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**FINAL REPORT
REMOVAL PRELIMINARY ASSESSMENT**

SALT CHUCK MINE

**THORNE BAY RANGER DISTRICT
TONGASS NATIONAL FOREST
REGION 10 - ALASKA**



Prepared by Bureau of Land Management
Juneau Field Office
Interagency Agreement No. 96IA-10-012
April, 1998

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1.0 EXECUTIVE SUMMARY

Numerous abandoned and inactive mine sites located in the Tongass National Forest were inventoried for physical and chemical hazards. Several of these sites contained significant chemical hazards that warranted additional examination to fulfill objectives outlined by the U.S. Environmental Protection Agency for conducting integrated site assessments under the Superfund Accelerated Cleanup Model (EPA, 1993). The intent was to collect data to generate a Hazard Ranking System score and determine whether a removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is required.

The Salt Chuck Mine is located at the northwest head of Kasaan Bay, on Prince of Wales Island, southeast Alaska. The mine exploited a magnetite clinopyroxenite/gabbro host rock that contained chalcopyrite, bornite, digenite, chalcocite, and covellite with magnetite, pyrrhotite and pyrite also present. Reported production from the mine amounted to 326,000 tons of ore at an average grade of 0.95% copper, 0.063 oz/t palladium, 0.036 oz/ton gold and 0.17 oz/ton silver. A flotation mill was constructed on site. Concentrates were produced and then transported to smelters for final processing. Production ceased in 1941.

An inventory-level evaluation of physical and chemical hazards was performed at the site in 1995. Underground and surface mine workings, structures and miscellaneous equipment were evaluated for imminent hazards and ranked for future prioritization. Potentially affected surface water and soils were sampled for hazardous substances. Several physical hazards were identified at the site. [Copper exceedances were detected in surface water samples. Mine tailings containing heavy metals were identified in the intertidal zone south of the mill.

Filtered water samples taken in 1997 validated the copper exceedance. Tissue and associated sediment samples taken in several locations revealed that most of the copper present in the tailings is not bioavailable. There are several hundred thousand cubic yards of tailings at Salt Chuck and the most practical removal option is to cap the tailings with coarse material and line the affected creeks with larger riprap. This will restrict migration of the tailings, while providing suitable substrate for regeneration of intertidal biota.

2.0 INTRODUCTION

Personnel from the U. S. Bureau of Land Management completed a preliminary inventory of physical and chemical hazards at 109 abandoned and inactive mine (AIM) sites throughout the Tongass National Forest. This work was completed in 1995/1996 under various agreements signed by the U.S.D.A. Forest Service, the former U. S. Bureau of Mines and the U. S. Bureau of Land Management. Several of these AIM sites contained significant chemical hazards and merited additional examination to fulfill objectives outlined by the U.S. Environmental Protection Agency for conducting integrated site assessments under the Superfund Accelerated Cleanup Model (EPA 1993). The purpose was to collect enough data to generate a Hazard Ranking System score and determine whether a removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is required.

The objectives of the preliminary assessment (PA) reports are to:

- 1) Collect and review existing information to determine if data gaps exist;
- 2) Collect sufficient data to determine the potential for releases of hazardous substances to the environment;
- 3) Evaluate the potential threat to the public or the environment from hazardous substances on site; and
- 4) Determine whether a removal action is warranted.

This PA work at the Salt Chuck Mine site was conducted under terms prepared for Interagency Agreement #96IA-10-012, signed and dated in April, 1997 (amended in August, 1997).

3.0 SITE DESCRIPTION

Location and Access

The Salt Chuck Mine is located at the northern extremity of Kasaan Bay, on Prince of Wales Island, about four miles south-southwest of Thorne Bay. The site takes its name from the

shallow, restricted bay called Salt Chuck which borders it to the south (figure 1). Ketchikan is located about 43 air miles southeast of the site.

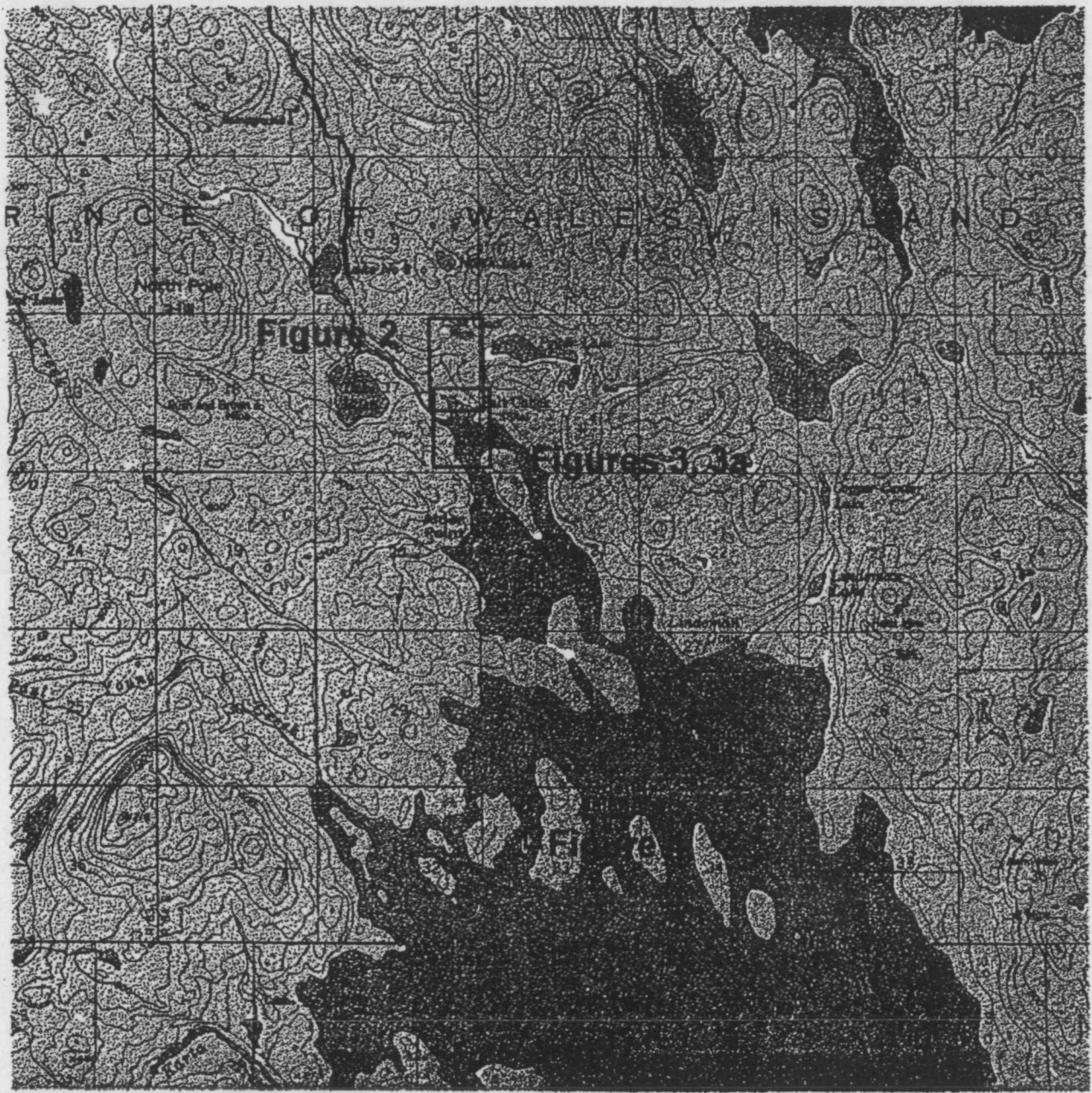
Logging road spurs from the main Prince of Wales Island road system extend past the north end of the site (near the glory hole). One of the mine waste rock dumps is visible from this road. An unimproved trail extends 0.5 miles from the glory hole to the mill facilities located near the beach. Although an extensive intertidal zone exists at the head of Kasaan Bay at low tides, the site can be easily accessed by float plane or boat during tides in excess of 13 feet. Access during low tides can result in a 0.5 mile walk to the site. The site is regularly accessible by helicopter. A Forest Service recreational cabin is present at Lake No. 3., about one mile northwest of the site. There was much evidence of visitation to the Salt Chuck site.

The mine workings are situated between 100 and 300 feet elevation and consist of a large glory hole connected to a main haulage adit, 2 shafts, and a tunnel. There are two abandoned camps at the mine. One is located on the north side of the unnamed creek, less than a hundreds yards east of the main haulage adit at elevation 100 feet. The other camp is located along the beach front near the mill. Large waste rock dumps are located near the glory hole, a few hundred feet west of the main adit portal, and behind the millsite. An extensive tailings deposit is located in the intertidal zone just south and west of the millsite. The uplands portion of the site encompasses nearly 45 acres. Figures 2 and 3 provide a plan map for the uplands and intertidal portions of the site.

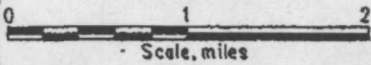
The legal description for this site is Township 72 South, Range 84 East, section 18, Copper River Meridian (latitude 55° 37' 38" north and longitude 132° 33' 25" west).

Climate

The nearest climatological data station to the Salt Chuck site is located at Annette Island, south of Ketchikan. Data recorded by the National Oceanic and Atmospheric Administration (NOAA) characterizes mean precipitation rates, average annual temperatures and maximum two-year 24 hour rainfall (ASCC, 1992; NCDC, 1998).



Scale 1:63 360



Scale, miles



Salt Chuck Mine

Source: USGS: Alaska Quadrangle
Craig (C-2)

Salt Chuck Mine

FIGURE 1

General Location Map

Figure 2.- Salt Chuck uplands: mine workings, structures and sample locations.

