the water to the sediment with the jaws in the open position.
5. Slowly bring the dredge to the surface.
6. Decant water if appropriate and necessary.
7. Deposit the Ponar contents onto a stainless steel bowl lined with clean foil.
8. For locations requiring AVS/SEM, transfer the sample into the appropriate container using a stainless steel spoon (or equivalent device). The AVS/SEM container should be filled with sediment leaving no air space. Wipe outside of containers with paper towel and place in iced cooler.
9. Deposit the sample remaining after collection of undisturbed AVS/SEM aliquot into a stainless steel bowl lined with clean foil. Collect additional volume as needed for bioassay sample locations, FDs, and MS/MSDs. Remove large organisms and pieces of debris and record sample description and sampling information (number of grabs, grab penetration) on the Surface Sediment Sample Collection Sheet (Attachment B-1).
10. Homogenize the sample in the foil-lined bowl using a stainless steel spoon (or equivalent device) prior to placement into sample containers. Transfer the sample into the appropriate containers using a stainless steel spoon (or equivalent device). Wipe outside of containers with paper towel and place in iced cooler.
11. Carefully remove used foil from the stainless steel bowl and dispose the used stainless steel spoon and foil in a garbage bag prior to moving to the next location to avoid need for decontamination.
12. Decontaminate the Ponar prior to collecting sample from next location.

Sediment samples will be stored on ice under custody control before they are delivered to the laboratory.

B.4.3 Airstone Porewater Sampling

This section summarizes the field methods and procedures applicable to collection of porewater samples in the tailings areas in Salt Chuck Bay. These sample locations are listed on Table B-2 and shown on Figure B-2. Attempts will be made to collect porewater samples while the sediment surface is exposed during low tide, and when the groundwater levels is less than two feet below the surface. This will require strict coordination with the tide tables. Porewater samples should be collected before any sediment sampling or other invasive activities are done at the intertidal area. Sampling probes consisting of an airstone and sample tubing will be installed about 2 days before sample collection. Porewater will be sampled by suction through a cylindrically-shaped, aquarium airstone (e.g., 10-15 cm long and 1.5 cm wide) placed vertically in the sediment. FD and MS/MSDs will be collected using the same equipment as the parent sample. The procedure for airstone installation and sample collection is described below:

1. Locate the geographic position for the sample location using GPS and record this and other parameters identified in the Porewater Sample Collection Sheet in Attachment B-1. Photograph and describe each location in the Photograph Log (see Attachment B-1).

2. Using a pre-marked wood or plastic dowel of about 1-1 ½ inch diameter (e.g., a broom stick), make a hole by pushing or tapping into the sediment to a depth of 2 feet below the sediment surface (note hole depth may be adjusted based on field conditions). Place the airstone and connected tubing (pre-marked to 2 feet) in the hole. Installation of sampling probes should occur when the tide level is at least 2 feet lower than the sediment surface. This will allow the subsurface water level to be well below the positioning elevation of the sampling device, preventing the installation hole from prematurely collapsing due to overly wet subsurface conditions. After installation, compress hole by foot around the protruding tubing. Tubing should extend at least one foot beyond tailings surface. Clamp the end of the tubing and mark location with orange flagging.
3. Decontaminate hole-making device and proceed to next probe installation location.
4. Wait 2 days (about four tide cycles), re-locate sample tubing.
5. Arrange sample containers and sampling equipment and exercise caution not to step on, or otherwise disturb the sample tubing. Remove clamp on tubing.
6. Label each sample container (with preservative) properly, and fill out appropriate chain of custody information.
7. Porewater sampling should proceed from the higher to lower elevation direction during the downswing of the tide. When tide level is about 1 foot below the sample location, extract water by slow suction from the buried airstone using a hand-held 50 ml luer-lock syringe. Discard the first draw of 50 ml, then fill syringe again. Connect 0.45 micron filter to syringe and transfer filtered water to pre-preserved sample containers (acid will be placed in sample container before water is transferred to bottle). Continue collection until sufficient sample volume (including volumes for FD and MS/MSD, if applicable) is collected. Discard filter(s).
8. If sufficient time and volume are available, collect additional volume of porewater and record water quality measurements. At a minimum, porewater conductivity and/or salinity should be measured at alternating sample locations.
9. Record sample description and water quality measurements on Porewater Sample Collection Sheet (Attachment B-1).
10. Remove and discard airstone and tubing.

Porewater samples will be stored on ice under custody control before they are delivered to the laboratory.

B.4.4 Surface Water Sampling

This section summarizes the field methods and procedures applicable to collection of surface water samples in Salt Chuck Bay and Browns Bay. These sample locations are listed on Table B-3 and shown on Figure B-2. Sample locations will be accessed by foot or boat during low tide. The FTL will determine whether or not the surface water depth and/or velocity of the water bodies will provide a safe entry.

The procedure for grab sample collection is described below:

1. Locate the geographic position using GPS and record this and other parameters identified in the Surface Water Sampling Sheet in Attachment B-1. Photograph and describe each location in the photo log (See Attachment B-1). Exercise caution not to disturb the sediment at or above the sample location.
2. Label the sample bottles and record all applicable information in the field logbook and complete the chain-of-custody form.
3. For grab samples, with minimum surface disturbance, submerge an unpreserved sample bottle (at least 500 mL) with the mouth of the container facing upstream and allow sample stream to flow gently into the bottle.

4. For time-series grab samples, stake the end of a sampling tubing several inches above the bottom of Lake Ellen Creek at Location SW-105 and run the other end to the bank and clamp off. At the appropriate time, sample with a peristaltic pump and draw the initial flush of water and discard, then collect the hourly grab sample. Begin hourly sampling at least 4 hours before low tide and continue with an equal number of grabs after low tide, according to the tide table for that day.

5. For grab samples and time-series grab samples to be analyzed for dissolved metals concentrations, transfer the sample to the pre-preserved sample container (acid will be placed in sample container before water is transferred to bottle) using a hand-held syringe and a 0.45 micron filter. Grab samples to be analyzed for total metals and PAHs will be transferred directly to sample bottles (no filtration). FDs and MS/MSDs will be obtained from the same sampling equipment as the parent samples. A new filter shall be used for each water sample location.

6. For samples to be analyzed for PAHs, transfer the samples directly into the appropriate containers

7. Fill each container approximately two-thirds full.

8. After sample aliquots are collected, measure field parameters (conductivity, pH, temperature, salinity, and dissolved oxygen) using the water quality meter and the procedures in the manufacturer's manual. Record sample description and water quality readings on the Surface Water Sampling Sheet in Attachment B-1.

9. Decontaminate equipment prior to collecting sample from next location.

Surface water samples will be stored on ice under custody control before they are delivered to the laboratory.

B.4.5 Crab and Shrimp Sampling

Crab and shrimp will be collected in Salt Chuck Bay and Browns Bay to determine whether tissues may have been impacted by past mining practices. Preliminary sample locations are listed in Table B-4 and shown on Figure B-5; however, these are not expected to be the actual sample locations. A variety of methods, including hand-netting during low tide and shellfish traps may be needed in order to meet sampling goals. Each sample will include an adequate number of individual species to achieve a total tissue weight indicated in Table B-8. The species of each crab or shrimp will be recorded at the time of sampling. Crab samples will be discrete species (e.g., Dungeness and Tanner crabs will not be mixed). Multiple shrimp species of similar size may be composited for tissue analysis. Shellfish from Browns Bay will be co-located with surface water sample locations. .

The following are the procedures for collecting biota samples:

1. Locate the geographic position for the proposed sample using GPS and record this and other parameters identified in the Shellfish Sample Collection Sheet (Attachment B-1). Photograph and describe each location in the photo log (see Attachment B-1). If surface water sampling is required, collect the samples prior to setting shellfish traps to minimize disturbances from traps.

2. Collect appropriate number of crabs and shrimp using one or more of the following methods:

   - Hand netting during low tide
   - Crab or shrimp trap

3. A reasonable effort will be spent at each location to sample for the shellfish. If species are not present or number of individuals is collected, move to nearby location (within 1000 feet of planned location) and attempt collection again, continue moving within 1,000 ft diameter circle until sufficient number of individuals is obtained.

4. Set shellfish traps in accordance with standard sport fishery practice and baiting. The standard soak time, defined as the time the pots are set until the time the pots are retrieved, will be approximately 24 hours.

5. After an appropriate time, retrieve traps and sort catches. Attempts should be made to retain shellfish for tissue analyses equivalent to the legal size and condition taken in the sport fishery. The minimum legal size for male Dungeness crab is 6 ½ inches in shoulder width; male Dungeness crab less than the minimum legal size and all female Dungeness crab that have been taken should be immediately returned to the water unharmed. At each sample location keep 3 to five crabs and 5 to 10 shrimp for compositing. Dungeness crabs will be favored over Tanner crabs. If shrimp are unavailable, both Dungeness and Tanner crabs may be taken.

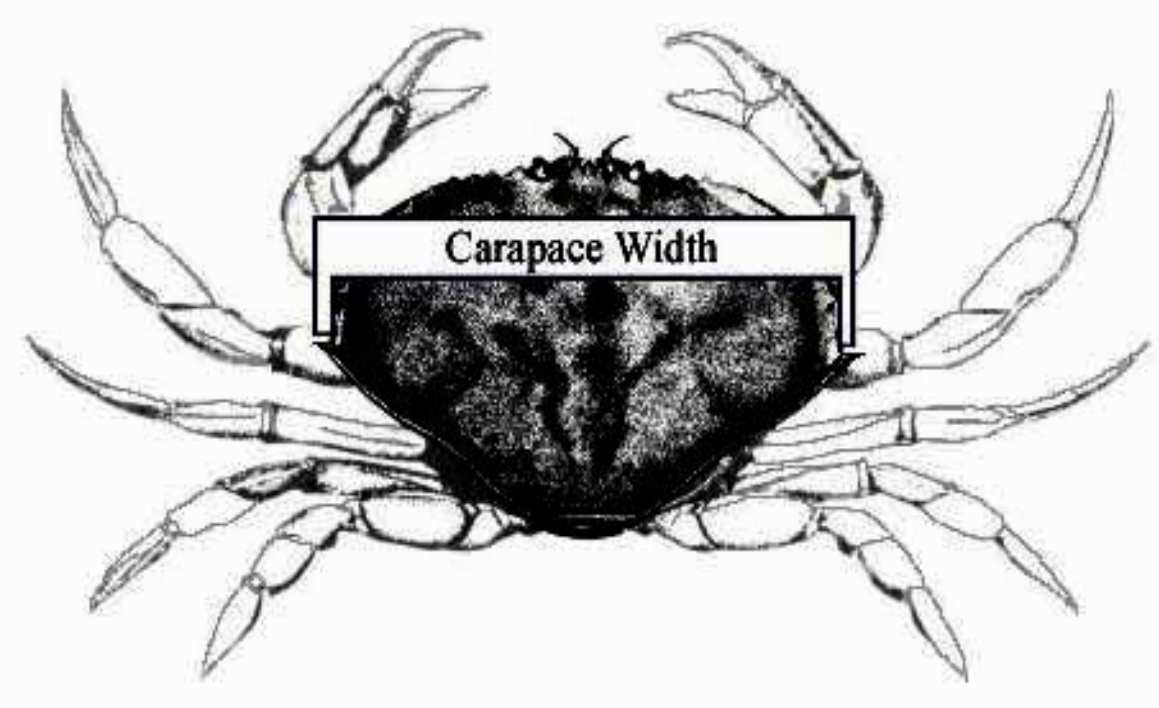
6. Photograph organisms and record species on Shellfish Sample Collection Sheet (Attachment B-1).

7. Place each individual crab in single resealable plastic bag, and then place all crabs from a given location in a second resealable bag. Place all shrimp at each location in two layers of resealable plastic bags. Label the outside layer of the two layered resealable plastic bags and fill out appropriate chain of custody information.

8. Place labeled samples on ice in coolers until transport to port. Once in port, freeze samples until tissue resection and processing can be done within a week.

9. Remove sample bags of whole crabs or shrimp from the freezer at the start of each resection day, and thaw just enough to allow processing.

10. Dry and line the tissue processing area with clean paper cloth. Carefully rinse excess sediment off outside of shellfish by running under tap water, and let drain for one minute. Record the sex of the crab by inspection of the telson width, and the carapace width of each crab to the nearest mm. Record carapace length of each shrimp to the nearest millimeter (1 mm) using a ruler. Carapace length is defined as behind the eye stalk to the beginning of the abdomen (see figure below). Measure total weight of the whole crab or shrimp to the nearest gram (1g) using a bench scale. Record on the Shellfish Sample Collection Sheet (Attachment B-1).



11. For each type of shellfish and sample location, pre-tare the tissue sample container on the scale.

12. For crabs, using clean latex or nitrile gloves remove muscle tissue from the claws and largest sections of legs. Break individual crab leg sections from the body or cut from the body using pre-cleaned stainless steel scissors. Slit each section of the leg down the flat edge using scissors. Once muscle tissue is exposed, use stainless steel forceps or spatula to remove the muscle tissue from all the claw and leg cavities.

13. For shrimp, using clean latex or nitrile gloves first separate the tail from the head/thorax by grasping each section and pulling them apart with a twisting motion. This typically cleanly separates muscle tissue from other tissues inside the carapace. To resect muscle tissue from the tail, make a sagittal cut along the ventral surface of the abdomen using a clean stainless steel scissors, then remove the muscle tissue from the abdominal cavity.

14. For each species and location, collect the appropriate amount of tissue and place samples inside the pre-labeled, pre-tared jar and weigh the sample container with composite tissue sample on the scale to ensure the minimum sample volume is met. Based on the total amount of tissue required for analysis, and the number of individual animals per composite, keep approximately the same mass of tissue from each animal until the total requirement is attained.

15. Place the sample (inside the container) in a plastic bag, label, and place in a cooler with ice. The sample should be transferred to a freezer at the earliest possible time. Once frozen, the sample should not be allowed to thaw prior to receipt by the laboratory.

B.4.6 Tailings Thickness Borings and Sample Collection

This section summarizes the field methods and procedures applicable to investigation of tailings thickness and vertical distribution of contaminants in the intertidal area and in upland tailings piles near the former mill. The tailings borings and sample locations/depths are listed on Table B-5 and shown on Figure B-3. All sample locations will be accessed by foot during low tide. Two types of borings will used, short (3 to 4 ft) borings advanced using hand-held equipment and deeper (up to 15 ft) borings advanced using direct-push equipment.

B.4.6.1 Short Cores

The following procedure will used to advance borings and obtain the short cores:

1. Locate the geographic position for proposed short core location using GPS and record this and other parameters identified in the Tailings Core Log (see Attachment B-1). Photograph and describe each location in the photo log (see Attachment B-1).

