

**SITE INSPECTION REPORT
FOR
TREADWELL MINE
JUNEAU, ALASKA**

Contract No.: 18-444-88

Work Order #20

Report Prepared by: ECOLOGY AND ENVIRONMENT, INC.

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Submitted To: Beth Potter, Environmental Specialist
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SITE INSPECTION REPORT
TREADWELL MINE
JUNEAU, ALASKA
CONTRACT NO. 18-444-88

Site Name/Address

Treadwell Mine
Juneau, Alaska

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Date(s) of Investigation

March 25 to 27, 1991

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ABSTRACT

Pursuant to Alaska Department of Environmental Conservation (DEC) Contract No. 18-444-88 and Work Order No. 20, Ecology and Environment, Inc. (E & E) conducted a Screening Site Inspection of the Treadwell Mine Complex, located in Juneau, Alaska, during March, 1991.

A total of ten soil and sediment samples, five surface water samples, and one quality control blank were collected for the SSI. The samples were collected from suspected mining waste deposition areas and nearby surface run-off routes. Samples were analyzed for TCL inorganic and volatile organic compounds.

Analytical results indicate elevated levels of several heavy metals, including mercury, are present in on-site soils. None of the samples collected from surface run-off indicate that contaminant migration via run-off was occurring during the field investigation.

1.0 INTRODUCTION

Pursuant to Alaska Department of Environmental Conservation (DEC) Contract No. 18-444-88 and Work Order No. 20, Ecology and Environment, Inc. (E & E) conducted a Screening Site Inspection (SSI) of the Treadwell Mine Complex located in Juneau, Alaska. The Site Inspection process is intended to evaluate actual or potential environmental or public health hazards at a particular site relative to other sites across the nation for the purpose of identifying remedial action priorities. The SSI represents the initial phase of the Site Inspection process and is intended to collect sufficient data to enable evaluation of the site's potential for inclusion on the National Priorities List (NPL) and, for those sites determined to be NPL candidates, establish priorities for additional action. The SSI process does not include extensive or complete site characterization, contaminant fate determination, or quantitative risk assessment.

This document presents a summary of the objectives, activities, and results of the Treadwell Mine SSI. Included are descriptions of site background information (Section 2.0) sampling objectives and scope (Sections 3.0 and 4.0), analytical results of sampling (Section 5.0), and investigation conclusions (Section 6.0).

2.0 BACKGROUND

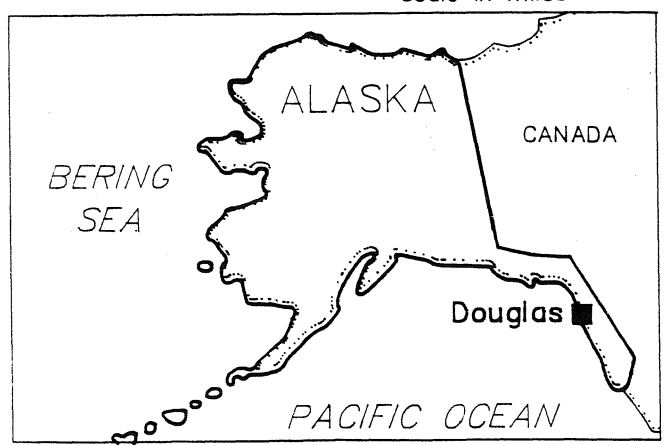
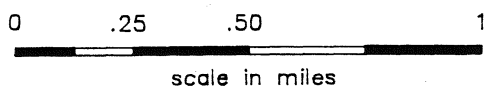
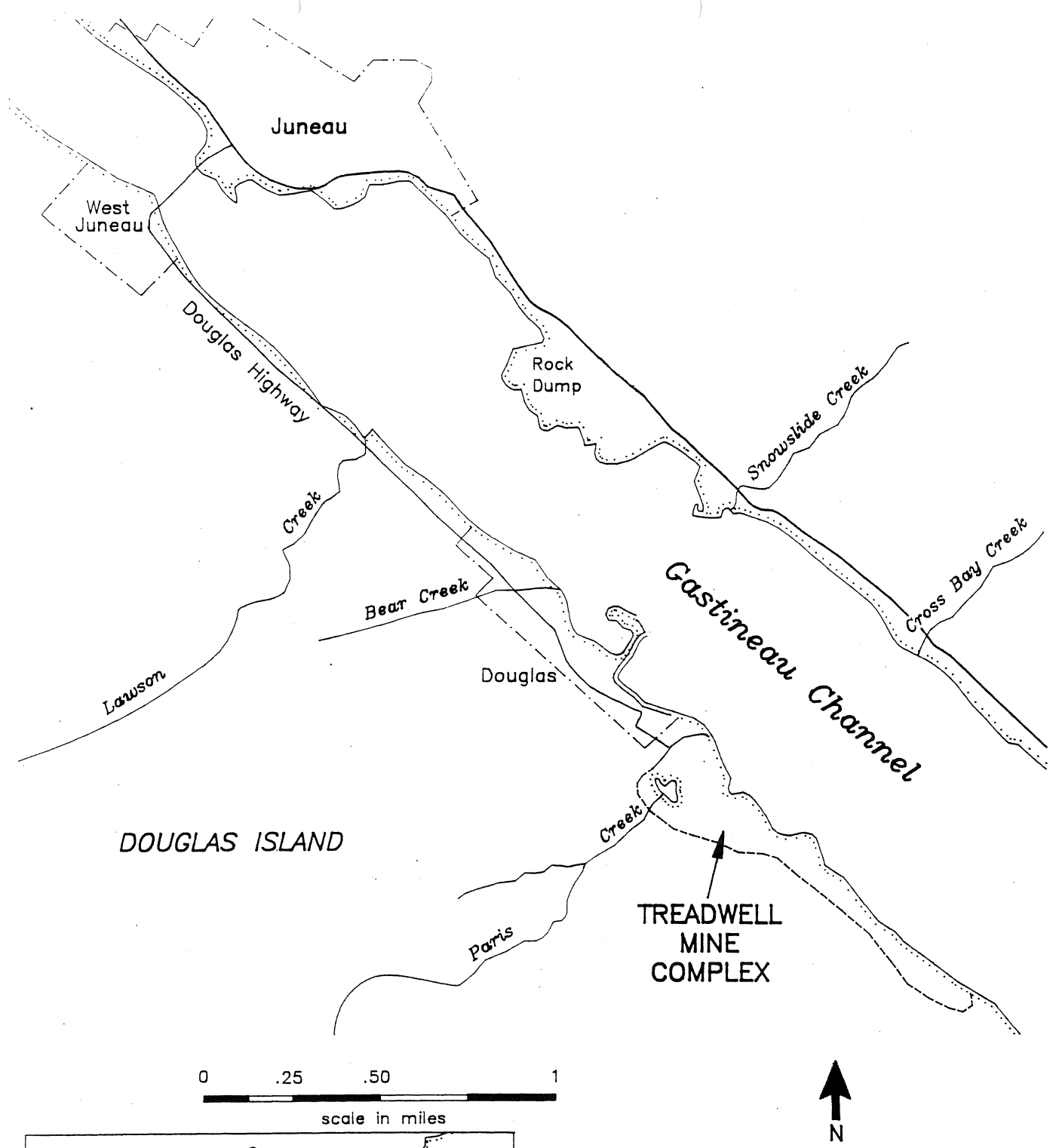
2.1 Site Location

The Treadwell Mine site is located in the SW 1/4 of section 36, Township 41 South, Range 67 East and the NW 1/4 of section 6, Township 42 South, Range 68 East of the Copper River Meridian. The site is located between latitudes 58°15'50.8" and 58°16'6.9" and longitudes 134°21'46.4" and 134°22'59.8". The Treadwell Mine site consists of an old mine complex located along the southeastern shore of Douglas Island, on Gastineau Channel, just south of Juneau, Alaska (Figure 1). The site area is accessed via the Douglas Highway (USGS 1986).

2.2 Site Operations and Waste Characteristics

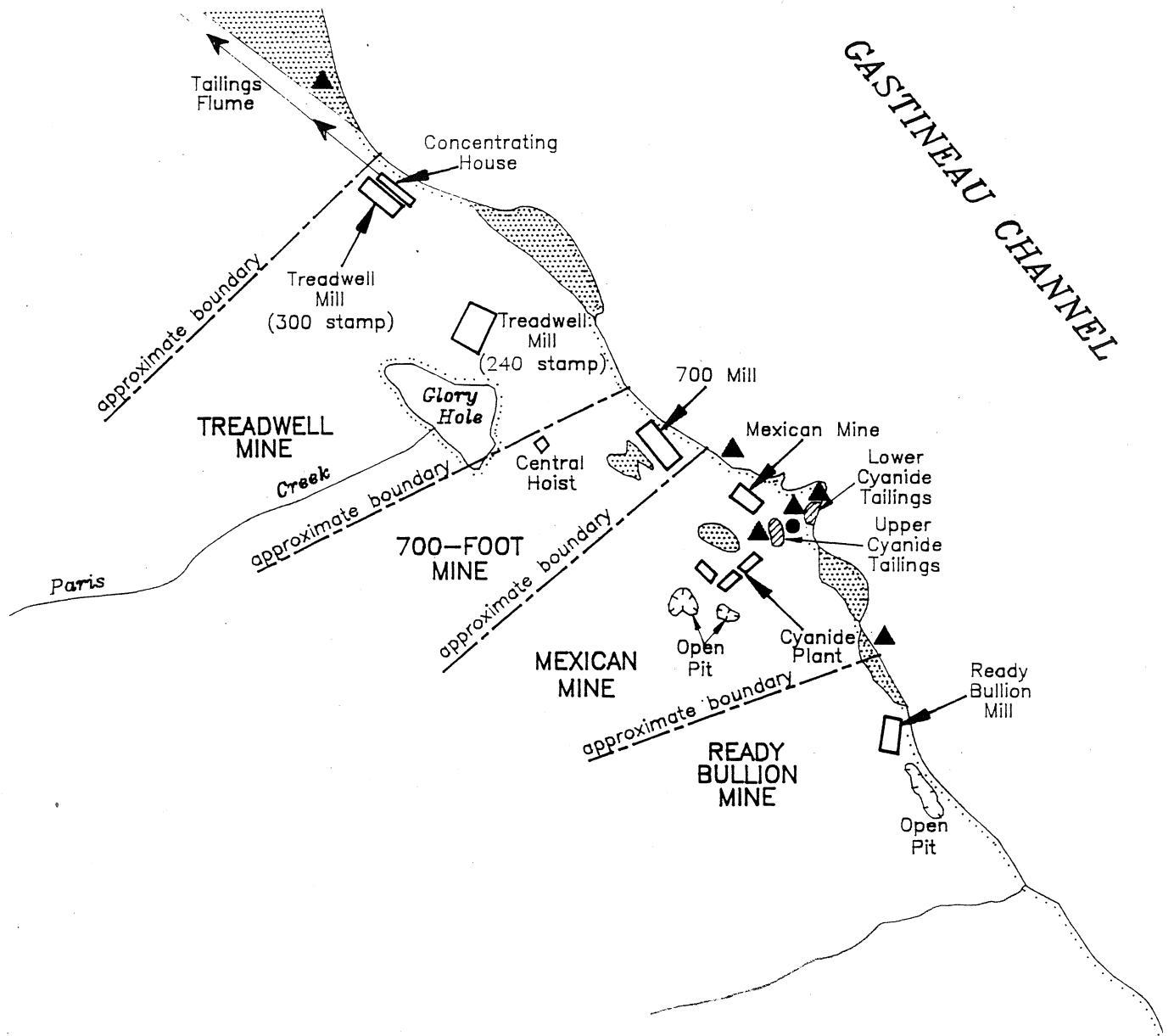
From 1891 until 1922, the Alaska Treadwell Gold Mining Company managed the mine complex, which was operated by three financially separate mining companies. The major mines at the site included: Ready Bullion Mine and 700-Foot Mine, operated by the Alaska United Gold Mining Company; Mexican Mine, operated by the Alaska Mexican Mining Company; and Treadwell Mine of the Treadwell Gold Mining Company. The four mines produced a total of 20.7 million tons of gold-bearing ore during their operations years. Pit mining was utilized at first, although by 1906, all mining activities were being conducted in underground tunnels. Mined ore was brought to the surface by a central hoist, and distributed to the separate mills on the shore of Gastineau Channel (Figure 2) (Stone 1987).

There are two primary groups of wastes associated with the Treadwell Mine Complex: 1) processed ore tailings; and 2) chemical wastes

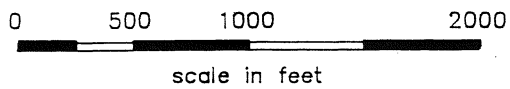


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FIGURE 1
LOCATION MAP
TREADWELL MINE



DOUGLAS ISLAND



LEGEND

 Ore tailings

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FIGURE 2
TREADWELL COMPLEX, 1914
TREADWELL MINE

from ore concentrating practices. Tailings from similar nearby mine sites have been found to contain elevated concentrations of arsenic, barium, and lead.

Approximately 20.7 million tons of ore were milled at the site. Research conducted previously at a similar nearby mining site concluded that approximately 99.9 percent of the milled ore became tailings after processing. Using this factor, it is estimated that more than 20.6 million tons of ore tailings may have been produced at the Treadwell Complex. These tailings have been deposited in a variety of locations around the site (Figure 2) (Stone 1987).