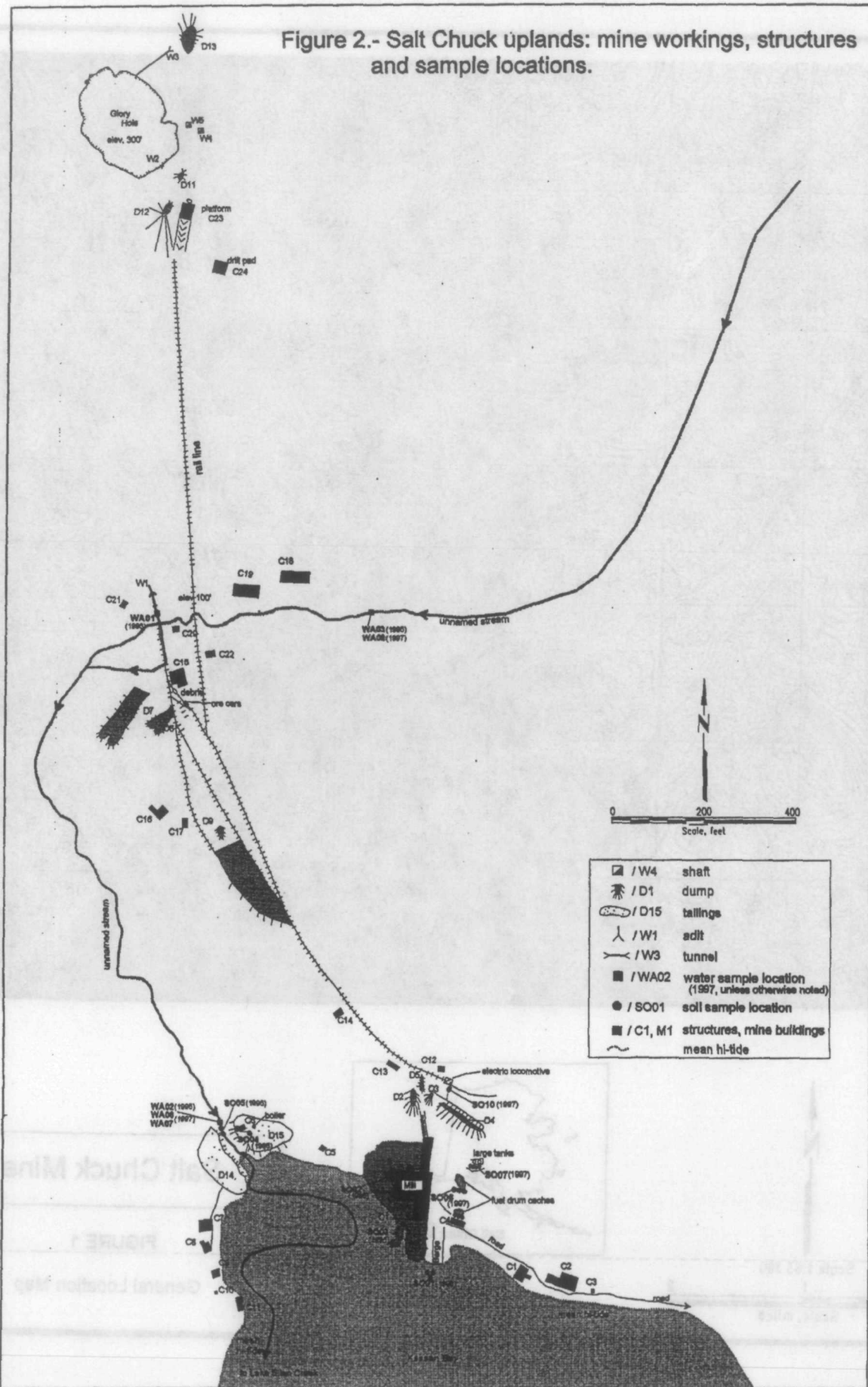


Figure 3.- Salt Chuck intertidal area: character and TCLP sample locations (1995).

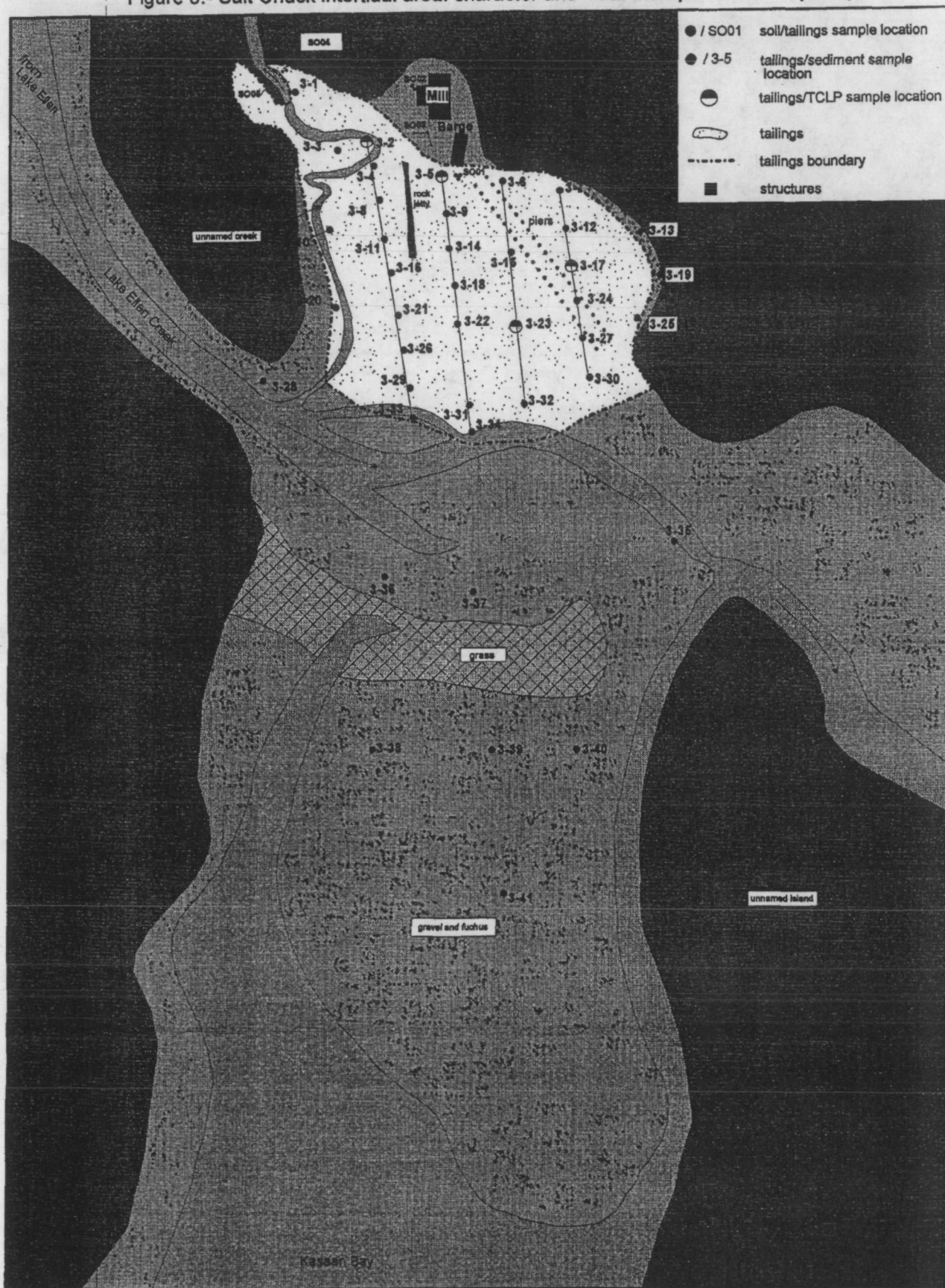
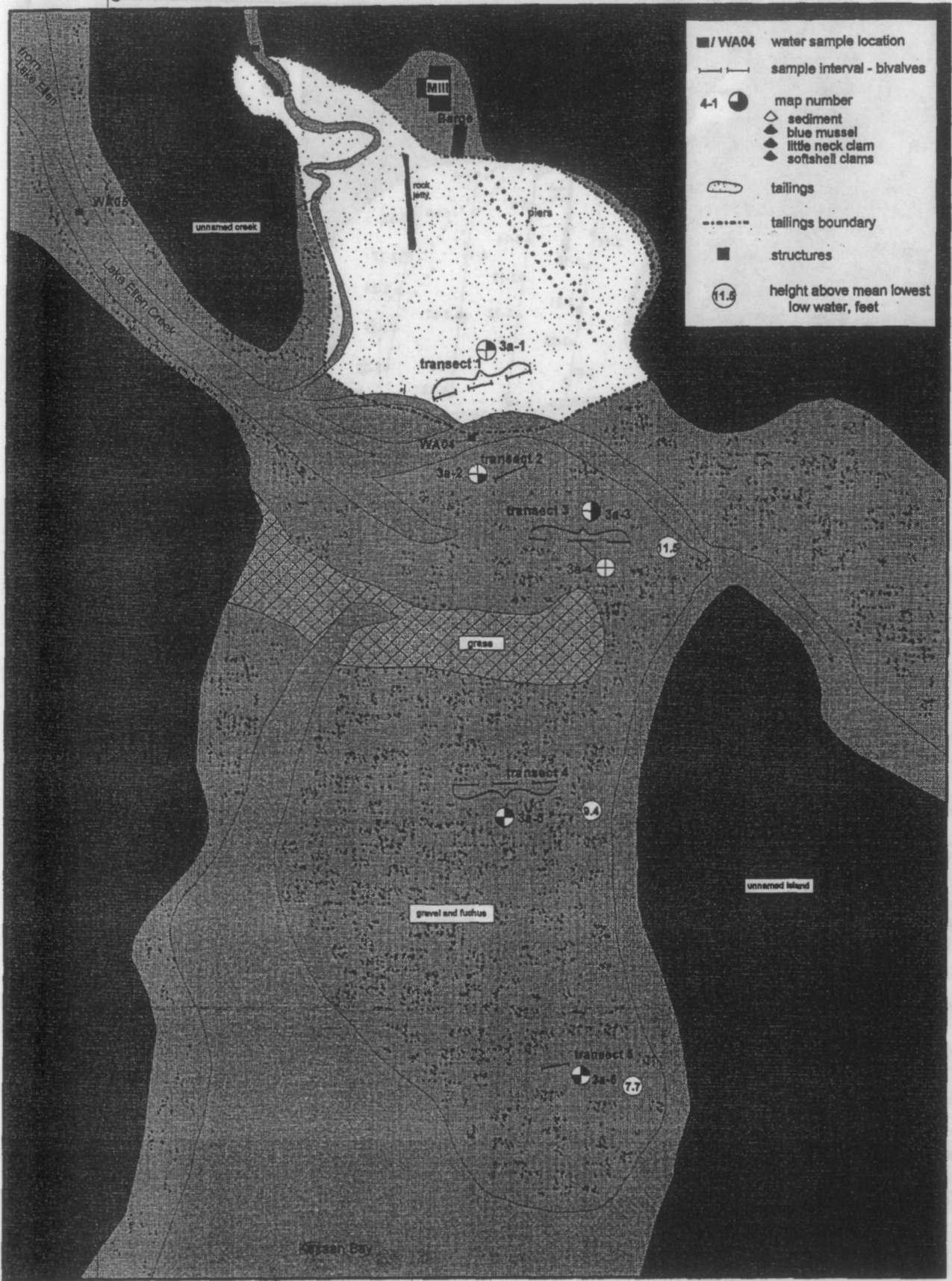
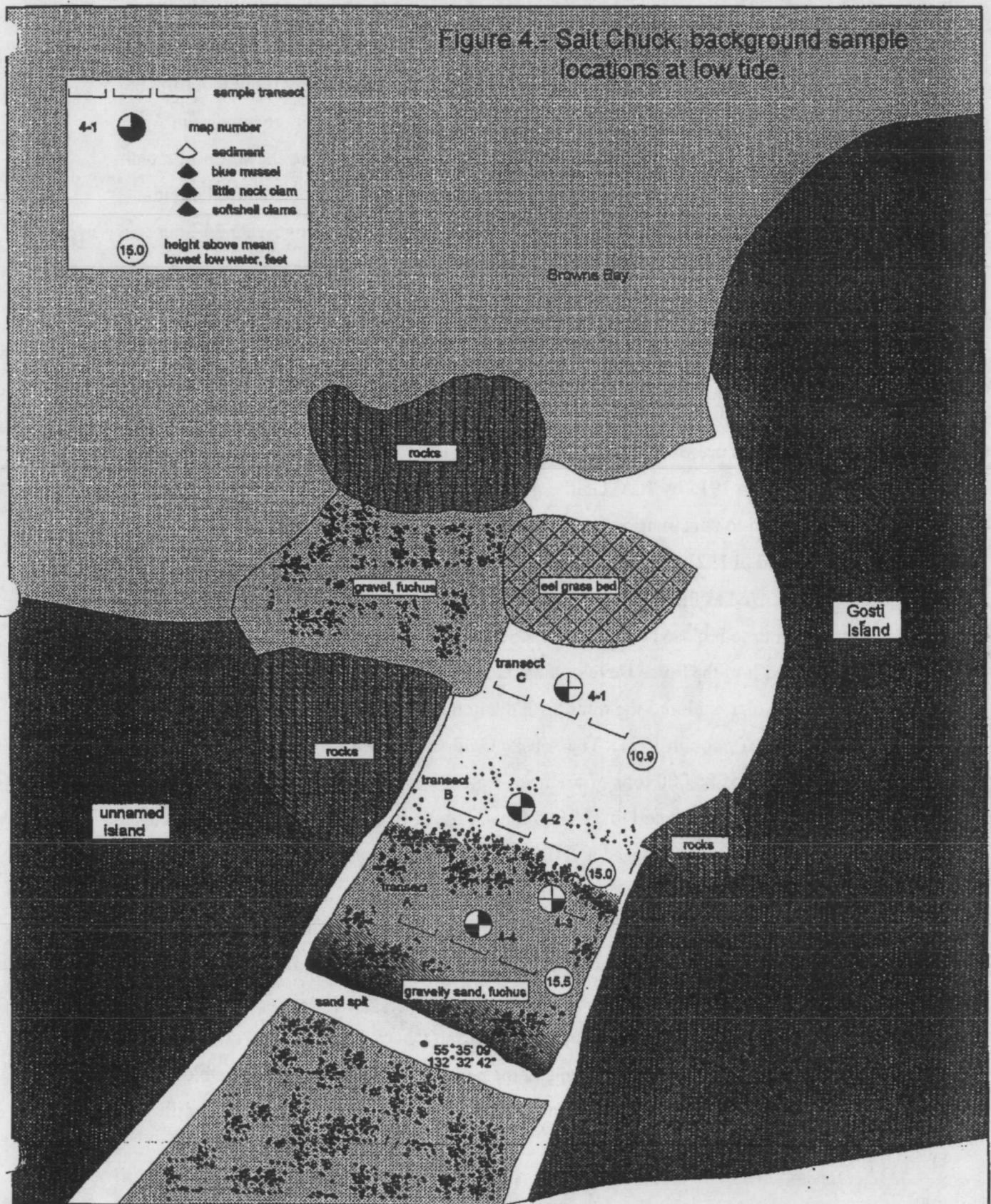