2. Setup generator.

3. Insert Lexan tube into the drive shoe. Core tube length and diameter will be determined using pilot tests that will be conducted prior to mobilization. Insert core catcher and attach vibration plate.

4. Raise the tube into a vertical position. Connect reciprocating hammer to vibration plate. Check plumbness of tube and turn on hammer motor. The core is then allowed to slowly penetrate the sediments. Light tension should be maintained on the assembly to keep the corer in place. Advance the core until the maximum length of the tube or refusal is reached.

5. When the target penetration depth is reached or refusal occurs, the motor is turned off and the core is slowly withdrawn from the tailings. The depth of penetration is then recorded in on the Tailing Core Log.

6. Carefully remove the Lexan tube from the device. Mark the outside of the tube with the Location ID and indicate the top and bottom of the core. Place caps on the ends of the core and tape caps in place.

7. If a FD or MS/MSD is to be collected at the location, use the same procedures to advance two additional cores in close proximity (within 5 feet) to the original boring location.

8. Transport labeled core to clean foil-covered table in the field laboratory. Extract the core from the tube by tapping the core with a rubber mallet or by inserting a rod to push the core out. The Field Geologist

will examine the core for lithology, presence of tailings, and other parameters identified in the Tailings Core Log. Tailings will be described according to color, grain size, and other distinguishing characteristics. In the past, tailings have generally been described as mostly olive green and black sand, with thin gray clay interbeds.

9. Depending on location, samples of the core may be collected following lithologic description. Sample collection procedures are listed below:
   - Line stainless steel bowls with aluminum foil and arrange sample containers and sampling equipment.
   - Label each sample container properly and fill out Tailings Core Sample Information Sheet (see Attachment B-1) and appropriate chain of custody information for each sample.
   - Using a new stainless steel spoon (or equivalent device), partition the core into separate intervals – up to four intervals will be sampled in each core: 0 to 0.5 ft, 0.5 to 1 ft, 1 to 2, ft, 2 to 3 ft. Record Sample Ids for each interval and intervals with FDs and MS/MSDs on the Tailings Core Log.
   - Place the full length of each interval into separate foil-lined aluminum bowls. If a FD or MS/MSD is to be collected at a particular interval, remove that interval from the additional cores obtained at the same location and add the material to the foil-lined bowl. Homogenize each sample interval (and additional volumes for FDs and MS/MSDs, as appropriate) in the foil-lined bowl using a stainless steel spoon (or equivalent device) prior to placement into sample containers. Transfer the sample into the appropriate containers using a stainless steel spoon (or equivalent device). Wipe outside of containers with paper towel and place in iced cooler.
   - Carefully remove used foil from the stainless steel bowl and dispose the used stainless steel spoon and foil in a garbage bag to avoid need for decontamination.
10. Decontaminate equipment and move to next boring location.

B.4.6.2 Deeper Cores

The following procedure will be used to advance and obtain deeper cores using a direct-push rig:

1. Locate the geographic position for proposed longer core location using GPS and record this and other parameters identified in the Tailings Core Log (see Attachment B-1). Photograph and describe each location in the photo log (see Attachment B-1).
2. Stage the direct-push rig over the desired drilling location. Lower a sampling tool with polyvinyl chloride (PVC) liner down the inside probe drive string to the end of the cutting shoe. Hydraulically push the probe drive string and sampler down through the sample interval to obtain an undisturbed sample of tailings/sediment. Once the probe drive string and sampler are fully advanced, withdraw the sampler and center rods from the probe drive string and remove the recovered core in the PVC liner from the sampler. After the tailings/sediment core is removed, another sampler with a PVC liner can be lowered down the inside of the probe drive string to the end of the cutting shoe to conduct continuous-core sampling to the maximum depth of the tailings deposit.
3. If a FD or MS/MSD is to be collected at the location, use the same procedures to advance two additional cores in close proximity (within 5 feet) to the original boring location.
4. After core recovery, extract the PVC liner encasing the tailings/sediment core from the sample sheath and cut open the PVC liner to expose the core. The Field Geologist will examine the core for lithology, presence of tailings, and other parameters identified in the Tailings Core Log.
5. Depending on location, samples of the core may be collected following lithologic description. Sample collection procedures are listed below:
   - Line stainless steel bowls with aluminum foil and arrange sample containers and sampling equipment..

- Label each sample container properly and fill out Tailings Core Sample Information Sheet and appropriate chain of custody information for each sample.
- Using a new stainless steel spoon (or equivalent device), partition the core into separate intervals – up to 16 intervals will be sampled in each core: 0 to 0.5 ft, 0.5 to 1 ft, 1 to 2, ft, 2 to 3 ft, and so forth until all tailings intervals to a maximum depth of 15 feet are accounted for. Record Sample Ids for each interval and intervals with FDs and MS/MSDs on the Tailings Core Log.
- Place the full length of each interval into separate foil-lined aluminum bowls. If a FD or MS/MSD is to be collected at a particular interval, remove that interval from the additional cores obtained at the same location and add the material to the foil-lined bowl. Homogenize each sample interval (and additional volumes for FDs and MS/MSDs, as appropriate) in the foil-lined bowl using a stainless steel spoon (or equivalent device) prior to placement into sample containers. Transfer the sample into the appropriate containers using a stainless steel spoon (or equivalent device). Wipe outside of containers with paper towel and place in iced cooler.
- Carefully remove used foil from the stainless steel bowl and dispose the used stainless steel spoon and foil in a garbage bag to avoid need for decontamination.

6. Decontaminate the sample collection equipment and move to next boring location.

B.4.7 Monitoring Well Installation and Development

A direct-push rig will be used to advance boreholes and install monitoring wells at two locations near the former mill (Figure B-4). The wells are expected to be shallow (less than 10 feet below grade) and screened to intercept groundwater just above the bedrock surface. Continuous cores will be collected for lithologic characterization and determination of well screen placement during advancement of boreholes. Lithology and other soil characteristics will be recorded on Soil Boring Logs (see Attachment B-1).

The monitoring wells will be constructed with new and clean, 1-inch diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing. Well screen for the groundwater monitoring wells will consist of 2.5-foot lengths of commercial pre-pack well screen consisting of No. 20 – 40 silica sand. The slot size of the perforations should be 0.010-inch. An expanding foam annular seal will be placed at the top of the sand pack, and a bentonite seal will be installed above the expanding foam annular seal and extend to near the ground surface. The wells will be completed with above-grade protective casings equipped with a lockable cap. A concrete pad that slopes away from the casing and well will be installed around the protective casing. Well construction information will be recorded on the Well Construction Log (see Attachment B-1)

The monitoring wells will be developed after the bentonite seal has been allowed to fully hydrate and swell. Monitoring well development will consist of surging then pumping with a peristaltic pump across upper, middle, and lowers zones of the screened interval to remove formation fines. Well development will continue until measured parameters (pH, electrical conductivity, and temperature) stabilize and turbidity is clear (generally less than 10 nephelometric turbidity units [NTU]). Final water quality parameter measurements will be recorded on the Well Development Log (see Attachment B-1). The sustained discharge rate, groundwater level response, and time of pumping will also be recorded on the Well Development Log.

B.4.8 Temporary Drive Point Installation

Temporary drive points may be used to collect porewater samples near the shoreline at the former mill. The drive points will consist of a 2-inch diameter PVC slotted well screen (with PVC well point) that is manually driven approximately 3 to 4 feet into the sediment/tailings. A 0.75-inch diameter PVC well screen with pre-pack filter (and end cap) will be installed inside the outer screen. The main purpose of the outer screen is to provide a durable casing to drive into the sediment (driving the pre-pack screen into the sediment would tear the fabric around the filter sand and would not work).

B.4.9 Groundwater Sampling

This section summarizes the field methods and procedures applicable to collection of groundwater samples from monitoring wells and porewater samples from drive points. Groundwater or porewater sample and field measurement will be collected, and water level will be measured at each well and drive point location (see Table B-6 for location and analysis information). FDs and MS/MSDs will be collected using the same sampling equipment as the parent samples.

The following are the procedures for collecting groundwater samples:

1. Confirm the geographic position of the well or drive point using GPS and record this and other parameters identified in the Well Purge and Groundwater Sampling Sheet (see Attachment B-1). Photograph and describe each location in the photo log (see Attachment B-1).
2. If the well is sealed with an airtight cap, allow time for pressure to equilibrate after the cap is removed before measuring water levels.
3. With the water level indicator switched on, wet the tip of the probe in potable water to test whether the meter is working properly. If no audible alarm is observed, the meter is not working properly.
4. Slowly lower the water level meter down the monitoring well until the probe contacts the groundwater surface, as indicated by the audible alarm. Do not let the probe tip and tape free-fall down the well. Always hold onto the meter's reel handle.
5. Raise the probe out of the water until the audible alarm stops. Continue raising and lowering the probe until a precise level is determined within 0.01 foot. Record the depth from the top of casing reference point to the top of the water table (i.e. Depth to Water). Report this in the Well Purge and Groundwater Sampling Sheet (see Attachment B-1).
6. To measure the total depth measurement, slowly lower the water level meter until the cable goes slack. Do not let the probe tip and tape free-fall down the well. Always hold onto the meter's reel handle.
7. Gently raise and lower the water level meter probe to tap the bottom of the well.
8. Record the reading on the cable at the established reference point to the nearest 0.01 foot in the Well Purge and Groundwater Sampling Sheet.
9. Connect an appropriate length of sample intake tubing to one end of an approximately 8- to 12-inch piece of silicone tubing. Connect the other end of the silicone tubing to a 3- to 4-foot piece of pump discharge tubing. Try and minimize the length of sample tubing whenever possible to reduce sample turbulence and aeration during pumping.
10. Slowly and carefully lower the sample intake tubing into the well to the desired sample intake depth (approximately 1 ft above bottom of well or drive point).
11. Secure the sample intake tubing to the top of the casing using multiple zip-tie fasteners or a spring clamp.
12. Insert the 8- to 12-inch silicone tubing section into the peristaltic pump head and lock the tubing within the pump head.
13. Clamp the other end of the discharge tubing to the purge bucket in a way that discharging purge water will flow into the bucket.
14. Connect the peristaltic pump directly to the generator (or battery if available) using an extension power cord.
15. Place the generator downwind of the sampling area a significant distance away (~20 feet or more). If a battery is available, it should be used while a sample is being collected.

16. Make sure that the generator supplying power to the pump is sufficiently fueled before purging and sampling to avoid power loss.

17. Using the low-flow method (< 0.5 L/min), purge the well until field parameters (such as DO, ORP, conductivity, pH, turbidity, and temperature) have stabilized, until three well casing volumes are purged, or until the well is purged dry. Measure field parameters using the water quality meter. Do not collect a representative groundwater sample until the groundwater level and the groundwater parameters have stabilized as defined as follows:

    - ± 1.0 ^{o}C temperature
    - ± 0.1 pH
    - ± 3% conductivity
    - ± 10 milivolts (mV) ORP
    - ± 10% DO
    - ± 10% turbidity or ≤ 10 NTUs

    To purge the well, turn on the pump and start to pump on the lowest setting. Adjust the flow slowly until water begins to discharge. Slowly pump at a flow rate of approximately 1 liter (0.25 gallons) every 3 minutes or 0.1 gal/min for approximately 1 to 2 minutes, or until the purge water begins to visually clear up. The intent is to limit any initial high turbidity water from filling and settling in the flow-through cell.

    Once most of the observable turbidity has cleared, briefly turn off the pump and secure the tube from the pump to the influent connector at the bottom of the flow-through cell. Turn on the pump again and then allow the flow-through cell to completely fill with water. A continuous effort should be made to keep air bubbles and significant air volume from collecting in the flow-through cell. TO remove any collected air volume within the flow-through cell, partially unscrew the multi-meter sonde from the flow-through cell while pumping until all the air escapes and water begins to slowly leak from the sonde/flow-through cell connection.

    Continue pumping and begin low-flow purging the monitoring well at a flow rate of approximately 1 liter (0.25 gallons) every 3 minutes or 0.1 gal/min, such that the pumping rate does not lower the water level more than 0.3 foot. Initially monitor the drawdown frequently, to establish a steady pumping rate that minimizes drawdown. If the minimal drawdown exceeds 0.3 foot, but remains stable, continue purging.

    Purge the water through the flow-through cell and into a 5-gallon graduated purge water discharge bucket. Observe the purge rate and cumulative total discharge volume based on the graduated marks on the purge bucket. Containerize purge water and manage as IDW as detailed in Section B4.11.

    Routinely measure and record the DO, ORP, conductivity, pH, turbidity, temperature, current ground water level, and cumulative total purge volume throughout the purge at approximately every 3 to 5 minute interval. A minimum of three of groundwater parameter measurements should be monitored and recorded. The groundwater level should be measured frequently during purging to verify that water level has not dropped lower than the desired 0.3 foot. Record the groundwater parameters, groundwater level, and cumulative total purge volume in the Well Purge and Groundwater Sampling Field Sheet (see Attachment B-1).

18. Sample the well immediately following purging, without moving or adjusting the position of the pump or sample intake line. Containerize purge water and manage as IDW as detailed in Section B.4.12.

19. Briefly turn off the pump and disconnect the aboveground end of the pump intake tube from water quality meter and flow-through cell before sampling. Do not sample from the discharge of the flow-through-cell.

20. Turn the pump back on and continue to pump at a flow rate of approximately 0.1 gal/min. Re-verify the pumping rate does not lower the water level in the well by more than 0.3 foot. While sampling, discharge any groundwater pumped between filling sample containers in a 5-gallon groundwater purge bucket. Dispose of this water along with other purge water accumulated.

21. Begin filling the laboratory-supplied analytical sample containers. For samples to be analyzed for dissolved concentrations, briefly turn off the pump and connect the field filtering apparatus to the aboveground end of the pump intake tube per the laboratory analytical method and/or filter equipment manufacturer's instructions. Once connected, turn the pump back on and pre-rinse the field filter apparatus with approximately 25 to 50 mL of pumped groundwater. To do this, pump water through the filter for approximately 30 seconds to flush and rinse the filter media. Begin filling the laboratory-supplied analytical sample containers with filtered water until complete. Fill the container approximately two-thirds full. Collect FDs and MS/MSD sample volumes using the same equipment as the parent samples.

22. Record any odor, color, sheen or other parameters identified in the Well Purge and Groundwater Sampling Sheet.

23. Decontaminate equipment and change out a new filter prior to collecting sample from next location.

B.4.10 Quality Control Samples

Quality control (QC) samples will be used to assess the overall quality of the project data. Field QC samples will include FDs, equipment rinsate blanks, filter blanks, and temperature blanks. These QC samples will be collected or prepared by sampling personnel in the field and submitted to the laboratory as natural samples. Laboratory QC samples include method blanks and MS/MSDs.