The two primary substances of concern used in ore concentrating processes at the Treadwell Complex were cyanide and mercury. Sodium cyanide, used in the cyanidation process, could have been spilled around the concentrating areas. Cyanide tailings cover an area of approximately 2,800 square feet near the cyanide plant (Upper Cyanide Tailings Pile) and approximately 9,100 square feet near Gastineau Channel. The total quantity of cyanide tailings disposed of on site is unknown (E & E 1988a; Versar 1989).

Although mercury was reclaimed for later use during ore-concentration operations, a significant quantity may have been lost through spills or disposal. During the period of June 1908, to May 1911, approximately 7 tons of mercury was unaccounted for during annual inventories at the 240- and 300-Stamp Treadwell mills. Assuming this loss rate as average for the operating history of the Treadwell mills, a total of up to 70 tons of mercury may have been abandoned at the 240- and 300-Stamp mill sites (ATGMC 1909-1911).

A significant quantity of surface run-off flows across portions of the site toward Gastineau Channel. During a site visit conducted by E & E in September, 1988, a small creek was flowing over the Upper Cyanide Tailings Pile, and several small streams were observed around the 240-Stamp and 300-Stamp Mill sites. One of the streams flowed directly into an open vertical mine shaft (E & E 1988a).

During the site inspection conducted in March, 1991, the site was covered with up to 4 feet of snow. Much of the run-off observed in 1988 was frozen or not present (E & E 1991).

2.3 Potential Contaminant Transport Pathways/Receptors

GROUNDWATER: The Treadwell area is situated on the shore of Douglas Island. In general, the coastal portions of the island are underlain by relatively thin (0 to 25 feet) layers of unconsolidated glaciomarine sediments. Metamorphic bedrock, consisting of fractured slate, schist, and metagabbro underlie the unconsolidated deposits (USGS 1971).

Groundwater occurs in both the bedrock and unconsolidated deposits. The bedrock yields water from fractures, and tends to yield only small volumes. Groundwater occurs under unconfined conditions in areas of relatively thick deposits of unconsolidated sediments. Recharge to the

groundwater system is primarily via infiltration of precipitation and meltwater run-off. Groundwater discharges to Gastineau Channel from bedrock and surficial sediments in the site area (USGS 1971).

Groundwater is not used for drinking purposes in the immediate site area. The nearest well to the site is located approximately one mile north of the site in Douglas. A total of 13 domestic wells are located within 4 miles of the site and serve an estimated 36 persons with drinking water. The Douglas and West Juneau area is served primarily by Juneau's municipal water system which draws water from wells in Gold Creek and the Salmon Creek Reservoir (DNR 1991).

SURFACE WATER: Numerous small unnamed creeks flow across the Treadwell area into Gastineau Channel. None of the creeks are used for drinking purposes and none are large enough to support fish populations. Ready Bullion Creek, located approximately one mile south of the Cyanide Tailings area (Figure 2) supports a small fish population. Portions of the beach along the Treadwell area have been filled with processed ore tailings. Gastineau Channel supports substantial marine life and is used for private and commercial fishing, transportation, and recreation. Relatively limited areas of wetlands exist on and near the site, however, the total acreage of these wetlands is less than 100 acres downstream of on-site contaminant sources (USFWS, 1991).

AIR: Juneau's climate is influenced by marine weather systems, creating generally cool wet summers and mild winters. Rainfall in the area is highly variable and is a function of topography. The Juneau Airport receives approximately 53 inches of precipitation annually, while downtown Juneau receives approximately 88 inches per year (USDA 1968). The 2-year, 24-hour maximum rainfall for Juneau is 2.6 inches (USDC 1962).

High velocity winds originating from the glaciers east of Juneau occur often during the winter months. These winds, known locally as Taku Winds, reach 100 miles per hour, and have been observed to blow dust and fine particles from the Treadwell tailings dumps hundreds of feet into the air. During the SSI, E & E personnel observed dust on snow in the wooded areas southwest of Sandy Beach (E & E 1988a, E & E 1991). This dust was assumed to be tailings particles based on its proximity to Sandy Beach and its observable similarity to the tailings material.

Table 2-1 provides a summary of the estimated total population residing within 4 miles of the site.

TABLE 2-1
Estimated Total Population
Treadwell Mine Area

Distance	Number of Households	Estimated Population
0 - 1/4 mile	42	115
1/4 - 1/2 mile	59	161
1/2 - 1 mile	180	485
1 - 2 miles	585	1,581
2 - 3 miles	1,718	4,641
3 - 4 miles	531	1,434
TOTAL:		8,417

Source: CBJ 1991

SOIL EXPOSURE: The Treadwell Mine area is used extensively for recreation by the local population. The Sandy Beach area has been developed into a park by the City and Borough of Juneau. Numerous trails extend down the beach, and human activity is evident at several of the former mill sites and structures. Nearby land-use includes residential and commercial areas. An estimated total of 761 persons reside within a 1-mile travel distance from the site (E & E 1991, CBJ 1991).

3.0 PROJECT DESCRIPTION

3.1 Sampling Objectives and Scope

As mentioned in Section 1.0, an SSI is primarily intended to gather sufficient data to enable evaluation of a site's potential for inclusion of the National Priorities List (NPL). Accordingly, the following sampling objectives were defined for the Treadwell Mine SSI:

1. Collect adequate information to satisfy United States Environmental Protection Agency (EPA) Revised Hazard Ranking System (HRS) data gaps;
2. Determine if the site poses an environmental or public health risk; and
3. Determine if emergency or less urgent action is required at the site.

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

- o On-site surface and subsurface soil/tailings samples were collected from suspected waste disposal locations;
- o On-site surface run-off samples were collected from areas near suspected waste disposal locations; and
- o Photographic and written documentation of on-site conditions and potential nearby contaminant receptors was collected.

3.2 Data Types, Uses, and Quality Requirements

The data types collected, their uses, and associated analytical quality requirements necessary to satisfy the sampling objectives are summarized in Table 3-1. Specific methods by which the necessary data were collected are described below.

4.0 SAMPLING PROGRAM

4.1 Sample Types, Numbers, Locations, and Rationale

A number of changes to the approved sampling plan were made by the field team in response to conditions encountered at the site. Snow-cover up to 4 feet deep in places prevented the collection of subsurface soil samples at the 240-Mill and Mexican Mill sites. Low temperatures and frozen surface run-off precluded the collection of samples from up-gradient locations at the 240-Mill and the Cyanide Tailings area.

Nine soil samples (including one QC duplicate) and one sediment sample were collected for the SSI. One soil sample (001SL) was collected to characterize background conditions in the site area. The sample was collected from a location approximately one mile north of Sandy Beach near Crow Hill Road. One sample was collected as a composite from the Sandy Beach Tailings (Figure 3). The aliquots were collected from 0-3 inches in depth to characterize tailings potentially available to be transported off-site by wind action. Two composite soil samples were collected from the 300-Mill area. Each sample consisted of aliquots collected from two drilled boreholes located near the concrete foundations of the mill (Figure 4). One sediment sample was collected from a run-off swale near the powerhouse of the 240-Mill (Figure 4). Two composite soil samples were collected from drilled boreholes at the 700 Mill (Figure 5). Two samples were collected from the Cyanide Tailings area (Figure 5). Table 4-1 summarizes the type, number, location, and rationale of all soil samples collected for the SSI.

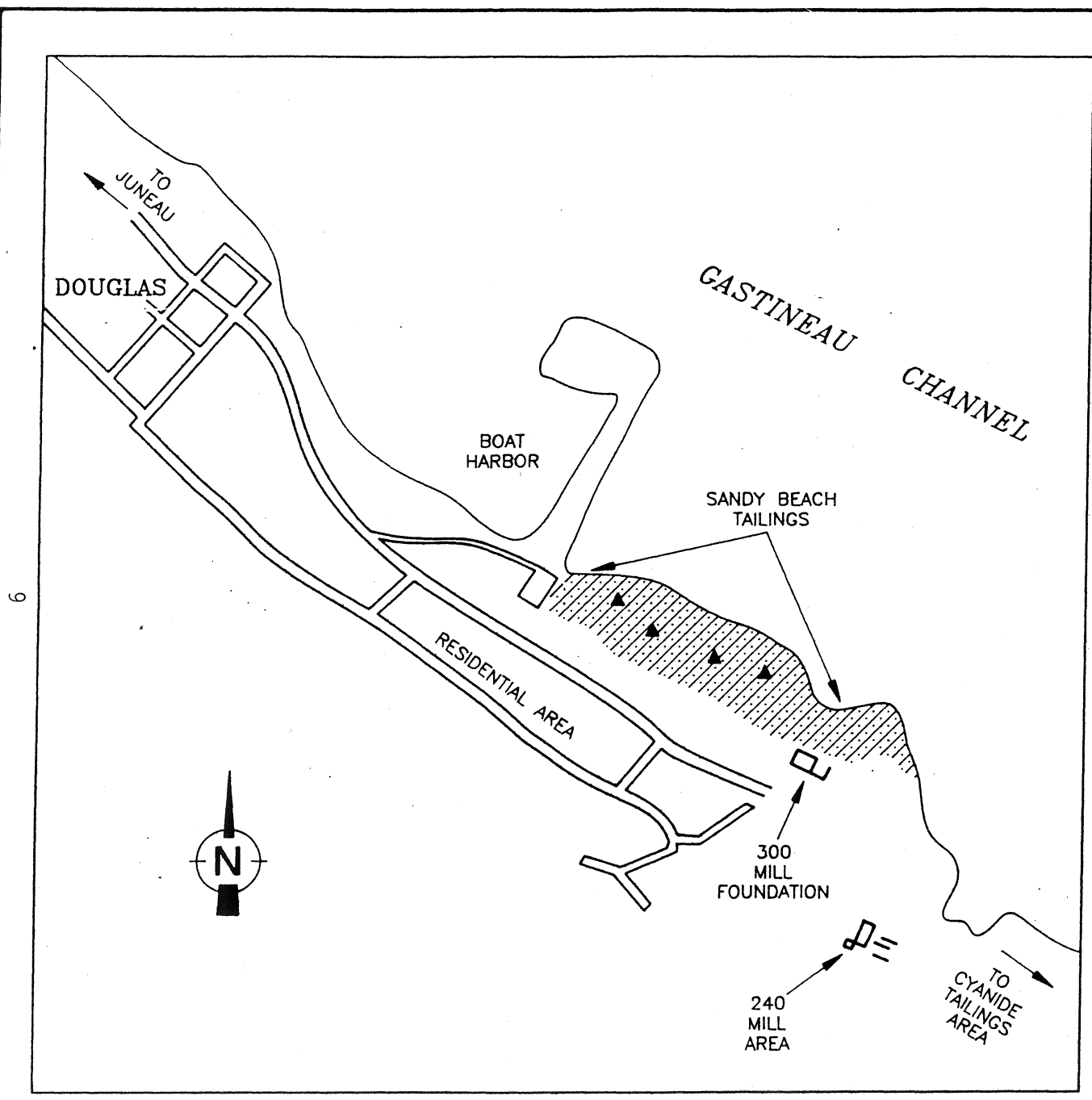
Four surface water samples were collected for the SSI. Samples were collected from surface run-off downgradient of the 300 Mill and 240 Mill (Figure 4) and the Cyanide tailings (Figure 5). A water sample collected up-gradient from the 300 Mill will be compared to the downgradient samples to determine the presence of contaminants migrating via surface run-off. Table 4-1 summarizes the type, number, location and rationale of all water samples collected for the SSI.

TABLE 3-1
Data Types, Uses, and Quality Requirements
Treadwell Mine Area

Objective Number ⁽¹⁾	Data Types Collected	Data Uses	Contaminants of Concern	Levels of Concern	Analytical Program Used ⁽²⁾
1	On-site soil contaminant concentrations	HRS Documentation	Arsenic Lead Mercury Zinc	> background	CLP, RAS
1	On-site surface runoff contaminant concentrations	HRS Documentation	Arsenic Lead Mercury Zinc	> background	CLP, RAS
2	On-site soil contaminant concentrations	Environmental/ Public Health Effects Characterization	Arsenic Lead Mercury Zinc	> 100 ppm > 100 ppm > 4 ppm > 100 ppm	CLP, RAS
3	On-site soil contaminant concentrations	Evaluation of Need for Emergency Action	Arsenic Lead Mercury Zinc	> 1000 ppm > 1000 ppm > 40 ppm > 1000 ppm	CLP, RAS

(1) See Section 3.1.

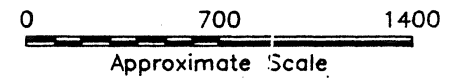
(2) CLP, RAS - Contract Laboratory Program, Routine Analytical Services.



