SAMPLING AND ANALYSIS PLAN

SOIL CHARACTERIZATION
FOR
ALASKA GASTINEAU MINE TAILINGS IN THANE, ALASKA
CS FILE NUMBER: 1513.38.013

MARCH 14, 2013

Prepared For:

AJT Mining Properties, Inc.
5601 Tonsgard Court
Juneau, AK 99801

Prepared By:

NORTECH

Environmental Engineering & Industrial Hygiene Consultants

2400 College Road
Fairbanks, Alaska 99709
p. 907.452.5688
f. 907.452.5694

3105 Lakeshore Dr, Suite 106A
Anchorage, Alaska 99517
p. 907.222.2445
f. 907.222.0915

Managing Office:
5438 Shaune Dr. Ste. B
Juneau, Alaska 99801
p: 907.586.6813
f: 907.586.6819

www.nortechengr.com

NORTECH

ENVIRONMENTAL ENGINEERING, HEALTH & SAFETY
Anch: 3105 Lakeshore Dr. Ste 106A, 99517 907.222.2445 Fax: 222.0915
Fairbanks: 2400 College Road, 99709 907.452.5688 Fax: 452.5694
Juneau: 5438 Shaune Dr. Ste. B, 99801 907.586.6813 Fax: 586.6819
info@nortechengr.com www.nortechengr.com

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF ACRONYMS

ADEC – Alaska Department of Environmental Conservation
AJT
ATS – Alaska Tideland Survey
CBJ – City and Borough of Juneau
COC – contaminant(s) of concern
Cy – cubic yards
EPA
FSG – Alaska Department of Environmental Conservation Draft Field Sampling Guidance Document dated May, 2010
Ft – feet or foot
Ft bgs – feet below ground surface
g - grams
MI – multi incremental
NORTECH – ***NORTECH*** Environment, Energy, Health & Safety Consultants
QP – qualified persons
SAP – sampling and analysis plan
SGS – SGS Environmental Services
Sq ft – square foot or square feet

1.0 INTRODUCTION

NORTECH Environmental Engineering and Industrial Hygiene (***NORTECH***) has been retained by the AJT Mining Properties Inc., (AJT) to complete site characterization activities at the area referred to as Alaska Gastineau Mine Tailings, the Sheep Creek Mine Portal, and the former Nowell Mine locations (the Site); all located in Thane, Alaska. The Site is located in the Sheep Creek Valley and borders the eastern side of the Gasteneau Channel.

The Environmental Protection Agency (EPA) directed a file review and a Site assessment in 1988 to evaluate the Site's status within the Agency's Uncontrolled Hazardous Waste Site Program. The results of that assessment are found in Environment and Ecology's (E&E) May 1988 report, *Site Inspection Report for Thane Mine Dump Site, Juneau Alaska* . The Site, EPA identification number AKD981767320, is currently listed as non-NPL status: State-Lead Cleanup with Eligible Response Site (ERS) Exclusion in the EPA Superfund Site Information database; the Alaska Department of Environmental Conservation Contaminated (ADEC) database currently lists the Site as low priority.

AJT and ***NORTECH*** are undertaking this activity to further characterize the concentrations of the RCRA 8 metals found in soils at the Site using multi-incremental sampling methods. This assessment will re-confirm the previous assessment's findings that lead and arsenic are the only metals present on the Site above ADEC standards but within naturally occurring background concentrations. The ultimate goal is to have no further action status granted for the properties.

The following sampling and analysis plan (SAP) has been prepared in accordance with the ADEC's *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites* document (September 23, 2009). This SAP outlines the general purpose, planning, and procedures for soil sampling that will be used during this project.

2.0 OBJECTIVES

The objective of the Site characterization is to adequately represent average concentrations of arsenic and lead via multi incremental sampling (MI) of six separate decision units (DUs). The decision units were determined based on E&E's previous assessed locations. These DUs will allow for evaluation of average arsenic and lead concentrations in each of the major historical use areas of the Sheep Creek Valley.

The project will be conducted in general accordance with the ADEC Draft Guidance on Multi Increment Soil Sampling (March 2009). Laboratory soil sample collection will be conducted in general accordance with the ADEC Draft Field Sampling Guidance (FSG)

Document (May 2010). Both guidance documents discuss methods on conducting site characterizations and cleanups.

An ADEC-approved Qualified Person (QP) will be onsite to conduct laboratory sampling, as outlined in this plan, during each phase of the project.

3.0 SITE DESCRIPTION AND BACKGROUND

NORTECH has reviewed the *History of the Juneau Gold Belt, 1869 - 1965* (Earl Redman, United States Department of the Interior, Bureau of Mines) and the *Bureau of Mines Mineral Investigations in the Juneau Mining District, Alaska, 1984 – 1988, Volume 2.—Detailed Mine, Prospect, and Mineral Occurrence Descriptions* (United States Department of the Interior) interviewed the current property leasers, the Ginters and Jeffersons, to become more knowledgeable of historic and current Site uses. The subsurface at the Site is constructed of historic mine tailings from the former mining activities and is currently used recreationally by the public.

The Site is comprised of three areas in the Sheep Creek Valley: the upper area surrounding the Sheep Creek Mine Portal, the middle area surrounding an old foundation at the former Nowell Mine, and the lower area comprising of tailings deposited between Thane Road, Gastineau Channel, and the Sheep Creek delta. The Site is recorded to be near latitude 58.263990° N by longitude -134.330963° W (ADEC Contaminated Sites database). Figure 1 of Appendix A depicts the Site Location. The Site consists of several properties with varying ownership. AJT owns the majority of the properties being assessed; Figure 2 of Appendix A shows the subject properties, surrounding properties, and their respective ownership. The lower area properties between Thane Road, Gastineau Channel, and the Sheep Creek delta are zoned as waterfront industrial, while the middle and upper areas, Sheep Creek Mine Portal and Nowell Mine, are zoned as rural reserve. Figure 3 of Appendix A shows the locations of the upper, middle, and lower areas and their preliminary DU study locations.

Soil types at the Site are anticipated to be well sorted medium grain sand due to its former processing. Bedrock may be encountered at shallow depths in the middle and upper study areas. The *Bureau of Mines and Mineral Investigations* report documents that portions of the ore body in the Sheep Creek Valley indeed contained documented arsenopyrite and galena in addition to pyrrhotite, sphalerite, chalcopyrite, pyrargyrite, native silver, tetrahedrite and gold.

Gastineau Channel borders the lower areas to the south and southwest and Sheep Creek lies along the eastern border of the entire study area. Other surface water include tidally influenced ponds on the western portion of the lower area. It is reported that water flows from the Sheep Creek Mine portal. The entire Sheep Creek Valley is designated as a Zone C Drinking Water Protection Area, the upper and middle portion is classified as a Zone B Drinking Water Protection Area, and the lower area is Zone A.

The ADEC Contaminated Sites database lists the Site as file number 1513.38.013. The ADEC database file lists surface soil sample results from 1987. The soil samples were taken by Echo Bay Mining Company during an effort to re-mine the tailings. The methods of sample locations, collection, and preservation methods for these samples are unknown and therefore the values listed may be arbitrary. The E&E Report discussing this sample is Attached as Appendix B.

The Site, EPA identification number AKD981767320, is currently listed as non-NPL status: State-Lead Cleanup with Eligible Response Site (ERS) Exclusion in the EPA Superfund Site Information database. ERS exclusion sites are such that the provisions of CERCLA 105(h) and 128(b) do not apply. This means that EPA does not have to defer final listing of the site on the NPL at the request of the state. The E&E Site Inspection, performed under EPA directive, analyzed the following matrices: processed mine tailings, surface water, groundwater, soil/sediment, and mussel tissue. The samples were analyzed for compounds and elements on EPA's Target Compound List and various metals using the Extraction Procedures Toxicity method. Results of the effort found that only arsenic and lead are present in the tailings dumps at elevated concentrations. In addition, they determined none of the identified elements detected were contributing to off-site surface water, groundwater, or surficial soil concentrations. E&E only collected one soil sample from the Nowell Mine Site; therefore the area was designated as needing further study.

Versar Inc., observed the E&E assessment and submitted response letters refuting a few of E&E's conclusions. Two conclusions are most pertinent to the current field work:

- 'The EP toxicity tests demonstrated conclusively that the tailings are not hazardous wastes'; and
- 'E&E states that the lead and arsenic content of mussel tissue is significantly above background. E&E fails to state that the standard for significance, in this case, is an arbitrary standard, and is not based on health considerations, or chronic or acute toxicity data.' Also, 'the statement is made that shellfish are at risk because elevated lead was detected in all on-site samples. However, lead was not detected in the marine water samples and no other pathway for the lead to enter the shellfish was identified. Further, impairment of the shellfish population has not been documented by the investigation.' E&E reported that all of the mussel samples, including that background sample, contained detectable levels of arsenic and lead.

3.0 FIELD SAMPLING PLAN

3.1 Decision Unit Mapping

Figure 3 of Appendix A depicts the six DUs that will be individually assessed at this Site. Table 1, below, presents each decision unit, decision unit classification, depth of investigation per unit, and how we will determine the border of the unit in the field. Major decision unit borders will be mapped and marked prior to soil sample collection activities, as described in the following section.

The decision classifications include high use, moderate use, and low use. High use classification describes areas used daily for recreation. Moderate use classification describes areas covered by vegetation or is only accessible by private road or hiking trail, limiting use, or areas where recreation may include occasional digging. Low use classification describes areas where soil is unlikely to be used or disturbed because of accessibility. The depth of investigation was determined to be between surface and four feet below ground surface (ft bgs). The depth was chosen to mimic previous investigations. Previous investigation determined the thickness of the tailings may be between 13 – 18 ft bgs in the lower investigation area.

Decision units with buildings or features inhibiting access to areas of the soil underneath will be accounted for during the sample grid setup procedure.

Table 1: Decision Unit Classification and Border Descriptions

Decision Unit Number	*Decision Classification*	*Unit Depth of Investigation (ft bgs)*	*Decision unit Borders*
1	Low	0 – 4	We will assess and map the entire area that does not have vegetation coverage.
2	Moderate	0 - 4	We will assess and map the entire area surrounding the old foundation and any other areas that do not have vegetation coverage.
3	Moderate	0 - 4	North: vegetation line, to be mapped South: Thane Road East: Sheep Creek West: vegetation line, to be mapped

Decision Unit Number	*Decision Classification*	*Unit Depth of Investigation (ft bgs)*	*Decision unit Borders*
4	High	0 – 4	North: Thane Road South: arbitrary line about 750 ft southwest of Thane Road, to be mapped East: tide ponds, to be mapped West: arbitrary line immediately East of Ginter warehouse, to be mapped
5	High	0 – 4	North: Thane Road South: arbitrary line about 750 ft southwest of Thane Road, to be mapped East: arbitrary line, to be determined West: arbitrary line immediately East of Ginter warehouse, to be mapped
6	High	0 – 4	North: Thane Road South: Gastineau Channel East: Sheep Creek, to be mapped West: arbitrary line, to be determined

3.2 Soil Sample Collection via Random Systematic MI Sampling

NORTECH will implement random systematic MI sampling for soil sample collection. This method will ensure uniform coverage of each decision unit and allow for laboratory sample results to be used to infer the mean of each decision unit contaminant concentrations.

After the major decision unit boundaries have been identified and marked, each decision unit will be mapped into a grid with thirty individual sections. Each section will then be broken into quadrants. Two random number generators will be implemented to determine the quadrant and the depth of soil sample collection. The soil sample will be 30 grams (g) in size. A 30 g soil sample will be collected from each of the thirty sections in a decision unit and composited with other decision unit samples.

3.3 Composition of Soil Samples for Laboratory Analysis

Once each decision unit's soil samples have been composited, they will be spread in a bin to dry. When dry, each composite will be sent through a 2 mm sieve and homogenized via mixing. The composite will be spread to an even area and set to a grid of thirty individual sections. Each section will be broke into quadrants. A 10 g aliquot of soil from each quadrant will be put into an 8 ounce laboratory supplied sample jar. A random number generator will be implemented to determine which quadrant the aliquot of soil will be collected from. The soil samples collected will be analyzed by SGS Environmental Services (SGS) in Anchorage, AK. The following list includes the analysis methods that will be used by SGS:

- Arsenic and Lead, Metals by method 6010.