B.4.10.1 Blind Field Duplicate Samples

FD samples will be collected to assess the homogeneity of samples collected in the field and the precision of the sampling process. FDs will be prepared by collecting two aliquots of sample from the sampling equipment and submitting them for analysis as separate samples (aliquots of sediment/tailings samples will be homogenized prior to splitting into separate samples). FDs will be collected from at least 10 percent of the sampling locations. Duplicate field parameter measurements will also be collected at a frequency of 10 percent of all sample locations. The duplicate samples will be submitted to the laboratories blind. Analyses will be the same as those required for the parent sample. Individual FD sample identification numbers and the total number of FDs samples for each analysis are listed in each sampling listing table (Tables B1 through B-7).

B.4.10.2 Equipment Rinsate Blank

Equipment rinsate blanks are used to evaluate sampling device cleanliness and potential carryover of target contaminants from equipment contribution. Equipment rinsate blanks are collected after a sample collection device is subjected to standard decontamination procedures. ASTM Type II water (purchased and certified from a commercial vendor) will be poured over or through the sampling device and collected in a sample container for analysis. One equipment rinsate blank will be collected for each type of sampling equipment used during the sampling event (at an interval of one per 20 samples collected using that equipment) and will be analyzed for metals, in the case of groundwater, the equipment blanks will also be analyzed for PAHs.

B.4.10.3 Filter Blank

One filter blank will be collected for the project per lot of filters to be used in the field for dissolved metals analysis. ASTM Type II water (purchased and certified from a commercial vendor) will be poured over or through the sampling device and collected in a sample container for analysis. The filter blank will be collected prior to field mobilization to insure the filters are appropriate for use in the field. The lot number of the filters will be recorded.

B.4.10.4 Temperature Blanks

All coolers shall contain at least one temperature blank. The temperature blank should be a 40-milliliter volatile organic analysis vial filled with water and placed in a representative position inside the cooler. Each vial shall be clearly marked "TEMPERATURE." If the temperature blank is positioned inappropriately or is not representative of the cooler temperature measurement, the project laboratory shall document the deficiency and notify the Project Chemist.

B.4.10.5 Matrix Spike/Matrix Spike Duplicates Samples

MS/MSD analyses will be performed in the laboratory to assess the accuracy of the analyses. These analyses will be performed according to the laboratory protocols and will occur at a frequency of once every 20 samples using extra volumes of sample matrices collected in the field. MS/MSD samples will be designated as such on the chain-of-custody form. Analyses will be the same as those required by the parent sample. Individual sample locations where MS/MSD volumes will be collected and the total number of MS/MSD samples for each sample group are listed in Tables B1 through B-7. Equipment Decontamination

Sampling equipment must be decontaminated consistently to ensure the quality of the samples collected. All equipment that comes into contact with potentially contaminated samples will be decontaminated. Disposal equipment intended for one-time use that is factory-wrapped generally does not need to be decontaminated before it is used unless there is evidence of contamination present. All one-time use, disposable sampling equipment and accessories will be discarded once used, and a new set of equipment will be used for each subsequent sample.

All equipment that comes into contact with tailings, contaminated soil, or groundwater during drilling or monitoring well development will undergo a thorough decontamination between uses at each boring to ensure no cross-contamination occurs. Temporary decontamination stations and related containment will be established near the work areas as needed during drilling. Specific locations for field decontamination will be determined based on discussions with EPA and input from the contractors. The decontamination process will consist of a high pressure hot-water and liquinox wash followed by a rinse with potable water.

Reusable sampling equipment will be decontaminated in a decontamination zone established near the equipment storage container or in the field near the sampling location. All reusable sampling equipment will be decontaminated prior to use and in between each sample to reduce the potential for cross-contamination. Stainless steel bowls will be covered with two layers of aluminum foil (dull side up) and new aluminum foil will be used for each sample location. Therefore no decontamination will be necessary for stainless steel bowls. New disposable nitrile gloves will be worn when handling clean sampling equipment to ensure that the equipment is not contaminated. Equipment decontamination procedures are as follows:

- Prewash with site water
- Wash with solution of tap water and Alconox® soap and brush
- Rinse with site water
- Rinse the brush with site water to remove any visible dirt
- Rewash with solution of tap water and Alconox® soap and brush
- Rinse with site water
- Double rinse with distilled water
- Repeat as necessary
- Cover (no contact) all decontaminated items with clean aluminum foil

B.4.11 Containment and Disposal of Investigation-derived Wastes

Waste generated during fieldwork includes PPE, disposable items (such as stainless-steel spoons), excess sediment samples, and decontamination wash water. All general refuse (such as PPE, gloves, paper towels, and plastic sheeting) that would not likely contain hazardous material will be disposed of as municipal waste. Excess tailings, sediment, porewater, surface water, groundwater, and biota encountered during the sampling activities will be left onsite at the sampling locations where they were collected. Excess or unsampled sediment from each core will be placed on the ground and tamped by foot to compact the sediment removed from the core barrel. Well development and purge water will be containerized, filtered through a sediment filter and granular activated carbon canister prior to discharge to the ground in the vicinity of the associated groundwater well. If sheen or free product is present in the groundwater purge water, a sorbent pad will be placed on top of the purged water to remove the product prior to filtering and discharge to the ground.

The volume of decontamination fluids generated during the project is expected to be small. These fluids will also be left onsite at the sampling locations that they are generated.

Excess tailings, sediment, porewater, surface water, groundwater and biota sent to the laboratory that are not analyzed and/or archived will be disposed of by the laboratory in accordance with its stand operating procedure for sample disposal.

B.5 References

EPA. 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.* Pulls, R.W. and Barcelona, M. J. EPA/540/S-95/504. April.

Tables

Table B-1
Surface Sediment (Thalweg) Sample Information
Salt Chuck Mine, Alaska

LocationID	LocationType	Northing	Easting	Sample ID	Sample Type	TAL Metals[a] except Hg	Hg	Bioassay	AVS/SEM	Grain size	Location	Problem Statement	Rationale
2013SC-SS-139	Surface Sediment	1383902.75	2915954.5	2013SC-SS-139	N	1	1				Thalweg on west side of Unnamed Island	1-1	Refine nature and extent of sediment contamination and assess risk
2013SC-SS-140	Surface Sediment	1383951.5	2916169.5	2013SC-SS-140	N	1	1	1	1	1			
2013SC-SS-140	Surface Sediment	1383951.5	2916169.5	2013SC-SS-9140	FD	1	1	1	1	1			
2013SC-SS-141	Surface Sediment	1383610	2916200.75	2013SC-SS-141	N	1	1						
2013SC-SS-143	Surface Sediment	1383255.75	2915923.75	2013SC-SS-143	N	1	1						
2013SC-SS-144	Surface Sediment	1383274	2916284.25	2013SC-SS-144	N	1	1						
2013SC-SS-145	Surface Sediment	1383278.375	2916503.5	2013SC-SS-145	N	1	1	1	1	1			
2013SC-SS-146	Surface Sediment	1382915	2916030.25	2013SC-SS-146	N	1	1	1	1	1			
2013SC-SS-147	Surface Sediment	1383058.875	2916613	2013SC-SS-147	N	1	1						
2013SC-SS-510	Surface Sediment	1372822.875	2917594.75	2013SC-SS-510	N	1	1	1	1	1	Browns Bay		
					Total	**10**	**10**	**5**	**5**	**5**			

[a] Metals to include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc

MS/MSD location

Table B-2
Porewater Sample Information
Salt Chuck Mine, Alaska

LocationID	Location Type	Northing	Easting	Elevation	Sample ID	Sample Type	Dissolved TAL Metals[a] except Hg	Dissolved Mercury	TCL PAHs[b,c]	Location	Problem Statement	Rationale
2013SC-PW-001	Porewater/drive point	1386801.25	2915265	13.5	2013SC-PW-001	N	1	1	1	Tailings area nearest mill	1-2, 1-6	Better characterize groundwater, tailings, and surface water contaminant interaction and assess risk
2013SC-PW-002	Porewater/drive point	1386815.125	2915216.5	10.3	2013SC-PW-002	N	1	1	1			
2013SC-PW-003	Porewater/drive point	1386791.625	2915307	11.6	2013SC-PW-003	N	1	1	1			
2013SC-PW-003	Porewater/drive point	1386791.625	2915307	12.0	2013SC-PW-9003	FD	1	1	1			
2013SC-PW-006	Porewater	1386828	2915169.75	12.0	2013SC-PW-006	N	1			Tailings area	1-2	
2013SC-PW-008	Porewater	1386763	2915251.5	11.5	2013SC-PW-008	N	1					
2013SC-PW-014	Porewater/drive point	1386709.875	2915339.5	7.9	2013SC-PW-014	N	1	1	1	Tailings area nearest mill	1-2, 1-6	
2013SC-PW-016	Porewater/drive point	1386736.625	2915401.25	9.8	2013SC-PW-016	N	1	1	1			
2013SC-PW-017	Porewater	1386683.125	2915277.5	8.8	2013SC-PW-017	N	1			Tailings area	1-2	
2013SC-PW-022	Porewater	1386653.5	2915209.5	12.1	2013SC-PW-022	N	1					
2013SC-PW-027	Porewater	1386684.25	2915453	9.1	2013SC-PW-027	N	1					
2013SC-PW-030	Porewater	1386613.75	2915315.5	6.7	2013SC-PW-030	N	1					
2013SC-PW-037	Porewater	1386618.5	2915128.5	13.0	2013SC-PW-037	N	1					
2013SC-PW-042	Porewater	1386631.875	2915505	8.1	2013SC-PW-042	N	1					
2013SC-PW-045	Porewater	1386592.5	2915068.5	11.0	2013SC-PW-045	N	1					
2013SC-PW-055	Porewater	1386492.625	2915381.5	7.3	2013SC-PW-055	N	1					
2013SC-PW-055	Porewater	1386492.625	2915381.5	7.3	2013SC-PW-055	FD	1					
2013SC-PW-056	Porewater	1386579.625	2915556.75	8.8	2013SC-PW-056	N	1					
2013SC-PW-064	Porewater	1386456.75	2915483	4.6	2013SC-PW-064	N	1					
2013SC-PW-065	Porewater	1386497.125	2915555	5.7	2013SC-PW-065	N	1					
2013SC-PW-066	Porewater	1386421.625	2915420.5	6.6	2013SC-PW-066	N	1					
2013SC-PW-068	Porewater	1386527.25	2915608.5	8.4	2013SC-PW-068	N	1					
2013SC-PW-069	Porewater	1386392.625	2915368.75	7.9	2013SC-PW-069	N	1					
2013SC-PW-071	Porewater	1386350.5	2915293.75	8.0	2013SC-PW-071	N	1					
2013SC-PW-071	Porewater	1386350.5	2915293.75	8.0	2013SC-PW-9071	FD	1					
2013SC-PW-073	Porewater	1386353.25	2915457.75	5.2	2013SC-PW-073	N	1					
2013SC-PW-074	Porewater	1386474.125	2915661	8.0	2013SC-PW-074	N	1					
2013SC-PW-076	Porewater	1386310.125	2915221.75	8.2	2013SC-PW-076	N	1					
2013SC-PW-080	Porewater	1386421	2915713.75	8.2	2013SC-PW-080	N	1					
2013SC-PW-081	Porewater	1386274	2915501	4.4	2013SC-PW-081	N	1					
2013SC-PW-086	Porewater	1386216.875	2915532.25	4.0	2013SC-PW-086	N	1					
2013SC-PW-088	Porewater	1386358.875	2915775	7.0	2013SC-PW-088	N	1					
2013SC-PW-090	Porewater	1386240.125	2915686	3.0	2013SC-PW-090	N	1					
2013SC-PW-091	Porewater	1386193.375	2915602.75	4.1	2013SC-PW-091	N	1					
2013SC-PW-092	Porewater	1386278.375	2915754	4.8	2013SC-PW-092	N	1					
2013SC-PW-092	Porewater	1386278.375	2915754	4.8	2013SC-PW-9092	FD	1					
2013SC-PW-094	Porewater	1386140.25	2915508	4.0	2013SC-PW-094	N	1					
2013SC-PW-096	Porewater	1386314.75	2915818.75	6.5	2013SC-PW-096	N	1					
2013SC-PW-097	Porewater	1386104.5	2915444.25	4.0	2013SC-PW-097	N	1					

Table B-2
Porewater Sample Information
Salt Chuck Mine, Alaska

LocationID	Location Type	Northing	Easting	Elevation	Sample ID	Sample Type	Dissolved TAL Metals[a] except Hg	Dissolved Mercury	TCL PAHs[b,c]	Location	Problem Statement	Rationale
2013SC-PW-100	Porewater	1386069.25	2915281	4.4	2013SC-PW-100	N	1					
2013SC-PW-101	Porewater	1386071.125	2915183.75	4.9	2013SC-PW-101	N	1					
2013SC-PW-102	Porewater	1386067.375	2915378.25	4.0	2013SC-PW-102	N	1					
2013SC-PW-103	Porewater	1386114.125	2915588.5	3.8	2013SC-PW-103	N	1					
2013SC-PW-169	Porewater	1386747.875	2915080.75	8.5	2013SC-PW-169	N	1			Tailings north of spit	1-2, 1-6	
2013SC-PW-170	Porewater	1386706.75	2915046.5	8.4	2013SC-PW-170	N	1					
2013SC-PW-171	Porewater	1386804.625	2915135.5	10.0	2013SC-PW-171	N	1					
2013SC-PW-174	Porewater/drive point	1386684.5	2915526	11.0	2013SC-PW-174	N	1	1	1	Downgradient of C1 C2 C3	1-2, 1-6	
2013SC-PW-175	Porewater/drive point	1386639.375	2915624	11.3	2013SC-PW-175	N	1	1	1			
						Total	**48**	**8**	**8**			

[a] Metals include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc
[b] If sufficient volume/time
[c] PAHs include 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene

MS/MSD location

Table B-3
Surface Water Sample Information
Salt Chuck Mine, Alaska

LocationID	LocationType	Northing	Easting	Sample ID	Sample Type	Dissolved TAL Metals[a] except Hg	Dissolved Hg	Total TAL Metals[a] except Hg	Total Hg	TCL PAHs[b]	Location	Problem Statement	Rationale
2013SC-SW-015	Surface Water	1386779.3	2915117.5	2013SC-SW-015	N	1	1			1	Unnamed Stream	1-2, 1-6	Better characterize groundwater, tailings, and surface water contaminant interaction and assess risk
2013SC-SW-029	Surface Water	1386633.3	2915377.5	2013SC-SW-029	N	1	1			1	Barge Slip Area		
2013SC-SW-075	Surface Water	1386469.5	2915505.75	2013SC-SW-075	N	1	1			1	Barge Slip Area		
2013SC-SW-084	Surface Water	1386196.1	2915149.75	2013SC-SW-084	N	1	1			1	Unnamed Stream	1-2, 1-6	
2013SC-SW-9084	Surface Water	1386196.1	2915149.75	2013SC-SW-9084	FD	1	1			1	Unnamed Stream		
2013SC-SW-085	Surface Water	1386450.6	2915831.5	2013SC-SW-085	N	1	1				Unnamed Stream B	1-2	
2013SC-SW-098	Surface Water	1386277.3	2915792.25	2013SC-SW-098	N	1	1				Unnamed Stream B		
2013SC-SW-099	Surface Water	1386287.8	2915640.75	2013SC-SW-099	N	1	1			1	Barge Slip Area	1-2, 1-6	
2013SC-SW-104	Surface Water	1386012.6	2914975.5	2013SC-SW-104	N	1	1	1	1		Lake Ellen Creek	1-2	
2013SC-SW-105	Surface Water	1385973.9	2915557.25	2013SC-SW-105	N	1	1	1	1		Lake Ellen Creek		
2013SC-SW-105	Surface Water	1385973.9	2915557.25	2013SC-SW-105-TWS[b]	N	1	1				Lake Ellen Creek		
2013SC-SW-106	Surface Water	1386409.6	2914408.75	2013SC-SW-106	N	1	1	1	1		Lake Ellen Creek		
2013SC-SW-106	Surface Water	1386409.6	2914408.75	2013SC-SW9106	FD	1	1	1	1		Lake Ellen Creek		
2013SC-SW-108	Surface Water	1386078.3	2915751.5	2013SC-SW-108	N	1	1				Lake Ellen Creek		
2013SC-SW-113	Surface Water	1385831.9	2916074	2013SC-SW-113	N	1	1				Lake Ellen Creek		
2013SC-SW-501	Surface Water	1376113.9	2917051.5	2013SC-SW-501	N	1	1				Browns Bay		
2013SC-SW-501	Surface Water	1376113.9	2917051.5	2013SC-SW-9501	FD	1	1				Browns Bay		
2013SC-SW-503	Surface Water	1375938.9	2918278.5	2013SC-SW-503	N	1	1				Browns Bay		
2013SC-SW-505	Surface Water	1375298.8	2916500	2013SC-SW-505	N	1	1				Browns Bay		
2013SC-SW-507	Surface Water	1374953.8	2918936.5	2013SC-SW-507	N	1	1				Browns Bay		
2013SC-SW-509	Surface Water	1373194.8	2917771.25	2013SC-SW-509	N	1	1				Browns Bay		
2013SC-SW-600	Surface Water	TBD	TBD	2013SC-SW-600	N	1	1	1	1		Salt Chuck Bay	1-3	Water for use in sediment SPLP analysis
2013SC-SW-601	Surface Water	TBD	TBD	2013SC-SW-601	N	1	1	1	1		Salt Chuck Bay	1-3	
					Total	**23**	**23**	**6**	**6**	**6**			

[a] Metals include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc

[b] Time-weighted incremental sample

[b] PAHs include 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene

MS/MSD location

Table B-4
Biota Sample Information
Salt Chuck Mine, Alaska

LocationID	Location Type	Northing	Easting	Species	Sample ID	Sample Type	TAL Metals[a] except Hg	Hg	Methyl-mercury	As Speciation	Location	Problem Statement	Rationale
2013SC-Biota-107	Biota	1385962.3	2915812.5	Crab	2013SC-Biota-107-Crab	N	1	1	1	1	Salt Chuck Bay	1-5	Better characterize risk
2013SC-Biota-130	Biota	1385594	2916345.25	Crab	2013SC-Biota-130-Crab	N	1	1	1	1			
2013SC-Biota-130	Biota	1385594	2916345.25	Crab	2013SC-TISS-9130-Crab	FD	1	1	1	1			
2013SC-Biota-138	Biota	1384138.1	2916165.5	Crab	2013SC-Biota-138-Crab	N	1	1	1	1			
2013SC-Biota-142	Biota	1384360.6	2917839.5	Crab	2013SC-Biota-142-Crab	N	1	1	1	1			
2013SC-Biota-148	Biota	1382673.3	2916903	Crab	2013SC-Biota-148-Crab	N	1	1	1	1			
2013SC-Biota-149	Biota	1381881.3	2917336.5	Crab	2013SC-Biota-149-Crab	N	1	1	1	1			
2013SC-Biota-150	Biota	1381079.3	2916462	Crab	2013SC-Biota-150-Crab	N	1	1	1	1			
2013SC-Biota-150	Biota	1381079.3	2916462	Crab	2013SC-TISS-9150-Crab	FD	1	1	1	1			
2013SC-Biota-151	Biota	1380864.3	2918231.5	Crab	2013SC-Biota-151-Crab	N	1	1	1	1			
2013SC-Biota-152	Biota	1380041	2916831.5	Crab	2013SC-Biota-152-Crab	N	1	1	1	1			
2013SC-Biota-153	Biota	1379741.6	2917533.75	Crab	2013SC-Biota-153-Crab	N	1	1	1	1			
2013SC-Biota-500	Biota	1376206	2916876.75	Crab	2013SC-Biota-500-Crab	N	1	1	1	1	Browns Bay		
2013SC-Biota-502	Biota	1376258.5	2917968.25	Crab	2013SC-Biota-502-Crab	N	1	1	1	1			
2013SC-Biota-504	Biota	1374873	2916725.5	Crab	2013SC-Biota-504-Crab	N	1	1	1	1			
2013SC-Biota-506	Biota	1375067.6	2919151.5	Crab	2013SC-Biota-506-Crab	N	1	1	1	1			
2013SC-Biota-508	Biota	1373460	2917848	Crab	2013SC-Biota-508-Crab	N	1	1	1	1			
2013SC-Biota-107	Biota	1385962.3	2915812.5	Shrimp	2013SC-Biota-107-Shrimp	N	1	1	1	1	Salt Chuck Bay		
2013SC-Biota-130	Biota	1385594	2916345.25	Shrimp	2013SC-Biota-130-Shrimp	N	1	1	1	1			
2013SC-Biota-138	Biota	1384138.1	2916165.5	Shrimp	2013SC-Biota-138-Shrimp	N	1	1	1	1			
2013SC-Biota-142	Biota	1384360.6	2917839.5	Shrimp	2013SC-Biota-142-Shrimp	N	1	1	1	1			
2013SC-Biota-148	Biota	1382673.3	2916903	Shrimp	2013SC-Biota-148-Shrimp	N	1	1	1	1			
2013SC-Biota-149	Biota	1381881.3	2917336.5	Shrimp	2013SC-Biota-149-Shrimp	N	1	1	1	1			
2013SC-Biota-150	Biota	1381079.3	2916462	Shrimp	2013SC-Biota-150-Shrimp	N	1	1	1	1			
2013SC-Biota-151	Biota	1380864.3	2918231.5	Shrimp	2013SC-Biota-151-Shrimp	N	1	1	1	1			
2013SC-Biota-152	Biota	1380041	2916831.5	Shrimp	2013SC-Biota-152-Shrimp	N	1	1	1	1			
2013SC-Biota-153	Biota	1379741.6	2917533.75	Shrimp	2013SC-Biota-153-Shrimp	N	1	1	1	1			
2013SC-Biota-153	Biota	1379741.6	2917533.75	Shrimp	2013SC-Bioat-9153-Shrimp	FD	1	1	1	1			
2013SC-Biota-500	Biota	1376206	2916876.75	Shrimp	2013SC-Biota-500-Shrimp	N	1	1	1	1	Browns Bay		
2013SC-Biota-502	Biota	1376258.5	2917968.25	Shrimp	2013SC-Biota-502-Shrimp	N	1	1	1	1			
2013SC-Biota-504	Biota	1374873	2916725.5	Shrimp	2013SC-Biota-504-Shrimp	N	1	1	1	1			
2013SC-Biota-506	Biota	1375067.6	2919151.5	Shrimp	2013SC-Biota-506-Shrimp	N	1	1	1	1			
2013SC-Biota-508	Biota	1373460	2917848	Shrimp	2013SC-Biota-508-Shrimp	N	1	1	1	1			
						Total	**33**	**33**	**33**	**33**			

As = arsenic

[a] Metals include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc

Table B-5
Tailing Borings and Sample Information
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-004	Boring	1386793.5	2915223.75	12.7	2013SC-SB-004-0.5	Short Core with Samples	N	1	1							Near mill	2-1	Better characterize groundwater, tailings, and surface water contaminant interaction and assess risk, Evaluate remedial alternatives
2013SC-SB-004	Boring	1386793.5	2915223.75	12.7	2013SC-SB-004-00	Short Core with Samples	N	1	1		1	1	1	1	1	Near mill	1-3, 2-1	
2013SC-SB-004	Boring	1386793.5	2915223.75	12.7	2013SC-SB-004-01	Short Core with Samples	N	1	1		1	1	1	1	1	Near mill	1-3, 2-1	
2013SC-SB-004	Boring	1386793.5	2915223.75	12.7	2013SC-SB-004-02	Short Core with Samples	N	1	1		1	1	1	1	1	Near mill	1-3, 2-1	
2013SC-SB-004	Boring	1386793.5	2915223.75	12.7	2013SC-SB-9004-00	Short Core with Samples	FD	1	1		1					Near mill	1-3, 2-1	
2013SC-SB-009	Boring	1386771.4	2915170.75	8.9	No samples	Short Core only	NA									Intertidal north of tailing spit	2-1	
2013SC-SB-010	Boring	1386732.4	2915274	11.9	No samples	Direct push core only	NA									Tailings spit	2-1	
2013SC-SB-011	Boring	1386725.8	2915208.75	16.0	No samples	Direct push core only	NA									Tailings spit	2-1	
2013SC-SB-012	Boring	1386831.4	2915108.25	10.6	No samples	Short Core only	NA									Intertidal north of tailing spit	2-1	
2013SC-SB-013	Boring	1386739.5	2915370	9.6	2013SC-SB-013-0.5	Short Core with Samples	N	1	1							East of Barge Slip	1-3, 2-1	
2013SC-SB-013	Boring	1386739.5	2915370	9.6	2013SC-SB-013-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-013	Boring	1386739.5	2915370	9.6	2013SC-SB-013-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-013	Boring	1386739.5	2915370	9.6	2013SC-SB-013-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-0.5	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-00	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-01	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-02	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-03	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-04	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-05	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-06	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-07	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-08	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-09	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-10	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-11	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-12	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-13	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-018	Boring	1386674.1	2915224.5	12.5	2013SC-SB-018-14	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-0.5	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-00	Direct push core with samples	N	1	1	1			1	1	1	Tailings spit	1-4, 2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-01	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-02	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-03	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-04	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-05	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-06	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-07	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-08	Direct push core with samples	N	1	1							Tailings spit	2-1	

Table B-5
Tailing Borings and Sample Information
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-09	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-10	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-11	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-12	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-13	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-019-14	Direct push core with samples	N	1	1							Tailings spit	2-1	
2013SC-SB-019	Boring	1386698.4	2915140.5	15.1	2013SC-SB-9019-00	Direct push core with samples	FD	1	1							Tailings spit	2-1	
2013SC-SB-020	Boring	1386774.8	2915070.5	7.8	No samples	Short Core only	NA									Intertidal north of tailing spit	2-1	
2013SC-SB-021	Boring	1386863.8	2915038.75	11.7	2013SC-SB-021-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-021	Boring	1386863.8	2915038.75	11.7	2013SC-SB-021-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-021	Boring	1386863.8	2915038.75	11.7	2013SC-SB-021-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-021	Boring	1386863.8	2915038.75	11.7	2013SC-SB-021-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-023	Boring	1386638	2915289.75	7.4	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-024	Boring	1386640.1	2915331.25	5.9	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-025	Boring	1386633.1	2915233.75	11.1	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-026	Boring	1386637.5	2915172.5	12.9	No samples	Direct push core only	NA									Tailings spit	2-1	
2013SC-SB-028	Boring	1386674.4	2915099.75	15.2	No samples	Direct push core only	NA									Tailings spit	2-1	
2013SC-SB-031	Boring	1386700.1	2915063.25	7.9	2013SC-SB-031-0.5	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-031	Boring	1386700.1	2915063.25	7.9	2013SC-SB-031-00	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-031	Boring	1386700.1	2915063.25	7.9	2013SC-SB-031-01	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-031	Boring	1386700.1	2915063.25	7.9	2013SC-SB-031-02	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-031	Boring	1386700.1	2915063.25	7.9	2013SC-SB-9031-00	Short Core with Samples	FD	1	1							Intertidal near mill	2-1	
2013SC-SB-032	Boring	1386632.1	2915398.5	5.5	2013SC-SB-032-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-032	Boring	1386632.1	2915398.5	5.5	2013SC-SB-032-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-032	Boring	1386632.1	2915398.5	5.5	2013SC-SB-032-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-032	Boring	1386632.1	2915398.5	5.5	2013SC-SB-032-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-033	Boring	1386591.9	2915304	7.2	2013SC-SB-033-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-033	Boring	1386591.9	2915304	7.2	2013SC-SB-033-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-033	Boring	1386591.9	2915304	7.2	2013SC-SB-033-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-033	Boring	1386591.9	2915304	7.2	2013SC-SB-033-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-034	Boring	1386587.4	2915245.5	11.0	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-035	Boring	1386672.3	2915481	8.7	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-036	Boring	1386844.9	2914975.75	10.0	No samples	Short Core only	NA									Intertidal north of tailing spit	2-1	
2013SC-SB-038	Boring	1386592.3	2915191.25	11.0	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-039	Boring	1386745.9	2914988.25	9.0	No samples	Short Core only	NA									Intertidal north of tailing spit	2-1	
2013SC-SB-040	Boring	1386568.5	2915356.75	6.1	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-0.5	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-00	Direct Push Upland Core with Samples	N	1	1	1						Tailings Pile near Unnamed Stream	1-4, 2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-01	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	

Table B-5
Tailing Borings and Sample Information
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-02	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-03	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-04	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-05	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-06	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-07	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-08	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-09	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-10	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-11	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-12	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-13	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-041-14	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-041	Boring	1386919.1	2914948.75	13.9	2013SC-SB-9041-01	Direct Push Upland Core with Samples	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-043	Boring	1386546	2915206.5	10.5	2013SC-SB-043-0.5	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-043	Boring	1386546	2915206.5	10.5	2013SC-SB-043-00	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-043	Boring	1386546	2915206.5	10.5	2013SC-SB-043-01	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-043	Boring	1386546	2915206.5	10.5	2013SC-SB-043-02	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-044	Boring	1386599.9	2915074.25	13.3	No samples	Direct push core only	NA									Tailings spit	2-1	
2013SC-SB-046	Boring	1386843.8	2914920	11.8	No samples	Direct Push Upland Core only	NA									Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-047	Boring	1386927.8	2914914.25	12.7	No samples	Direct Push Upland Core only	NA									Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-048	Boring	1386554	2915107.5	10.3	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-049	Boring	1386514	2915260.5	10.7	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-050	Boring	1386515.1	2915318.75	8.5	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-051	Boring	1386605.4	2915522.75	8.4	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-052	Boring	1386673.3	2915583.5	10.1	2013SC-SB-052-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-052	Boring	1386673.3	2915583.5	10.1	2013SC-SB-052-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-052	Boring	1386673.3	2915583.5	10.1	2013SC-SB-052-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-052	Boring	1386673.3	2915583.5	10.1	2013SC-SB-052-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-052	Boring	1386673.3	2915583.5	10.1	2013SC-SB-9052-01	Short Core with Samples	FD	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-0.5	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-00	Direct Push Upland Core with Samples	N	1	1	1						Tailings Pile near Unnamed Stream	1-4, 2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-01	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-02	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-03	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-04	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-05	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-06	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-07	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	