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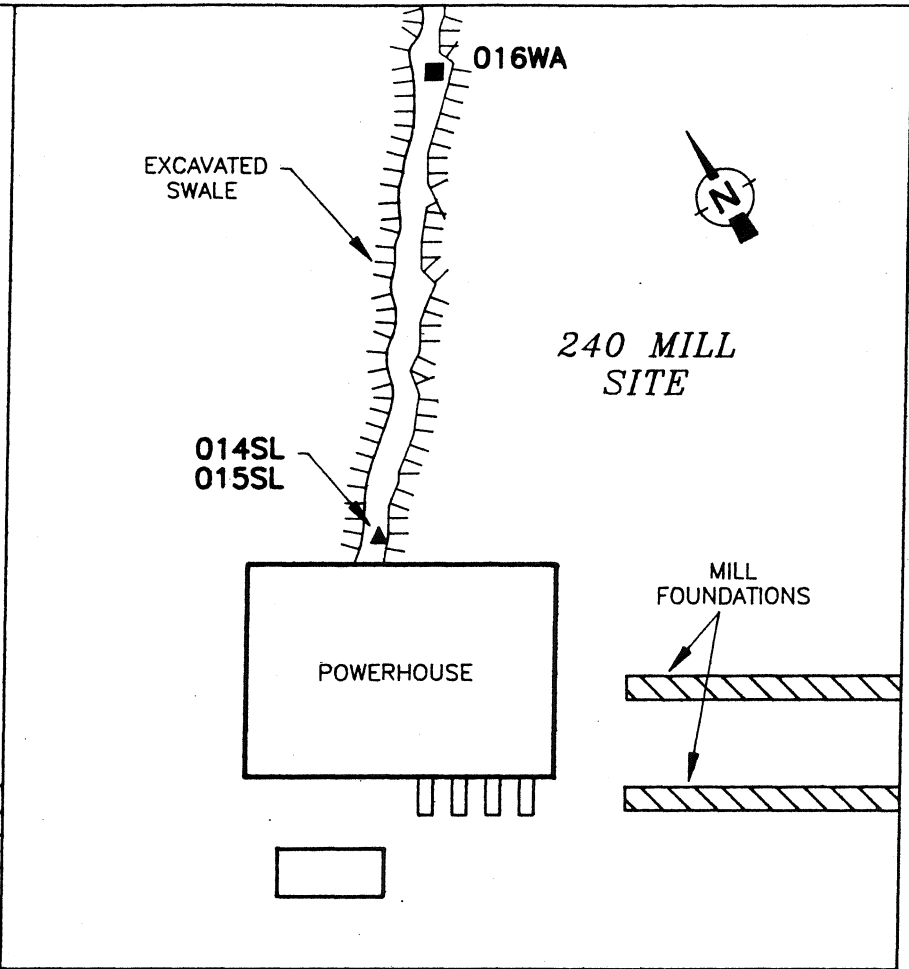
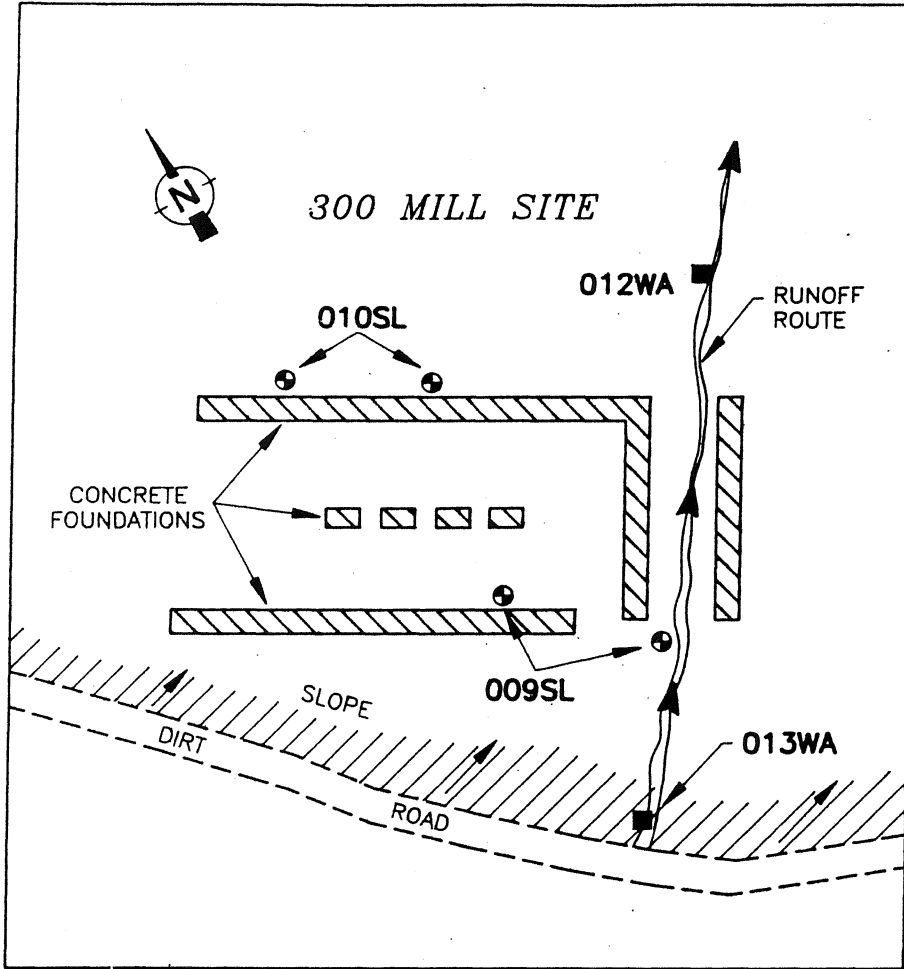
LEGEND

- ▲ Sandy beach sample (002SL) Aliquot location



TREADWELL MINE SSI Douglas, Alaska CONTRACT 18-444-88	
TITLE: SANDY BEACH SAMPLE LOCATION MAP	
Project No. JL4010	
ecology & environment, inc. ANCHORAGE, ALASKA	FIG. 3
Date: 05/91 Drawn by: RSM Scale: _____	

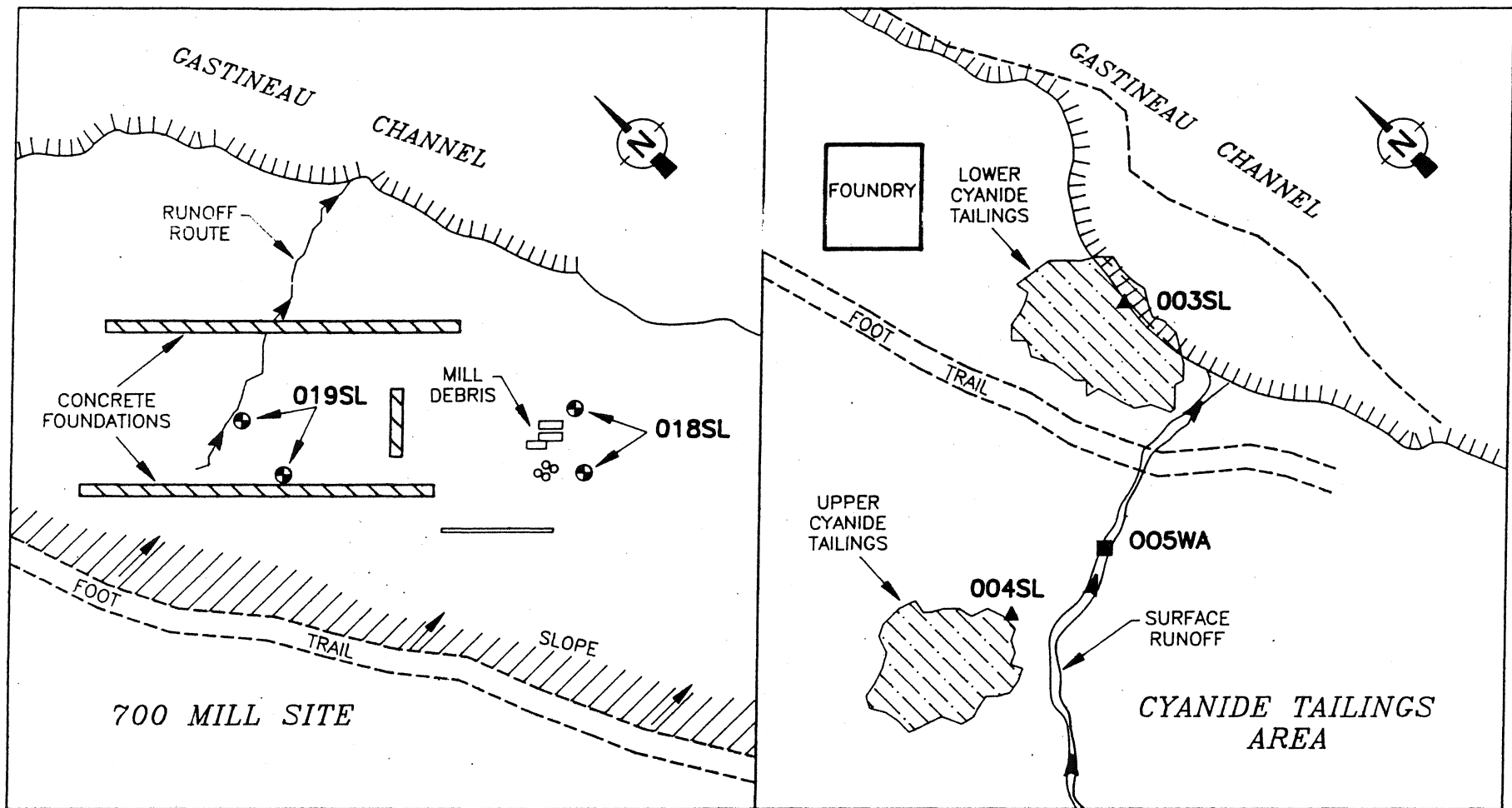
10



NOT TO SCALE

- LEGEND**
- ⊕ Borehole location
 - Surface runoff sample location
 - ▲ Sediment sample location

TREADWELL MINE SSI Douglas, Alaska CONTRACT 18-444-88	
TITLE: 300- AND 240- MILL SITE SAMPLE LOCATION MAP	
Project No. JL4010	
ecology & environment, inc. ANCHORAGE, ALASKA	FIG. 4
Date: 05/91 Drawn by: RSM Scale: NTS	



NOT TO SCALE

LEGEND

- ⊕ Borehole location
- Surface runoff sample location
- ▲ Sediment sample location

TREADWELL MINE SSI
 Douglas, Alaska
 CONTRACT 18-444-88

TITLE:
 700-MILL AND
 CYANIDE TAILINGS SAMPLE
 LOCATION MAP

Project No. JL4010

ecology & environment, inc.
 ANCHORAGE, ALASKA

FIG. 5

Date: 05/91 Drawn by: RSM Scale: NTS

TABLE 4-1
Sample Summary
Treadwell Mine Area

Sample Number	Sample Location	Matrix	Sample Type	Rationale
001SL	Off-Site Background	Soil	Grab	Background soil characterization
002SL	Sandy Beach Tailings	Soil	Composite	Characterization of surface tailings
003SL	Lower CN ⁻ Tailings	Soil	Grab	Characterization of cyanide tailings
004SL	Upper CN ⁻ Tailings	Soil	Grab	Characterization of cyanide tailings
005SL	Cyanide Tailings Runoff	Water	Grab	Identifiatiion of contaminated runoff
009SL	300 Mill	Soil	Composite	Identifiatiion of suspected waste deposition
010SL	300 Mill	Soil	Composite	Identifiatiion of suspected waste deposition
012SL	300 Mill Runoff	Water	Grab	Identifiatiion of contaminated runoff
013SL	300 Mill Runoff	Water	Grab	Identifiatiion of contaminated runoff
014SL	240 Mill	Sediment	Grab	Identifiatiion of suspected waste deposition
015SL	240 Mill	Sediment	Grab	Identifiatiion of suspected waste deposition
016SL	240 Mill Runoff	Water	Grab	Identifiatiion of contaminated runoff
018SL	700 Mill	Soil	Composite	Identifiatiion of suspected waste deposition
019SL	700 Mill	Soil	Composite	Identifiatiion of suspected waste deposition
100WA	_____	Water	Trip Blank	Quality control

4.2 Sampling Methods

Media-specific sampling procedures used during the Treadwell Mine SSI are described in the project work plan (E & E 1990). The procedures used are consistent with methodologies described in the Contract Quality Assurance Project Plan (QAPP) (E & E 1988b).

Soil samples were collected consistent with methods presented in EPA's "Preparation of Soil Sampling Protocol: Techniques and Strategies", Section 7.1.3 and 7.4.3 (EPA 1983). Samples were collected consistent with guidelines presented in EPA's "A Compendium of Superfund Field Operations Methods, Volume 1", Section 8.5.6 (EPA 1987a).

4.3 Sample Analytical and Handling Requirements

Sample analytical requirements for the Treadwell Mine SSI are summarized in Table 4-2. Included are descriptions of requested analytes, the type of analytical program(s) used, and sample-preservation techniques. Analytical methods and bottle requirements for samples collected during this investigation are described in the Contract QAPP (E & E 1988b).

All samples intended for analysis through the E & E's Analytical Service Center (ASC) were handled and documented in accordance with procedures specified in EPA's User's Guide to the Contract Laboratory Program (EPA 1986), CLP Statements of Work (EPA 1987b, EPA 1987c), and National Enforcement Investigations Center Policies and Procedures (EPA 1985). Sample packaging conformed with applicable Department of Transportation Regulations (49 CFR 171-177) and/or International Air Transport Association guidelines (IATA 1987) as specified in the Contract Quality Assurance Project Plan QAPP Plan (E & E 1988). Samples were shipped to the laboratory via an overnight delivery service.