Figure 3a.- Salt Chuck intertidal area: shellfish, sediment and water sample locations (1997).



7

Figure 4.- Salt Chuck, background sample locations at low tide.



sample transect

4-1 map number

sediment

blue mussel

little neck clam

softshell clams

15.0 height above mean lowest low water, feet

The mean annual precipitation rate at Annette, averaged from 1963-1992 is 111 inches, with extremes of 134 inches in 1991 and 86.4 inches measured in 1985. September through January are the wettest months, with October consistently being 33% wetter than any other month. The average annual temperature over the same time period is 46°F, with an average maximum temperature of 51°F and an average minimum of 41°F. July and August are the warmest months with average high temperatures approaching 65°F and January is typically the coldest month with average low temperatures dropping just below 30°F. The maximum two-year 24-hour rainfall was 4.59 inches, averaged from 1994 and 1996 data (NCDC, 1998).

Operational and Ownership History/Production

The Salt Chuck Mine, originally known as the Goodro Mine, was discovered in 1905 and shipments of hand-sorted ore were made until 1915 (Thorne, 1945). The Salt Chuck Mining Company was formed in 1915 by J. A. Chilberg. Discovery that the ore contained palladium/platinum led to construction of a mill with a rated capacity of 30 tons per day in 1917. The mill was enlarged in 1923 to obtain a working capacity of 300 tons per day (Thorne, 1945). Management reorganized as the Alaskan Palladium Mining Company and worked the property until 1926, at which time it closed again. John Koel purchased the property at a marshall's sale in 1929 and optioned it to the Solar Development Co., a subsidiary of Consolidated Mining and Smelting Co., Ltd. Solar explored the mine with diamond drilling and extensive sampling, but ultimately dropped the option in 1931. The Alaska Gold and Metals Company retreated 11,000 tons of tailings and mined 80,000 tons of ore from the old stopes between 1934-1941. Total production from the mine amounted to 326,000 tons of ore at an average grade of 0.95% copper, 0.063 oz/t palladium, 0.036 oz/ton gold and 0.17 oz/ton silver (Thorne, 1945).

The U.S. Bureau of Mines completed 1,550 feet of drilling at the mine from 1943-1944. The U.S. Geological Survey mapped the geology of the mine at this time (Goodall, 1989).

Utah Construction and Mining Company optioned the Salt Chuck Mine in 1958 and continued assessment work until 1963, when they dropped the option. Newmont held a claim block over the Salt Chuck from 1967 to 1972. They conducted an airborne magnetic survey and drilled

several holes looking for additional ore (Goodall, 1989).

The Bureau of Mines returned to the site in 1978. Workers took samples to complement their statewide assessment of platinum group metals as part of a critical and strategic minerals program.

The Salt Chuck site was restaked in 1979 by Fox Geological Services, Inc. Orbex Industries Ltd., had also staked claims in the area in 1979. Orbex acquired an option to the entire parcel in 1980 and held their interest through 1989. Silver Glance Resources Inc. took over Orbex at this time and continued work at the site. Fox Geological Services, Inc., maintained claims until 1996. Stealth Ventures, Inc. restaked claims at the site in December, 1996 (BLM, 1997b).

Regional and Local Geology

The geology in the Salt Chuck area is characterized by a variety of early Paleozoic igneous rocks that intruded a sequence of older Descon Formation sedimentary and volcanic rocks. The Salt Chuck Mine is hosted in a magnetite clinopyroxenite/gabbro component of these igneous rocks. Mineralization consists primarily of chalcopyrite, bornite, digenite, chalcocite, and covellite with magnetite, pyrrhotite and pyrite also present (Maas, 1995). There were three separate ore zones exploited at Salt Chuck, all plunging about 70° east-southeast along the irregular pyroxenite/gabbro contact. Sulfides composed more than 5% (by volume) of certain clinopyroxenite specimens, but the average sulfide content of the entire deposit is much lower than this. Up to 3% calcite was also present in some specimens (Watkinson, 1992).

Several other mines, prospects and mineral occurrences are located within a two-mile radius of the Salt Chuck site. These include the Rush and Brown, North Pole Hill, Kathy, Venus and Paul Young (Maas, 1995).