Table B-5
Tailing Borings and Sample Information
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Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-08	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-09	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-10	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-11	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-12	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-13	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-053-14	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-9053-00	Direct Push Upland Core with Samples	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-053	Boring	1386899.9	2914896	13.4	2013SC-SB-9053-11	Direct Push Upland Core with Samples	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-054	Boring	1386546.1	2915464.25	5.8	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-057	Boring	1386500.3	2915106.25	9.1	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-058	Boring	1386468.6	2915215.75	9.7	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-059	Boring	1386454.5	2915272	9.6	2013SC-SB-059-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-059	Boring	1386454.5	2915272	9.6	2013SC-SB-059-00	Short Core with Samples	N	1	1	1	1	1	1	1	1	East of Barge Slip	1-4, 2-1, 1-3	
2013SC-SB-059	Boring	1386454.5	2915272	9.6	2013SC-SB-059-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-059	Boring	1386454.5	2915272	9.6	2013SC-SB-059-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-060	Boring	1386601.8	2915636.5	10.4	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-061	Boring	1386446.9	2915116	8.3	2013SC-SB-061-0.5	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-061	Boring	1386446.9	2915116	8.3	2013SC-SB-061-00	Short Core with Samples	N	1	1	1			1	1	1	Intertidal near mill	1-4, 2-1	
2013SC-SB-061	Boring	1386446.9	2915116	8.3	2013SC-SB-061-01	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-061	Boring	1386446.9	2915116	8.3	2013SC-SB-061-02	Short Core with Samples	N	1	1							Intertidal near mill	2-1	
2013SC-SB-062	Boring	1386544.5	2915590.5	8.5	2013SC-SB-062-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-062	Boring	1386544.5	2915590.5	8.5	2013SC-SB-062-00	Short Core with Samples	N	1	1	1	1	1	1	1	1	East of Barge Slip	1-4, 2-1, 1-3	
2013SC-SB-062	Boring	1386544.5	2915590.5	8.5	2013SC-SB-062-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-062	Boring	1386544.5	2915590.5	8.5	2013SC-SB-062-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-062	Boring	1386544.5	2915590.5	8.5	2013SC-SB-9062-01	Short Core with Samples	FD	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-063	Boring	1386413.8	2915220	9.1	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-067	Boring	1386479.1	2915544	5.1	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-070	Boring	1386400.3	2915123.5	6.9	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-072	Boring	1386617.3	2915740.75	10.7	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-077	Boring	1386448.3	2915665.75	7.6	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-078	Boring	1386498.5	2915718.25	9.0	2013SC-SB-078-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-078	Boring	1386498.5	2915718.25	9.0	2013SC-SB-078-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-078	Boring	1386498.5	2915718.25	9.0	2013SC-SB-078-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-078	Boring	1386498.5	2915718.25	9.0	2013SC-SB-078-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-079	Boring	1386379.4	2915631.75	3.6	2013SC-SB-079-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-079	Boring	1386379.4	2915631.75	3.6	2013SC-SB-079-00	Short Core with Samples	N	1	1	1	1	1	1	1	1	East of Barge Slip	1-4, 2-1	
2013SC-SB-079	Boring	1386379.4	2915631.75	3.6	2013SC-SB-079-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-079	Boring	1386379.4	2915631.75	3.6	2013SC-SB-079-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	

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Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-082	Boring	1386540.1	2915845.25	9.4	2013SC-SB-082-0.5	Short Core with Samples	N	1	1							East of Barge Slip	2-1	
2013SC-SB-082	Boring	1386540.1	2915845.25	9.4	2013SC-SB-082-00	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-082	Boring	1386540.1	2915845.25	9.4	2013SC-SB-082-01	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-082	Boring	1386540.1	2915845.25	9.4	2013SC-SB-082-02	Short Core with Samples	N	1	1		1	1	1	1	1	East of Barge Slip	1-3, 2-1	
2013SC-SB-082	Boring	1386540.1	2915845.25	9.4	2013SC-SB-9082-01	Short Core with Samples	FD	1	1			1				East of Barge Slip	1-3, 2-1	
2013SC-SB-083	Boring	1386446.5	2915799.25	7.3	No samples	Short Core only	NA									Intertidal south of mill	2-1	
2013SC-SB-087	Boring	1386300.4	2915698.25	4.1	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-089	Boring	1386330	2915770.75	6.3	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-093	Boring	1386345	2915833.75	6.3	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-095	Boring	1386431.8	2915909	8.5	No samples	Short Core only	NA									East of Barge Slip	2-1	
2013SC-SB-109	Boring	1385946.8	2915953.25	NA	2013SC-SB-109-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-109	Boring	1385946.8	2915953.25	NA	2013SC-SB-109-00	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-109	Boring	1385946.8	2915953.25	NA	2013SC-SB-109-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-109	Boring	1385946.8	2915953.25	NA	2013SC-SB-109-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-109	Boring	1385946.8	2915953.25	NA	2013SC-SB-9109-01	Short Core with Samples	FD	1	1							Area D	2-1	
2013SC-SB-110	Boring	1386024	2916157	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-111	Boring	1386067.1	2916215.5	NA	2013SC-SB-111-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-111	Boring	1386067.1	2916215.5	NA	2013SC-SB-111-00	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-111	Boring	1386067.1	2916215.5	NA	2013SC-SB-111-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-111	Boring	1386067.1	2916215.5	NA	2013SC-SB-111-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-112	Boring	1386111.8	2916308.75	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-114	Boring	1385545.8	2915410.25	NA	No samples	Short Core only	NA									Pennisula	2-2	
2013SC-SB-115	Boring	1385866.6	2916168.5	NA	2013SC-SB-115-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-115	Boring	1385866.6	2916168.5	NA	2013SC-SB-115-00	Short Core with Samples	N	1	1	1			1	1	1	Area D	1-4, 2-1	
2013SC-SB-115	Boring	1385866.6	2916168.5	NA	2013SC-SB-115-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-115	Boring	1385866.6	2916168.5	NA	2013SC-SB-115-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-115	Boring	1385866.6	2916168.5	NA	2013SC-SB-9115-00	Short Core with Samples	FD	1	1	1			1	1	1	Area D	1-4, 2-1	
2013SC-SB-116	Boring	1386185.8	2916455.25	NA	No samples	Short Core only	NA									Area D	2-2	
2013SC-SB-117	Boring	1385571.8	2915713.25	NA	No samples	Short Core only	NA									Pennisula	2-1	
2013SC-SB-118	Boring	1385900.6	2916267.75	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-119	Boring	1386083.6	2916428.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-120	Boring	1385504.5	2915575.75	NA	2013SC-SB-120-0.5	Short Core with Samples	N	1	1							Pennisula	2-2	
2013SC-SB-120	Boring	1385504.5	2915575.75	NA	2013SC-SB-120-00	Short Core with Samples	N	1	1				1	1	1	Pennisula	2-2	
2013SC-SB-120	Boring	1385504.5	2915575.75	NA	2013SC-SB-120-01	Short Core with Samples	N	1	1							Pennisula	2-2	
2013SC-SB-120	Boring	1385504.5	2915575.75	NA	2013SC-SB-120-02	Short Core with Samples	N	1	1							Pennisula	2-2	
2013SC-SB-120	Boring	1385504.5	2915575.75	NA	2013SC-SB-9120-00	Short Core with Samples	FD	1	1							Pennisula	2-2	
2013SC-SB-121	Boring	1386172.6	2916569.75	NA	2013SC-SB-121-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-121	Boring	1386172.6	2916569.75	NA	2013SC-SB-121-00	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-121	Boring	1386172.6	2916569.75	NA	2013SC-SB-121-01	Short Core with Samples	N	1	1							Area D	2-1	

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Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-121	Boring	1386172.6	2916569.75	NA	2013SC-SB-121-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-122	Boring	1385954	2916384	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-123	Boring	1385988.3	2916480.25	NA	2013SC-SB-123-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-123	Boring	1385988.3	2916480.25	NA	2013SC-SB-123-00	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-123	Boring	1385988.3	2916480.25	NA	2013SC-SB-123-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-123	Boring	1385988.3	2916480.25	NA	2013SC-SB-123-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-123	Boring	1385988.3	2916480.25	NA	2013SC-SB-9123-00	Short Core with Samples	FD	1	1							Area D	2-1	
2013SC-SB-124	Boring	1385741.3	2916313	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-125	Boring	1386038.1	2916580.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-126	Boring	1386096.5	2916638.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-127	Boring	1385800.9	2916421	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-128	Boring	1385856.9	2916526	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-129	Boring	1385908.8	2916616.25	NA	2013SC-SB-129-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-129	Boring	1385908.8	2916616.25	NA	2013SC-SB-129-00	Short Core with Samples	N	1	1	1			1	1	1	Area D	1-4, 2-1	
2013SC-SB-129	Boring	1385908.8	2916616.25	NA	2013SC-SB-129-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-129	Boring	1385908.8	2916616.25	NA	2013SC-SB-129-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-129	Boring	1385908.8	2916616.25	NA	2013SC-SB-9129-00	Short Core with Samples	FD	1	1				1	1	1	Area D	1-4, 2-1	
2013SC-SB-131	Boring	1385960.4	2916738.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-132	Boring	1385656.6	2916522.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-133	Boring	1385721	2916644.5	NA	2013SC-SB-133-0.5	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-133	Boring	1385721	2916644.5	NA	2013SC-SB-133-00	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-133	Boring	1385721	2916644.5	NA	2013SC-SB-133-01	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-133	Boring	1385721	2916644.5	NA	2013SC-SB-133-02	Short Core with Samples	N	1	1							Area D	2-1	
2013SC-SB-133	Boring	1385721	2916644.5	NA	2013SC-SB-9133-01	Short Core with Samples	FD	1	1							Area D	2-1	
2013SC-SB-134	Boring	1385772.3	2916737.25	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-135	Boring	1385831.8	2916825.25	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-136	Boring	1385625.6	2916782.5	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-137	Boring	1385712.6	2916941.75	NA	No samples	Short Core only	NA									Area D	2-1	
2013SC-SB-154	Boring	1386502.3	2915438.75	5.0	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-155	Boring	1386372	2915512.75	4.3	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-156	Boring	1386241.9	2915586.75	3.3	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-157	Boring	1386111.6	2915660.5	4.1	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-158	Boring	1386040.5	2915535.5	2.7	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-159	Boring	1385969.5	2915410.5	3.1	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-160	Boring	1386099.8	2915336.5	4.4	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-161	Boring	1386230	2915262.5	6.2	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-162	Boring	1386301	2915387.5	6.2	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-163	Boring	1386170.8	2915461.5	4.2	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-164	Boring	1386431.3	2915313.75	8.9	No samples	Short Core only	NA									Intertdal south of mill	2-1	

Table B-5
Tailing Borings and Sample Information
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-165	Boring	1386360.3	2915188.5	8.6	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-166	Boring	1386062.9	2915149	4.4	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-167	Boring	1386048.5	2915246.25	4.1	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-168	Boring	1386186.8	2915186.5	6.2	No samples	Short Core only	NA									Intertdal south of mill	2-1	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-00	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-9172-00	Direct Push Upland Core with Samples	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-01	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-02	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-03	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-04	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-05	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-06	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-07	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-08	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-09	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-10	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-11	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-12	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-13	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-172	Boring	1386841.4	2914907	14.3	2013SC-SB-172-14	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-00	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-01	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-9173-01	Direct Push Upland Core with Samples	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-02	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-03	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-04	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-05	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-06	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-07	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-08	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-09	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-10	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-11	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-12	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-13	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-173	Boring	1386941.4	2914943	16.0	2013SC-SB-173-14	Direct Push Upland Core with Samples	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-176	Boring	TBD	TBD	NA	2013SC-SB-176-00	Hand dug	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-176	Boring	TBD	TBD	NA	2013SC-SB-9176-00	Hand dug	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-177	Boring	TBD	TBD	NA	2013SC-SB-177-00	Hand dug	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-178	Boring	TBD	TBD	NA	2013SC-SB-178-00	Hand dug	N	1	1							Tailings Pile near Unnamed Stream	2-3	

Table B-5
Tailing Borings and Sample Information
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	TAL Metals[a] except Hg	Hg	Cr VI	Modified SPLP metals[b]	TCL PAHs	TOC	Grain Size	Bulk Density	Location	Problem Statements	Rationale
2013SC-SB-178	Boring	TBD	TBD	NA	2013SC-SB-917-00	Hand dug	FD	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-179	Boring	TBD	TBD	NA	2013SC-SB-179-00	Hand dug	N	1	1							Tailings Pile near Unnamed Stream	2-3	
2013SC-SB-180	Boring	TBD	TBD	NA	2013SC-SB-180-00	Hand dug	N	1	1							Tailings Pile near Unnamed Stream	2-3	
							Total	**206**	**206**	**10**	**36**	**36**	**42**	**42**	**42**			

[a] TAL metals to include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc
[b] PAHs include 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene

MS/MSD location

Table B-6
Groundwater Sample Information
Salt Chuck Mine, Alaska

Location Type	Well Number	Sample ID	Sample Type	Total TAL Metals[a] except Hg	Dissolved TAL Metals[a] except Hg	Total Hg	Dissolved Hg	DRO/RRO	TCL PAHs[b]	Location	Problem Statement	Rationale
Groundwater	GW-01	2013SC-GW-01	N	1	1	1	1	1	1	Former mill	1-2, 1-6	Better characterize groundwater contamination and assess potential impacts to porewater and surface water
Groundwater	GW-01	2013SC-GW-901	FD	1	1	1	1	1	1			
Groundwater	GW-02	2013SC-GW-02	N	1	1	1	1	1	1			
Groundwater	GW-03	2013SC-GW-03	N	1	1	1	1	1	1			
Groundwater	GW-04	2013SC-GW-04	N	1	1	1	1	1	1			
Groundwater	GW-05r	2013SC-GW-05	N	1	1	1	1	1	1			
Groundwater	GW-06	2013SC-GW-06	N	1	1	1	1	1	1			
Groundwater	GW-07	2013SC-GW-07	N	1	1	1	1	1	1			
Groundwater	GW-08	2013SC-GW-08	N	1	1	1	1	1	1			