Samples will be collected using a combination of hand equipment, such as shovels, trowels, and spoons, and disposable sampling equipment such as nitrile gloves. ***NORTECH*** will visually classify each soil sample and this soil information will be documented in the field notes description of the sample. Sampling equipment that contacts environmental media will be decontaminated both before initial use and between decision units, to avoid cross contamination. Samples will be placed in the appropriate sampling container, sealed, and placed promptly on ice (usually frozen gel packs) in a cooler in the custody of ***NORTECH*** personnel.

Samples collected from decision unit 5 will be performed and submitted to SGS in triplicate for quality assurance purposes.

4.0 CONTAMINANTS OF POTENTIAL CONCERN AND THEIR ACCEPTABLE LEVELS

The contaminants of potential concern for this Site include the RCRA 8 metals due to known historic Site uses. Appropriate cleanup standards for Site are the ADEC Method Two, over 40 inch zone, direct contact levels. The following list includes the RCRA 8 metals and their associated ADEC cleanup standards in soil:

- Arsenic: 3.7 mg/kg
- Lead: 400 mg/kg

NORTECH proposes to analyze only for arsenic and lead as they have been previously determined to be the only metals present above ADEC acceptable levels.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

NORTECH has completed ADEC's Human Health Conceptual Site Model Scoping Form for the Site, see Appendix C. The following exposure pathways have been identified as complete:

- Direct Contact via incidental soil ingestion and dermal absorption, and
- Ingestion of wild and farmed foods, and

Additional exposure pathways identified during the exercise that may require further evaluation include direct contact with soil/sediment.

6.0 DATA REPORTING

Upon completion of the field work phase of this project, a Site Characterization Report will be submitted describing the results of the work efforts and any deviations observed from this SAP. All laboratory results and tabulated field notes taken during field work will be included in the Site Characterization Report.

7.0 HEALTH AND SAFETY

Based on the project description and previous assessments, toxic vapors and fumes and low oxygen conditions are not expected. Level D Personal Protective Equipment (PPE) is deemed sufficient for the expected conditions. Level D PPE may include Hard Hat, Steel Toed Footwear, Ear Protection, Hand Protection, and Safety Goggles.

8.0 LIMITATIONS

While ***NORTECH*** believes that the activities and methods described in this work plan are appropriate, reasonable alternative field procedures may be utilized to perform the activities necessary under this contract. Alternative procedures may be necessary based on changes that have occurred on the site, unforeseen site conditions, and/or changes in AJT or ADEC requirements. If necessary, alternative methodology utilized by ***NORTECH*** will be appropriate, safe, within industry standards, and approved by ADEC as necessary.

9.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

The following Environmental Professionals will be overseeing and performing the QP activities of the Site work. Their resumes are included for reference in Appendix D.

Jason Ginter, Juneau Technical Manager for ***NORTECH,*** has a B.S. in Chemistry and extensive experience conducting site remediation, hazardous materials investigations, property assessments, and other environmental fieldwork throughout Alaska.

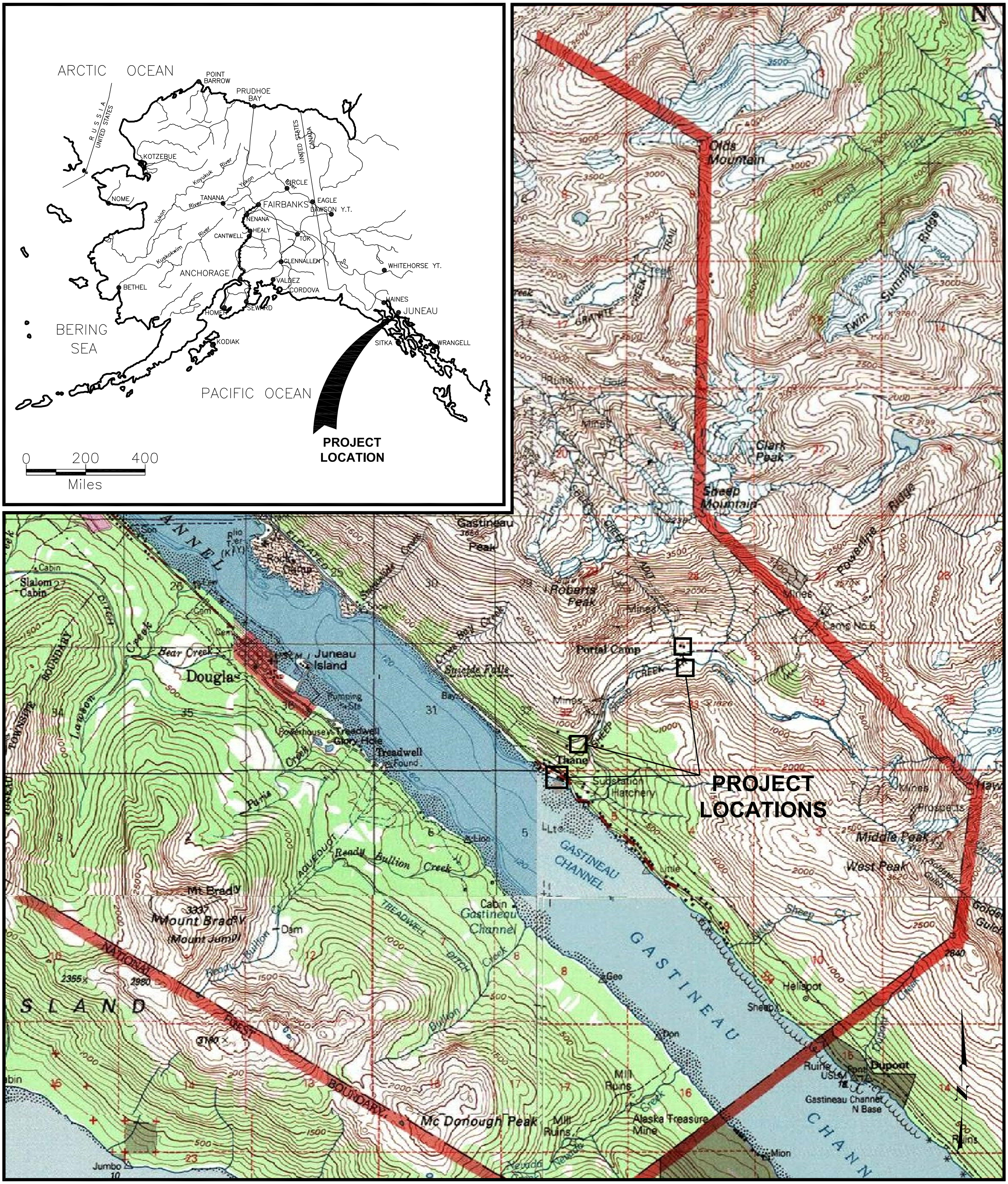
Principal, Juneau Technical Manager

Tara Martin, Environmental Professional for ***NORTECH,*** has a B.S. in Geophysical Engineering and has experience conducting property assessments, environmental investigations, groundwater monitoring, laboratory analysis, and other environmental fieldwork.

Tara Martin

Tara Martin, Environmental Professional

APPENDIX A
Figures



NORTECH

ENVIRONMENTAL ENGINEERING HEALTH & SAFETY
2400 College Road, Fairbanks, Alaska 99709 Ph: 907-452-5688
3105 Lakeshore Dr. Anch, Alaska 99517, Ph: 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801 Ph: 907-586-6813

Location Map
Alaska Gastineau Mine Tailings Soil Assessment
Thane, Alaska

SCALE: 1"=1mile		FIGURE: 1
DESIGN: TM		
DRAWN: CMR		
PROJECT NO:	13-1036	
DWG:	131036a(01)	
DATE:	3/12/2013	

NORTECH
ENVIRONMENT, ENERGY, HEALTH & SAFETY CONSULTANTS
2400 College Road, Fairbanks, AK. 99709, Ph: 907-452-5688
3105 Lakeshore Dr., Anchorage, AK. 99517, Ph: 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801, Ph: 907-586-6813

Vicinity Property Ownership Map
Alaska Gastineau Mine Tailings Soil Assessment
Thane, Alaska

DATE: 3/12/2013	SCALE: 1" = 1000'
PROJ MGR: TM	PROJECT: 13-1036
DRAWN: CMR	DWG. NO.: 131036a(02)

FIGURE 2

NORTECH

ENVIRONMENTAL ENGINEERING HEALTH & SAFETY
2400 College Road, Fairbanks, Alaska 99709 Ph: 907-452-5688
3105 Lakeshore Dr. Anch, Alaska 99517, Ph: 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801 Ph: 907-586-6813

Decision Unit Locations
Alaska Gastineau Mine Tailings Soil Assessment
Thane, Alaska

SCALE: 1" = 1000'		FIGURE: 3
DESIGN: TM		
DRAWN: CMR		
PROJECT NO:	13-1036	
DWG:	131036a(03)	
DATE:	3/12/2013	

APPENDIX B
E&E Report and Letters

SITE INSPECTION REPORT FOR THANE MINE DUMP SITE JUNEAU, ALASKA

TDD F10-8712-02
PAN FAK0109SAR

Field Investigation Team: James Herndon, William Richards, Glenn Roberts, Gloria Skinner, Timothy Syverson, Jeffrey Whidden

Report Prepared by: Ecology and Environment, Inc.
Date: May 1988

Submitted to: J.E. Osborn, Regional Project Officer
Field Operations and Technical Support Branch
U.S. Environmental Protection Agency
Region X
Seattle, Washington

SITE INSPECTION REPORT
THANE MINE DUMP SITE
JUNEAU, ALASKA
TDD F10-8712-02

Site Name/Address

Thane Mine Dump
4404 Thane Road
Juneau, Alaska 99801

Investigation Participants

Jeffrey Whidden, FIT-PM, Ecology and Environment, Inc.
Seattle, Washington (206) 624-9537
William Richards, FIT-SM, Ecology and Environment, Inc.
Seattle, Washington (206) 624-9537
Lynn Kent, USEPA-ADEC, Juneau, Alaska (907) 465-2666

Principal Site Contacts

Gregory Sparks, Project Manager, Echo Bay Management Corporation,
Denver, Colorado (303) 592-5450
Rick Fredrickson, Site Foreman, Echo Bay Mines,
Juneau, Alaska (907) 586-4161

Date of Investigation

December 10, 1987 — 1415 - 1600

Dates of Sampling

February 8-12, 1988

- Tailings Samples
- Marine Water and Sediment Samples
- Benthic Organism Samples
- Creek Water and Sediment Samples
- Domestic Well Samples
- Off-Site Soil Samples

DISCLAIMER

This report has been prepared by Ecology and Environment, Inc. under EPA Contract 68-01-7347 and reviewed and approved for public release by the U.S. Environmental Protection Agency (EPA). Mention of commercial products does not constitute endorsement by the U.S. Government. Editing and technical content of this report are the responsibility of Ecology and Environment, Inc., Seattle, Washington and do not necessarily reflect the views or policies of the EPA.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF TABLES (Cont.)

LIST OF FIGURES

ABSTRACT

Under U.S. Environmental Protection Agency (EPA) Technical Directive Document (TDD) F10-8712-02, a file review and site inspection was conducted on the Thane Mine Dump Site, near Juneau, Alaska, to evaluate the site's status within the Agency's Uncontrolled Hazardous Waste Site Program. Primary objectives of the SI included: 1) collection of data adequate to determine the hazardous constituent quantity within the tailings dumps; 2) determine the existence of, or potential for, releases of contaminants to ground water, surface water, air, and off-site soil; and 3) evaluate the existence of, or potential for, human food chain contamination of fisheries in Gastineau Channel. As part of the field investigation, a total of 88 samples were collected from the following matrices: processed mine tailings, surface water, ground water, soil/sediment, and mussel tissue. Samples were analyzed for compounds and/or elements on EPA's Target Compound List (TCL). In addition, six tailings samples were analyzed for various metals using the Extraction Procedure (EP) Toxicity method.

Sampling data indicate that arsenic and lead are present in the tailings dumps at elevated concentrations. However, neither of these elements, nor any of several additional inorganic elements detected in a sample from a second source, the Nowell Mill Site, were determined to be contributing to off-site surface water, ground water, or surficial soil concentrations. Mussel tissue data from samples collected at one of the tailings dumps indicated lead concentrations approximately three to four times those found in a background sample. The single soil sample collected from the Nowell Mill Site displayed elevated concentrations of several elements, including mercury. Additional data are required to accurately assess potential soil contamination problems in the Nowell Mill Site area.