Sample chain-of-custody records for the project are presented in Appendix B. Included on the chain-of-custody are project numbers, sample names, laboratory numbers, and chain-of-custody numbers.

4.4 Equipment Decontamination

Dedicated personal protection and sampling equipment was used for the collection of each sample to avoid cross-contamination. Therefore, equipment decontamination between samples was not necessary. The dedicated equipment was decontaminated prior to arrival in the field.

5.0 SAMPLE RESULTS AND DISCUSSION

The following subsections present analytical data developed during this study. Photographic documentation is provided in Appendix C, and results of quality assurance review of the analytical data are summarized in Appendix D. Complete analytical results, including sample-specific detection limits for all samples collected during the SSI, are included in Appendix E.

TABLE 4-2
Sample Analytical Requirements

Sample Matrix	No. Samples Collected	Location	Analytical Requirements ⁽¹⁾	Analytical Program ⁽²⁾	Preservation Technique
Soil	1	Sandy Beach Tailings	Inorganics	CLP, RAS	None
	1	Off-Site Background	Inorganics	CLP, RAS	None
	2	Cyanide Tailings	Inorganics plus Cyanide	CLP, RAS	None
	2	300-Mill	Inorganics	CLP, RAS	None
	2	240-Mill	Inorganics	CLP, RAS	None
	2	700-Mill	Inorganics	CLP, RAS	None
Water	1	Cyanide Tailings	Inorganics plus Cyanide	CLP, RAS	pH > 12
	2	300-Mill	Inorganics	CLP, RAS	None
			VOCs		pH < 2, 4°C
	1	240-Mill	Inorganics	CLP, RAS	None
			VOCs		pH < 2, 4°C

(1) VOCs - Volatile Organic Compounds
(2) CLP - Contract Laboratory Program
RAS - Routine Analytical Services

For discussion purposes, HRS criteria for a "significantly elevated concentration" will be used (40CFR300, Appendix A). This criteria is defined as greater than or equal to detected background concentrations, or greater than or equal to three times the analytical detection limit attained during sample analysis. All inorganic analytical results are total inorganic concentrations.

5.1 Soil and Sediment Sample Results

Table 5-1 summarizes the analytical results of the soil and sediment samples collected for the SSI. Bold typed values in the table represent significantly elevated concentrations.

All of the TCL inorganics except silver and cyanide were detected in at least one of the samples. Significantly elevated concentrations of arsenic, barium, cadmium, copper, iron, lead, mercury, selenium, and zinc were detected.

The Sandy Beach Tailings exhibited a slightly elevated lead concentration. The levels observed in this sample are, in general, consistent with other tailings dumps in the Juneau area. Although cyanide was not detected in either of the cyanide tailings samples, arsenic, cadmium, copper, iron, lead, mercury, and selenium were detected at significantly elevated concentrations. Based on the presence of cyanide in previous samples from these tailings (Versar 1989), the absence of cyanide in samples collected for the SSI is likely a result of collecting extremely weathered tailings due to snow cover. The 300 and 700 Mill sites' samples contained significantly elevated concentrations of mercury. The sediment sample collected from the swale near the 240 Mill contained significantly elevated concentrations of lead, mercury, and zinc.

The soil and sediment sample results indicate that residual mercury from the mine's milling operations is present at the site, and is available to migrate off-site by surface runoff. Other inorganic contaminants detected at elevated concentrations are likely related to ore concentrating operations.

5.2 Surface Water Samples

Table 5-2 summarizes the analytical results of the surface water samples collected for SSI. None of the analyte concentrations are significantly elevated above the levels detected in the background sample (O13WA). The surface water sample collected from the 240 Mill swale contained mercury at a concentration of 0.26 ppb. Mercury was not detected downgradient of the 300 Mill. Cyanide was not detected in the sample collected from runoff near the Cyanide Tailings, but the sample contained relatively high levels of copper and zinc. Acetone and methylene chloride detected in the samples were also detected in the laboratory method blanks, and are not present as a result of on-site contamination. No other VOCs were detected in the samples.

The VOC trip blank contained acetone and methylene chloride. These compounds are common laboratory solvents and were also detected in the

laboratory method blank. They are not considered to be present as a result of sample cross-contamination.

TABLE 5-1
Analytical Results
Soil and Sediment Samples
(mg/kg - ppm)

Sample Number:	001SL Background	002SL Sandy Beach	003SL Lower CN- Tailings	004SL Upper. CN- Tailings	009SL 300 Mill S. Side
Analyte:					
<u>Metals</u>					
Aluminum	18,800 J	1,660 J	215 J	245 J	7,990 J
Antimony	u(14.6)	u(12.0)	u(12.8)	u(13.5)	u(16.6)
Arsenic	24.6	3.4	139	163	7.6
Barium	42.0 B	80.1	115	74.6	109
Beryllium	1.7	0.24	0.42	0.34	0.77
Cadmium	6.0 J	1.3 J	36.0 J	51.9 J	4.5 J
Calcium	1,650	7,480	16,800	164	6,400
Chromium	132	4.7 B	10.2 B	16.7 B	38.6 B
Cobalt	35.1	4.2 B	107	169	13.8 B
Copper	74.6 J	26.6 J	370 J	934 J	29.4 J
Iron	30,600 J	7,460 J	210,000 J	300,000 J	22,000 J
Lead	8.7 B	58.2	450	240	27.9
Magnesium	14,900 J	3,220	u(43.3)	u(45.9)	8,560
Manganese	416	398 J	9.3 J	16.5 J	395 J
Mercury	0.17 J	0.24 J	5.9 J	5.0 J	1.2 J
Nickel	74.0 J	8.5 J	69.1 J	104 J	53.3 J
Potassium	2,680	818	310	247	880
Selenium	u(0.57)	(0.47)	10.7	38.3	u(0.65)
Silver	u(0.9)	u(0.71)	u(0.75)	u(0.80)	u(0.98)
Sodium	119 B	1,480	u(48.3)	u(51.3)	247
Thallium	u(0.57)	u(0.47)	u(0.5)	u(0.53)	u(0.65)
Vanadium	56.8	14.6	u(1.8)	u(1.9)	29.7
Zinc	49.1 J	25.1	54.4 J	73.3	149 J
Cyanide	NR	NR	u(1.2)	u(1.3)	NR

J - Listed concentration is an estimate due to quality control limitations.
u - Analyte undetected at listed quantitation limit.
B - Analyte also detected in method blank.
NR - Analysis not requested.

TABLE 5-1 (cont.)
Analytical Results
Soil and Sediment Samples
(mg/kg - ppm)

Sample Number:	010SL 300 Mill N. Side	014SL 240 Mill	015SL 240 Mill DUP	018SL 700 Mill S. Side	019SL 700 Mill N. Side
Analyte:					
<u>Metals</u>					
Aluminum	8,030 J	8,800 J	8,280 J	7,060 B	9,150 J
Antimony	u(13.4)	u(14.0)	182 J	u(15.0)	u(13.3)
Arsenic	9.0	26.0	28.7	22.9	17.3
Barium	83.8	172	221	90.3	63.9
Beryllium	0.75	0.62	0.62	0.67	0.70
Cadmium	4.5 J	18.4 J	13.5 J	18.5 J	4.4 J
Calcium	5,200	4,790	5,800	4,560	9,760
Chromium	38.8 B	25.2 B	24.2 B	47.2	37.7 B
Cobalt	13.0 B	22.1 B	24.9 B	26.0 B	15.6
Copper	24.4 J	103 J	172 J	76.8 J	69.2 J
Iron	22,100 J	95,400 J	68,900 J	102,000 J	23,400 J
Lead	33.7	652	2,380	127	63.8
Magnesium	9,040	5,540	5,550	5,380	7,680
Manganese	371 J	659 J	501 J	1,110 J	633 J
Mercury	0.80 J	18.7 J	17.7	1.2 J	7.2 J
Nickel	54.4 J	50.6 J	46.8 J	64.8	36.2 J
Potassium	678	486	262	718	943
Selenium	u(0.53)	0.67	1.2	u(0.59)	0.53
Silver	u(0.79)	u(0.82)	u(0.88)	u(0.88)	u(0.78)
Sodium	173	122	176	131	112
Thallium	u(0.53)	0.55	u(0.58)	u(0.59)	u(0.52)
Vanadium	27.3	u(1.9)	6.7	u(2.1)	32.3
Zinc	174 J	819 J	461 J	180 J	78.3 J
Cyanide	NR	NR	NR	NR	NR

J - Listed concentration is an estimate due to quality control limitations.
u - Analyte undetected at listed quantitation limit.
B - Analyte also detected in method blank.
NR - Analysis not requested.

TABLE 5-2
Analytical Results
Surface Water Samples
(mg/L - ppm)

Sample Number:	005WA CN- Tailings Runoff	012WA 300 Mill D-gradient	013WA 300 Mill U-gradient (Background)	016WA 240 Mill Runoff	100WA Trip Blank
Analyte:					
<u>Metals</u>					
Aluminum	1.4	3.75	3.45	0.138 B	NR
Antimony	u(0.051)	u(0.051)	u(0.051)	u(0.051)	NR
Arsenic	u(0.002)	0.0022	u(0.0002)	u(0.002)	NR
Barium	0.088	0.124	0.129	68.1	NR
Beryllium	u(0.001)	u(0.001)	u(0.001)	u(0.001)	NR
Cadmium	0.006 J	u(0.005)	u(0.005)	u(0.005)	NR
Calcium	15.3	28.6	28.8	48.7	NR
Chromium	u(0.006)	0.0072 B	0.0116 B	u(0.006)	NR
Cobalt	0.0294 B	0.0117 B	0.0125 B	0.010 B	NR
Copper	0.069	0.0112	0.0158	0.004	NR
Iron	7.9 J	6.31 J	6.63 J	0.0703 BJ	NR
Lead	0.0081 B	0.004 B	0.0036 B	0.003J	NR
Magnesium	2.510	5.77	5.94	5.610	NR
Manganese	0.111 J	0.968 J	0.102 J	0.0033 BJ	NR
Mercury	u(0.0002)	u(0.0002)	u(0.0002)	0.00026	NR
Nickel	0.0114 J	.0113 J	0.0118 J	u(0.009)	NR
Potassium	0.783	2.45	2.45	1.570	NR
Selenium	u(0.0002)	u(0.0002)	u(0.002)	u(0.002)	NR
Silver	u(0.0003)	u(0.0003)	u(0.003)	u(0.003)	NR
Sodium	3.040	21.0	24.2	3.940	NR
Thallium	u(0.002)	u(0.0002)	u(0.002)	0.0044	NR
Vanadium	u(0.007)	0.074	0.0192	u(0.007)	NR
Zinc	0.175 J	0.044 J	0.0487 J	0.0676 J	NR
Cyanide	u(0.010)	NR	NR	NR	NR
<u>VOCs (µg/l-ppb)</u>					
Methylene Chloride	NR	0.008 B	0.007 B	0.008 B	0.019 B
Acetone	NR	0.010 B	0.015 B	u(0.010)	0.015 B

B - Analyte also detected in method blank.

NR - Analysis not requested.

u - Analyte undetected at listed quantitation limit.

J - Listed concentration is an estimate due to quality control limitations.

6.0 SUMMARY AND CONCLUSIONS

6.1 Summary

The Treadwell Mine complex supported four major gold mines that produced approximately 20.7 million tons of gold bearing ore between 1891 and 1922. Mined ore was treated at the site with mercury and cyanide for the purpose of concentrating the gold. Available information indicated that a significant quantity of mercury may have been lost or potentially disposed of during the operational years of the mine. Previous assessments of the site indicated that processed ore tailings and cyanide tailings are also present at the site.

The primary potential contaminant exposure pathways associated with the site include surface water, air, and soil. Groundwater is not considered to be a significant potential exposure route based on the absence of wells or other groundwater use within 1 mile (cross-gradient) of site. Site area conditions are characterized by numerous small creeks flowing into Gastineau Channel through former mill sites and tailings dumps. None of the creeks are used for drinking, although Gastineau Channel is an important recreation and commercial fishing resource.

High velocity winds have been observed to blow processed ore tailings into the air, and evidence of blown tailings dust was observed by the field team in March 1991. Residential and commercial areas border the north side of the site, and a city park has been established at the Sandy Beach tailings dump. An estimated total of 8,417 persons reside within 4 miles of the site.

The site area is used by the local population for hiking and recreation. No barriers to entry exist at any of the areas of potential soil contamination.

As part of this investigation, nine on-site soil and sediment samples, one off-site soil sample, five on-site surface water samples, and one quality control blank were collected to determine the presence and concentration of EPA TCL inorganic and volatile organic analytes at the site. Sample analytical results indicate that soils at several mill sites and tailings dumps contain significantly elevated concentrations of heavy metals. Mercury was detected at elevated levels at all of the mill sites sampled. Surface water sample results do not indicate that significant migration of dissolved inorganics was occurring during the field investigation. No VOCs resulting from on-site contamination were detected in the samples.