[a] Metals include **aluminum**, antimony, arsenic, barium, beryllium, cadmium, cobalt, chromium (total), copper, **iron**, lead, **manganese**, magnesium, nickel, selenium, silver, thallium, vanadium, zinc

DRO/RRO = Diesel range organics/residual range organics

[b] PAHs include 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene

MS/MSD location

Table B-7
Agronomic Samples
Salt Chuck Mine, Alaska

Location ID	LocationType	Northing	Easting	Elevation	Sample ID	Boring Type	Sample Type	S10C, complete with recommendations [a, b]	Soil Texture (% sand, % silt, % clay)	Nitrogen, Ammonia	Problem Statements	Rationale
2013SC-SS-181	Agronomic	TBD	TBD	TBD	2013SC-SS-176	Surface sed	N	1	1	1	2-4	Evaluate remedial alternatives
2013SC-SS-182	Agronomic	TBD	TBD	TBD	2013SC-SS-177	Surface sed	N	1	1	1	2-4	
2013SC-SS-183	Agronomic	TBD	TBD	TBD	2013SC-SS-178	Surface sed	N	1	1	1	2-4	
2013SC-SS-184	Agronomic	TBD	TBD	TBD	2013SC-SS-179	Surface sed	N	1	1	1	2-4	
2013SC-SS-185	Agronomic	TBD	TBD	TBD	2013SC-SS-180	Surface sed	N	1	1	1	2-4	
2013SC-SS-186	Agronomic	TBD	TBD	TBD	2013SC-SS-181	Surface sed	N	1	1	1	2-4	
2013SC-SS-187	Agronomic	TBD	TBD	TBD	2013SC-SS-182	Surface sed	N	1	1	1	2-4	
2013SC-SS-188	Agronomic	TBD	TBD	TBD	2013SC-SS-183	Surface sed	N	1	1	1	2-4	
2013SC-SS-189	Agronomic	TBD	TBD	TBD	2013SC-SS-184	Surface sed	N	1	1	1	2-4	
2013SC-SS-190	Agronomic	TBD	TBD	TBD	2013SC-SS-185	Surface sed	N	1	1	1	2-4	

a = S3C (Complete Analysis): Organic Matter, Estimated Nitrogen Release, Phosphorus (Weak Bray and Sodium Bicarbonate-P), Extractable Cations (Potassium. Magnesium, Calcium, Sodium), Hydrogen, Sulfate-S, pH, Cation Exchange Capacity and percent cation saturation (computed), Soluble Salts and Excess Lime, Nitrate-Nitrogen
b = S10 (Soil Salinity Package): Saturation Percentage, Soluble Salts, Sodium, Calcium, Magnesium, Chloride, Boron, Carbonate, Bicarbonate, pH, SAR and ESP

Table B-8
Sample Volume, Containers, Preservatives, and Holding Times
Salt Chuck Mine, AlaskaSalt Chuck Mine, Alaska

Media	Analyses[a]	Method	Minimum Sample Volume[b]	Container	Preservative	Maximum Holding Time
Sediment and Tailings	Total TAL Metals (except Hg)	6010/6020 or CLP	8 oz	8 oz wide mouth Glass Teflon lined cap	Cool, 4°C	180 days
	Total Hg	7471A or CLP				28 days
	Cr(VI)	7196	8 oz	8 oz wide mouth Glass Teflon lined cap		30 days until extraction; 4 days after extraction
	TCL PAHs	8270-SIM or CLP	8 oz	8 oz wide mouth Glass Teflon lined cap		14 days until extraction; 40 days after extraction
	Modified SPLP Metals (all metals listed above except Cr VI)	SW1312 for extraction, 6010/6020 or CLP for dissolved TAL metals and 7470A or CLP for dissolved Hg	8 oz	8 oz wide mouth Glass Teflon lined cap		28 days until extraction; 180 days after extraction
	AVS/SEM metals (cadmium, copper, nickel, lead, zinc)	PSEP	4 oz	4 oz wide mouth Glass Teflon lined cap	Cool, 4°C, no head space	14 days
	Bioassay (polychaete and bivalve)	Screening: ASTM E-1611/PSEP (polychaete), and EPA-823-B-004 (bivalve)	1 gallon	1 gallon wide mouth Polyethylene	Cool, 4°C	8 weeks
	Percent Solids[c]	c	c	c		c
	TOC	PSEP	2 oz	2 oz wide mouth Glass Teflon lined cap		28 days
	Grain Size	ASTM D422	2/3 of a gallon	1 gallon ziploc, fill 2/3 full	NA	No limit
	Bulk Density	ASTM D6683	2/3 of a gallon	1 gallon ziploc, fill 2/3 full	NA	No limit
	S10C, complete with recommendations [d,e]	Western States Proficiency Testing	NA	Two (2) 8-ounce glass, wide-mouth, w/Teflon lid	NA	NA
	Soil Texture (%sand, % silt, % clay)	Western States Proficiency Testing	NA	8-ounce glass, wide-mouth, w/Teflon lid	NA	NA
	Nitrogen, Ammonia	Western States Proficiency Testing	NA	8-ounce glass, wide-mouth, w/Teflon lid	NA	NA
Marine Surface Water	Dissolved TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO3 to pH < 2	180 days
	Dissolved Hg	7470A or CLP				28 days
	Total TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO3 to pH < 2	180 days
	Total Hg	7470A or CLP				28 days
	TCL PAHs (include calculation of total aqueous hydrocarbons)	8270-SIM or CLP	2 L	2 x 1000 ml NM amber Glass Teflon lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Porewater	Dissolved TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO3 to pH < 2	180 days
	Dissolved Hg	7470A or CLP				28 days
	TCL PAHs	8270-SIM or CLP	2 L	2 x 1000 ml NM amber Glass Teflon lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Biota (Crab or Shrimp)	TAL Metals (except Hg)	6010/6020 or CLP	100 g	4 oz wide mouth Glass Teflon lined cap	Freeze, -7°C to -15°C	1 year if frozen
	Methylmercury	1630 mod				
	Hg	7000 series or CLP				
	Arsenic Speciation	3100 for extraction, 6870 for analysis				
Groundwater	Total TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO_3 to pH < 2	180 days
	Total Hg	7470A or CLP				28 days
	Dissolved TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene		180 days
	Dissolved Hg	7470A or CLP				28 days
	DRO	AK-102	2 L	2 x 1000 ml NM amber Glass Teflon lined cap	Cool, 4°C, HCl to pH < 2	14 days until extraction; 40 days after extraction
	RRO	AK-103				

Table B-8
Sample Volume, Containers, Preservatives, and Holding Times
Salt Chuck Mine, AlaskaSalt Chuck Mine, Alaska

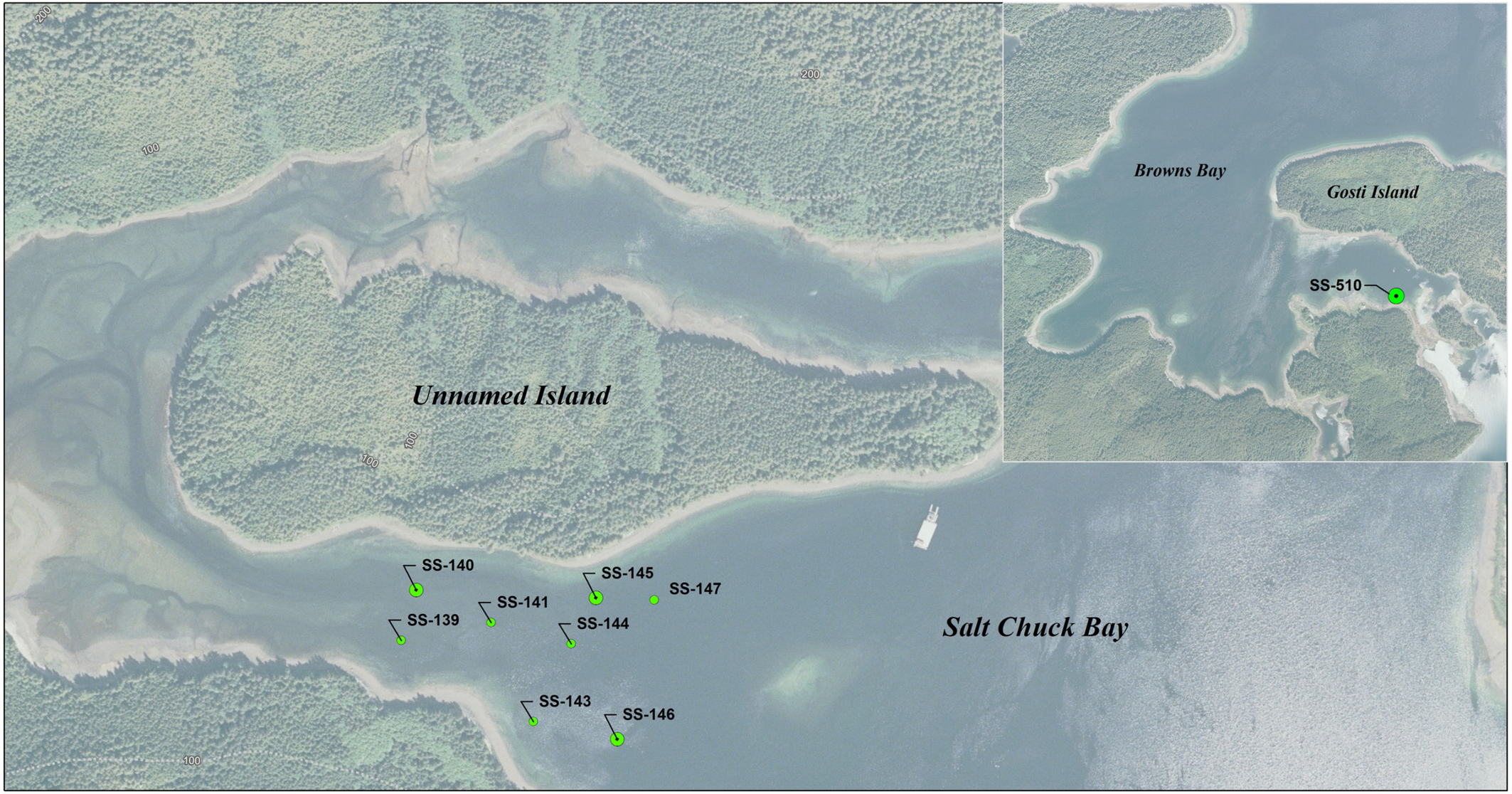
Media	Analyses[a]	Method	Minimum Sample Volume[b]	Container	Preservative	Maximum Holding Time
	TCL PAHs	8270-SIM or CLP	2 L	2 x 1000 ml NM amber Glass Teflon lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Site Water (for modified SPLP)	Total TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO_3 to pH < 2	180 days
	Total Hg	7470A or CLP				28 days
Filter Blank	TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO_3 to pH < 2	180 days
	Hg	7470A or CLP				28 days
Equipment Blank	Total TAL Metals (except Hg)	6010/6020 or CLP	1 L	1 L Polyethylene	Cool, 4°C, HNO_3 to pH < 2	180 days
	Total Hg	7470A or CLP				28 days
	TCL PAHs	8270-SIM or CLP	2 L	2 x 1000 ml NM amber Glass Teflon lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction

NOTE:

a = see Table 2-1 of QAPP for detailed list of analytes
b = sample volume indicated is for a normal sample only, it does not include field duplicate, MS, or MSD sample volume. Sample volume for the field duplicate, MS, or MSD sample is the same as the normal sample collected from the corresponding sample location. Refer to Tables B-1 through B-7 for samples with MS, MSD, or field duplicate sample and adjust sample volume accordingly for locations with MS, MSD, and/or field duplicate samples.
c = will be conducted with TAL metals analysis
d = S3C (Complete Analysis): Organic Matter, Estimated Nitrogen Release, Phosphorus (Weak Bray and Sodium Bicarbonate-P), Extractable Cations (Potassium. Magnesium, Calcium, Sodium), Hydrogen, Sulfate-S, pH, Cation Exchange Capacity and percent cation saturation (computed), Soluble Salts and Excess Lime, Nitrate-Nitrogen
e = S10 (Soil Salinity Package): Saturation Percentage, Soluble Salts, Sodium, Calcium, Magnesium, Chloride, Boron, Carbonate, Bicarbonate, pH, SAR and ESP

°C = degree Celsius
ASTM = American Society for testing and materials
AVS/SEM = acid volatile sulfide and simultaneously extracted metals
CLP = Contract Laboratory Program
DRO = diesel range organics
EPA = U.S. Environmental Protection Agency
HCl = hydrochloric acid
Hg = mercury
HNO_3 = nitric acid
L = liter
mL = milliliter
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
NM = narrow mouth
oz = ounce
PAHS = polynuclear aromatic hydrocarbons
PSEP = Puget Sound Estuary Program
RRO = residual range organics
SPLP = synthetic precipitate leaching procedure
TAL = target analyte list
TCL = target compound list
TOC = total organic carbon

Figures



Surface Sediment Sample Location
Surface Sediment Sample Location with Bioassay
100-foot Contour Line (TNF)

N

0 375 750 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Stream, with modifications based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest

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Figure B-1
Proposed 2013 Thalweg and Background Sediment Sample Locations
Salt Chuck Mine, Alaska