Soils

The soils surrounding the main mine workings at the Salt Chuck site have been predominantly

classified as McGilvery and Tolstoi soils with minor components of Kogish Peat and Maybeso Mucky Peat to the north (USDA, 1994). These soils occur within broken mountainslope topography that contains rock outcrops, deep organic-rich soils and peat. The soil profile was characterized to a 15-inch depth and consists of a one to four inch layer of peat and forest litter overlying a mixed layer containing dusky red to black peat and a sandy to gravelly loam. The soil units are moderately to well-drained and support a variety of plant species, including Western hemlock, blueberry, red cedar, devil's club and salmonberry.

The soils adjacent to the intertidal zones are classified as 'Karta - Tolstoi' very gravelly loam. The soil profile is characterized by a thin layer of forest litter and organic debris overlying a dark to grayish brown to black silt loam up to 6 inches thick. This silt loam is underlain by a yellowish-red to olive green gravelly to gravelly sandy loam up to 4 feet thick. These soils are moderately well drained and support a vegetative series dominated by Western hemlock and blueberry.

Surface Hydrology

Meteoric water enters the glory hole at elevation 300 feet and subsequently drains into the haulage level of the main adit (W1, fig. 2). This water mixes with groundwater flow entering the adit through faults, fractures and shear zones in the overlying country rock. A significant quantity of water is presently damned up behind a rock and debris plug near the adit portal. A steady trickle discharges from the portal with an estimated flow rate of $< 0.1 \text{ ft}^3/\text{second}$ (cfs). A small unnamed stream, originating northeast of the site at Power Lake, bisects the property and converges with the water discharging from the main adit portal. The stream continues its southerly course and flows into the head of Kasaan Bay, west of the millsite. Flow rate from the same location in this stream ranged from 1 to 8 cfs (samples WA03, WA08). Maximum flow observed in this drainage was up to 10 cfs. Stream flow varied directly with rainfall conditions.

At low tide, the unnamed stream traverses along the western edge of the tailings deposit and merges with Lake Ellen Creek (figure 3), a much larger stream that emanates from Lake Ellen, 0.5 miles to the west. Flow in Lake Ellen Creek was roughly 15 to 20 cfs. The water was

tannin-colored, but the gravel and boulder-lined stream bed and banks were not iron stained. Lake Ellen Creek flows along the front edge of the tailings deposit and empties into Kasaan Bay.

The tidal influence on Lake Ellen Creek and the unnamed stream is significant. Salt water completely inundates portions of these streams at high tide, and conversely, exposes these streams at low tide. Barnacles, fucus and other saltwater biota residing in and along portions of these drainages demarcate the extent of the tidal fluctuation.

Ecological Setting

The mine workings and surface facilities at Salt Chuck are situated in an uplands environment characterized by gently rolling hills, bedrock, and abundant vegetation. There are isolated areas of palustrine, scrub-shrub, needle-leaved evergreen located north-northeast of the glory hole (USFWS, 1989). A field survey of the small creek bisecting the property and flowing past the main adit to the intertidal area indicates that wetland frontage is present along most of its length. The area adjacent to the creek draining Lake Ellen is mapped as riverine, tidal, unconsolidated bottom, permanent tidal wetland (USFWS, 1994).

Timber harvest units located north and east of the site were actively logged in 1997. These activities have no apparent direct effects to the Salt Chuck site. Lake Ellen Creek is an anadromous fish habitat, supporting pink, chum and coho salmon, steelhead and dolly varden (ADFG, 1982). Small sculpins and frogs were observed near the mouth of the small stream that bisects the site. Abundant deer tracks were observed on the intertidal sediments, and bear scat was seen within the site boundaries. Site vegetation is typical of Southeast Alaska and includes spruce, cedar, hemlock, and alder trees intermixed with abundant berry bushes, devil's club, and small scrub shrubs.

4.0 PREVIOUS ENVIRONMENTAL EXAMINATIONS

Bureau of Mines personnel conducted an inventory-level examination at the Salt Chuck Mine in 1995. A tape and compass site-survey was completed (figures 2 and 3) and physical and

chemical hazards were evaluated. An unpublished summary report was generated from this work and it included: 1) general background information, 2) main features, 3) physical and chemical hazards, 4) mitigation recommendations, and 5) recommendations for further study. A copy of this report is included in appendix B.

Overview

All accessible underground and surface mine workings, facilities and structures were evaluated for physical hazards. Unfiltered water samples were taken from affected drainages and analyzed for the 13 priority pollutant metals to determine if metals are leaching into downstream waters (figures 2, 3a). Character samples were taken from the mine tailings and analyzed to determine the presence of heavy metals (figure 3). These samples contrast with environmental samples by having less-rigorous laboratory and decontamination procedures employed than environmental samples require. Elevated metal values obtained from a character sample would instigate an environmental sampling program. Toxicity characteristic leaching procedure (TCLP) tests were conducted on selected tailings samples to determine if metals are leaching into the biologically active intertidal zone south of the millsite (figure 3).

There were 13 waste rock piles located throughout the site, and no indication that acid mine drainage was generated or metals were leaching from these features. Most waste rock piles were composed of large, boulder-sized material that was unvegetated. There was no evidence of rilling or gullyng of these dumps by surface water. No paste pH tests or acid-base accounting was conducted at this site.

Mitigation and Further Study Recommendations

The Salt Chuck Mine has historical significance in that it was the only hard-rock mine producing palladium in the United States in its time. The site contains an extensive array of mine-related artifacts. The site is accessible by road, trail, and water, and there is evidence that people regularly visit the site. Obvious hazards requiring mitigation include blocking the opening to the glory hole from the end of the access tunnel; boarding up the opening to the corkscrew raise

located east of the glory hole; cleaning up the sludge and fuel spill at the millsite; erecting a fence around the millsite until a final determination of its historic value can be made; and removing the garbage and rusty equipment/debris that clearly have no historical value. The site should be evaluated by a team of archaeologists and mining historians before any restoration or mitigation is initiated.

Waters discharging from the main adit (W1) contained copper concentrations that exceeded the Alaska Freshwater Criteria for this metal. Filtered water samples analyzed for dissolved metals are needed to verify this exceedence. Mitigation of surface water contamination would be difficult as water exiting this working is constantly recharged by rainwater funneling through the glory hole, and by groundwater entering it through faults, fractures and shear zones.

Mine tailings placed in the intertidal zone contain high concentrations of copper. Nearly all of the samples contained at least 270 ppm copper, and most contained over 1,000 ppm copper. TCLP tests revealed that copper and zinc are leaching into the marine environment. No TCLP regulatory limits have been established for these metals. Bureau of Mines personnel recommended taking tissue samples from shellfish to determine if bioaccumulation of copper is taking place in this portion of Kasaan Bay. Sediment samples would have to be taken adjacent to the biota samples to provide a basis for comparison. Analytical results will be used to generate an HRS score and an ecological risk assessment. These tools will provide the basis for mitigation recommendations for these tailings.

5.0 HAZARD RANKING SYSTEM

The Hazard Ranking System (HRS) is a tool used by EPA's Superfund program to place sites on the National Priority List (NPL). The HRS assesses the relative threat to human health or the environment associated with actual or potential hazardous substance releases to the environment. The HRS generates a relative rather than absolute measure of risk as compared to those sites already listed on the NPL. Factors that affect an HRS score include the specific pathways and identified targets that may be affected by a hazardous substance. The HRS does not consider Clean Water Act substances.

Ecological Toxicity of Site Contaminants

The minimum standard to assess if a contaminant release has occurred is if analytical results are greater than three times background levels for a particular substance in the same media. If background concentrations are not detected, then any concentration observed above detection limits is considered a release (PRC, 1996).

HRS relates a contaminant source release to its potential impact on the environment. The impact, or ecological toxicity of mine-related contaminants, was further evaluated to determine if a removal action is appropriate for this site. The ecotoxicity was assessed by comparing the background and source samples' concentration to specific standards established for ambient water and sediment quality, and to public health standards for trace metals in shellfish.

Water quality was assessed by comparing analytical results to the Alaska Freshwater Criteria for the thirteen priority pollutant metals (McKerney, 1997). Arsenic concentrations were also compared to the National Toxics Rule standard which is considerably lower than the Alaska Freshwater Criteria (McKerney, 1997). A list of the 13 metals and associated standards is included in appendix table 3.

Alaska has not established sediment quality guidelines for marine sediments. Analytical results from tailings, sediments and soil samples were compared to standards established by Long and McDonald for samples taken in the marine environment. The effects range-low (ERL) and effects range-medium criteria (ERM) proposed by Long and McDonald were used to establish whether a sediment is negatively impacting organisms living in or near estuarine or marine sediments (Long and others, 1995). "Concentrations below the ERL represent a minimal-effects range; a range intended to estimate conditions in which effects would rarely be observed." "...Concentrations equivalent to and above the ERM value represent a probable-effects range within which effects would frequently occur (Long and others, 1995)."

Tissue and sediment samples were analyzed for chromium, copper, mercury, nickel, lead, silver and zinc. The selection of these metals, rather than the 13 priority pollutant metals, was based on

the analytical results from the 41 character samples and four TCLP samples taken during the inventory examination conducted in 1995 (see appendix tables 4 and 4a). Cost considerations were also factored into this decision.

There are no established guidelines for trace metal concentration in tissue samples from biota for Alaska. Human consumption guidelines have been set by the Food and Drug Administration for concentrations of cadmium, nickel, chromium, arsenic and lead, but no similar standards exist for copper and zinc. These public health standards are based on rate of consumption and age of consumer and are highly variable (O'Connor, 1995). There are several factors that influence the natural level of metals in an organism, including an individual organism's ability to achieve an equilibrium balance by shedding itself of undesirable metals. This natural or median level falls within a range and varies between species and locations. Metal concentrations in mussel samples from the Salt Chuck were compared to mean concentrations reported nationwide in NOAA's Mussel Watch program (O'Connor, 1992), and to metal concentrations in blue mussel samples from mineralized locations throughout Southeast Alaska (Rudis, 1996). There is little data available to make comparisons of metal concentrations in clam species. Copper levels in oysters were considered as an adjunct to this study, because they are commonly consumed by humans with no ill effects. The median concentration of copper in oysters is nearly 10 times greater than for mussels (Beliaeff, and others, 1998).