6.2 Conclusions

Sampling data and visual observations collected during the Treadwell Mine SSI indicate that there is a potential for contamination of surface runoff, Gastineau Channel, and nearby beaches with heavy metals resulting from abandoned mining wastes at the sites. Because of the extensive recreational use of the site area, contaminated soil and

runoff may be a potential hazard to the local population. The potential exists for human ingestion or inhalation of blowing ore tailings, however, this potential was not fully characterized during the SSI.

It should be noted that the conditions encountered during the field investigation in March 1991 may not be representative of summer or fall conditions at the site. Although no analytical data was collected to characterize the site during warmer periods of the year for the SSI, it is expected that increased runoff and larger areas of contaminated soils\tailings would create conditions in which elevated contaminant migration rates to surface water and air would occur.

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APPENDIX A

**EPA Target Compound List
Inorganics and VOCs**

Table A-1

ORGANICS ANALYSES

Volatile Compounds	Contract Required Quantitation Limits *	
	Low Concentration Water ^a (µg/L)	Low Concentration Soil/Sediment ^b (µg/kg)
1. Chloromethane	10	10
2. Bromomethane	10	10
3. Vinyl Chloride	10	10
4. Chloroethane	10	10
5. Methylene Chloride	5	5
6. Acetone	10	10
7. Carbon Disulfide	5	5
8. 1,1-Dichloroethene	5	5
9. 1,1-Dichloroethane	5	5
10. trans-1,2-Dichloroethene	5	5
11. Chloroform	5	5
12. 1,2-Dichloroethane	5	5
13. 2-Butanone	10	10
14. 1,1,1-Trichloroethane	5	5
15. Carbon Tetrachloride	5	5
16. Vinyl Acetate	10	10
17. Bromodichloromethane	5	5
18. 1,2-Dichloropropane	5	5
19. trans-1,3-Dichloropropene	5	5
20. Trichloroethene	5	5
21. Dibromochloromethane	5	5
22. 1,1,2-Trichloroethane	5	5
23. Benzene	5	5
24. cis-1,3-Dichloropropene	5	5
25. 2-Chloroethylvinylether	10	10
26. Bromoform	5	5
27. 2-Hexanone	10	10
28. 4-Methyl-2-Pentanone	10	10
29. Tetrachloroethene	5	5
30. 1,1,2,2-Tetrachloroethane	5	5
31. Toluene	5	5
32. Chlorobenzene	5	5
33. Ethyl Benzene	5	5
34. Styrene	5	5
35. Total Xylenes	5	5

Table A-2

INORGANIC ANALYSES

Contract Required Quantitation Limits *

Element	Low Concentration Water ($\mu\text{g/L}$)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

* Specific detection limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

APPENDIX B

Sample Chain-of-Custody Records

* CLP METHODOLOGY *

CHAIN-OF-CUSTODY RECORD

Project No.: JLY		Project Name: TREATMENT MINE SSI			Project Manager: W. RICHARDS		REMARKS										
Samplers: (Signatures) <i>W. Richards</i> <i>J.P. Lohan</i>					Field Team Leader:												
STATION NUMBER	DATE	TIME	SAMPLE TYPE			SAMPLE INFORMATION	STATION LOCATION	NUMBER OF CONTAINERS			CLP INORGANICS CYANIDE CLP Volatile ORGANICS						
			COMP	GRAB	AIR			EXPECTED COMPOUNDS (Concentration)*									
	3/25/91	1340	X			METALS	9113 TRED 002SL	1	1								Soil
	3/25/91	1610		X			9113 TRED 001SL	1	1								
	3/26/91	1030	X				9113 TRED 009SL	1	1								
	3/26/91	1058	X				9113 TRED 010SL	1	1								
	3/26/91	1120		X			9113 TRED 016WA	1	1								WATER
	3/26/91	1140		X			9113 TRED 014SL	1	1								Soil
	3/26/91	1140		X			9113 TRED 015SL	1	1								
	3/26/91	1315	X				9113 TRED 018SL	1	1								
	3/26/91	1346	X				9113 TRED 019SL	1	1								
	3/26/91	1430		X			9113 TRED 003SL	1		✓	✓						(CN ⁻ in same container
	3/26/91	1445		X			9113 TRED 004SL	1		✓	✓						" " " "
	3/26/91	1508		X			9113 TRED 005WA	2	1	1							WATER (NaOH to pH 12)
	3/26/91	1610		X			9113 TRED 012WA	3	1		2						WATER (HCl to pH 2 formal)
	3/26/91	1628		X			9113 TRED 013WA	3	1		2						
Relinquished By: (Signature) <i>W. Richards</i>		Date/Time: 3/27/91		Received By: (Signature)		Relinquished By: (Signature)		Date/Time:		Received By: (Signature)		Ship Via: Federal Express from Juneau					
Relinquished By: (Signature)		Date/Time:		Received By: (Signature)		Relinquished By: (Signature)		Date/Time:		Received By: (Signature)		BL/Airbill Number: 0257203785					
Relinquished By: (Signature)		Date/Time:		Received For Laboratory By: (Signature)		Relinquished By: (Signature)		Date/Time:		Received For Laboratory By: (Signature)		Date: 3/27/91					

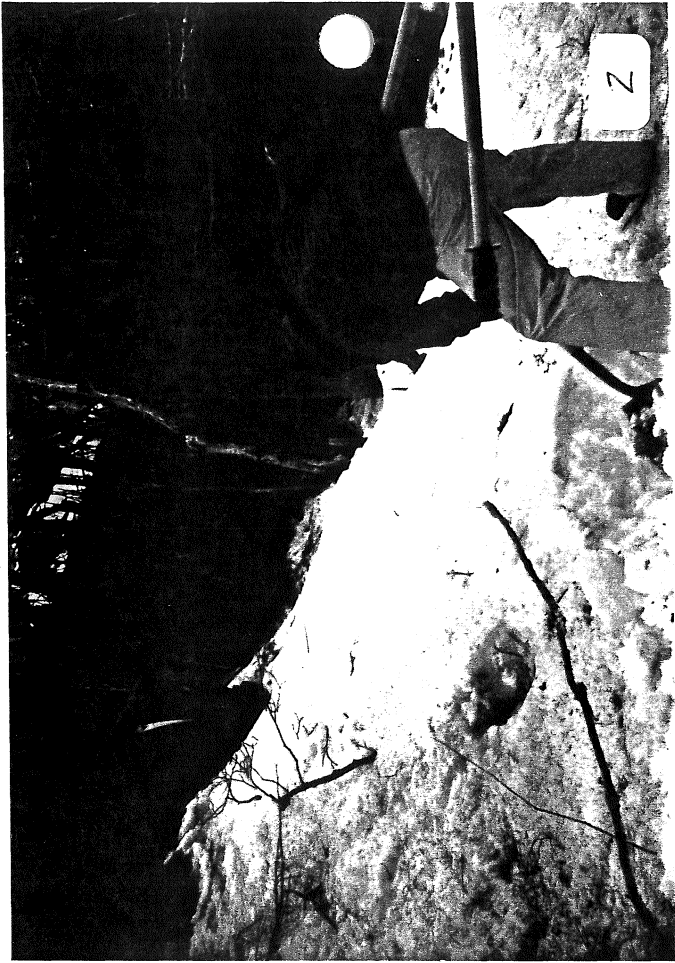
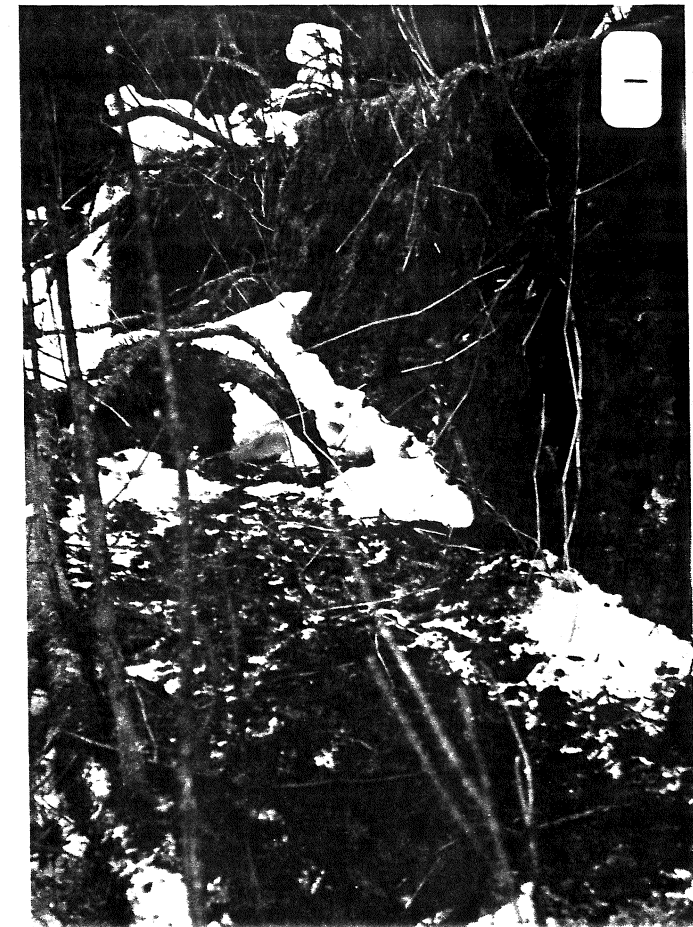
Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

*See CONCENTRATION RANGE on back of form.

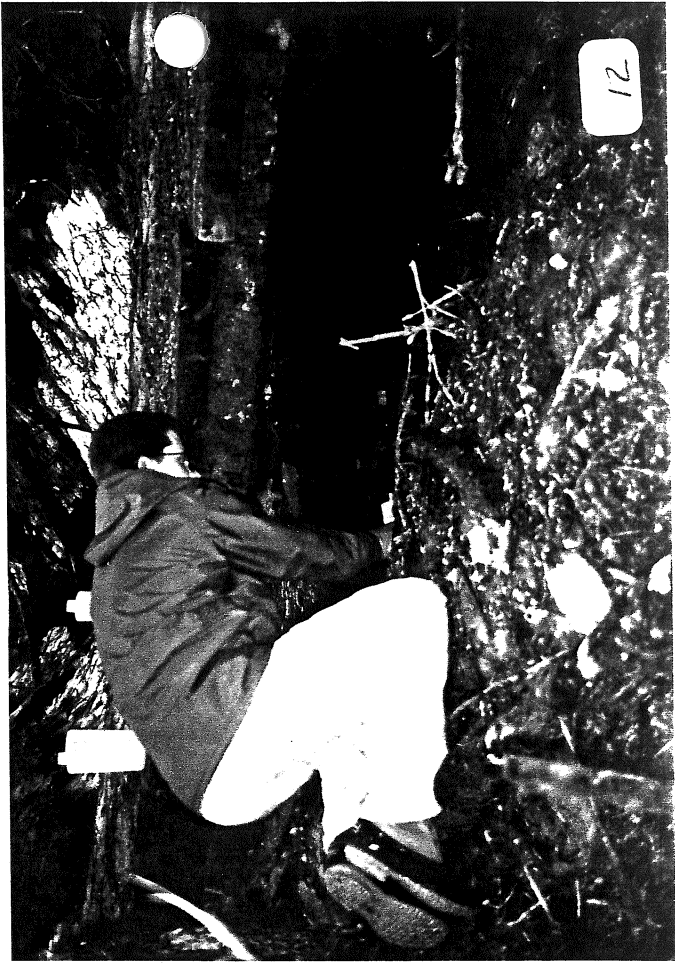
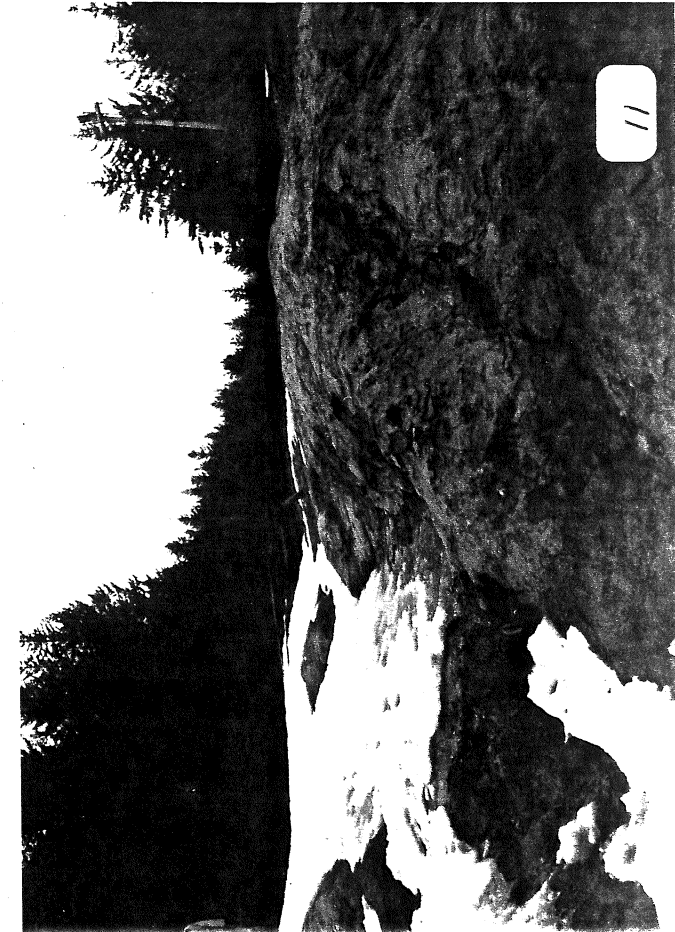
APPENDIX C

Photographic Documentation

C-LINE #52584
CAMM PRINTS



C-LINE #52584
SUMMIT PRINTS



APPENDIX D

Quality Assurance Memoranda

DATA QUALITY ASSURANCE REVIEW
INORGANIC DATA

Site: Treadwell Mine SSI
JL4010

Laboratory: Ecology and Environment, Inc. Analytical Services Center
(ASC) Job No. 9100.732.