1.0 INTRODUCTION

The Thane Mine Dump Site, near Juneau, Alaska, has been identified by the United States Environmental Protection Agency (EPA) from Preliminary Assessment screening as requiring additional information to accurately profile the nature and extent of past waste disposal activity at the site. Ecology and Environment, Inc. (E&E) was requested by the EPA under Contract No. 68-01-7347, and Technical Directive Document (TDD) No. F10-8712-02 to conduct a Site Inspection (SI) of the dump site and associated areas. The SI was intended to evaluate the existence and nature of potential heavy metals contamination identified in a Preliminary Assessment (PA) completed by E&E in October 1987 (1).

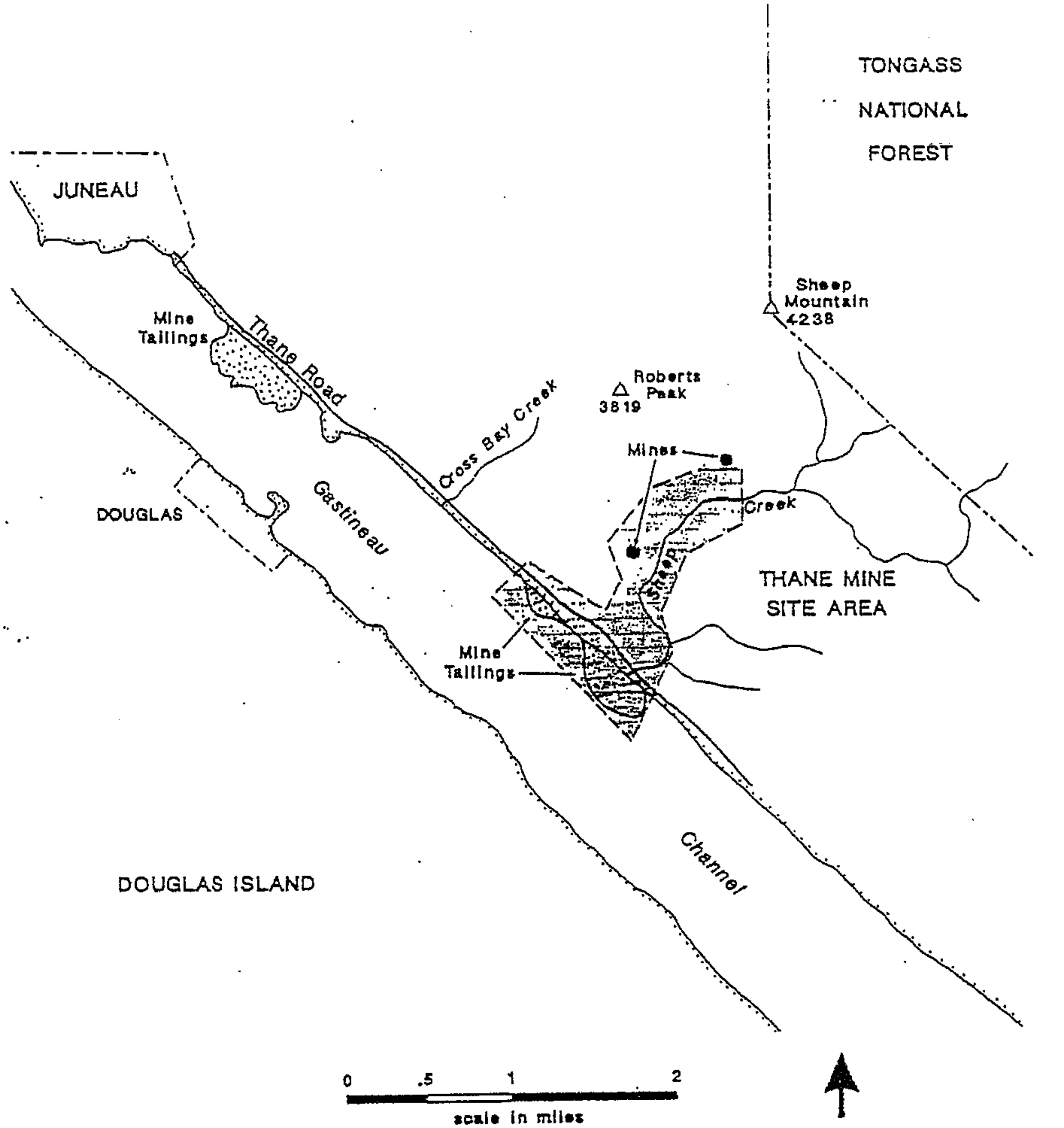
The Thane Mine Dump is a tailings disposal site that received milling residuals from nearby mines between approximately 1912 and 1920. The tailings were deposited on the tidal flats of Gastineau Channel over an approximate area of 50 acres (Figure 1). Samples collected from the surface of the tailings in 1987 by the current property owner, Echo Bay Mines (EB), revealed the presence of arsenic and lead when analyzed. The presence of mercury in the tailings and nearby stream sediments has been alleged due to the use of mercury amalgamation processes by the mills between 1896 and 1914. Additionally, extreme winter winds allegedly blow and transport tailings from the dump site to nearby areas.

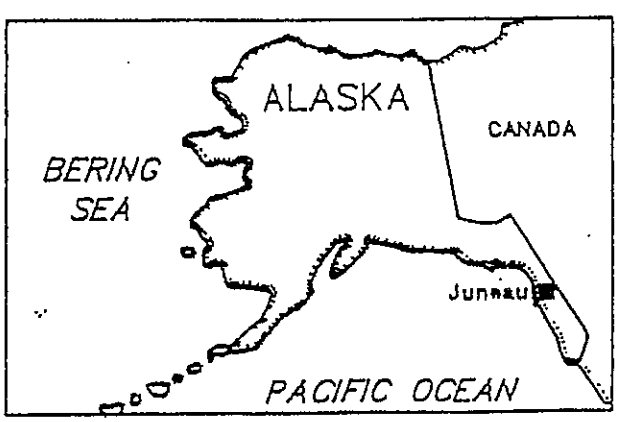
This document is a compilation of data gathered for and during the investigation of the Thane Mine Dump Site. Information pertaining to the ownership, history, environmental setting, and operations at the site are included in this report, as is information developed during field sampling and site characterization activities. Information collected during the investigation is summarized on EPA Form 2070-13 in Appendix A.

2.0 OWNER/OPERATOR HISTORY

In 1896, the Novell Gold Mining Company (Novell) acquired two mines in the Sheep Creek Basin near Juneau, Alaska. Novell constructed a 20-stamp processing mill in the basin to crush ore containing silver and gold (Figure 2). In 1911, the Alaska Gastineau Mining Company was incorporated and purchased Novell Gold Mining Company's holdings in Sheep Creek. In 1912, the Alaska Gastineau Mining Company, under the management of B.L. Thane, began construction of a large capacity ore processing mill on Gastineau Channel. The Alaska Gastineau Company then constructed an adit (mine tunnel) from the Sheep Creek Basin beneath Mt. Roberts to access gold-rich zones previously reached by tunnels driven from the Gold Creek Basin. The Sheep Creek adit, completed in 1914, allowed ore to be transported from the mines via a rail system in Sheep Creek to the mill being constructed on Gastineau Channel (2).

While the Alaska Gastineau Company was completing the new processing mill, a test mill was set up in the Old Novell Mining Company's mill to determine the most economical method of treating the ore. From their experiments, the management of the Alaska Gastineau Company decided to use gravity separation techniques in the new mill on Gastineau Channel.





ecology & environment, inc.	
Job: F10-8712-02	Waste Site: AK 0109
Drawn by: B.T.	Date: Jan. 8, 1988

FIGURE 1
LOCATION MAP
THANE MINE DUMP
Juneau, AK

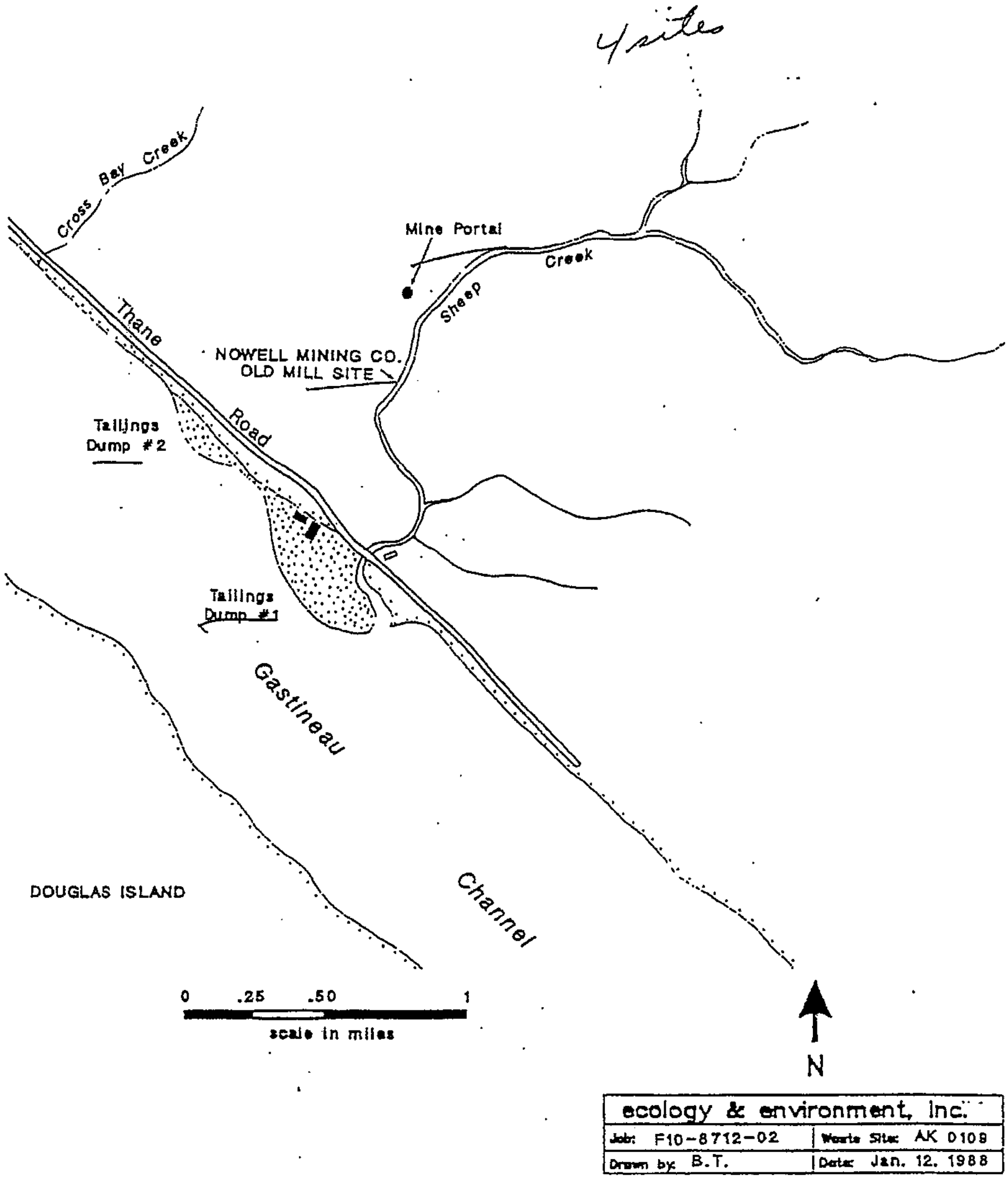


FIGURE 2
SITE MAP
THANE MINE DUMP
Juneau, AK

In 1914, the old Nowell Company test mill used by the Alaska Gastineau Company burned after being hit by lightning. By November of 1915, the new Alaska Gastineau mill was completed, and treated 6,000 tons of ore per day. The tailings produced from the Alaska Gastineau mill were transported by tram for disposal on the beach of Gastineau Channel near Thane (2).

Falling prices of gold and the first World War lowered the productivity of the Alaska Gastineau Company's mill. By 1921, the mill was closed permanently. By this time, approximately 11 million tons of tailings had been deposited in Gastineau Channel (3). Table 1 presents a summary of operations for the Alaska Gastineau Mining Company during its operational years.