Background and control samples were taken for sediment and tissue samples to establish a baseline upon which to compare samples containing hazardous substances. Waste streams were quantified and average grades were determined.

Contaminant Migration Pathways

The potential threat of a hazardous substance release into the groundwater, surface water, air and soil pathways to a particular target must be determined. The surface water and soil pathways were evaluated at the Salt Chuck site. Groundwater and air migration pathways were not considered for this investigation.

The groundwater pathway was not considered because there are no drinking wells within a 15-mile target distance limit downstream from the Salt Chuck site. The nearest year-round population is located at Thorne Bay, about 4.5 miles north of the site. This is outside the four-mile target distance limit for air migration. The majority of the tailings are below mean high-tide and are covered by seawater during a flood tide. The tailings are somewhat compacted and not susceptible to wind-blown transport under most conditions. The air pathway was not evaluated for these reasons.

Targets

Human and environmental targets may be affected by hazardous substances at or leaving the Salt Chuck site. Recreational visitors frequently visit the site. The glory hole is regularly used by rock climbers for rappelling. The logging roads adjacent to the site are frequently used by hunters and casual recreational vehicle traffic. There is much evidence of human traffic throughout the site. Trails are well-worn, contemporary garbage is strewn about, and visitors were encountered by BLM personnel during the inventory examination completed in 1995. There are active mining claims covering the site and personnel working the claims are potential targets. There are no drinking water intakes downstream of the site, but these visitors may consume freshwater from the streams flowing through the site. A large intertidal zone containing several species of clams, blue mussels and other organisms is located adjacent to the main tailings deposit. Visitors or local fauna harvesting these shellfish may be affected by hazardous substances that have bioaccumulated in these organisms.

There are several potential environmental targets at or near the site. These include the assemblage of invertebrate life contained in the intertidal zone, the anadromous fisheries utilizing Lake Ellen Creek, transient and resident wildlife in the area, and the sensitive environment (wetlands) surrounding the site. There are no sensitive environmental areas designated by the Alaska Coastal Management Program near the site (ADGC, 1994). However, the Prince of Wales Area Plan designated the head of Kasaan Bay as a unique area with high habitat and recreational values (ADNR, 1988).

The Alaska Dept. of Fish and Game (ADF&G), Division of Subsistence, had no harvest data available for invertebrate species in this part of Kasaan Bay. A cursory inspection of the intertidal zone south of the millsite revealed abundant blue mussels, little neck clams, softshell clams, butter clams, juvenile dungeness crabs, barnacles, worms, nymphs, fucus and other seaweed types. Pink salmon were observed in the drainage leading to Lake Ellen during the inventory examination, but ADF&G had no harvest or escapement data for salmon in this portion of Kasaan Bay.

Detailed salmon escapement surveys were conducted in four separate years from 1980-1993 on Paul Young Creek, located three miles south of Salt Chuck. Average pink salmon escapement in this drainage was 1,550 per year (ADFG, 1997).

Transient and resident wildlife are present in the area. However, no critical habitat has been specified for Federally designated threatened and endangered (T&E) species near the site. The only Federally designated terrestrial T&E species in the project area is the American Peregrine Falcon. This species visits during seasonal migration and there are no known nesting sites throughout all of Southeast Alaska (USFWS, 1997). There is no designated habitat used by State listed T&E species in Kasaan Bay (ADFG, 1997). There is no known habitat for Federally designated marine T&E species in the project area. The humpback whale is a transient visitor to the area, as is the Steller sea lion. There are no designated sea lion haulouts near Karta Bay (50 CFR, part 226.120, 1996). The only State designated T&E species visiting the area is the humpback whale.

HRS Data Gaps

Previous sampling at the Salt Chuck Mine indicated that hazardous substances may be present in the surface water and soil pathways. Filtered water samples analyzed for dissolved metals are required to delineate a copper exceedance relative to Alaska Freshwater Standards. Character samples of the tailings had been collected in 1995, but contaminant release into biota within and downstream of the tailings area had not been documented. Tissue analysis from mollusc samples taken in the intertidal zone south of Salt Chuck will provide the necessary data. Sediment

samples were taken from the same location as the shellfish samples to infer the bioavailability of the metals present. Sediment samples were taken downhill from an electric locomotive to determine if lead and antimony had been released from batteries used to power the engine. Background concentrations for each media were obtained to help determine if a release occurred.

6.0 PA/SI SAMPLING PROGRAM

BLM personnel sampled the surface water, mine tailings, and potentially contaminated soil at the Salt Chuck site and a control site from July 23-25, 1997. Weather conditions during these visits were generally overcast with slight rain, temperatures in the high 50s°F to low 60s°F, and a slight southeasterly breeze. There had been considerable rain the week prior to this investigation.

These visits were made to: 1) obtain tissue samples from resident shellfish near the millsite and at a control site three miles away; 2) obtain sediment samples from these same locations; 3) obtain filtered water samples from selected water bodies throughout the Salt Chuck site; and 4) take soil samples from an abandoned fuel cache and downhill from an electric locomotive.

Samples were collected with dedicated glassware and reusable sample retrieval equipment. Shovels, augering equipment and scoops were decontaminated between uses. Water samples were sent under chain-of-custody to Montgomery Laboratories (Juneau, AK). Tissue and sediment samples were sent under chain-of-custody to Battelle Marine Sciences Laboratories (Sequim, WA). Soil samples were sent under chain-of-custody to Analytica Environmental Laboratories (Broomfield, CO). Control samples were taken from all media to ensure a high quality of laboratory procedures. Quality assurance/quality control plans and procedures for integrated site assessments are provided under separate cover (BLM, 1997a).

Overview

Tissue samples from molluscs were taken to determine the trace metal concentrations of selected metals in these organisms. Sediment samples were taken from the same locations as the molluscs to facilitate a comparison of metal concentrations (bioavailability) in these two media.

Sample locations were randomly selected along a centerline surveyed through the biologically active zone within and downstream from the mine tailings. Transects were established perpendicular to this centerline and three 100-foot-wide zones were established along each transect, when possible (figure 3a). Individual samples were collected from 60-foot sections within the interval length. A single composite sample was made from the three individual samples taken along the transect. Separate samples for each species (blue mussels, softshell clams or little neck clams) were collected along a transect if that species was available. This methodology varied when biota was not present along an entire transect (e.g. figure 3a, transect 2). A similar sample collection methodology was used at the control site (figure 4). The only difference in methodology between the millsite and control site was related to the width of the sample area and corresponding width of the individual zones. The control site was much narrower so individual zones were only 40 feet wide, and 30-foot sections of these zones were sampled.

Additional samples were taken to validate and characterize contaminant releases from the water and soil pathways. Water sample locations were selected to determine if Lake Ellen Creek is being contaminated by metals leaving the Salt Chuck uplands and mill tailings area. Splits were taken at each water sample location. The Alaska Freshwater Standards require filtered samples analyzed for dissolved metals for five of the 13 priority pollutant metals (copper, cadmium, chromium, lead and mercury). One split was passed through a 45-micron filter and analyzed for dissolved metals to validate the copper exceedance identified during the inventory examination. The other split was unfiltered and analyzed for total metals.

Soil samples for TPH and contamination from batteries were composed of material collected from three to five holes in close proximity and then mixed to produce a composite sample. This methodology provides a larger sample volume and reduces the inherent heterogeneity (and possible 'nugget' effect) from a grab sample. Sample locations from the 1995 and 1997 site examinations are provided in figures 2, 3, 3a, and 4.

Background Samples

Background samples of tissue, sediment and surface water were taken to determine baseline concentrations of metals in the respective pathways.

Tissue and Sediments

A control site for shellfish and sediment samples was chosen in an intertidal area located immediately west of Gosti Island, about three miles south of the Salt Chuck millsite (figure 4). This was the closest location in Kasaan Bay that had similar characteristics to the affected site and was not influenced by outfall from other mining properties in the area. A raised, sandy spit divided the intertidal area. Samples of blue mussels (*Mytilus Trossolus*), little neck clams (*Protothaca Staminea*), softshell clams (*Mya Arenaria*) and sediments were taken from the northern half of this area. The zone measured roughly 220 feet wide by 350 feet long. The intertidal area was bounded by Gosti Island to the east and an unnamed island to the west. The texture of the intertidal sediments varied from south to north. A loosely packed, gravelly sand with abundant fuchus (seaweed) graded into a homogenous sandy silt as one moved from the sand spit north to Browns Bay. An extensive patch of eel grass commenced about 350 feet north of the spit (figure 4). No biota samples were taken from eel grass near the Salt Chuck millsite, so no biota samples were taken from the eel grass at the control site.

Samples were taken every six feet along individual zones and a single composite sample was made from each transect. Sediment samples were collected from the upper six inches of detrital material, spaced at similar intervals along the zone as the biota. Organic material was removed from the uppermost layer of sediment (0.5 to 1 inch thick) prior to sampling.

Samples from the control site consisted of four sediment samples (map Nos. 4-1, 4-2, and 4-4), three samples of little neck clams (map Nos. 4-1, 4-2, 4-4), three samples of blue mussels (map Nos. 4-2, 4-4) and one sample of softshell clams (map No. 4-3). The little neck clams were sparse in number near the sand spit but increased significantly to the north as the matrix became sandier. Blue mussels affix themselves to fuchus and coarse gravels, and as this material graded

into a sandier matrix to the north, the concentration of mussels decreased significantly. The softshell clams were clustered in a pocket of loose, gravelly sand north of transect A (figure 4), and were not found anywhere else in this control zone. Duplicate samples of blue mussels and sediments were taken along transect A (map No. 4-4, samples SCM14 and SC54). Matrix spike samples of mussels and sediments were collected along this same transect (map No. 4-4, sample SCM13m and SC13m).