Data Reviewer: Lynn Fischer, Anchorage

Sample Matrix: 10 Low Soils and 4 Low Waters.

Analysis: Metals and Cyanide.

Sample Nos.: 9113TRED001SL, 9113TRED002SL, 9113TRED03SL,
9113TRED004SL, 9113TRED009SL, 9113TRED010SL,
9113TRED014SL, 9113TRED015SL, 9113TRED018SL,
9113TRED019SL, 9113TRED005WA, 9113TRED012WA,
9113TRED013WA, and 9113TRED016WA.

Data are acceptable for use with the qualifications noted.

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample affects the loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

The holding time limit for metal analysis is 6 months. The holding time limit for cyanide is 28 days. Both criteria were met.

2.0 INITIAL AND CONTINUING CALIBRATION VERIFICATION

Initial and continuing calibration verification solutions contain known concentrations of elements being analyzed for and are repeatedly checked throughout a sample batch run. The inability of the lab to perform acceptably on the calibration criteria may indicate that severe problems exist in the laboratory's analytical system. Associated sample data generated under such conditions should be considered suspect.

The following problems were noted in the calibration data. The continuing calibration of thallium (118%) fell outside the quality control limits (90 - 110%). All associated positive results were flagged "J", estimated quantity. The initial calibration of mercury did not have a correlation coefficient above 0.995. All associated positive results were flagged "J", estimated quantity. The cyanide distilled standard was only analyzed at the end of the analytical run. As a result all Cyanide data were flagged "J", estimated quantity.

3.0 CRDL STANDARDS

CRDL standards contain analytes at concentrations corresponding to their respective CRDL values. These standards are run prior to and following sample analysis. These standards serve as a check for the

linearity of the analytical system at or near an analytes CRDL value.

No data were flagged on the basis of CRDL standard results. However, it should be noted that Antimony had low values reported (80.9, 82.2, and 37.4) and lead had high values (154.0, 138.0, 120.0). (Antimony data were flagged due to low spike recoveries. Lead was detected as a blank contaminant.)

4.0 BLANKS

Laboratory blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination problems. Generally, if analyte concentrations greater than the CRDL are found in a laboratory blank, it is likely that the analyte is present as a contaminant in some phase of the analytical procedure and associated sample concentrations may be biased high.

Ideally no contaminants should be detected in any blank. The following contaminants were detected in either the initial calibration blank, a continuing calibration blank, or a preparation blank: aluminum (30.6 ug/L), cobalt (5.7 ug/L), chromium (7.9 ug/L), iron (49.7 ug/L), manganese (1.3 ug/L) and lead (2.4 ug/L). All positive values reported above the detection limit and less than 5 times the largest value detected in any blank were flagged "B".

5.0 ICS INTERFERENCE CHECK SAMPLE

EPA interference check samples are run to verify interelement and background correction factors used by the lab during sample analysis. If laboratory results for the interference check sample (ICS) do not match the actual known concentration it is possible that certain elements in the solution are affecting the results for other elements. Such matrix effects could be due to chemical interactions or physical interferences. It is assumed that similar problems would exist for sample results and therefore they should be treated with caution.

All ICS result met the CLP criteria.

6.0 SPIKE SAMPLE ANALYSIS

The spiked sample analysis is also designed to provide information about the effect of sample matrix on the digestion and measurement methodology. Sample spike recovery values which do not meet EPA/CLP criteria may indicate that sample analyte results are being attenuated in the analysis procedure. It is possible to estimate the bias of other sample results by noting the degree to which the spike concentration was elevated or lowered in the resultant data. These bias results should be considered only crude approximations however, as sample specific problems may be the cause of the discrepancy, particularly in soil samples.

The quality control limit for spiked sample recoveries is 75 - 125%. All spike recoveries for the water samples met this criteria. The following results for the soils were outside the quality control limit: cadmium (43.5%), copper (349.2%), zinc (-120.2%), and antimony (72.6%). All associated positive results were flagged "J", estimated quantity.

7.0 DUPLICATE ANALYSIS

Duplicate samples are run to evaluate the precision of the sample

DATA QUALITY ASSURANCE REVIEW
ORGANIC

Site: Treadwell Mine SSI
JL4010

Laboratory: Ecology and Environment, Inc. Analytical Services Center
(ASC) Job No. 9100.732.

Data Reviewer: Lynn Fischer, Anchorage

Sample Matrix: 4 Low Waters.

Analysis: Volatile Organic Compounds (VOCs)

Sample Nos.: 9113TRED012WA, 9113TRED013WA, 9113TRED016WA, and
9113TRED100WA.

Data are acceptable for use as presented by the laboratory.

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time usually results in the loss of an analyte due to a variety of mechanisms, such as deposition on sample container walls, co-precipitation with particulates, or volatilization.

All samples were preserved with hydrochloric acid in the field and analyzed within the 14 day holding time period.

2.0 GC/MS TUNING

Prior to sample analysis, GC/MS tuning is carried out on the analytical instrumentation using Bromofluorobenzene (BFB) for VOC analysis. Specific ions in the mass spectra are identified and measured to ensure that the instrumentation is correctly tuned and can produce the proper mass resolution, identification, and sensitivity. The failure of a laboratory to meet GC/MS tuning criteria indicates severe deficiencies exist with the GC/MS system being used.

The GC/MS tuning met the criteria established by the Contract Laboratory Program (CLP).

3.0 CALIBRATION

Prior to sample analysis the GC/MS system undergoes an initial calibration at five concentrations for each VOC target compound list (TCL) compound to determine the linearity of the response. For each compound an average relative response factor (RRF) is determined and later used for compound quantification of the results. A relative standard deviation (RSD) for the average RRF is also calculated and must be less than the established quality control percentage value. Calibration must be verified each 12 hour period for a GC/MS system; continuing calibration results check satisfactory instrument performance on a day to day basis. A continuing calibration RRF value is calculated for each TCL compound; this value is compared to the

initial calibration average RRF value. Continuing calibration compound results which show low RRF results and/or high percent difference (%D) values indicate the instrument is no longer correctly calibrated for the particular compound.

All calibration criteria were met for both the initial and continuing calibration of all the VOC TCL compounds.

4.0 BLANKS

Laboratory method blank samples are evaluated to assess the existence and magnitude of possible contamination problems. Comparison of sample results to compound concentrations found in the blanks makes it possible to determine if these compounds were actually present in the sample or perhaps were introduced as a contaminant during some phase of the analysis procedure.

One laboratory method blank, VBLKW1, was analyzed with this set of samples. Both methylene chloride (6 ug/L) and acetone (11 ug/L) were detected in this sample. All positive results for methylene chloride and acetone were flagged "B" by the laboratory.

5.0 SURROGATE SPIKE RECOVERY

Laboratory performance of individual samples is established by means of surrogate spiking activities. All samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that a matrix effect exists, resulting in similarly low or high sample results for other compounds as well.

All surrogate recoveries fell within the CLP quality control limits as defined in the Data Validation Functional Guidelines.

6.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSIS (MS/MSD)

The MS/MSD analysis is designed to evaluate what possible effect the inherent sample matrix might have on compound recovery. To assess the possible matrix effect, specific compounds are spiked into a selected sample and a duplicate of that sample. The spike recoveries and relative percent difference (RPD) between the sample and the duplicate are then determined. Poor spike recoveries and high RPD values may indicate a significant matrix is present and adversely affecting sample results for that particular matrix or sample medium.

All spike recoveries and RPD fell within the CLP quality control limits as defined in the Data Validation Function Guidelines.

7.0 SUMMARY

Data are deemed acceptable as presented. No data were flagged for failure to meet the quality control criteria.

results. The failure of the lab to reproduce similar results for a duplicate sample may indicate that the sample was of a non-homogeneous nature (particularly in soil samples). It is also possible that the laboratory technique is inadequate.

The defined limits for duplicate analysis are +/- 20% for water samples and +/- 35% for soil samples. The following soil duplicate results are outside the defined limit: mercury (46.2%), cadmium (65.7%), manganese (30.3%), nickel (32.4%), iron (69.8%), and zinc (70.0%). In the water analysis only the zinc duplicate result (53.8%) was outside the limit.

8.0 LABORATORY CONTROL SAMPLE ANALYSIS

The laboratory control sample (LCS) is analyzed to serve as a monitor of the efficiency of the digestion procedure. The inability of the laboratory to successfully analyze an LCS is indicative of an analytical problem related to the digestion/sample preparation procedures and/or instrument operations.

The LCS met the defined CLP criteria.

9.0 SUMMARY

In summary all the qualitative results are acceptable as presented. The quantitative results for the following elements are suspect: aluminum, antimony, cadmium, chromium, cobalt, copper, iron, manganese, mercury, nickel, and zinc.

MEMORANDUM

To: William Richards, Project Manager

From: Lynn Fischer, Chemist ^{USA}

Date: August 2, 1991

Re: Lead value reported for the background soil sample collected at the Treadwell Mine Site.
Contract Number: 18-444-88.
Work Order 20.

Lead was detected in the laboratory preparation blank associated with sample 001SL collected at the Treadwell Mine Site, Juneau, Alaska. This soil sample, 001SL, was collected to characterize the background soil conditions.

Lead was only detected in one associated blank, the preparation blank, at a value of 2.4 ug/L.

The analytical result for lead in sample 001SL is 8.7 ug/kg. This result was flagged B to signify that the value may be biased high. Although the reported value may be biased high the bias is expected to be minimal; as lead was only detected in one of the 7 associated blanks at a value near the method detection limit.

Data were reviewed by following the EPA Functional Guidelines For Evaluating Inorganic Data; all the remaining Quality Control (QC) criteria were met for the lead analysis (calibration data, spike results, etc.).

In summary, the reported lead value appropriately represents the background conditions at the site.

cc: Beth Potter

APPENDIX E
Analytical Data

M E M O R A N D U M

TO: William Richards

FROM: Gary Hahn *RGH*

DATE: April 29, 1991

SUBJECT: Treadwell Mine SSI Report (JL-4020)

REF: 9100.732

CC: Lab File

Attached is the laboratory report of the analysis conducted on 15 samples received at the Analytical Services Center on March 30, 1991. Analysis was performed according to the procedures set forth in the USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, 2/88 and the Statement of Work for Inorganic Analysis, 7/88.

All samples on which this report is based will be retained by E & E for a period of 30 days from the date of this report, unless otherwise instructed by the client. If additional storage of samples is requested by the client, a storage fee of \$1.00 per sample container per month will be charged for each sample, with such charges accruing until destruction of the samples is authorized by the client.

GH/dms
enclosure

Case Narrative

9100.732

Treadwell Mine SSI (JL-4020)

VOLATILE ANALYSIS

Four compounds, tentatively identified as unknown hydrocarbons, were detected and reported in the volatile sample 100WA. Since these compounds were not detected in the matrix spike and spike duplicate analysis of sample 100WA, they are suspected to be carryover from a previous analysis.

METALS

Iron and aluminum results reported for the soil matrix samples have been flagged "E" based on the serial dilution analysis. A chemical and/or physical interference is suspected.

Mistakenly, a water matrix serial dilution analysis was not performed.

The selenium result for sample 003SL has been flagged "E" indicating an interference problem based on the analytical spike recovery.

Recovery for the thallium continuing calibration standard analyzed at 20:52 on 4/23/91 fell outside of the CLP limit. A calibration reslope was performed, an acceptable CCV standard analyzed, and the analytical sequence continued.


The arsenic analytical sequence started at 09:50 on 4/23/91 was not performed according to the SOW - an ICV, ICB, and CRA standard were not analyzed.

Sodium recovery in the water matrix laboratory control sample exceeded the CLP limit. Sample redigestion and reanalysis was not performed.

CYANIDE

Although all required standard and blank analyses were performed, they were not done in the specific order described by the SOW.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.