TABLE 1

SUMMARY OF OPERATIONS
ALASKA GASTINEAU MINING COMPANY (2)

Year	Tons Ore Milled (Approximate)	Total Cost Per Ton Ore Milled	Average Assay	Total Value Produced
1912-1914	74,977	Unknown	$1.5985	$ 111,067
1915	1,115,294	$0.30448	1.1569	1,046,103
1916	1,892,788	0.26881	1.193	1,837,290
1917	2,240,346	0.26026	1.103	2,009,631
1918	1,285,445	0.32706	1.109	1,136,223
1919	2,251,658	0.27441	0.83	1,474,490
1920	2,133,458	0.29201	0.88	1,487,575
Total	10,993,966			$9,102,379

In 1934, all of the holdings of the Alaska Gastineau Company were purchased by the Alaska Juneau Gold Mining Company. In 1972, ownership of the property was transferred to the Alaska Electric Light and Power Company (AELP) and the City and Borough of Juneau. The State of Alaska has retained lands used for tailings disposal below mean high tide (2,4).

In approximately 1983, the Juneau Gold Mining Company (no relation to the Alaska Juneau Gold Mining Company) acquired a lease on the property previously used for tailings disposal by the Alaska Gastineau Company. The Juneau Gold Mining Company constructed a small mill on the tailings with the intent of using gravity separation methods to extract trace gold from the tailings. This operation failed financially after two to three months of operation (1). In 1986, Echo Bay Mines (EB) acquired the tailings dump (Figure 2) near Sheep Creek. EB is currently conducting mining feasibility tests in the old mine shafts in the Sheep Creek Basin to determine if gold mining is economically viable. EB plans to utilize the tailings disposal site for office and warehouse space in support of mining activities in Sheep Creek (5). A summary of property ownership related to the Thane Mine Dump Site is presented in Table 2.

TABLE 2

OWNERSHIP SUMMARY

Year	Property	Owner
1896	Sheep Creek Mill Site	Nowell Gold Mining Company
1911	Sheep Creek Mill Site	Alaska Gastineau Gold Mining Company
	Sheep Creek Adit and Portal	Alaska Gastineau Gold Mining Company
	Gastineau Channel Mill Site	Alaska Gastineau Gold Mining Company
	Tailings Dump #1 and #2*	Alaska Gastineau Gold Mining Company.
1934	All properties	Alaska Juneau Gold Mining Company
1972	Sheep Creek Mill Site	State of Alaska
	Sheep Creek Portal	State of Alaska
	Gastineau Channel Mill Site	AELP and City/Borough of Juneau
	Tailings Dump #1	AELP and City/Borough of Juneau
	Tailings Dump #2	State of Alaska (State Tidelands)
1983	Tailings Dump #1	Juneau Gold Mining Company (leasee to State of Alaska)
1986	Tailings Dump #1	Echo Bay Mines (leasee to State of Alaska)
	Sheep Creek Adit and Portal	Echo Bay Mines

* Tailing Dumps #1 and #2 are described in Section 3.0, and are illustrated in Figure 2.

3.0 LOCATION

The Thane Mine Dump Site is located approximately four miles south of the City of Juneau, in southeastern Alaska. The site area is accessed by Thane Road. For the purposes of this investigation, the site was defined as four spatially separated potential contaminant sources: Tailings Dump #1, Tailings Dump #2, the Nowell Mining Company Mill Site, and the Sheep Creek Mine Portal (Figure 2). Tailings Dump #1, the property currently used by EB for office and warehouse space, is located in Section 5, Township 42 South, Range 68 East of the Copper River Meridian. Tailings Dump #2, located northwest of Tailings Dump #1, is located in the SW 1/4 of Section 32, Township 41 South, Range 68 East. The Nowell Mining Company old mill site, located in the Sheep Creek Basin at an approximate elevation of 600 feet above sea level, is

located in the SW 1/4 of Section 32, Township 41 South, Range 68 East. The Sheep Creek Mine Portal currently used by EB is located at an approximate elevation of 800 feet above sea level. The entire site area lies between latitudes 58° 16′ 41" to 58° 15′ 28", and longitudes 134° 20′ 17" to 134° 18′ 18" (6).

4.0 SITE DESCRIPTION AND SURROUNDING AREA

The tailings dumps located on Gastineau Channel cover a total area of approximately 50 to 60 acres, and are located on top of natural tidal flats that make up the majority of the shoreline along Gastineau Channel (Figure 2). The tailings are uncovered, and are not known to be underlain by clay or other impermeable materials (7). Land use surrounding the tailings dumps is primarily low density residential along Thane Road, multiple-family housing (apartments) near Juneau, and commercial near Sheep Creek (fish hatchery and AELP sub-station). In addition, the Thane Orehouse Restaurant, which operates during summer months, is located on tailings adjacent to the EB offices (8). Gastineau Channel is used for recreation, commercial fishing, and transportation (7).

The old Novell mill site located in the Sheep Creek Basin covers an area of approximately one acre, although burned timbers indicating the existence of a building foundation were observed to cover approximately 1/4 acre. The old mill site is surrounded by dense underbrush and trees. The EB mine portal is considered a potential point source for contamination, and buildings and ore unloading docks at the portal cover an area of approximately one acre. Land use in the Sheep Creek Basin is primarily recreational and commercial (mining) (7).

The largest population center in the site area is the City of Juneau, with an approximate population of 30,000. Population demographics within a four-mile radius of Tailings Dump #1 are summarized in Table 3.

5.0 TOPOGRAPHY AND DRAINAGE

The tailings dumps are located on the eastern shore of Gastineau Channel, and form broad, exposed flats during low tide. Directly east of Gastineau Channel, mountains of the Coast Range rise from saltwater at an average gradient of 50%. Sheep Creek flows out of these mountains to Gastineau Channel. The creek's headwaters are at approximately 1,500 feet above sea level, and the creek drains a total area of approximately 3,700 acres. Approximately five tributary valleys supply additional runoff to the creek between its headwaters and Gastineau Channel (6). Average annual flow in Sheep Creek between 1911 and 1969 is approximately 50 cubic feet per second, although during the SI, flow was estimated at 23 cubic feet per second using field measurements (7,9). Numerous ground-water seeps and small unnamed streams exist within the creek basin. Peaks surrounding the Sheep Creek Basin average 2,000 to 3,000 feet above sea level, and are glaciated on their north and east slopes. Timberline in the area is approximately 1,500 feet above sea level (6).

TABLE 3

DEMOGRAPHICS AND LAND USE

Radial Distance (from Tailings Dump #1)	Demographic Description	Land Use	Reference
On-Site	EB (Number of Employees): 4	Commercial (mining)	(10)
0 - 1/4 Mile	Orehouse Restaurant: 2 Avg. # customers/day served at restaurant: 50*	Commercial and Residential/ Recreation	(8)
	Fish Hatchery: 2		(11)
	AELP Substation: 4		(12)
	Residents: approx. 18		(13)
1/4 - 1/2 Mile	Residents: approx. 35	Residential/ Recreation	(13)
1/2 - 1 Mile	Residents: approx. 61	Residential/ Recreation	(13,14)
1 - 2 Miles	EB: approx. 14	Commercial/ Industrial	(10)
	Residents: 75	Residential/ Recreation	(14)
2 - 3 Miles	Residents: 1,719	Residential/ Recreation	(14)
3 - 4 Miles	Residents: 2,746	Residential/ Recreation	(14)

* Restaurant operates during summer months only.

6.0 GEOLOGY/HYDROLOGY

6.1 Regional Geology/Hydrology

Of the many geologic processes that have shaped the land surface in the Juneau area, glaciation has been the dominant process. The major peaks, valleys, and channels, including Gastineau Channel, were carved out of bedrock by glaciers during the Pleistocene Epoch (15). Streams and rivers that drain the upland areas have played an additional role in shaping the geologic character of the area.

The primary geologic materials in the area include consolidated bedrock and unconsolidated glacial and alluvial sediments (15). Bedrock in the area is composed of slate, schist, and metagabbro. Metamorphic bedrock in the area is the host rock for the gold and silver bearing quartz lenses that have been mined since the late 19th century (16).

The unconsolidated deposits include silts, sands, gravels, and clays that can be subdivided by mode of deposition. The Gastineau Channel Formation is a sequence of glaciomarine sediments exposed along Gastineau Channel. These sediments are a heterogeneous sequence of pebbles and larger clasts that are mixed in a matrix of fine-grained silts and sands. They are interpreted as deposits resulting from the melting of debris-laden sea ice and/or ice-bergs (17). Other unconsolidated sediments in the area are derived from rivers and streams. These alluvial silts, sands, and gravels are localized in comparison to the glaciomarine sediments.

An additional group of sediments include the recent beach gravels found along the modern shorelines in the area. The beach gravels occur in a thin layer overlying other deposits, and are the result of recent erosion (7).

Ground water in the Juneau area is found both in bedrock and in the unconsolidated sediments. The bedrock yields water from fractures, and tends to yield only small volumes. The quantities of water from bedrock are sufficient for small private wells, but generally not for primary municipal supplies (15). Bedrock is an important source of ground water in outlying areas along the mountain fronts where surficial deposits are thin.

The gravels and sands in the unconsolidated deposits are the most important ground water resource in the area. The availability and quality of ground water in the unconsolidated deposits is dependent on elevation and proximity to saltwater. Deposits located at higher elevations tend to be drained of any water, and deposits near the shoreline tend to be influenced by saltwater intrusion (15). The thicker sections of the saturated sands and gravels yield quantities of water adequate for municipal supplies.

Ground water in the area occurs under both unconfined and confined conditions. In most areas, ground water occurs under unconfined conditions, but confined conditions exist in areas where saturated zones are overlain by local layers of silt and clay. No extensive confining layers are reported to exist above the major ground water supplies, and local confining layers are seldom completely impermeable (15).

Recharge to the ground water system is primarily via infiltration of precipitation and ice/snow meltwater. The primary methods of ground water discharge include subsurface outflow to the ocean and seepage to streams (15).

6.2 Site Geology/Hydrology

The Thane area is underlain by the glaciomarine deposits that mantle the lower portions of the mountain front south of Juneau (15). In the area adjacent to Sheep Creek, the glaciomarine deposits are overlain by recent alluvial deposits. The thickness of the surficial deposits and the depth to bedrock in the Thane area are unknown. No geologic logs are available for the private wells that exist in the area. However, the shallowest well identified in the area has a total depth of 80 feet below ground surface (bgs). Other wells in the Thane area have been completed to depths up to 400 feet bgs (13). All wells in the Thane area reportedly tap ground water from fractured bedrock (18).

Wells in the Thane area generally yield only small amounts of water (18). The movement of ground water in the vicinity is assumed to be generally toward Gastineau Channel. However, in the immediate vicinity of the Sheep Creek Basin, ground water is assumed to flow toward the creek, where a portion may discharge to the creek.

Soil layers, generally less than a few feet in thickness, overlie the unconsolidated sediments in the Thane area. Two soil types are identified in the area: the Kupreanof Series and Wadleigh Series, both of which are generally gravely loams (19). The Kupreanof Series occurs on 3.5 to 70% slopes, and is generally well drained. The Wadleigh Series occurs on 12 to 20% slopes, and is poorly drained (19).

The ore bodies within the metamorphic rocks mined locally contain various mineral assemblages that include nickel, lead, iron, zinc, and arsenic among other constituents (16).

7.0 WATER USE

7.1 Surface Water

The closest surface water (fresh water) to the site is Sheep Creek, which originates in the upper Sheep Creek Basin at an approximate elevation of 1,500 feet above sea level (6). Sheep Creek flows southwesterly for approximately 3.5 stream miles and discharges to Gastineau Channel. Sheep Creek is used as a drinking water source by 14 people and as source water for fish pens at the Douglas Island Pink and Chum Company fish hatchery (13). In addition, a small natural salmon run reportedly spawns in Sheep Creek below the dam each year, and a natural trout population inhabits the upper section of the creek (7). All 14 persons using Sheep Creek for drinking purposes receive water drawn from a single intake located approximately 200 feet upstream of the fish hatchery. The intake is located downstream of the Nowell Mill Site and upstream of Tailings Dump #1 (Figure 2) (6,7).