Surface Water

Sample WA08 was taken from the unnamed stream that bisects the Salt Chuck site. The sample was taken well upstream from the dilapidated structures and debris present along the north side of this drainage (figure 2). This location was nearly identical to the location used for sample WA03 taken during the inventory examination in 1995. A split from this sample was filtered and analyzed for dissolved metals during the current examination. Stream flow was estimated at 8 ft³/second, pH was 8.3, conductivity was 30 μ S and water temperature was 18°C. The water was tannin-colored, reflecting the organic debris incorporated into the high flow.

Sample WA05 was taken from Lake Ellen Creek, approximately 200 feet upstream from its confluence with the unnamed stream draining the Salt Chuck site (figure 3a). This sample location is flooded at a high tide. General characteristics at this sample site included an estimated flow rate of 15-20 ft³/second, tannin-colored water but no iron-staining of the boulder lined banks, pH of 8.1, conductivity of 1500 μ S, and temperature of 19°C. There is abundant fucus and barnacles attached to the boulders lining the creek banks. Small fry and sculpins were observed in this portion of the creek. No salmon were observed in the creek during the 1997 site visits, although numerous salmon and trout species are known to use this habitat.

Source Samples

Source samples were taken from shellfish tissue and sediments within and adjacent to the periphery of the tailings. Surface water samples were taken from the unnamed stream bisecting the site and from Lake Ellen Creek. Soil samples were taken beneath a cache of abandoned 55-

gallon drums and from the periphery of two 1000- gallon fuel tanks adjacent to the millsite. A soil sample was taken downhill from a battery-powered, electric locomotive.

Tissue and Sediments

The extent of the tailings at the Salt Chuck site was defined by 41 character samples taken during the inventory examination (figure 3). The tailings cover an area exceeding 10 acres in size (roughly 700 by 700 feet) with an average thickness approaching 5 feet and a maximum thickness exceeding 13 feet. The majority of the tailings pile was devoid of biota and flora of any kind. The surface was generally homogenous and consisted of fine, organic-rich silt and coarse sand displaying subtle color variations from dark green to brown to reddish brown. A few small tidal channels crossing the tailings were iron stained. Beach grasses, beach asparagus, barnacles, clams and mussels were commonly found outside the periphery of the tailings, near the wooded areas and towards Kasaan Bay.

Portions of the tailings north of Lake Ellen Creek are covered by a veneer of organic-rich, silty creek sediments spread around by the tidal currents. This silty layer is up to three inches thick near the creek, but gradually thins and completely disappears within 200 to 250 feet of the creek. The interface between the silty layer and the tailings is distinct. An occasional twig or rock embedded in this layer allows fuchus and/or mussels and barnacles to attach and propagate.

The first appearance of blue mussels and barnacles was about 200 feet north of Lake Ellen Creek. These populations increase closer to the creek as the substrate contained more debris for them to attach to. However, the overall density of biota was spotty when compared to the concentrations found further south from Lake Ellen Creek. The silty organic-rich layer supported healthy populations of sea worms. Worm chimneys were widespread on top of this silty layer. The worms did not penetrate into the underlying tailings.

A centerline was established stretching from the barge through the middle of the tailings pile to the opposite side of Lake Ellen Creek. Individual transects near the tailings were chosen based on population densities and opportunity. Transects located closer to Kasaan Bay proper were

selected randomly because population densities were more uniform.

Transect 1 was laid out about 100 feet north of Lake Ellen Creek (figure 3a). Biota were not concentrated equally along the transect, but an attempt was made to collect blue mussels and sediments at 15-foot intervals along each 60-foot-wide zone. The mussels averaged from 0.75 to 1 inch long. A portion of each zone sample was combined to make a single composite sample for the entire transect (map No. 3a-1, sample SCM22). There were no clam species found north of Lake Ellen Creek. A composite sediment sample was taken from spaced intervals in the same zones along this transect (SC66).

The initial occurrence of softshell clams was discovered about 90 feet south of the south bank of Lake Ellen Creek (transect 2, figure 3a). The clams were about 2 to 2.5 inches long and were discovered from 2 inches to 15 inches deep into the substrate. The species were concentrated in patches, and not equally distributed along the 100 foot sample zone. Composite samples of clams and sediments were taken (map No. 3a-2).

Transect 3 was established about 300 feet south of Lake Ellen Creek at an elevation of 11.5 feet above mean lowest low water. Three zones were set up and composite samples of blue mussels, softshell clams and sediments were collected (map No. 3a-3, samples SCM9, SCC3A, SC49). The blue mussel population was more concentrated (relative to transect 1) and individual specimens averaged one inch in length, similar to sample 3a-1. Softshell clams were widespread along this transect. Individual specimens averaged from 1.5 to 2 inches long. The clams were burrowed into a loosely compacted, dark-green to iron-stained, coarse sandy matrix. The color of the material is largely similar to the tailings found north of Lake Ellen Creek, but the loose nature, coarse texture and localized iron-stained appearance were distinct differences. A select sample of an iron-stained portion of the sediments was taken from this transect (map no. 3a-4, sample SC47).

Transect 4 was established approximately 750 feet south of the south bank of Lake Ellen Creek at an elevation of 9.4 feet above mean lowest low water (figure 3a). Concentrations of fuchus and mussels were mostly uniform across the entire transect. Average size of the mussel

specimens was 1 to 1.5 inches, clearly larger than the specimens found closer to Lake Ellen Creek. The substrate is composed of loosely packed, gravelly sand with abundant shell fragments and numerous worms. There are patches of iron-stained soil at depth along the transect, but its presence did not alter the mussel or worm population density. A composite sample of the blue mussels and sediments was obtained from this transect (map No. 3a-5, samples SCM4, SC43). A pocket of several varieties of clams was found along a 12-foot interval in the west zone of this transect. The clams were scattered throughout a one foot depth into the substrate. A grab sample of little neck clams was obtained here (map No. 3a-5, sample SCC1). Average size was 1 inch long and the clams were very uniform in shape and color.

Transect 5 was established 800 feet south of transect 4, at an elevation of 7.7 feet above mean lowest low water. This portion of the intertidal area contained more blue mussels and little neck clams compared to other transects already mentioned. Individual mussels were larger here and ranged up to 2 inches long. The little neck clams averaged 1 inch long, similar to those found in other transects. The overall width of the transect was limited to one zone. The outgoing tide uncovered a larger area along this transect, as depicted on figure 3a. A composite sample of blue mussels, little neck clams and sediments was obtained here (map No. 3a-6, samples SCM5, SCC2, SC44).

Surface Water

Sample WA06 was taken from the small unnamed creek that bisects the site at a location just above the northwestern extent of the mill tailings (figures 2, 3a). This is the same location as sample site WA02 collected during the inventory examination, the difference being that WA06 was filtered and analyzed for dissolved metals according to protocol established by the Alaska Freshwater Standards (McKerney, 1997). Field screening at this site revealed a pH of 8.0, conductivity of 30 μ S, and temperature of 18°C. Flow rate was estimated at 10 ft³/second. The water was tannin colored, but there was no iron staining of the boulder-laden banks. Sample WA07 was a duplicate sample collected from this location.

Sample WA04 was also taken from Lake Ellen Creek, just downstream from its confluence with

the unnamed tributary stream mentioned above. The unnamed tributary had flowed past the entire length of tailings before converging with Lake Ellen Creek. Trace elements from the tailings leaching into the unnamed stream would be more concentrated at this location than further downstream in Lake Ellen Creek. Field screening results showed a pH of 8.1, conductivity of 930 μ S, and a temperature of 18°C. The water was tannin colored, and a slight iron-stained discoloration was noticed along the creek banks. A second location was not chosen further downstream in Lake Ellen Creek because of suspected contamination of the fresh water sample from the salt waters of Kasaan Bay.

Batteries

An electric locomotive was abandoned above the millsite at the end of the rail line that extends from the main adit portal (figure 2). This locomotive was powered by a series of batteries that are still present in the body of the locomotive. Hazardous substances released from these batteries would collect and be channeled into a small gully present just below the engine. A composite soil sample (SO10) was taken from the soil in the gully and analyzed for lead and antimony.

Total Petroleum Hydrocarbons (TPH)

Several two and four cylinder, diesel-powered engines were used to power the mill. Fuel was stored in two large 1,000 gallon capacity tanks located just east of the millsite. One tank contains an unknown quantity of water and the other tank is empty. There are approximately 30 empty 55-gallon drums located in two ^{oil} caches, downhill from the larger tanks (figure 2). Two soil samples were taken from the fuel storage area to determine if petroleum products have been released into the soil pathway.

Sample SO06 was a composite sample taken from several holes dug around and downhill from the 55-gallon drum caches. The soil profile was defined by abundant humus, organic debris and rotting wood overlying a light to dark brown soil. Most drums were empty, however some of the drums contained dried TPH residue and samples were obtained directly beneath these. The soils

did not appear oil-soaked. Minor TPH odor was associated with this sample site.

Sample SO07 was taken from 4 holes excavated around the periphery of the large fuel tanks. There was no petroleum odor associated with these holes. Sample material was similar to SO06, however less forest litter and organic debris overlaid this area. Soils directly beneath the tanks were stained and emitted a TPH odor. The quantity of material present under the tanks was less than two yd³. No samples were taken beneath the large tanks because of obvious contamination. ~~We were more concerned with determining the extent of migration from the TPH source.~~

7.0 ANALYTICAL RESULTS

Analytical results from tissue and sediment samples are found in appendix tables 1 and 2, respectively. Water sample results are presented in appendix table 3; character sample results from mine tailings are depicted in appendix table 4; and results from the TCLP tests are found in appendix table 4a. Results from tissue and sediment samples were reported in $\mu\text{g/g}$ which is equivalent to ppm.