EPA

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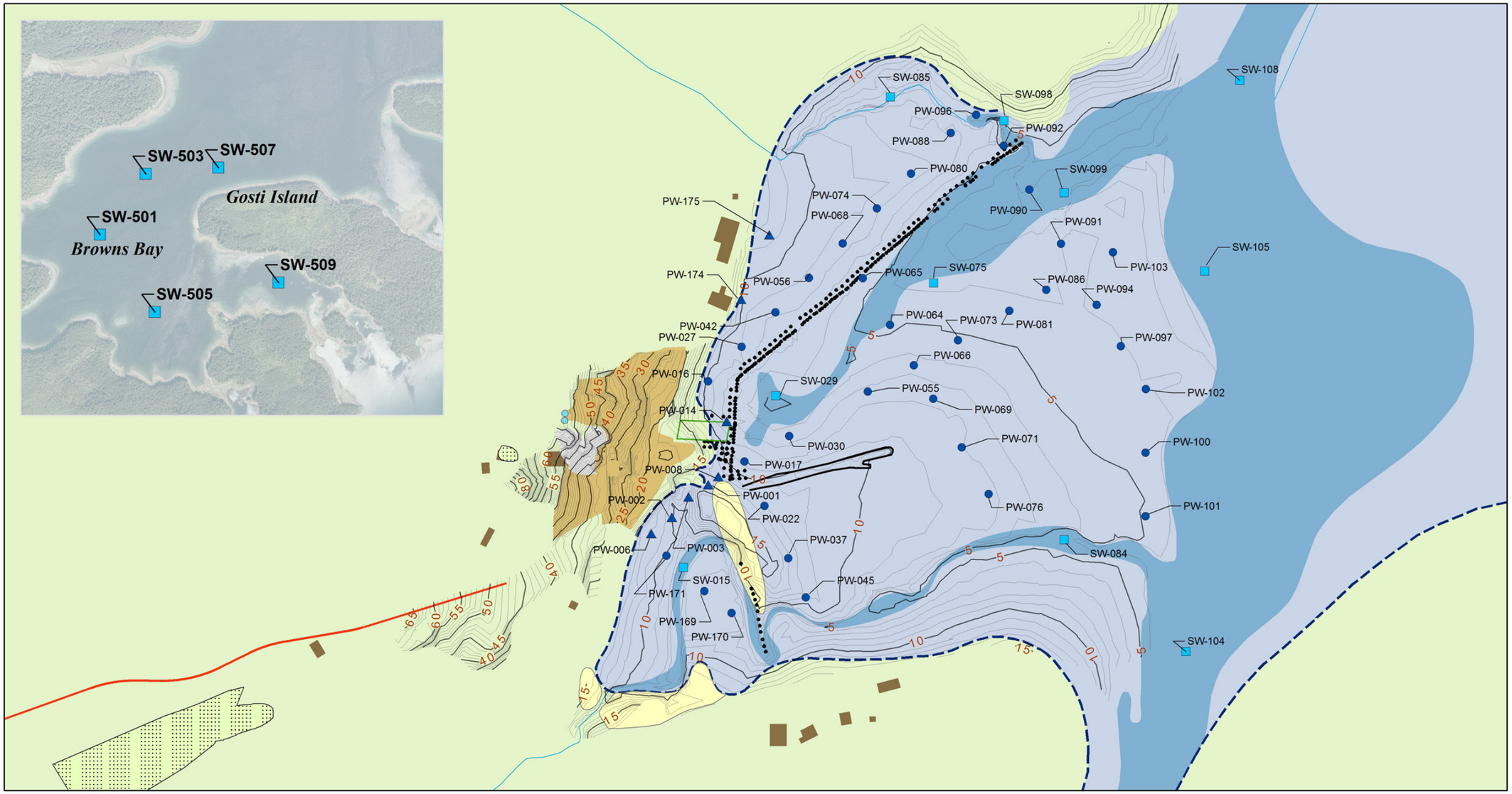

- Porewater
- Surface Water
- Drive-Point Porewater
- Major Elevation Contour (feet NAVD88)
- Minor Elevation Contour (feet NAVD88)
- Approximate Shoreline(Mean High Tide)
- SEAK Hydro
- Access Road
- Rock Jetty
- Barge
- Piling Structure
- Former Above Ground Storage Tanks
- Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
- Building
- Water Course
- Intertidal Area
- Rock Out Crop
- Waste Rock Pile
- Tailings

N

0 200 400 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

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Figure B-2
Proposed 2013 Surface Water and Porewater Sample Locations
Salt Chuck Mine, Alaska

EPA

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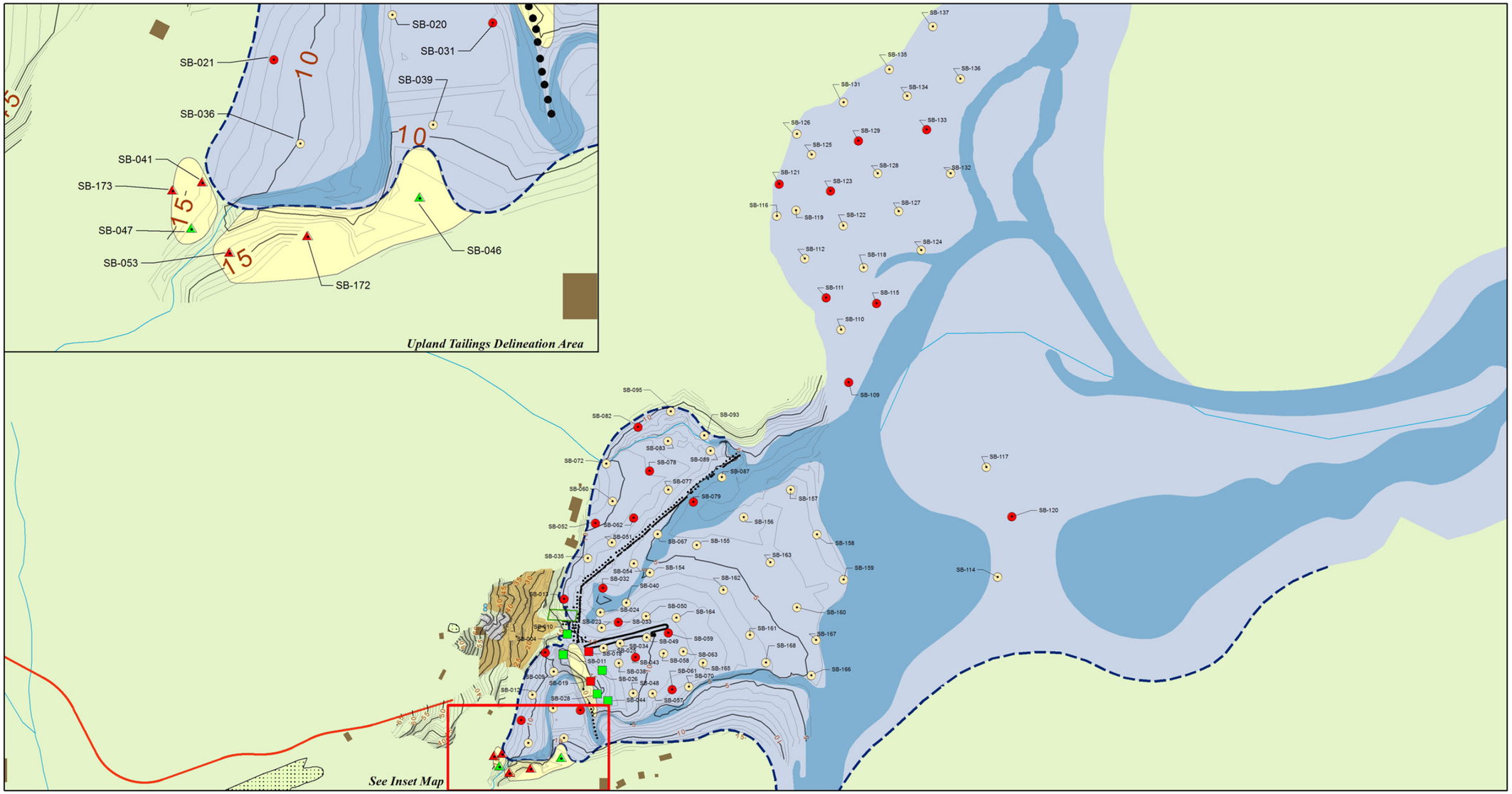

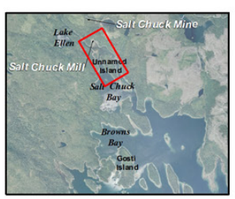

- Short Core Intertidal Tailings Location Thickness
- Direct Push Intertidal Tailings Location Thickness
- Direct Push Upland Tailings Location Thickness
- Short Core Intertidal Location Thickness and Samples
- Direct Push Intertidal Tailings Location Thickness and Samples
- Direct Push Upland Tailings Location Thickness and Samples

- Major Elevation Contour (feet NAVD88)
- Minor Elevation Contour (feet NAVD88)
- Approximate Shoreline(Mean High Tide)
- SEAK Hydro
- Access Road
- Rock Jetty
- Barge
- Piling Structure
- Former Above Ground Storage Tanks

- Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
- Building
- Water Course
- Intertidal Area
- Rock Out Crop
- Waste Rock Pile
- Tailings

N

0 200 400 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

DRAFT

Figure B-3
Proposed 2013
Tailings Thickness and
Core Sample Locations
Salt Chuck Mine, Alaska

EPA

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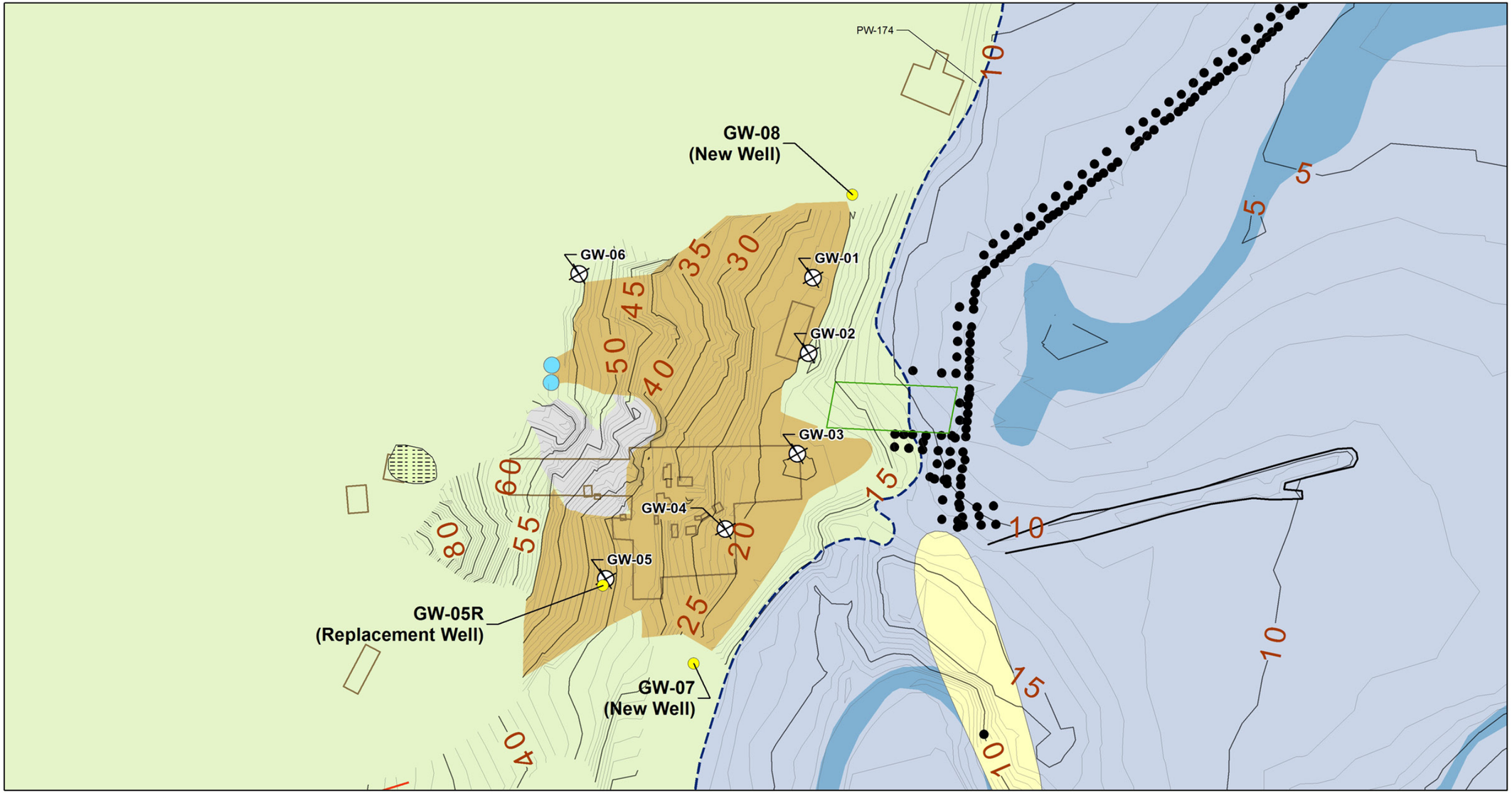

Proposed New or Replacement Monitoring Well
Existing Monitoring Well
Major Elevation Contour (feet NAVD88)
Minor Elevation Contour (feet NAVD88)
Access Road
Rock Jetty
Barge
SEAK Hydro
Approximate Shoreline(Mean High Tide)
Piling Structure
Former Above Ground Storage Tanks
Waste Rock Pile
Tailings
Water Course
Intertidal Area
Building
Tailings and Contaminated Soil Removal Area (Backfilled and Covered)
Rock Out Crop

N

0 100 200 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Train, Stream, Trenched Water, with modification based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4) GPS coordinates adjusted based on best available data for the site

DRAFT

Figure B-4
Proposed 2013 Groundwater Sample Locations
Salt Chuck Mine, Alaska

EPA

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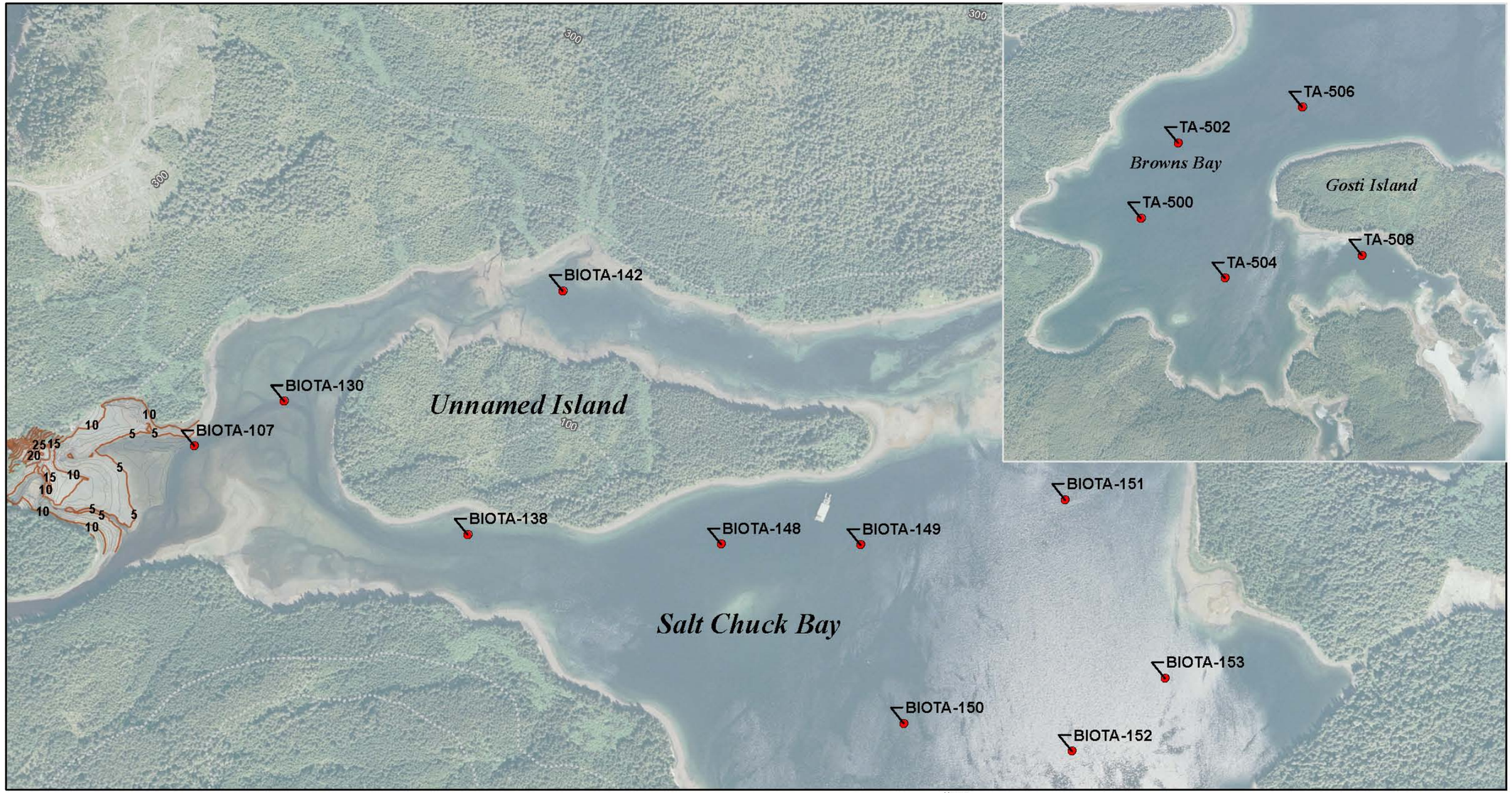