Gary Aahn

Manager - Analytical Services Center

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

001SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7184

Level (low/med): LOW Date Received: 3/30/91

% Solids: 70.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	18800		E	P
7440-36-0	Antimony	14.6	U	N	P
7440-38-2	Arsenic	24.6			F
7440-39-3	Barium	42.0	B		P
7440-41-7	Beryllium	1.7			P
7440-43-9	Cadmium	6.0		N *	P
7440-70-2	Calcium	1650			P
7440-47-3	Chromium	132			P
7440-48-4	Cobalt	35.1			P
7440-50-8	Copper	74.6		N	P
7439-89-6	Iron	30600		*E	P
7439-92-1	Lead	8.7		W	F
7439-95-4	Magnesium	14900			P
7439-96-5	Manganese	416		*	P
7439-97-6	Mercury	0.17		*	CV
7440-02-0	Nickel	74.0		*	P
7440-09-7	Potassium	2680			P
7782-49-2	Selenium	0.57	U	W	F
7440-22-4	Silver	0.9	U		P
7440-23-5	Sodium	119	B		P
7440-28-0	Thallium	0.57	U	W	E
7440-62-2	Vanadium	56.8			P
7440-66-6	Zinc	49.1		*	P
	Cyanide				NR

J LAF
J LAF
F
P
J LAF
P
P
J LAF
J LAF
B LAF
J LAF
J LAF
J LAF
J LAF
J LAF

Color Before: _____

Clarity Before: _____

Texture: Homogeneous

Color After: YELLOW

Clarity After: CLOUDY

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

002 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7183

Level (low/med): LOW Date Received: 3/30/91

% Solids: 85.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1660		E	P	J LAF
7440-36-0	Antimony	12.0	U	N	P	J LAF
7440-38-2	Arsenic	3.4			F	
7440-39-3	Barium	80.1			P	
7440-41-7	Beryllium	0.24			P	
7440-43-9	Cadmium	1.3		N*	P	J LAF
7440-70-2	Calcium	7480			P	
7440-47-3	Chromium	4.7			P	B LAF
7440-48-4	Cobalt	4.2			P	B LAF
7440-50-8	Copper	26.6		N	P	J LAF
7439-89-6	Iron	7460		*E	P	J LAF
7439-92-1	Lead	58.2		S	F	
7439-95-4	Magnesium	3220			P	
7439-96-5	Manganese	398		*	P	J LAF
7439-97-6	Mercury	0.24		*	CV	J LAF
7440-02-0	Nickel	8.5	B	*	P	J LAF
7440-09-7	Potassium	818	B		P	
7782-49-2	Selenium	0.47	U		F	
7440-22-4	Silver	0.71	U		P	
7440-23-5	Sodium	1480			P	
7440-28-0	Thallium	0.47	U	W	F	
7440-62-2	Vanadium	14.6			P	
7440-66-6	Zinc	25.1		*	P	J LAF
	Cyanide				NR	

Color Before: _____

Clarity Before: _____

Texture: GRANULAR

Color After: YELLOW

Clarity After: CLEAR

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

003 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7191

Level (low/med): LOW Date Received: 3/30/91

‡ Solids: 80.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	215		E	P
7440-36-0	Antimony	12.8	U	N	P
7440-38-2	Arsenic	139			F
7440-39-3	Barium	115			P
7440-41-7	Beryllium	0.42	B		P
7440-43-9	Cadmium	36.0		N*	P
7440-70-2	Calcium	16800			P
7440-47-3	Chromium	10.2			P
7440-48-4	Cobalt	107			P
7440-50-8	Copper	370		N	P
7439-89-6	Iron	210000		*E	P
7439-92-1	Lead	450			P
7439-95-4	Magnesium	43.3	U		P
7439-96-5	Manganese	9.3		*	P
7439-97-6	Mercury	5.9		*	CV
7440-02-0	Nickel	69.1		*	P
7440-09-7	Potassium	310	B		P
7782-49-2	Selenium	10.7		E	F
7440-22-4	Silver	0.75	U		P
7440-23-5	Sodium	48.3	U		P
7440-28-0	Thallium	0.5	U		F
7440-62-2	Vanadium	1.8	U		P
7440-66-6	Zinc	54.4		*	P
	Cyanide	1.2	U		AS

J LAF
J LAF
J LAF
B LAF
J LAF
J LAF
J LAF
J LAF
J LAF
J LAF
J LAF
J LAF

Color Before: _____

Clarity Before: _____

Texture: HOMOGENEOUS

Color After: Yellow

Clarity After: Cloudy

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

004SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7192

Level (low/med): LOW Date Received: 3/20/91

* Solids: 75.3

Concentration Units (ug/L or mg/kg dry weight): mc/kg

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	245		E	P	J LAF
7440-36-0	Antimony	13.5	U	N	P	J LAF
7440-38-2	Arsenic	163			F	
7440-39-3	Barium	74.6			P	
7440-41-7	Beryllium	0.34	B		P	
7440-43-9	Cadmium	51.9		N*	P	J LAF
7440-70-2	Calcium	164			P	
7440-47-3	Chromium	16.7			P	B LAF
7440-48-4	Cobalt	169			P	
7440-50-8	Copper	934		N	P	J LAF
7439-89-6	Iron	300000		*E	P	J LAF
7439-92-1	Lead	240			P	
7439-95-4	Magnesium	45.9	U		P	
7439-96-5	Manganese	16.5		*	P	J LAF
7439-97-6	Mercury	5.0		*	CV	J LAF
7440-02-0	Nickel	104		*	P	J LAF
7440-09-7	Potassium	247			P	
7782-49-2	Selenium	38.3		S	F	
7440-22-4	Silver	0.80	U		P	
7440-23-5	Sodium	51.3	U		P	
7440-28-0	Thallium	0.53	U		F	
7440-62-2	Vanadium	1.9	U		P	
7440-66-6	Zinc	73.3		*	P	J LAF
	Cyanide	1.3	U		AS	J LAF

Color Before: _____

Clarity Before: _____

Texture: HOMOGENEOUS

Color After: ORANGE

Clarity After: CLOUDY

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

005 WA

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 7197

Level (low/med): LOW Date Received: 3/30/91

* Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1400			P
7440-36-0	Antimony	51.0	U		P
7440-38-2	Arsenic	2.0	U		F
7440-39-3	Barium	88.7	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	6.0			P
7440-70-2	Calcium	15300			P
7440-47-3	Chromium	6.0	U		P
7440-48-4	Cobalt	20.4	B		P
7440-50-8	Copper	69.0			P
7439-89-6	Iron	7900			P
7439-92-1	Lead	8.1			F
7439-95-4	Magnesium	2510	B		P
7439-96-5	Manganese	111			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.4	B		P
7440-09-7	Potassium	783	B		P
7782-49-2	Selenium	2.0	U		F
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	3040	B		P
7440-28-0	Thallium	2.0	U	W	F
7440-62-2	Vanadium	7.0	U		P
7440-66-6	Zinc	175		*	P
	Cyanide	10.0	U		AS

J LAF

B LAF

J LAF

B LAF

J LAF

J LAF

J LAF

J LAF

Color Before: COLORLESS Clarity Before: CLOUDY Texture: _____

Color After: COLORLESS Clarity After: CLOUDY Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

009 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7185

Level (low/med): LOW Date Received: 3/30/91

% Solids: 61.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7990		E	P	J LAF
7440-36-0	Antimony	16.6	U	N	P	J LAF
7440-38-2	Arsenic	7.6			F	
7440-39-3	Barium	109			P	
7440-41-7	Beryllium	0.77	B		P	
7440-43-9	Cadmium	4.5		N*	P	J LAF
7440-70-2	Calcium	6400			P	
7440-47-3	Chromium	38.6			P	B LAF
7440-48-4	Cobalt	13.8			P	B LAF
7440-50-8	Copper	29.4		N	P	J LAF
7439-89-6	Iron	22000		*E	P	J LAF
7439-92-1	Lead	27.9			F	
7439-95-4	Magnesium	8560			P	
7439-96-5	Manganese	395		*	P	J LAF
7439-97-6	Mercury	1.2		*	CV	J LAF
7440-02-0	Nickel	53.3		*	P	J LAF
7440-09-7	Potassium	880	B		P	
7782-49-2	Selenium	0.65	U		F	
7440-22-4	Silver	0.98	U		P	
7440-23-5	Sodium	247	B		P	
7440-28-0	Thallium	0.65	U		F	
7440-62-2	Vanadium	29.7			P	
7440-66-6	Zinc	149		*	P	J LAF
	Cyanide				NR	

Color Before: _____

Clarity Before: _____

Texture: HOMOGENEOUS

Color After: YELLOW

Clarity After: CLOUDY

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

012 WA

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 7193

Level (low/med): LOW Date Received: 2/20/91

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3750			P
7440-36-0	Antimony	51.0	u		P
7440-38-2	Arsenic	2.2	B		F
7440-39-3	Barium	124	B		P
7440-41-7	Beryllium	1.0	u		P
7440-43-9	Cadmium	5.0	u		P
7440-70-2	Calcium	28600			P
7440-47-3	Chromium	7.2	B		P
7440-48-4	Cobalt	11.7	B		P
7440-50-8	Copper	11.2	B		P
7439-89-6	Iron	6310			P
7439-92-1	Lead	4.0			F
7439-95-4	Magnesium	5770			P
7439-96-5	Manganese	96.8			P
7439-97-6	Mercury	0.20	u		CV
7440-02-0	Nickel	11.3	B	LAF	P
7440-09-7	Potassium	2450			P
7782-49-2	Selenium	2.0	u		F
7440-22-4	Silver	3.0	u		P
7440-23-5	Sodium	21000			P
7440-28-0	Thallium	2.0	u	W	F
7440-62-2	Vanadium	17.4	B		P
7440-66-6	Zinc	44.0		X	P
	Cyanide				WK

B LAF
B LAF
J LAF
B LAF
J LAF
J LAF
J LAF

Color Before: Colorless Clarity Before: Cloudy Texture: _____

Color After: Colorless Clarity After: Cloudy Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

013 WA

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 7194

Level (low/med): LOW Date Received: 3/30/91

‡ Solids: 0

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3450			P
7440-36-0	Antimony	51.0	U		P
7440-38-2	Arsenic	2.0	U		F
7440-39-3	Barium	129	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	28800			P
7440-47-3	Chromium	11.6			P
7440-48-4	Cobalt	12.5	B		P
7440-50-8	Copper	15.8	B		P
7439-89-6	Iron	6630			P
7439-92-1	Lead	3.6			F
7439-95-4	Magnesium	5940			P
7439-96-5	Manganese	102			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.8	B	LAF	P
7440-09-7	Potassium	2450	B		P
7782-49-2	Selenium	2.0	U		F
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	24200			P
7440-28-0	Thallium	2.0	U	W	F
7440-62-2	Vanadium	19.2	B		P
7440-66-6	Zinc	48.7		*	P
	Cyanide				NR

B LAF
B LAF
J LAF
B LAF
J LAF
J LAF
J LAF

Color Before: Colorless Clarity Before: Cloudy Texture: _____

Color After: Colorless Clarity After: Cloudy Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

015 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.731 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7188

Level (low/med): LOW Date Received: 3/30/91

% Solids: 68.5

Concentration Units (ug/L or mg/kg dry weight): mg/kg

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8280		E	P	J LAF
7440-36-0	Antimony	182		N	P	J LAF
7440-38-2	Arsenic	28.7			F	
7440-39-3	Barium	221			P	
7440-41-7	Beryllium	0.62	B		P	
7440-43-9	Cadmium	13.3		N*	P	J LAF
7440-70-2	Calcium	5800			P	
7440-47-3	Chromium	24.2			P	B LAF
7440-48-4	Cobalt	24.9			P	B LAF
7440-50-8	Copper	172		N	P	J LAF
7439-89-6	Iron	69800		*E	P	J LAF
7439-92-1	Lead	2380			P	
7439-95-4	Magnesium	5550			P	
7439-96-5	Manganese	501		*	P	J LAF
7439-97-6	Mercury	17.7		*	CV	
7440-02-0	Nickel	46.8		*	P	J LAF
7440-09-7	Potassium	626	B		P	
7782-49-2	Selenium	1.2	A		F	
7440-22-4	Silver	0.88	U		P	
7440-23-5	Sodium	176	B		P	
7440-28-0	Thallium	0.58	U		F	
7440-62-2	Vanadium	6.7	B		P	
7440-66-6	Zinc	461		*	P	J LAF
	Cyanide				NR	

Color Before: _____

Clarity Before: _____

Texture: GRANULAR

Color After: YELLOW

Clarity After: CLOUDY

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

016 WA

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): WATER Lab Sample ID: 7195

Level (low/med): LOW Date Received: 3/30/91

* Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	138	B		P
7440-36-0	Antimony	51.0	U		P
7440-38-2	Arsenic	2.0	U		F
7440-39-3	Barium	68.1	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	48700			P
7440-47-3	Chromium	6.0	U		P
7440-48-4	Cobalt	10.1	B		P
7440-50-8	Copper	4.0	B		P
7439-89-6	Iron	70.3	B		P
7439-92-1	Lead	3.0		S	F
7439-95-4	Magnesium	5610			P
7439-96-5	Manganese	3.3	B		P
7439-97-6	Mercury	0.26			CY
7440-02-0	Nickel	9.0	U		P
7440-09-7	Potassium	1570	B		P
7782-49-2	Selenium	2.0	U	W	F
7440-22-4	Silver	3.0	U		P
7440-23-5	Sodium	3940	B		P
7440-28-0	Thallium	4.4	B		F
7440-62-2	Vanadium	7.0	U		P
7440-66-6	Zinc	67.6		*	P
	Cyanide				NR