Tissue and Sediments

Background concentrations of trace metals in blue mussels, softshell clams and little neck clams were comparable, and little variation was noticed across all seven samples. Metal concentrations from blue mussels were compared to geometric mean concentrations of metals from the NOAA Mussel Watch program (O'Connor, 1992). Copper values from Salt Chuck samples were lower than the mean concentrations, however other trace metals contained in sample SCM18 (map No. 4-2) and sample SCC12 (map No. 4-3) were above these mean values. Sample SCM 18 contained $0.114 \mu\text{g/g}$ mercury as compared to a geometric mean value of $0.094 \mu\text{g/g}$ mercury. Sample SCC12 contained $0.437 \mu\text{g/g}$ silver and $139 \mu\text{g/g}$ zinc as compared to a geometric mean of $0.141 \mu\text{g/g}$ silver and $130 \mu\text{g/g}$ zinc.

Sediment samples taken from the control site contained consistently low values of the seven analytes. There were no anomalous or spiked values. All values were well below the ERL

guidelines established for marine and estuary sediments (Long and others, 1995).

Analytical results from tissue samples taken near the millsite showed elevated levels of copper, zinc and mercury compared to values obtained at the control site. Blue mussel samples from transect 1 (sample SCM22) contained 48.3 $\mu\text{g/g}$ copper. Samples of blue mussels from transect 3 (sample SCM9) contained 22.8 $\mu\text{g/g}$ copper. Softshell clams collected across transect 2 (sample SCC13) contained 29.8 $\mu\text{g/g}$ copper, 0.145 $\mu\text{g/g}$ mercury and 134 $\mu\text{g/g}$ zinc. Softshell clams taken across transect 3 (sample SCC3A) contained 48.0 $\mu\text{g/g}$ copper, 0.140 $\mu\text{g/g}$ mercury and 157 $\mu\text{g/g}$ zinc.

Sediment samples from the five transects established near the millsite contained elevated values of copper, silver, mercury and chromium. These elevated values are relative to the ERL guidelines and/or the background levels obtained at the control site. Sample SC66, collected across transect 1, contained 501 ppm copper, 137 ppm chromium, 0.185 ppm mercury and 0.234 ppm silver. Sample SC71, collected across transect 2, contained 159 ppm copper and 93.8 ppm chromium. The high grade sample of iron-stained sediment taken from transect 3 (sample SC47) contained lower metal concentrations than the composite sample taken across the entire transect (sample SC49). Sample SC49 contained 154 ppm copper and 86.8 ppm chromium as compared to 43.0 ppm copper and 69.6 ppm chromium contained in SC47. Sample SC43, taken across transect 4 contained 0.303 ppm mercury. Sample SC44, collected across transect 5, contained 157 ppm copper.

Surface Water

Filtered water samples taken from the unnamed creek draining the Salt Chuck site contained elevated concentrations of copper (sample WA06). Sample WA06 contained 3.9 $\mu\text{g/l}$ copper at a hardness of 12 mg/l, as measured by CaCO_3 . The Alaska Freshwater Standard at this hardness is 1.93 $\mu\text{g/l}$ copper. Samples WA04 and WA05, taken from Lake Ellen Creek, contained 2.1 $\mu\text{g/l}$ copper and 3.1 $\mu\text{g/l}$ copper, respectively. These concentrations are both below the Alaska Freshwater Standards for copper at their respective hardnesses (appendix table 3). No metals were detected in the background sample.

Tailings

Forty one character samples were taken from the mine tailings during the 1995 inventory examination. These samples were analyzed using less rigorous laboratory standards than the tissue and sediment samples recapped above. However, analytical results from these samples revealed a consistently high level of copper. Most of the samples contained in excess of 1,000 ppm copper. Tidal and stream activity has reworked and moved the tailings outside of the original depositional area, creating a halo of copper contamination around the tailings pile. Analytical results from samples taken along the periphery of the intertidal zone (figure 3, map Nos. 3-13, 3-19, 3-25, 3-28 and 3-35) verify this.

TCLP tests were conducted on splits from four of the character samples. Copper, zinc and barium were recovered during these tests. Copper values ranged from 0.75 mg/l (sample SC11) to 6.87 mg/l (sample SC21). Zinc values ranged from 0.46 mg/l (sample SC21) to 0.63 mg/l (sample SC24). There are no regulatory standards for copper or zinc in a TCLP test. Barium values were up to 0.16 mg/l, well below the regulatory limit of 100 mg/l.

Batteries

Lead and antimony were detected in soil sample SO10, taken downhill from the electric locomotive. Analytical results revealed 21 ppm lead and 1 ppm antimony.

Total Petroleum Hydrocarbons (TPH)

Sample SO07 contained 9,600 mg/kg total petroleum hydrocarbons (TPH). No TPH was detected in sample SO06. The contaminated soil is limited in extent and no TPH odors were detected in soils downhill from the tanks. Sample SO01 (1995 exam) identified a significant concentration of TPH within the mill structure (163,000 mg/kg), but no TPH was recovered from a sample taken in the intertidal zone (SO02).

8.0 SOURCES AND THEIR IMPACTS TO PATHWAYS AND POTENTIALLY AFFECTED TARGETS

The water and soil pathways have been contaminated by hazardous substances attributed to the Salt Chuck site. Descriptions of the affected media and targets are summarized in the following sections.

Surface Water

The unnamed stream that bisects the Salt Chuck site and flows into Kasaan Bay contained copper concentrations that exceeded the Alaska Freshwater Standards. Copper was not detected in background samples taken upstream in this drainage. Water sampling during the inventory examination revealed hazardous substances discharging from the main adit portal and entering the unnamed stream. Flow rate in this unnamed stream varied from 1 to 10 ft³/second during individual site visits. This stream merges with Lake Ellen Creek near the southern tip of the tailings pile (figure 3a).

Numerous pink salmon were observed schooling up and entering Lake Ellen Creek during incoming tides. ADF&G does not conduct fish escapement surveys on Lake Ellen Creek, so an official fish count was not available. There were no salmonids observed in the unnamed creek, however resident life in this stream consisted of small frogs and sculpins. Bear and deer tracks were seen on the tailings near this creek and it can be assumed that deer take water from this stream. Site visitors and mining claimants may unknowingly consume water in the unnamed creek after it converges with water discharging from the main adit portal.

It is noteworthy that this unnamed stream can contribute significant water and hazardous substances to Lake Ellen Creek. However, it appears that sufficient dilution takes place to reduce the threat to salmonid populations.

Tailings

The mine tailings contain consistently high concentrations of copper. All of the character samples contained in excess of 270 ppm copper, the ERM for copper in estuary sediments (Long and others, 1995). The Washington State marine sediment management standard for copper is 390 ppm and again, the Salt Chuck tailings contain significantly higher copper levels relative to this standard. The highest values exceeded 3,800 ppm copper. Samples collected from the top six inches of the tailings material (taken in conjunction with the bivalve samples) contained 501 ppm copper. There is ample data available to quantify the copper concentrations present in the mine tailings. However, the data is less conclusive when determining whether the copper is bioavailable to the resident shellfish and biota in this portion of Kasaan Bay.

Blue mussels, softshell clams and associated sediments were sampled on or near the tailings pile. Data from transects 1, 3 and 5 revealed the following copper concentrations in mussels and sediments (figure 3a). Analytical results from transect one revealed 501 ppm copper in sediments and 48.3 ppm copper in mussel tissue. Samples from transect 3 contained 154 ppm copper in sediments and 22.8 ppm copper in blue mussels. Sample results from transect 5 revealed 157 ppm in sediments and 11.6 ppm copper in mussels. Analytical data for softshell clams from transects 2 and 3 revealed 29.8 ppm and 48.0 ppm copper in tissue, and 159 ppm and 154 ppm copper in sediments, respectively.

The TCLP tests revealed that low levels of copper (up to 6.87 mg/l) are leaching out of the tailings. However, this data shows no direct correlation between copper values in sediments and copper values in the shellfish living or feeding off the top of these sediments. The data does show a relative decrease of copper in mussel tissue related to increased distance from the tailings pile. This generalization was not consistent with the data from softshell clams. There was more copper found in softshell clam tissue obtained from transect 2 than from transect 3.

The copper concentration in mussel tissue from samples obtained along transects 1 and 3 exceeded three times the level of copper obtained from background samples (~ 4.3 µg/g copper) at the control site. These two values also exceeded copper concentrations found in blue mussel

samples from other mineralized zones in Southeast Alaska (Rudis, 1996). Mean copper concentrations in blue mussels reported in Rudis' study varied from 9.178 (+/-) 3.079 $\mu\text{g/g}$ to 10.047 (+/-) 1.520 $\mu\text{g/g}$. Median concentrations of copper in various mussel species sampled for the NOAA Mussel Watch Program are between 8.1-10 $\mu\text{g/g}$ (O'Connor, 1995). However, annual median concentrations of copper contained in oysters from 45 various sites is enriched by more than a factor of 10 relative to mussels or between 96-126 $\mu\text{g/g}$ (Beliaeff and others, 1998).

O'Connor's work concluded that there were no important concentration differences between mytilus species (mussels) at the various sites used in the Mussel Watch Program. It is therefore valid to make comparisons between mussel species (O'Connor, 1995). The comparison of trace metal concentrations between mussels and oysters illustrates the difference in bioaccumulation of metals between species from the same location. There are no public health standards for copper in shellfish so these numbers should be used for reference and not as cleanup guidelines.

The tailings are not contained within a man-made or natural impoundment and are subject to erosion and transport by the unnamed creek, Lake Ellen Creek and tidal currents. Some of the tailings are covered by a veneer of creek and marine sediments, but the majority of tailings are exposed.