Gastineau Channel is a saltwater body connected with the Pacific Ocean. Mine tailings were disposed of directly into the channel, and therefore are in continual contact with surface water. The channel is used for private and commercial fishing and recreation (20). Shellfish collection in Gastineau Channel near Thane is discouraged by the Alaska Department of Environmental Conservation due to the history of paralytic shellfish poisoning (red tide) in the area (21).

Several small unnamed streams south of Sheep Creek are utilized for drinking purposes. These streams were not evaluated as part of the SI due to their spatial separation from suspected contaminant migration routes associated with the site (22). Surface water use in the site area is summarized in Table 4.

TABLE 4

THANE AREA SURFACE WATER USE

Surface Water	Use	Population Served	Distance to Site
Sheep Creek	Drinking/ Fish Hatchery	14	Approx. 1/2 mile (Nowell Mill Site)
Gastineau Channel	Private/ Commercial Fishing	NA	0 (tailings)
Unnamed Streams	Drinking	Unknown	1 - 2 miles

7.2 <u>Ground Water</u>

Ground water in the Thane area is used for domestic drinking purposes and for commercial food preparation. Ten wells and one spring serve approximately 40 people within three miles of the site. All of the wells are completed in fractured bedrock between 80 and 400 feet below ground surface (13,18,22). The Thane Orehouse Restaurant owns a registered well, 80 feet in depth, that is immediately adjacent to Tailings Dump #1. This well is assumed to be partially used for commercial food preparation. Four permanent employees of Echo Bay Mines drink water drawn from a natural spring located several hundred feet east of Tailings Dump #1 (10,22).

The City and Borough of Juneau Water Department maintains a public supply well located approximately 3.75 miles north of Thane. This well was not evaluated during the SI for the following reasons: 1) the well is used only as a backup to the public water supply; 2) a mine tailings dump similar to the Thane dumps, known as the A.J. Rock Dump, is located between Thane and the municipal well, and could not have been isolated as an additional contaminant source using existing wells; and 3) the ground water gradient is not expected to be in the direction of the municipal well from Thane (6,15). Ground water use in the site area is summarized in Table 5.

TABLE 5

THANE AREA GROUND WATER USE

Owner	Intake	Depth	Approximate Distance to Site	Population Served
Ray	Well	400′	< 1/4 mi.	~ 3.8
Thane Orehouse	Well	80′	< 1/4 mi.	2
Byington	Well	80′	~ 1/4 mi.	0
Clare	Well	147′	~ 1/3 mi.	~ 3.8
Hagerup	Well	100′	~ 1/2 mi.	1
Sperl	Well	300′	~ 1/3 mi.	6
Dicostanzo	Well	80′	~ 2/3 mi.	4
Charon	Well	290′	~ 2/3 mi.	2
Terrell	Well	120′	~ 2/3 mi.	6
Cassell	Well	175′	~ 1 mi.	7
Echo Bay Mines	Spring	N/A	< 1/4 mi.	4

8.0 CLIMATE

Juneau's climate is dictated by marine weather systems originating in the Pacific Ocean and the rugged mountainous terrain surrounding the area. Summertime high temperatures generally reach only 60 to 75°F, while wintertime lows often drop below 0°F. Rainfall is highly variable and is a function of topography. The Juneau airport receives approximately 53 inches of precipitation annually, while downtown Juneau, only six miles to the southeast, receives approximately 88 inches per year (23). The two-year 24-hour maximum rainfall for the greater Juneau area is approximately 2.6 inches (24).

High velocity winds originating from the glaciers east of Juneau occur often during the winter months. These high winds, known locally as the Taku Winds, reach 100 miles per hour in some instances, and have been observed to blow dust and small particles from the tailings dumps hundreds of feet into the air (1,7,13).

9.0 OVERVIEW OF SITE OPERATIONS

Tailings Dump #1 is currently being used for offices and warehouse space by Echo Bay Mines. EB has recently constructed a road into the Sheep Creek Basin to the mine portal area. EB is reopening parts of the former Alaska-Gastineau mine tunnels to determine if modern mining techniques can be economically viable. According to EB representatives, tailings generated by future large scale mining would be deposited underground or transported by barge for deep sea disposal (7).

There are currently no commercial or industrial activities being conducted at Tailings Dump #2 or the Nowell Mill Site.

ported that the majority of this drainage originates as surface runoff on the steep slopes above the mine, and is not the result of seepage from the tunnel (7). EB collected a water sample from the drainage in 1987 and analyzed the sample for selected Federal Primary Drinking Water Standard elements (27). Table 6 summarizes the results of the analyses (28).

TABLE 6

SUMMARY OF MINE PORTAL DRAINAGE
WATER SAMPLE - October 6, 1987

Element	Concentration (mg/l)	Federal Primary Drinking Water Standard (m/l)
Arsenic	< 0.001	0.05
Barium	< 0.10	1.00
Cadmium	< 0.005	0.010
Chromium	< 0.010	0.05
Lead	< 0.001	0.05
Mercury	< 0.0002	0.002
Selenium	< 0.002	0.01
Silver	< 0.01	0.05

11.0 PREVIOUS INVESTIGATIVE HISTORY

The Thane Mine Dump Site was identified as a potential hazardous waste site in 1984 by the Alaska Department of Environmental Conservation. No on-site inspection was conducted, although a citizen complaint reporting the presence of mercury in Sheep Creek was filed with the state. A Preliminary Assessment (PA) of the site was conducted in October 1987 by the EPA Region X Field Investigation Team (1). The PA included a brief history of the site and identified potential human and environmental targets associated with the tailings dump. Following the completion of the PA, EB collected thirteen surface samples from the tailings, as mentioned in Section 10.1.

12.0 SITE INSPECTION BY E&E

12.1 Objectives and Scope

The objectives of the site inspection were to:

- determine if the site poses a public health or environmental risk;

10.0 CHARACTERISTICS OF POTENTIAL CONTAMINANT SOURCES

In general, heavy metals contained within the mine tailings are the primary basis for concern at the Thane Mine Dump Site. Additionally, mercury, which was transported to the site for ore processing, is a potential contaminant. This section provides a description of potential/known contaminants associated with each of the four identified sources at the site.

10.1 Tailings Dump #1

Tailings Dump #1 is composed of processed ore tailings from the Alaska Gastineau mill. The dump covers an area of approximately 50 acres, part of which is submerged during high tide in Gastineau Channel (Figure 2). Of the approximately 11 million tons of tailings disposed of by the Alaska Gastineau mill, an estimated 80 to 90 percent of the tailings were deposited at Tailings Dump #1 (3). The tailings originated from the sulfide ores found beneath Mt. Roberts. The sulfide ores are comprised of minerals containing arsenic, lead, nickel, and zinc (16). EB, the current leasee of a portion of Tailings Dump #1, collected 13 surface samples from the tailings for total lead, arsenic, and mercury analyses in 1987. The results of this testing revealed an average concentration of lead, arsenic, and mercury of 77 mg/kg, 22 mg/kg, and 0.01 mg/kg, respectively (25).

10.2 Tailings Dump #2

Tailings Dump #2 is also composed of processed ore tailings from the Alaska Gastineau mill. The dump covers an area of approximately 7-10 acres, part of which is submerged by high tide in Gastineau Channel. Tailings were deposited at this dump for a short time during the early operational years of the Alaska Gastineau mill, until its abandonment in approximately 1915 or 1916. No previous analyses of the tailings of Dump #2 have been conducted (3,7).

10.3 Novell Mill Site

The Novell Mill Site was identified as a potential contaminant source from information suggesting that mercury amalgamation ore purification processes were used at the site. Mercury for amalgamation was brought to the mill in 70-pound iron flasks. The potential for spills, and the unknown quantity of mercury left at the mill after its abandonment following a fire in 1914, are the basis of concern for mercury deposition at this site (26). No previous analysis of soils surrounding the mill site have been conducted, and no containment provisions are known to have existed (7).

10.4 Sheep Creek Mine Portal

Mine portals frequently act as a migration route for acidic waters containing heavy metals. The Sheep Creek Adit used by EB discharges a small volume (estimated 2-3 ft^3/sec) of water which infiltrates the ground approximately 500 feet south of the portal. However, it is re-

- determine if there is a need for emergency action, or other less urgent action at the site;

- collect adequate data to determine the waste quantity of tailings using several alternatives (i.e., hazardous constituent quantity, source volume, and source area);

- determine the existence or potential for contamination of surface water in Sheep Creek, Gastineau Channel, and ground water in the site vicinity;

- determine whether local drinking water supplies have been impacted by contaminants from the site; and

- determine the existence or potential for human food chain contamination in fisheries of Gastineau Channel.

To accomplish these objectives, the following field activities were conducted:

- collection of samples from each potential contaminant source identified by background research;

- collection of water and sediment samples from Sheep Creek and Gastineau Channel;

- collection of ground water samples from nearby, potentially affected domestic wells;

- collection of benthic organism samples from Gastineau Channel intertidal zones;

- collection of surface soil samples from nearby residences;

- measurement of site boundaries and distances to potential targets;

- determination of target and/or receptor populations and densities;

- analysis of samples for EPA Target Compound List (TCL) parameters (Appendix B); and

- evaluation of tailings leachability using Extraction Procedure (EP) Toxicity methods.

12.2 Sample Numbers, Types, and Analytes

Table 7 summarizes the numbers, types, and analytical parameters of samples collected during the investigation. A total of 30 tailings samples were collected from Tailings Dump #1. Of this total, 22 samples were collected as 0-4 foot depth composites. Four other samples were collected at discrete depths approximately 18 feet below the surface.

TABLE 7

SAMPLE TYPES, NUMBERS, AND ANALYSES

Sample Matrix	Number of Samples	Location of Samples	QA/QC Samples: Blanks	QA/QC Samples: Duplicates	Total Samples	Sample Type	Analytical Parameters	Sample Numbers
Tailings	26	Tailings Dump #1	0	0	26	Composite	TCL Inorganics	1A1 - 1F1
Tailings	4	Tailings Dump #1	0	0	4	Composite	EP Toxicity (metals only)	1A2 and 1A3 (0-4'), 1D1 and 1D4 (bottom)
Tailings	12	Tailings Dump #2	0	0	12	Composite	TCL Inorganics	2A1 - 2C2
Tailings	2	Tailings Dump #2	0	0	2	Grab	EP Toxicity (metals only)	2B3 and 2C1 (0-4')
Marine Water	4	Gastineau Channel	0	0	4	Grab	TCL Inorganics	GCW 1 - GCW 4
Marine Sediments	6	Gastineau Channel	0	0	6	Composite	TCL Inorganics	GCS 1 - GCS 6
Creek Water	6	Sheep Creek	1	0	8	Grab	TCL Inorganics	SCW 1 - SCW 5, SCW 7 and SCW 9
Mine Portal Discharge Water	1	Mine Portal	0	0	1	Grab	TCL Inorganics	SCW 8
Creek Water	1	Intake on Sheep Creek	0	0	1	Grab	Full Inorganic & Organic TCL	SCW 2
Creek Sediments	7	Sheep Creek and Mine Portal	0	0	7	Grab	TCL Inorganics	SCS 1 - SCS 5, SCS 7 and SCS 9
Surface Soil	1	Nowell Mill Site	0	0	1	Grab	TCL Inorganics	SCS 6
Benthic Organisms (Mussels)	4	Gastineau Channel and Background Location	0	0	4	Composite	TCL Inorganics	B1 - B4
Ground Water	6	Domestic Wells Between Cross Bay Creek and End of Thane Road	1	1	8	Grab	Full Inorganic & Organic TCL	DW 1 - DW 6
Surface Soil	7	Residences Between Cross Bay Creek and End of Thane Road	0	1	8	Composite	TCL Inorganics	OSS 1 - OSS 7

All of these samples were analyzed for TCL inorganic elements. Four additional samples collected from selected locations at Tailings Dump #1 were submitted for EP Toxicity testing (metals only).

A total of 14 tailings samples were collected from Tailings Dump #2. Eleven 0-4 foot depth composites were collected, as well as one sample from a discrete depth of approximately five feet. All of these samples were analyzed for TCL inorganic elements. Two samples collected from selected locations at Tailings Dump #2 were submitted for EP Toxicity testing (Figure 3).

Twelve surface water samples were collected during the SI. Four samples were collected from Gastineau Channel, one at the mine portal, and seven from Sheep Creek (Figures 3 and 4). One of the Sheep Creek water samples was collected at the drinking water intake. All samples were analyzed for TCL inorganic elements. In addition, the water sample collected at the drinking water intake was analyzed for the full range of TCL organic compounds. Sample SCW 9 was collected as a background sample.