- Biota (Crab and Shrimp) Locations
- Major Elevation Contour (feet NGVD 88)
- Minor Elevation Contour (feet NGVD 88)
- 100-foot Contour Line (TNF)

0 375 750 Feet

Notes:
(1) Aerial photography courtesy US Census Bureau; approximate date 2006. NAD83, UTM Zone 8N, Meters. Pixel size 1 meter.
(2) Source Documents: Figures 2-2 and 2-3, URS, Salt Chuck Mine Report, March 2010. Features: C-Series, D-Series, Mean High Tide, Stream, with modifications based on site observations from 2012 RI investigation.
(3) TNF = Tongass National Forest
(4)1 - foot contours surveyed Febuary 2013.

DRAFT

Figure B-5
Proposed 2013 Biota (Crab and Shrimp) Sample Locations
Salt Chuck Mine, Alaska

EPA

KHEIDEMAN 3/28/2013 7:50:35 PM

Attachment B-1 Field Forms

CH2MHILL

PROJECT NUMBER _____ **CORE NUMBER** _____

SHEET OF

INTERTIDAL TAILING CORE LOG - SHORT CORE

PROJECT : SALT CHUCK REMEDIAL INVESTIGATION LATITUDE: LONGITUDE:

CORIING FIELD TEAM MEMBER: START:

CORING METHOD AND EQUIPMENT USED : END : LOGGER :

					SIZE DISTRIBUTION			TAILING DESCRIPTION SOIL NAME (USCS SYMBOL): COLOR; GRAIN SIZE (COARSE-GRAINED SOIL ONLY); GRADING (COARSE-GRAINED SOIL ONLY); ANGULARITY (COARSE-GRAINED SOIL ONLY); DENSITY (COARSE-GRAINED)/CONSISTENCY (FINE-GRAINED); MOISTURE; PLASTICITY (FINE-GRAINED SOIL ONLY); DILATANCY	COMMENTS (e.g.: ODOR, DEBRIS, SHEEN, BIOLOGICAL ACTIVITY, ETC.)	SAMPLE ID (LOCATION ID + TOP DEPTH)
					%G	%S	%F			
1										
2										
3										
4										
5										

CH2MHILL

PROJECT NUMBER _____ **CORE NUMBER** _____

SHEET OF

INTERTIDAL TAILING CORE LOG - DEEP CORE

PROJECT : SALT CHUCK REMEDIAL INVESTIGATION LATITUDE: LONGITUDE:

CORIING FIELD TEAM MEMBER: START:

CORING METHOD AND EQUIPMENT USED : END : LOGGER :

					SIZE DISTRIBUTION			TAILING DESCRIPTION SOIL NAME (USCS SYMBOL): COLOR; GRAIN SIZE (COARSE-GRAINED SOIL ONLY); GRADING (COARSE-GRAINED SOIL ONLY); ANGULARITY (COARSE-GRAINED SOIL ONLY); DENSITY (COARSE-GRAINED)/CONSISTENCY (FINE-GRAINED); MOISTURE; PLASTICITY (FINE-GRAINED SOIL ONLY); DILATANCY	COMMENTS (e.g.: ODOR, DEBRIS, SHEEN, BIOLOGICAL ACTIVITY, ETC.)	SAMPLE ID (LOCATION ID + TOP DEPTH)
					%G	%S	%F			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

SALT CHUCK MINE RI/FS
SURFACE SEDIMENT COLLECTION FIELD FORM

Project Name: _____ Project Number: _____

Date/Time: _____ Sampler Names: _____

Weather: _____

Location ID _____ Latitude/Longitude: _____/_____

Sample ID _____ GPS Instrument/Accuracy: _____

Sample Equipment Used: _____

Number of Sampling Attempts: _____ Refusal? Yes/No

Water Depth: _____ ft

Sample Depth: _____inches Estimated Tailings Thickness: _____ inches

Sample Description:

Color: _____ Grain Size: _____

Vegetation (describe):_____

Photograph No(s): _____

Sample Analyses: _____

_____

_____

_____

No. of Sample Containers: _____

Comments: _____

_____

_____

Deviations from Sampling Plan: _____

_____

FTL Signature: _____ Date/Time: _____

CH2MHILL

SALT CHUCK MINE RI/FS
SHELLFISH COLLECTION FIELD FORM

Project Number: _____ Sampling Date/Time: _____

Sampler Names and Signatures: _____

Weather: _____

Location ID _____ Latitude/Longitude: _____/_____

Sample ID _____ GPS Instrument/Accuracy: _____

Water Body Name: _____

Site Description: _____

Collection Method: _____

Species Name: _____

Composite Sample ID#: _____ Number of Individuals: _____

Shellfish #	Size (mm) and weight (g)	Shellfish #	Size (mm) and weight (g)	Shellfish #	Size (mm) and weight (g)
001		013		025	
002		014		026	
003		015		027	
004		016		028	
005		017		029	
006		018		030	
007		019		031	
008		020		032	
009		021		033	
010		022		034	
011		023		035	
012		024		036	

Minimum Size/Maximum Size x 100=_____%____ Composite mean size _____mm

Notes: (e.g. morphological anomalies)

Photograph No(s): _____

Sample Analyses: _____

Deviations from Sampling Plan: _____

FTL Signature: _____ Date/Time: _____

CH2MHILL

SALT CHUCK MINE RI/FS
POREWATER COLLECTION FIELD FORM

Project Name: _____ Project Number: _____

Date/Time: _____ Sampler Names: _____

Weather: _____

Location ID _____ Latitude/Longitude: _____/_____

Sample ID _____ GPS Instrument/Accuracy: _____

Sample Equipment Used: _____

Airstone Installation Method and Date: _____

Airstone Depth: _____inches

Sediment Characteristics (color, grain size): _____

Vegetation (describe): _____

Photograph No(s): _____

Number of Sampling Attempts: _____

Porewater Sample Description: _____

Sample Analyses: _____

_____

_____

No. of Sample Containers: _____

Field Parameters (if time/volume allow) : Conductivity _____ pH _____

Temp. _____ Salinity _____

DO _____ Turbidity _____

Comments: _____

_____

Deviations from Sampling Plan: _____

_____

FTL Signature: _____ Date/Time: _____

SALT CHUCK MINE RI/FS
SURFACE WATER COLLECTION FIELD FORM

Project Name: _____ Project Number: _____

Date/Time: _____ Sampler Names: _____

Weather: _____

Location ID _____ Latitude/Longitude: _____/_____

Sample ID _____ GPS Instrument/Accuracy: _____

Sample Equipment Used: _____

Tidal Condition: _____

Water Depth: _____ ft

Photograph No(s): _____

Surface Water Sample Description: _____

Sample Analyses: _____

_____

_____

No. of Sample Containers: _____

Field Parameters : Conductivity _____ pH _____

Temp. _____ Salinity _____

DO _____ Turbidity _____

Comments: _____

_____

_____

Deviations from Sampling Plan: _____

_____

_____

FTL Signature: _____ Date/Time: _____

SALT CHUCK MINE RI/FS
GROUNDWATER COLLECTION FIELD FORM

Project Name: _____ Project Number: _____

Date/Time: _____ Sampler Names: _____

Weather: _____

Well ID _____ Sample ID _____

Sample Equipment Used: _____

Tidal Condition: _____

Depth to Groundwater: _____ ft Casing Diameter: _____ inches

Total Depth: _____ ft Casing Volume: _____ gallons

Water Column: _____ ft Screen Interval: _____ to _____ ft

Flow Rate: _____ gpm Pump Time: _____ min

Well Goes Dry? Yes/No If yes, how many attempts to purge and sample?_____

Field Parameters:

Round	Time	Volume Purged	pH	Cond	Turbidity	DO	Temp.	ORP
1								
2								
3								
4								
5								

Criteria for stable parameters: pH ± 0.1; Cond. ± 3%; Turbidity ± 10% (≤10 NTU); DO ± 10%; Temp. ± 1.0 °C; ORP ± 10 mV

Sample Appearance and Odor: _____

Sample Analyses: _____

_____

_____

No. of Sample Containers: _____

Photograph No(s): _____

Deviations from Sampling Plan: _____

_____

FTL Signature: _____ Date/Time: _____

CH2MHILL

PROJECT NUMBER	DATE SHEET 1 OF

PHOTOGRAPH LOG

PROJECT: Salt Chuck Remedial Investigation **LOCATION:**

PHOTO NO.	SCENE DESCRIPTION

Cooler Checklist (Initial Shipment)
SALT CHUCK MINE RI/FS

COOLER	DATE SHIPPED	COC# (Include both Inorganic and Organic)	Sample ID & Date/Time Match Field Forms?	Samples Logged into Scribe (Include Trip Blank & CLP ID Not Duplicated for Diff Sample IDs)?	QC COC Against Labels (100% QC by non-Scribe Person, Write Down Sample ID on COC, Analyses Match Lab)?	Sample ID Written on COC Matched Scribe, Addressed COC Comments, & Reprinted COC?	COC (Signed, Inside Bag Zipped & Taped to Cooler?)	Double Lined w/ Contractor Bags?	Bubble Wrapped & in Ziploc Bags?	Iced?	Temp Blank?	Notes	Signed and Date Custody Seals (Both Inside and Outside Cooler)?	Airbill
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														

Cooler Checklist (Initial Shipment)
SALT CHUCK MINE RI/FS

COOLER	DATE SHIPPED	COC# (Include both Inorganic and Organic)	Sample ID & Date/Time Match Field Forms?	Samples Logged into Scribe (Include Trip Blank & CLP ID Not Duplicated for Diff Sample IDs)?	QC COC Against Labels (100% QC by non-Scribe Person, Write Down Sample ID on COC, Analyses Match Lab)?	Sample ID Written on COC Matched Scribe, Addressed COC Comments, & Reprinted COC?	COC (Signed, Inside Bag Zipped & Taped to Cooler?)	Double Lined w/ Contractor Bags?	Bubble Wrapped & in Ziploc Bags?	Iced?	Temp Blank?	Notes	Signed and Date Custody Seals (Both Inside and Outside Cooler)?	Airbill
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														

Cooler Checklist (Re-shipping)
SALT CHUCK MINE RI/FS

COOLER	DATE SHIPPED	COC# (Include both Inorganic and Organic)	CLP ID Match COC (Check 2 Random Samples)?	Double Lined w/ Contractor Bags?	Bubble Wrapped & in Ziploc Bags?	Iced?	Temp Blank?	Notes	Signed and Date Custody Seals (Both Inside and Outside Cooler)?	Airbill (Address Match Lab on COC?)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										

Cooler Checklist (Re-shipping)
SALT CHUCK MINE RI/FS

COOLER	DATE SHIPPED	COC# (Include both Inorganic and Organic)	CLP ID Match COC (Check 2 Random Samples)?	Double Lined w/ Contractor Bags?	Bubble Wrapped & in Ziploc Bags?	Iced?	Temp Blank?	Notes	Signed and Date Custody Seals (Both Inside and Outside Cooler)?	Airbill (Address Match Lab on COC?)
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										

Scribe Sample Tracking Sheet

Salt Chuck Mine 2013 Remedial Investigation

Page Number: _____ of _____

	SAMPLE ID	DATE	TIME	MATRIX*	COLLECTION	DEPTH	SAMPLE CODE	TOTAL # OF CONTAINERS	ANALYSIS	MS/MSD**	FIELD DUP	FILTER BLANK	EQUIPMENT BLANK	COMMENTS/DEVIATIONS FROM QAPP***
EXAMPLE 1	SCSD-302	8/1/12	08:00	SED	GRAB	0-0.5	1	10	TAL METALS except Hg	Y	N	N	N	MS/MSD for bioassay samples only
EXAMPLE 2	SCTL-501-1-1.5	7/29/12	14:45	TAILING	DISCRETE	1-1.5	8	4	Hg	N	N	N	N	NONE
EXAMPLE 3	SCFB-2	8/2/12	15:30	WATER	GRAB	NA	NA	8	TCL PAHs	N	N	Y	N	NONE
1														
GPS Coordinates:														
2														
GPS Coordinates:														
3														
GPS Coordinates:														
4														
GPS Coordinates:														
5														
GPS Coordinates:														
6														
GPS Coordinates:														
7														
GPS Coordinates:														
8														
GPS Coordinates:														
9														
GPS Coordinates:														
10														
GPS Coordinates:														

NOTE: *SED = sediment or intertidal tailing; BIVALVES = bivalve tissue; VEG = vegetation; WATER = water; SOIL = soil; TAILING = upland tailing; WR = waste rock; GW = groundwater
**MS and MSD for organic analyses, MS and QC duplicate for inorganic analyses (except grain size), and QC duplicate for grain size analyses

***In the event limited bivalve tissue sample volume is available, samples will be tested for only selected analyses in the following order of priority from most to least importance: 1) TAL metals (except Hg), 2) Hg, 3) TCL PAHs, and 4) Percent Lipids
NA = not applicable

Appendix C
Health and Safety Plan

The HSP is submitted separately in conjunction with the QAPP