B LAF

B LAF

BJ LAF

B LAF

BJ LAF

J LAF

Color Before: COLORLESS

Clarity Before: CLEAR

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

018 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7189

Level (low/med): LOW Date Received: 3/30/91

* Solids: 68.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7060		E	P	J LAF
7440-36-0	Antimony	15.0	A	N	P	J LAF
7440-38-2	Arsenic	22.9			E	
7440-39-3	Barium	90.3			P	
7440-41-7	Beryllium	0.67	B		P	
7440-43-9	Cadmium	18.5		N*	P	J LAF
7440-70-2	Calcium	4560			P	
7440-47-3	Chromium	47.2			P	
7440-48-4	Cobalt	26.0			P	B LAF
7440-50-8	Copper	76.8		N	P	J LAF
7439-89-6	Iron	102000		* E	P	J LAF
7439-92-1	Lead	127			P	
7439-95-4	Magnesium	5380			P	
7439-96-5	Manganese	1110		*	P	J LAF
7439-97-6	Mercury	1.2		*	CV	J LAF
7440-02-0	Nickel	67.8		*	P	J LAF
7440-09-7	Potassium	718	B		P	
7782-49-2	Selenium	0.59	U		F	
7440-22-4	Silver	0.88	U		P	
7440-23-5	Sodium	131	B		P	
7440-28-0	Thallium	0.59	U	W	P	
7440-62-2	Vanadium	2.1	U		P	
7440-66-6	Zinc	180		*	P	J LAF
	Cyanide				NR	

Color Before: _____

Clarity Before: _____

Texture: HOMOGENEOUS

Color After: YELLOW

Clarity After: CLOUDY

Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

019 SL

Lab Name: Ecology & Environment Inc. Contract: _____

Lab Code: _____ Case No.: 9100.732 SAS No.: _____ SDG No.: _____

Matrix (soil/water): SOIL Lab Sample ID: 7190

Level (low/med): LOW Date Received: 3/20/91

% Solids: 76.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9150		E	P	J LAF
7440-36-0	Antimony	13.3	U	N	P	J LAF
7440-38-2	Arsenic	17.3			F	
7440-39-3	Barium	63.9			P	
7440-41-7	Beryllium	0.70	B		P	
7440-43-9	Cadmium	4.4		N*	P	J LAF
7440-70-2	Calcium	9760			P	
7440-47-3	Chromium	37.7			P	B LAF
7440-48-4	Cobalt	15.6			P	B LAF
7440-50-8	Copper	69.2		N	P	J LAF
7439-89-6	Iron	23400		*E	P	J LAF
7439-92-1	Lead	63.8			F	
7439-95-4	Magnesium	7680			P	
7439-96-5	Manganese	633		*	P	J LAF
7439-97-6	Mercury	7.2		*	CV	J LAF
7440-02-0	Nickel	36.2		*	P	J LAF
7440-09-7	Potassium	943	B		P	
7782-49-2	Selenium	0.53	B	W	F	
7440-22-4	Silver	0.78	U		P	
7440-23-5	Sodium	112	B		P	
7440-28-0	Thallium	0.52	U	W	F	
7440-62-2	Vanadium	32.3			P	
7440-66-6	Zinc	78.3		*	P	J LAF
	Cyanide				NR	

Color Before: _____

Clarity Before: _____

Texture: MIXTURE

Color After: GREEN

Clarity After: CLOUDY

Artifacts: _____

Comments:

M E M O R A N D U M

TO: William Richards

FROM: Gary Hahn *GH for BA*

DATE: April 29, 1991

SUBJECT: Treadwell Mine SSI Report (JL-4020)

REF: 9100.732

CC: Lab File

Attached is the laboratory report of the analysis conducted on 15 samples received at the Analytical Services Center on March 30, 1991. Analysis was performed according to the procedures set forth in the USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, 2/88 and the Statement of Work for Inorganic Analysis, 7/88.

All samples on which this report is based will be retained by E & E for a period of 30 days from the date of this report, unless otherwise instructed by the client. If additional storage of samples is requested by the client, a storage fee of \$1.00 per sample container per month will be charged for each sample, with such charges accruing until destruction of the samples is authorized by the client.

GH/dms
enclosure

Case Narrative

9100.732

Treadwell Mine SSI (JL-4020)

VOLATILE ANALYSIS

Four compounds, tentatively identified as unknown hydrocarbons, were detected and reported in the volatile sample 100WA. Since these compounds were not detected in the matrix spike and spike duplicate analysis of sample 100WA, they are suspected to be carryover from a previous analysis.

METALS

Iron and aluminum results reported for the soil matrix samples have been flagged "E" based on the serial dilution analysis. A chemical and/or physical interference is suspected.

Mistakenly, a water matrix serial dilution analysis was not performed.

The selenium result for sample 003SL has been flagged "E" indicating an interference problem based on the analytical spike recovery.

Recovery for the thallium continuing calibration standard analyzed at 20:52 on 4/23/91 fell outside of the CLP limit. A calibration reslope was performed, an acceptable CCV standard analyzed, and the analytical sequence continued.

The arsenic analytical sequence started at 09:50 on 4/23/91 was not performed according to the SOW - an ICV, ICB, and CRA standard were not analyzed.

Sodium recovery in the water matrix laboratory control sample exceeded the CLP limit. Sample redigestion and reanalysis was not performed.

CYANIDE

Although all required standard and blank analyses were performed, they were not done in the specific order described by the SOW.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.



Gary Hahn
Manager - Analytical Services Center

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

012WA

Lab Name: E & E INC.

Contract: .

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7193

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6443

Level: (low/med) LDW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:		Q
		(ug/L or ug/Kg)	UG/L	
74-87-3	Chloromethane	10	IU	
74-83-9	Bromomethane	10	IU	
75-01-4	Vinyl Chloride	10	IU	
75-00-3	Chloroethane	10	IU	
75-09-2	Methylene Chloride	8	IB	
67-64-1	Acetone	10	IB	
75-15-0	Carbon Disulfide	25	2u	
75-35-4	1,1-Dichloroethene	5	IU	
75-34-3	1,1-Dichloroethane	5	IU	
540-59-0	1,2-Dichloroethene (total)	5	IU	
67-66-3	Chloroform	5	IU	
107-06-2	1,2-Dichloroethane	5	IU	
78-93-3	2-Butanone	10	IU	
71-55-6	1,1,1-Trichloroethane	5	IU	
56-23-5	Carbon Tetrachloride	5	IU	
108-05-4	Vinyl Acetate	10	IU	
75-27-4	Bromodichloromethane	5	IU	
78-87-5	1,2-Dichloropropane	5	IU	
10061-01-5	cis-1,3-Dichloropropene	5	IU	
79-01-6	Trichloroethene	5	IU	
124-48-1	Dibromochloromethane	5	IU	
79-00-5	1,1,2-Trichloroethane	5	IU	
71-43-2	Benzene	5	IU	
10061-02-6	trans-1,3-Dichloropropene	5	IU	
75-25-2	Bromoform	5	IU	
108-10-1	4-Methyl-2-Pentanone	10	IU	
591-78-6	2-Hexanone	10	IU	
127-18-4	Tetrachloroethene	5	IU	
79-34-5	1,1,2,2-Tetrachloroethane	5	IU	
108-88-3	Toluene	5	IU	
108-90-7	Chlorobenzene	5	IU	
100-41-4	Ethylbenzene	5	IU	
100-42-5	Styrene	5	IU	
1330-20-7	Xylene (total)	5	IU	

CE 4-30-91

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

012WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7193

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6443

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

013WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7194

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6444

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	IU
74-83-9	Bromomethane	10	IU
75-01-4	Vinyl Chloride	10	IU
75-00-3	Chloroethane	10	IU
75-09-2	Methylene Chloride	7	IB
67-64-1	Acetone	15	IB
75-15-0	Carbon Disulfide	5	IU
75-35-4	1,1-Dichloroethene	5	IU
75-34-3	1,1-Dichloroethane	5	IU
540-59-0	1,2-Dichloroethene (total)	5	IU
67-66-3	Chloroform	5	IU
107-06-2	1,2-Dichloroethane	5	IU
78-93-3	2-Butanone	10	IU
71-55-6	1,1,1-Trichloroethane	5	IU
56-23-5	Carbon Tetrachloride	5	IU
108-05-4	Vinyl Acetate	10	IU
75-27-4	Bromodichloromethane	5	IU
78-87-5	1,2-Dichloropropane	5	IU
10061-01-5	cis-1,3-Dichloropropene	5	IU
79-01-6	Trichloroethene	5	IU
124-48-1	Dibromochloromethane	5	IU
79-00-5	1,1,2-Trichloroethane	5	IU
71-43-2	Benzene	5	IU
10061-02-6	trans-1,3-Dichloropropene	5	IU
75-25-2	Bromoform	5	IU
108-10-1	4-Methyl-2-Pentanone	10	IU
591-78-6	2-Hexanone	10	IU
127-18-4	Tetrachloroethene	5	IU
79-34-5	1,1,2,2-Tetrachloroethane	5	IU
108-88-3	Toluene	5	IU
108-90-7	Chlorobenzene	5	IU
100-41-4	Ethylbenzene	5	IU
100-42-5	Styrene	5	IU
1330-20-7	Xylene (total)	5	IU

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

013WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7194

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6444

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

016WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7195

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6445

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	IU
74-83-9	Bromomethane	10	IU
75-01-4	Vinyl Chloride	10	IU
75-00-3	Chloroethane	10	IU
75-09-2	Methylene Chloride	8	IB
67-64-1	Acetone	10	IU
75-15-0	Carbon Disulfide	5	IU
75-35-4	1,1-Dichloroethene	5	IU
75-34-3	1,1-Dichloroethane	5	IU
540-59-0	1,2-Dichloroethene (total)	5	IU
67-66-3	Chloroform	5	IU
107-06-2	1,2-Dichloroethane	5	IU
78-93-3	2-Butanone	10	IU
71-55-6	1,1,1-Trichloroethane	5	IU
56-23-5	Carbon Tetrachloride	5	IU
108-05-4	Vinyl Acetate	10	IU
75-27-4	Bromodichloromethane	5	IU
78-87-5	1,2-Dichloropropane	5	IU
10061-01-5	cis-1,3-Dichloropropene	5	IU
79-01-6	Trichloroethene	5	IU
124-48-1	Dibromochloromethane	5	IU
79-00-5	1,1,2-Trichloroethane	5	IU
71-43-2	Benzene	5	IU
10061-02-6	trans-1,3-Dichloropropene	5	IU
75-25-2	Bromoform	5	IU
108-10-1	4-Methyl-2-Pentanone	10	IU
591-78-6	2-Hexanone	10	IU
127-18-4	Tetrachloroethene	5	IU
79-34-5	1,1,2,2-Tetrachloroethane	5	IU
108-88-3	Toluene	5	IU
108-90-7	Chlorobenzene	5	IU
100-41-4	Ethylbenzene	5	IU
100-42-5	Styrene	5	IU
1330-20-7	Xylene (total)	5	IU

Handwritten: 5 IU

Handwritten: 04-30-91

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

016WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7195

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6445

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

100WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7196

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6446

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column: (pack/cap) CAP

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	IU
74-83-9	Bromomethane	10	IU
75-01-4	Vinyl Chloride	10	IU
75-00-3	Chloroethane	10	IU
75-09-2	Methylene Chloride	19	IB
67-64-1	Acetone	15	IB
75-15-0	Carbon Disulfide	5	IU
75-35-4	1,1-Dichloroethene	5	IU
75-34-3	1,1-Dichloroethane	5	IU
540-59-0	1,2-Dichloroethene (total)	5	IU
67-66-3	Chloroform	5	IU
107-06-2	1,2-Dichloroethane	5	IU
78-93-3	2-Butanone	10	IU
71-55-6	1,1,1-Trichloroethane	5	IU
56-23-5	Carbon Tetrachloride	5	IU
108-05-4	Vinyl Acetate	10	IU
75-27-4	Bromodichloromethane	5	IU
78-87-5	1,2-Dichloropropane	5	IU
10061-01-5	cis-1,3-Dichloropropene	5	IU
79-01-6	Trichloroethene	5	IU
124-48-1	Dibromochloromethane	5	IU
79-00-5	1,1,2-Trichloroethane	5	IU
71-43-2	Benzene	5	IU
10061-02-6	trans-1,3-Dichloropropene	5	IU
75-25-2	Bromoform	5	IU
108-10-1	4-Methyl-2-Pentanone	10	IU
591-78-6	2-Hexanone	10	IU
127-18-4	Tetrachloroethene	5	IU
79-34-5	1,1,2,2-Tetrachloroethane	5	IU
108-88-3	Toluene	5	IU
108-90-7	Chlorobenzene	5	IU
100-41-4	Ethylbenzene	5	IU
100-42-5	Styrene	5	IU
1330-20-7	Xylene (total)	5	IU

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

100WA

Lab Name: E & E INC.

Contract:

Lab Code: EANDE

Case No.: 9100_732

SAS No.:

SDG No.:

Matrix: (soil/water) WATER

Lab Sample ID: 7196

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: C6446

Level: (low/med) LOW

Date Received: 03/30/91

% Moisture: not dec.

Date Analyzed: 04/05/91

Column (pack/cap) CAP

Dilution Factor: 1.0

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN HYDROCARBON	27.15	7.01J	
2.	UNKNOWN TERPENE	28.59	7.01J	
3.	UNKNOWN HYDROCARBON	29.34	11.1J	
4.	UNKNOWN HYDROCARBON	31.13	5.01J	