Thirteen surface water sediment samples were collected. Six samples were collected as surficial composites from transects established perpendicular to the shoreline of Gastineau Channel, located north and south of the tailings dumps. The remaining seven were collected from Sheep Creek, at locations corresponding to those where water samples were collected (Figures 3 and 4). In addition, a single soil sample was collected at the Novell Mill Site, and was analyzed for TCL inorganic elements.

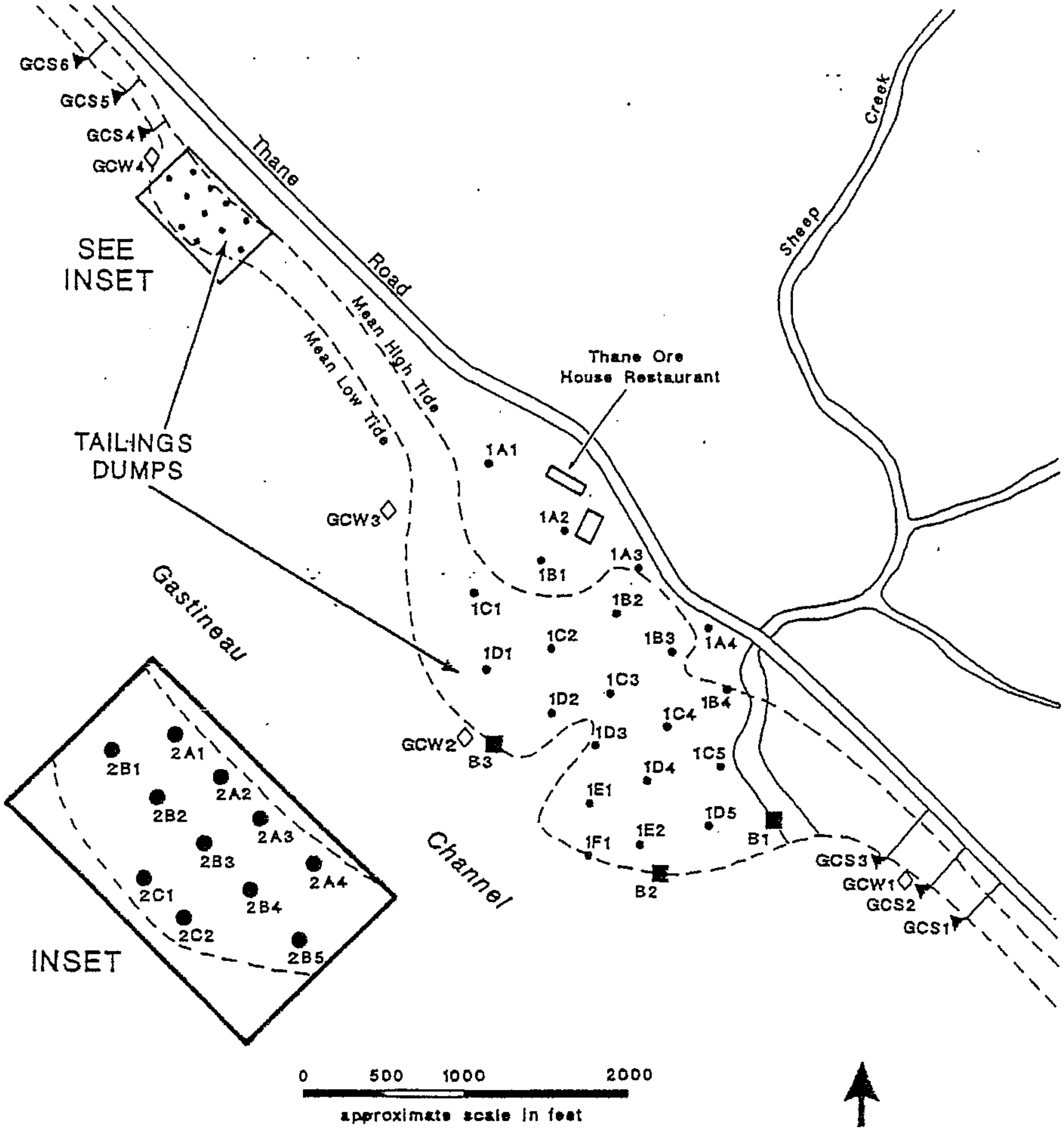
Four mussel samples were collected during the SI. Three were collected from the periphery of Tailings Dump #1 (Figure 3). The fourth (background) was collected from the north shore of Douglas Island, approximately 12 miles north of Thane. Whole tissue analyses were performed on the mussel samples for the following inorganic analytes: total antimony, arsenic, cadmium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc.

Six ground water samples were collected as part of the SI. The samples were collected from domestic wells located between the site and the south end of Thane Road (Figure 5). The ground water samples were analyzed for the entire EPA TCL.

Seven off-site surface soil samples were collected from properties between the site and the south end of Thane Road (Figure 5). The off-site soil samples were analyzed for TCL inorganic elements.

12.3 Sampling Methodologies and Equipment Decontamination

Sampling techniques, methodologies, and rationale used during the Thane Mine Dump SI were as described in the Field Operations Study Plan (TDD F10-8702-02, January 1988) (29). Decontamination procedures used for equipment and personnel are also discussed in the Study Plan.

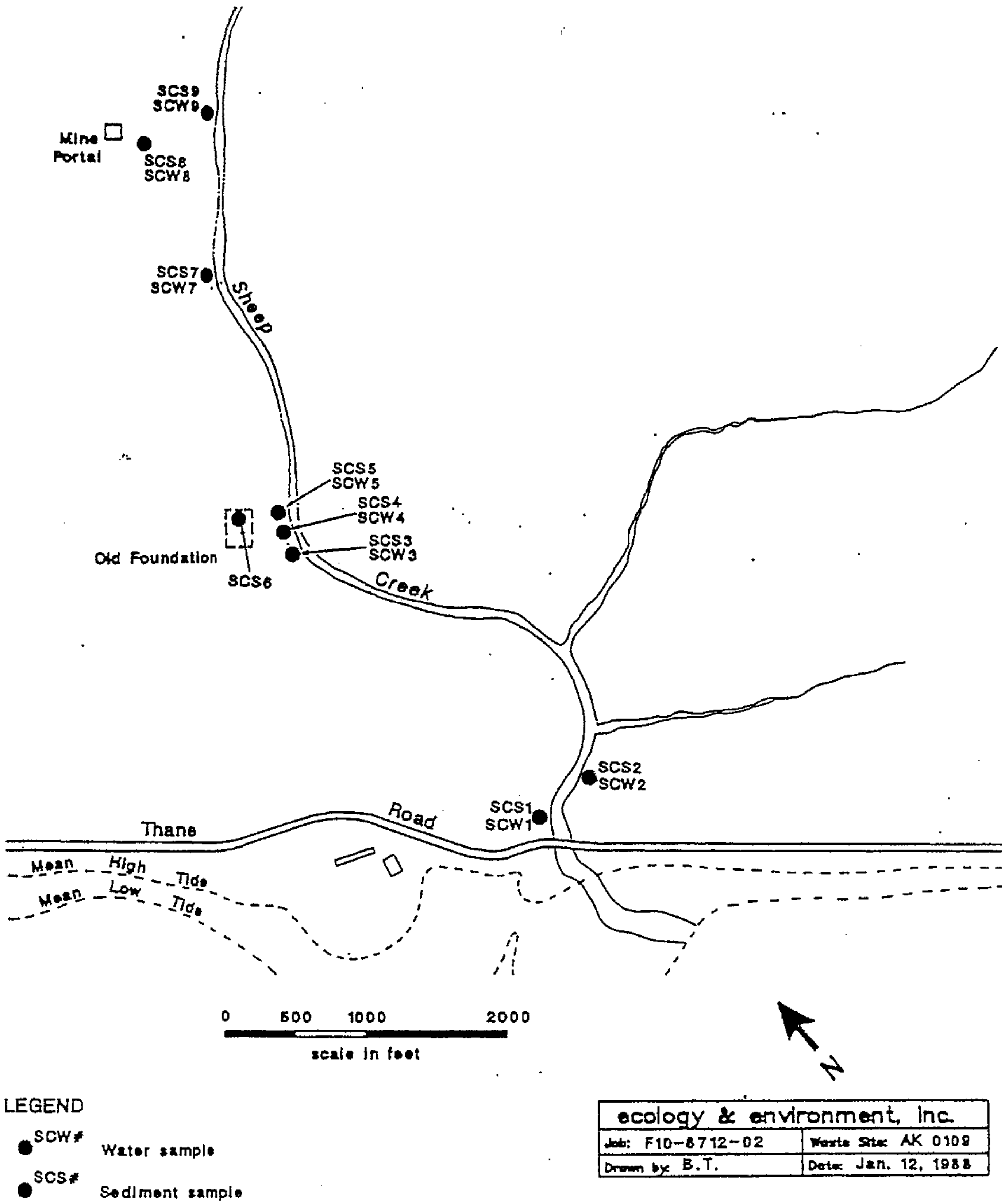


LEGEND

- • Tailings sample
- ▲ GCS Beach sediment sample
- ◇ GCW Marine water sample
- ■ B Benthic sample (mussel)

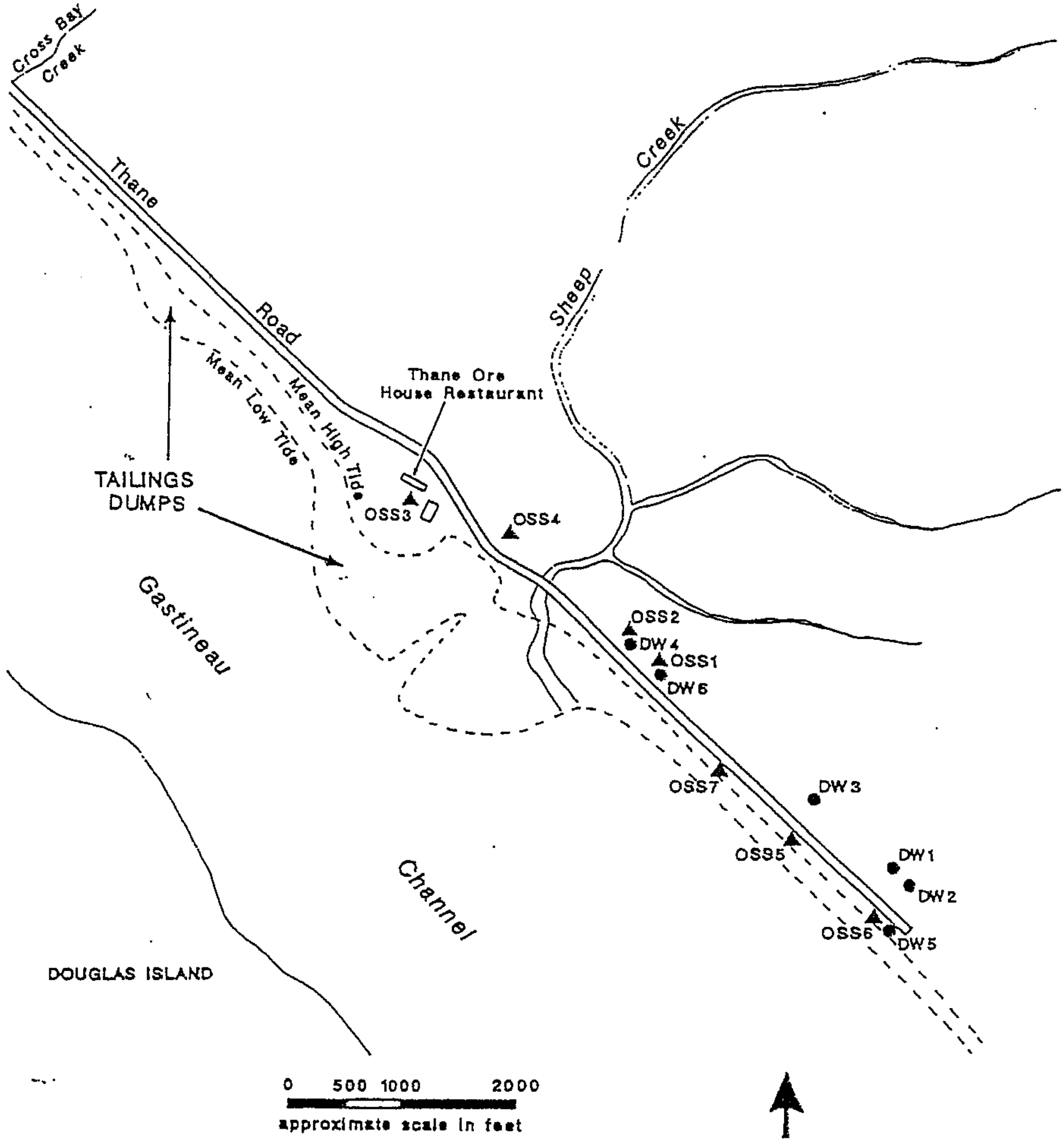
ecology & environment, inc.	
Job: F10-8712-02	Waste Site: AK 0109
Drawn by: B.T.	Date: April 27, 1988

FIGURE 3
TAILINGS SAMPLE LOCATION MAP
THANE MINE DUMP
Juneau, AK



ecology & environment, inc.	
Job: F10-8712-02	Waste Site: AK 0109
Drawn by: B.T.	Date: Jan. 12, 1988

FIGURE 4
SHEEP CREEK SAMPLE
LOCATION MAP
THANE MINE DUMP
Juneau, AK



LEGEND

DW1 Domestic well sample

OSS1 Soil sample

ecology & environment, inc.	
Job: F10-8712-02	Waste Site: AK 0109
Drawn by: B.T.	Date: Jan. 12, 1988

FIGURE 5
OFF-SITE SAMPLE LOCATION MAP
THANE MINE DUMP
Juneau, AK

Versar INC. SACRAMENTO

September 14, 1988

Mr. David Stone
Customer Service Engineer
Alaska Electric Light and Power
134 Franklin Street
Juneau, Alaska 99801

Mr. Steve Gilbertson
Land Manager
City and Borough of Juneau
155 South Seward Street
Juneau, Alaska 99801

Reference: Comments on the Ecology and Environment, Inc., Report on the Site Inspection at the Thane Mine; Versar Job No. 6147.1

Dear Mr. Gilbertson and Mr. Stone:

Pursuant to our telephone conversation, I am sending you my comments on the Ecology and Environment, Inc., (EE) report on the site inspection at the Thane Mine. I have limited my comments to those items which deal with the environmental aspects of the report.

<u>Page 20, Section 3.1, Paragraph 6</u>

The marine water collected to establish the background was improperly selected. The background sample, taken during a rising tide, is incoming sea water, and is not directly comparable to the water sample taken during slack tide, which has interacted with the tailings. A proper background sample would be taken during slack tide from an area of natural sediments.

<u>Page 35, Section 14.1</u>

The EP Toxicity Tests demonstrated conclusively that the tailings are not hazardous wastes. The purpose of calculating the quantity of lead and arsenic present in the tailings, and then labeling that quantity the "hazardous constituent quantity" serves no purpose, except to attempt to provide justification for initiating the investigation. The tailings have been demonstrated to be nonhazardous; therefore, the "hazardous constituent quantity" is zero.

5330 PRIMROSE DRIVE • SUITE 228 • FAIR OAKS, CALIFORNIA 95628 • TELEPHONE: (916) 962-1612

Page 38, Last Paragraph

The Federal Ambient Water Quality Criteria for chronic effects to salt water aquatic life is inappropriately applied. The standards cited for mercury, 0.025 micrograms per liter (ug/l), and nickel, 7.1 ug/l are for a 24-hour average concentration. The standards for a single sample are 3.7 ug/l for mercury and 140 ug/l for nickel. None of the marine water samples exceeded these values. It should also be noted that these samples were collected at the time when maximum values would be obtained for metals derived from the tailings, and it is highly unlikely that the 24-hour average value would be exceeded. Finally in this paragraph, EE states that the standard of 0.144 ug/l of mercury for the protection of human health is exceeded by marine water sample GW-4. This standard is for ingestion of both water and contaminated water organisms. EE fails to point out, however, that the salt water in the channel is unlikely to be used as a source of drinking water.

Page 39, Second Paragraph

EE states that the lead and arsenic content of mussel tissue is significantly above background. EE fails to state that the standard for significance, in this case, is an arbitrary standard, and is not based on health considerations, or chronic or acute toxicity data.

Page 39, Third Paragraph

The Thane Orehouse Restaurant is built on tailings. A soil sample from this location can hardly be classified as offsite.

Page 39, Fourth Paragraph

There is no justification for suggesting that the arsenic in the ground water wells is attributable to the presence of tailings for the following reasons:

1) The tailings are at tidewater. For arsenic from the tailings to reach the wells, salt water would have to be intruding the ground water supplying the wells. The chemical analyses show no evidence of salt water intrusion.

2) Ground water flows from the wells towards the tailings.

3) Arsenic was not found in the leachate generated during the Extraction Procedure Toxicity Tests.

4) Other metals found in the tailings, including those found in the EPTT, were not found in the well water.

<u>Page 42, Section 15.0, Paragraph 1</u>

The statement that "...leaching of metals in higher concentrations may have occurred in or shortly after their disposal in the early part of the century", is speculative, and is not supported by a single point of evidence in the report. Such a statement has no place in the conclusions of the report. Further in that paragraph, the statement is made that shellfish are at risk because elevated lead was detected in all on-site samples. However, lead was not detected in the marine water samples and no other pathway for the lead to enter the shellfish was identified. Further, impairment of the shellfish population has not been documented by the investigation. Finally, the statement that humans may ingest wind-blown tailings while using the tailings dumps for recreational purposes is also without merit. The ingestion (or, perhaps, more properly inhalation) of wind-blown tailings has not been documented, and there is no known recreational use of the tailings. Again, these are unsupported speculative statements which have no place in the conclusatory section of a report.

<u>General Comments</u>

The phrases "significantly above background" and "significantly elevated levels" are poorly defined in the report. It should be made clear that these standards are arbitrarily set, and not derived from health- or environmental-based standards to prevent the derivation of unwarranted conclusions by readers of the report. Also, because the focus of the investigation was to determine if wastes which are specifically defined as "hazardous" by federal regulations, and the presence of these hazardous wastes could indicate that health or environmental hazards are present, the use of the work "hazardous" should be limited to describe those materials which meet the regulatory definition to prevent misinterpretation of the results and conclusions.

Very truly yours,

Clarence Johnson
Senior Geohydrologist

Versar INC. SACRAMENTO

January 15, 1988

Mr. Steve Gilbertson
Land Manager
City and Borough of Juneau
155 South Seward Street
Juneau, Alaska 99801

Mr. David Stone
Customer Service Engineer
Alaska Electric Light and Power
134 Franklin Street
Juneau, Alaska 99801

RECEIVED
JAN 19 1988
A.E.L.P. & CO

Dear Mr. Gilbertson and Mr. Stone:

On January 13, 1988, I had telephone conversations with Mr. Bill Richards of Environment and Ecology, Inc. (EEI), and Mr. Bill Glasser and Ms. Michelle Anderson of the U. S. Environmental Protection Agency (EPA), regarding the Preliminary Assessment (PA) and proposed site investigation of the Thane tailings area. In addition, I have reviewed the portions of the Superfund Amendments and Reauthorization Act (SARA) which authorize and direct the EPA to conduct the Preliminary Assessments. Summaries of the review of SARA and the telephone conversations are given below.

Section 105 of SARA (see Attachment 1) directs the EPA to identify all locations which may have hazardous wastes, evaluate the threat to the public health and the environment, and implement the best remedial measures at those locations where action is required. This section also requires that the investigated sites be given a Hazard Ranking System (HRS) score to determine if the site should be placed on the National Priorities List (NPL), which is a listing of Superfund sites. The EPA has estimated that 26,000 sites will have to be evaluated nationwide as part of the PA program. The EPA procedure for evaluating the identified sites is to conduct a PA followed by a site inspection, if one is necessary to fill data gaps. Following this, the EPA will make a determination of the actions required for a site. The action may range from no further work to placement on the NPL and initiation of a Superfund investigation.

Section 107 of SARA (see Attachment 2) defines the liability for the costs associated with the PAs. This section explicitly states that if contamination is found, the landowner, among others, can be required to pay for the cost of the PA, as well as any cleanup costs incurred. Ms. Anderson stated that the EPA may also recover the costs of a PA even if no environmental hazards are found. This does not appear to be explicitly stated in Section 107. At this time, the EPA does not have a policy of recovering the costs of a PA from potentially responsible parties if no environmental hazards are found.

Mr. Richards stated that a proposed work plan for the Thane tailings area would be delivered to the EPA on January 13 or 14, 1988. The purpose of the proposed work is to fill data gaps identified in the PA prepared for the EPA by Mr. Richards titled "Preliminary Assessment Report, Thane Mine Dump Site, Juneau, Alaska," dated October, 1987. The data collected will be used to compile a HRS score for the site to determine the necessity of taking further remedial action to minimize environmental hazards. According to Mr. Richards, the tasks recommended in the work plan include:

1. The volume of the tailings will be determined by drilling boreholes to measure the thickness of the pile. According to Mr. Richards, there are no drillers in Juneau with adequate hazardous waste safety training to put in the boreholes. Therefore to conduct the drilling, EEI will ship a small drill rig to Juneau and man it with their own personnel.

2. The composition of the tailings will be determined by taking samples for chemical analysis from the boreholes.

3. Water and stream sediment samples for chemical analysis will be taken at the mine portal along Sheep Creek, and along the course of Sheep Creek.

4. Benthic organisms will be collected for bioassay from the toe of the tailings pile and from the discharge area of Sheep Creek in Gastineau Channel.

5. A bioassay will be conducted on a fish from the hatchery pens located offshore.

6. Ground water samples will be collected for chemical analysis from wells in the area.

7. Surface soil samples will be collected from nearby residential areas.

The PA does not cite any site specific evidence which establishes that a threat of environmental impairment exists at the site. It is, therefore, difficult to understand how a program of this magnitude can be logically justified.

Mr. Glasser will review the proposed work plan for the Thane area for the EPA. To date, the EPA has not issued a formal opinion on the level of work required to investigate the site. Mr. Glasser has agreed to send me a copy of the plan when it has been finalized.

The work plan for the Thane area appears to cover a larger area than discussed in the PA issued in October, 1987. This expanded area includes land owned by the Unit. Because the possibility exists that the EPA may try to recover the costs of the PA if environmental hazards are found on Unit property, the work conducted at the Thane area should be monitored closely. I would recommend that a request be made to the EPA that the Unit be allowed to review and comment on the plan prior to final EPA approval, and that the Unit be given an estimate of the cost to complete the work. Although the EPA is unlikely to grant this request, the Unit will have established that it has objections to the plan and has attempted to discuss the objections with the EPA. This may be important if an attempt is made by the EPA to recover the costs of the PA in the future.

If you have any questions or comments about the contents of this letter, please call me.

Very truly yours,

Clarence Johnson
Senior Geohydrologist

Attachments

Versar INC. SACRAMENTO

March 16, 1988

Mr. Steve Gilbertson
Land Manager
City and Borough of Juneau
155 South Seward Street
Juneau, Alaska 99801

RECEIVED
MAR 18 1988
A.E.L.P. & CO.

Mr. David Stone
Customer Service Engineer
Alaska Electric Light and Power
134 Franklin Street
Juneau, Alaska 99801

Reference: Oversight of EPA Directed Sampling in the Thane, Alaska Area;
Versar Job No. 6147.1

Dear Mr. Gilbertson and Mr. Stone:

From February 8 through February 12, 1988, Ecology and Environment, Inc. (E and E), acting for the United States Environmental Protection Agency (EPA), collected ground water, surface water, stream sediment, and tailings samples in the Thane, Alaska, area for chemical analysis. The purpose of the study was to determine if uncontrolled hazardous wastes were present at the site, and to obtain data to evaluate the validity of the Hazard Ranking System used to score the environmental impairment potential of the site. On February 8, 9, and 10, I observed their E and E's sampling activities to ensure that no techniques were used which would produce biased results. The observations made during the sampling activities are documented below.

Ground water samples were collected from several domestic wells in the Thane area for analysis for Target Compound List (TCL) inorganics, cyanide, and TCL organics. The wells were purged until the temperature, pH, and specific conductance had stabilized. While it is doubtful that an accurate measure of the ground water temperature could be obtained by the methods used by E and E, it is probable that the wells were purged sufficiently to obtain a valid sample. The pH and specific conductance readings obtained during the time I was observing the sampling showed the water to be very high quality. According to a driller's log, the aquifer which is used as a source of ground water is reported to be between 60 feet and 100 feet below the ground surface. Artesian pressure forces the ground water upward to approximately 30 feet below the surface in the wells, which indicates that the aquifer is under a confining pressure.

5330 PRIMROSE DRIVE • SUITE 228 • FAIR OAKS, CALIFORNIA 95628 • TELEPHONE: (916) 962-1612

Surface water and stream sediment samples were collected along Sheep Creek from the mouth of the stream to above the area of the Echo Bay mine portal. These samples were analyzed for TCL inorganics and cyanide. One sample taken near the mouth was also submitted for analysis for TCL organics. The E and E location for the sample at the mouth of the stream was moved upstream, above the bridge, at my recommendation to prevent contamination of the sample by highway deicing chemicals or petroleum hydrocarbons. The stream water and sediment sampling was concentrated in the area adjacent to and downstream from the old Nowell mine site. Additional samples taken were a water sample of mine water discharge, and a soil sample from the Nowell mine site. The stream sediment samples were taken either along the edge of the stream, or from the bottom of plunge pools with a measuring cup attached to a long wooden handle. The samples from the plunge pools were taken to determine if mercury is present in the stream sediment samples.

Tailings samples were taken with a power auger on a grid laid out on the tailings dump. The southern third of the grid included a large area of sediments from Sheep Creek. The samples were taken from the surface to four feet below the surface over most of the grid. In some areas, the tailings were sampled to a depth of nine feet. All of the samples taken were analyzed for TCL inorganics and cyanide. Four samples were taken for Extraction Procedure (EP) Toxicity Tests. Splits of three of the samples taken for the EP Toxicity Tests were sent for analysis to Ensco-Cal Laboratories at the request of Echo Bay to provide a more rapid determination of the hazardous characteristics of the tailings, and to serve as an independent check of the EPA results. The results of the analyses show that no metals were detected in the extraction liquid. The complete laboratory results will follow when they have been received from the laboratory.

Additional sampling included taking sediment samples for chemical analyses for background levels of TCL inorganics and cyanide, mussel samples for bioassay for TCL inorganics and cyanide, and soil samples from nearby residences for chemical analyses for TCL inorganics and cyanide. Because these samples were deemed to be of lesser importance, I did not observe these sampling activities.

The conclusions concerning the site inspection, based on the field observations made during the sampling activities and the results of the EP Toxicity Tests, are:

1. Of the 23 metals on the inorganic TCL, only lead, mercury, zinc, copper, and arsenic could be of concern as a result of mining related activities in the area. The TCL organics include 35 volatile organic compounds, 65 semi-volatile organic compounds,

and 26 pesticide and polychlorinated biphenyl (PCB) compounds. There is no evidence to suggest that these compounds are of environmental concern as a result of past or present activities in the area. Also, there is no evidence that cyanide was used as part of the gold recovery process at any of the mines in the Thane area.

2. Because the ground water supply wells are obviously upgradient from the tailings disposal area, it is reasonable to expect that the ground water supplied by the domestic wells cannot be impacted by the tailings deposited at tidewater. Echo Bay has conducted analyses of the mine water discharge in the past, and no contamination was found. It is reasonable to assume that no ground water supply wells are being impacted by past or present mining activities.

3. The field tests conducted on the stream and mine discharge water samples did not indicate any problems with water quality.

4. The results of the EP Toxicity Tests show that the tailings should not be classified as hazardous wastes.

5. Unless the results of the chemical analyses of the sediment and water samples from the stream show unexpectedly high concentrations of metals, further EPA action in the Thane area is unlikely.

If you have any questions or comments about the EPA sampling in the Thane area, please call me.

Yours very truly,

Clarence Johnson

Clarence Johnson
Senior Geohydrologist

APPENDIX C
Preliminary Conceptual Site Model

Print Form

Human Health Conceptual Site Model
Scoping Form

Site Name: Alaska Gastineau Mine Tailings

File Number: 1513.38.013

Completed by: T. Martin, NORTECH

Introduction
The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☒ Other: mine tailings

Release Mechanisms *(check potential release mechanisms at the site)*

- ☐ Spills
- ☐ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☒ Other: historic mining processes. documented to not have included cyanide nor mercury

Impacted Media *(check potentially-impacted media at the site)*

- ☒ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☒ Air
- ☒ Sediment
- ☒ Groundwater
- ☒ Surface water
- ☒ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☒ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☒ Subsistence harvester (i.e. gathers wild foods)
- ☒ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☒ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

arsenic

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☐

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

EP toxicity tests proved the metals are not leaching. Groundwater wells in the vicinity and Sheep Creek's surface water, including the water coming from the Sheep Creek Portal, was tested in the 1988 study.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

surface water was assessed in 1988 study.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☒

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☒

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Complete

Comments:

mussels assess in 1988 study; determined to not be affected by tailings

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☐

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- o Climate permits recreational use of waters for swimming.
- o Climate permits exposure to groundwater during activities, such as construction.
- o Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- o The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- o The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- o Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- o Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- o Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- o Climate permits recreational activities around sediment.
- o The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

APPENDIX D
Resumes of Environmental Professionals

JASON J. GINTER

STAFF CHEMIST
JUNEAU OFFICE MANAGER

EDUCATION

- B.S. Chemistry, University of Buffalo, 1994

CERTIFICATES AND LICENSES

- Certified Energy Auditor, 2011
- EPA Method 9 Visible Emissions Certification
- OSHA Hazardous Waste Operations, Planning and Emergency Response
- RCRA HazMat Transportation
- Water and Wastewater Treatment Operator Grade 1
- Certified Erosion and Sediment Control Lead (CESCL) AKID#2157

EXPERIENCE AND QUALIFICATIONS

Jason Ginter is ***NORTECH***'s Juneau office and technical manager. He has worked in the environmental remediation field since 1993 and in Alaska since 1997. He has worked in contaminated site remediation, water quality monitoring, hazardous materials and asbestos sampling, hazardous waste shipping and disposal, water and wastewater treatment, and building energy audits. He has 19 years of environmental experience with EPA, ADEC and ASTM test methods.

In Alaska, Mr. Ginter has worked for Easton Environmental as the project engineer's field representative for the chemical treatment of *Exxon Valdez* affected beaches in 1997. This work has been documented in the US Library of Congress as part of the government record of cleanup regarding the *Exxon Valdez* oil spill. Since 1997, he has worked for SBL/***NORTECH*** on projects including all phases of environmental sampling, cleanup and reporting from Prudhoe Bay to Ketchikan. Some of his project experience includes on-water oil spill response; C-Site cleanups such as Diamond Park which included site assessment and directing excavation for cleanup of 12,000 cubic yards of asphalt batch plant waste; developing and implementing the PCB cleanup plan for the Haines Light and Power generating plant; and sampling, delineation and assessment of contaminated areas at the Yakutat Airport; and closure assessment of every ADOT underground storage tank in Southeast Alaska. Mr. Ginter has a current EPA AHERA accreditation for asbestos building inspections.

***Hazardous Materials Investigations and Remediation Design*:** Mr. Ginter has been involved in the successful closure of over 150 petroleum contaminated sites in Southeast Alaska, with responsibilities ranging from developing Corrective Action Plans for ADEC approval, implementation of remediation strategies including air sparging, excavation and removal, and in-situ treatment of petroleum contaminated soils, delineation of spill affected areas, on-water oil spill response, unknown hazardous materials assessment and identification, shipping and disposal.

***Environmental Site Assessments**:* Mr. Ginter has conducted many Phase I and Phase II investigations around the State of Alaska. Experience in this area includes all aspects of investigations, including site research, developing and gaining regulatory approval for sampling plans, conducting hand and mechanical soil, sediment, and groundwater sampling, tank removal, and closure of many of these sites. Project experience includes Phase I, Phase II, and corrective action design and implementation in downtown, industrial, and residential portions of Juneau, Haines, Ketchikan, Sitka Yakutat, Kodiak, Skagway, Gustavus and numerous remote camp sites throughout southeast and southcentral Alaska.

Remedial Design, Evaluation, and Implementation: Several site assessment projects have developed into remedial design and long-term monitoring projects. Mr. Ginter has designed and evaluated active remediation systems including groundwater pump and treat, air sparge systems, *in-situ* treatment of petroleum contaminated soil using chemical processes and soil vapor extraction systems. Mr. Ginter has also designed long-term groundwater and soil monitoring plans, monitored natural attenuation programs, and institutional controls for a variety of sites, including the PCB contamination at the Haines power plant. Many of these projects have involved developing human health and ecological risk based closure guidelines. Recent remediation assessments and/or designs include projects at the Yakutat Airport, and the Old Dairy Road and Duck Creek USFS facilities.

Worker Safety and Compliance: Mr. Ginter has extensive experience working in hazardous conditions, and has logged over 1,700 hours of level C site work, and over 700 hours of level B site work, in addition to training southeast Alaska contractors and personnel in both 40 and 8 hour HAZWOPER classes. Mr. Ginter prepared the Health and Safety Plan and work plan for the emergency response work at the Fairbanks NAPA site in 2011. The site work and supporting documents were inspected by the State of Alaska Occupational Safety and Health Administration, no violations were noted.

Emergency Response: Mr. Ginter has conducted emergency response to chemical and petroleum spills and emergencies on the eastern seaboard, desert southwest, and throughout Alaska. His role has ranged from small unit leader to On Scene Coordinator, on projects as diverse as oil spills on the Delaware River (PA), Tampa Bay (FL), and spills to land and water throughout Alaska, most recently including the fire damaged Fairbanks NAPA store, which spread a variety of petroleum and chemical contaminants over several acres during fire suppression. Mr. Ginter is ***NORTECH's*** emergency response supervisor.

Commercial Energy Auditing: Mr. Ginter obtained his CEA credentials in 2011, and has been actively performing energy audits on schools in small towns and villages throughout Interior Alaska. The schools are being audited for energy efficient performance as part of a statewide project being funded by the Alaska Housing and Finance Corporation (AHFC). Mr. Ginter has constructed and operated an off-the-grid homesite and lodge, and is excited to bring his experience with energy efficient building systems to use within small rural communities.

TARA R. MARTIN

STAFF PROFESSIONAL I

EDUCATION

- B.S., Geophysical Engineering, Montana Tech of the University of Montana, 2006
    - Minor: Hydrogeology

COURSES COMPLETED

- Geology/Geophysics and Hydrogeology Field Courses
- Subsurface Remediation
- Groundwater Flow Modeling/Contaminant Transport
- C and Matlab Programming

CERTIFICATES AND LICENSES

- HAZWOPER 40-hr. Hazardous Material Training Certificate, 2007 – Current
- EPA/AHERA Building Inspector, Cert. No: TBI 24-11-149
- ADEC Qualified Field Sampler
- Certificate of Training for gINT Geotechnical and Geo-environmental Software
- Experience with *Aqtesolv* for slug test and recovery test analysis
- Experience with *Voxler,* Golden Software's 3D data visualization software.

EXPERIENCE AND QUALIFICATIONS

Tara R. Martin is a Staff Professional I at ***NORTECH***, responsible for field analysis and reporting for contaminated sites work in Southeast Alaska. She has prior experience that includes field work, geotechnical investigations, and EPA regulatory supervision. Ms. Richards has worked as a hydrogeologist on a CERCLA site for a private engineering firm and has also managed an environmental testing laboratory in Juneau, specializing in both organic and inorganic analysis.

In addition, her areas of expertise include groundwater sampling using low-flow technology; soil sampling; borehole logging; installation of monitoring wells and development; aquifer characterization using a network of pressure transducers to monitor water levels, slug tests, and pumping tests; various field instrumentation; data reduction, database usage, and quality assurance; and finally data usage via statistical analysis and/or modeling.

At ***NORTECH***, Ms. Martin has performed spill response and cleanup work in addition to completing training for and writing spill prevention control and countermeasure (SPCC) plans. She has executed and reported both Phase I and Phase II environmental property assessments and hazardous materials surveys. Finally, she is designing a soil remediation facility to service the Juneau, Alaska area.