Batteries

Low levels of lead and antimony were detected in soil samples taken below the electric locomotive. The concentrations of both metals were below the threshold effects level guidelines for metals in sediments (Environment Canada, 1995). These levels indicate that negative effects to biota will occur rarely.

9.0 REMOVAL ACTION ASSESSMENT

Three objectives for conducting a removal preliminary assessment at the Salt Chuck site were:

- 1) to determine if the site contained CERCLA releases of hazardous substances, and

- 2) to determine if any reportable releases of petroleum products (TPH) had occurred, and
- 3) to evaluate time-critical versus non time-critical removal action.

CERCLA Releases

Releases of hazardous substances are classified as observed CERCLA releases when contaminant concentrations are: 1) at least three times background levels, or 2) detected in any concentration when none was detected in background. Character samples of mine tailings contained copper concentrations that exceeded three times the background level. Sediment samples from the tailings zone, collected in conjunction with tissue samples, also had copper values that exceeded three times background levels (Mercury and silver concentrations exceeding three times background levels were present in one of the sediment samples from the tailings pile.) These concentrations comprise an observed CERCLA release of these contaminants.

Reportable Releases of Total Petroleum Hydrocarbons (TPH)

Samples taken from a petroleum sludge within the mill structure contained 16.3% TPH. The sludge is not contained, but further sampling revealed that the TPH product is not migrating into the intertidal zone. A small quantity of TPH-stained soil is present next to the mill structure. There was 0.96% TPH contained in a composite soil sample taken around the periphery of the large diesel tanks adjacent to the millsite (SO02). This material is unconfined, but samples taken downslope from these tanks did not contain TPH. Total volume of material containing TPH is estimated to be less than 10 yd³.

Potential Threat to the Environment

The tailings pile and surface water discharging from the main adit and flowing past these tailings into Kasaan Bay present an ongoing threat to the environment. The determination of whether these releases pose a threat requiring a removal action is based on the eight factors defined by 40 CFR 300.415 (b) (2), paragraphs i-viii. The Salt Chuck site meets the following criteria:

- i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants;
- ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
- iv) High levels of hazardous substances or pollutants or contaminants in soils largely at the surface, that may migrate;
- v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;
- vii) The availability of other appropriate federal or state response mechanisms to respond to the release.

The Salt Chuck site is a popular destination for Prince of Wales Island residents and visitors. People have been observed rappelling in the glory hole and there is much evidence of recent visitation throughout the site. Forest Service recreational shelters are located nearby and logging roads provide access to the upper workings. A crude trail extends from the upper workings past the main adit portal and down to the beach. The site can be reached by small boat at high tide, but this mode of access is less frequently used than the roads. There is an abundance of shellfish species located in the intertidal areas surrounding the site, but no subsistence use is documented. Lake Ellen Creek supports runs of pink, coho and chum salmon, dolly varden and steelhead. Typical species of Southeast Alaska fauna use the habitat surrounding the site. These targets may directly or indirectly ingest the hazardous substances present on site and contaminate the food chain.

The Salt Chuck site is bisected by a small stream and wetland frontage is present along most of its length. The area adjacent to the creek draining Lake Ellen is mapped as riverine, tidal, unconsolidated bottom, permanent tidal wetland (USFWS, 1994). The intertidal area containing the mine tailings is a sensitive environment, designated as a unique area with high habitat and recreational values. These three areas are contaminated by hazardous substances. The tailings are near surface (mostly uncapped) and adverse weather conditions could exacerbate the migration of these contaminated tailings into Kasaan Bay.

The Salt Chuck site has been listed on the Federal Agency Hazardous Waste Compliance Docket

(Docket), published in the Federal Register on June 27, 1997. EPA will evaluate this PA report and decide if a site inspection report is necessary. Ultimately, EPA or State of Alaska Dept. Of Environmental Conservation may respond to the releases documented at the Salt Chuck site.

Further degradation to the intertidal area in this portion of Kasaan Bay is occurring at a slow rate. Reestablishment of a rich ecosystem on top of the tailings pile is occurring at an equally slow rate. The tailings were created at least 55 years ago and hazardous substance releases from the tailings have impacted the surrounding ecosystem. The principal kill zone at the site is found directly over the tailings. This may be due to a lack of sufficient substrate for seaweed, mussels and barnacles to recolonize or it could be due to the toxicity of the tailings. It could also be related to the time that this portion of the intertidal zone is uncovered during low tide. These same biota reside in larger numbers across Lake Ellen Creek from the tailings pile, where the height above mean lowest low water is much less. Salmonid and other fish species continue to use Lake Ellen Creek.

A non-time critical removal action should be considered for these tailings. Removal options include actual removal of the tailings from the site, or capping and stabilizing the tailings with crushed rock and large riprap boulders. Sources of this capping material include the numerous waste rock dumps located adjacent to the millsite and along the railbed connecting the millsite to the main adit. A small rock jetty located at the north end of the tailings pile illustrates the innocuous nature of this waste rock when exposed to continuous tidal activity. This jetty has been present for decades and the constituent rocks display no sign of oxidation and acid generation. Capping may also provide suitable habitat for further recolonization by mussels, seaweed and barnacles depending on the resultant height above mean lowest low water.

10.0 CONCLUSIONS AND RECOMMENDATIONS

The surface water and soil pathways at the Salt Chuck contain copper concentrations that exceed applicable standards for each medium. These exceedances are attributable to the site. Surface water discharge from the main adit converges with the unnamed stream bisecting the site and flows into the head of Kasaan Bay. This stream mixes with Lake Ellen Creek and significant

dilution takes place to reduce the copper exceedance. Lake Ellen Creek currently provides suitable habitat for several salmon and trout species and sculpins and small frogs are resident in the unnamed creek. Visitors may drink water from the unnamed creek downstream from the adit portal. Plugging the adit and piping the discharge to a distant location within Kasasan Bay would provide a short term solution to the water quality problem in the unnamed creek. An engineering evaluation/cost analysis or ecological risk assessment should be performed prior to mitigating the copper exceedance in the surface water pathway. Signs warning of the contamination should be placed outside the adit portal in the near term.

The affected soil pathway includes mine tailings and TPH-contaminated soil. Tailings removal is justified by the elevated copper concentrations, but tissue samples taken from blue mussels, softshell clams and little neck clams indicate that these high levels of copper are not entirely bioavailable. Physically removing the tailings would be cost prohibitive and unnecessary. An alternate approach would be to cap the tailings with at least six to eight inches of crushed rock. Larger riprap could be used to armor the banks of the unnamed stream and Lake Ellen Creek, adjacent to the tailings. This capping material would effectively contain the tailings and restrict further migration, while providing suitable habitat for seaweed, barnacles and mussels to regenerate.

The soil surrounding the large diesel tanks should be tilled and bioremediated. The quantity of soil is minimal, and the TPH concentration is not excessive. These soils could be removed if proper conditions for bioremediation are not sustainable over the duration of the process.

The Salt Chuck site contains a wide array of mining artifacts and associated physical hazards. The site is visited regularly and physical hazards at the glory hole, main adit portal and the millsite pose an imminent danger that should be addressed. Warning signs should be erected in the near term while a cultural assessment is completed.

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Appendix table 1.- Analytical results from tissue samples (results presented in µg/g unless otherwise noted).

Sample #	Map #	Species	Chromium	Copper	Mercury	Nickel	Lead	Silver	Zinc
MILLSITE									
SCM22	3a-1	Blue mussels (Mytilus Trossolus)	1.12	48.3	0.0450	0.984	0.368	0.122	123
SCC13	3a-2	Softshell clams (Mya Arenaria)	1.21	29.8	0.145	1.51	0.110	0.0591	134
SCC3A	3a-3	Softshell clams	1.95	48.0	0.140	2.78	0.442	0.0605	157
SCM9	3a-3	Blue mussels	1.37	22.8	0.101	1.48	0.404	0.0443	86.0
SCM4	3a-5	Blue mussels	0.813	10.7	0.0717	1.27	0.261	0.135	113
SCC1	3a-5	Little neck clams (Protothaca Staminea)	2.00	9.58	0.0597	6.95	0.257	0.0345	103
SCC2	3a-6	Little neck clams	0.812	13.2	0.0780	4.66	0.103	0.03	104
SCM5	3a-6	Blue mussels	0.862	11.6	0.0873	0.808	0.277	0.0598	88.9
CONTROL SITE									
SCC10	4-1	Little neck clams	0.980	5.32	0.0506	4.91	0.109	0.0842	101
SCC11	4-2	Little neck clams	1.20	5.44	0.0724	4.81	0.116	0.103	91.9
SCM18	4-2	Blue mussels	0.705	4.72	0.114	0.737	0.151	0.0733	81.9
SCC12	4-3	Softshell clams	0.897	5.31	0.0434	1.39	0.124	0.437	139
SCC6	4-4	Little neck clams	1.09	5.40	0.0482	5.24	0.115	0.127	90.6
SCM13	4-4	Blue mussels	0.821	4.08	0.0458	0.727	0.194	0.0772	80.2
SCM14	4-4	Blue mussels	0.716	4.23	0.0512	0.746	0.180	0.141	76.5
NOAA geometric mean		Blue mussels	NA	8.9	0.094	NA	1.8	NA	130

Appendix table 2.- Analytical results from sediment samples (results presented in ppm unless otherwise noted).

Sample #	Map #	Description	Chromium	Copper	Mercury	Nickel	Lead	Silver	Zinc
MILLSITE									
SC66	3a-1	within tailings zone	137	501	0.185	30.3	3.30	0.234	87.5
SC71	3a-2	~ 125 feet from tailings	93.8	159	0.0308	28.3	3.80	0.132	71.7
SC49	3a-3	~ 350 feet from tailings	86.8	154	0.0342	27.8	3.42	0.130	80.9
SC47	3a-4	~ 350 feet from tailings	69.6	43.0	0.0354	20.1	3.42	0.0863	67.9
SC43	3a-5	~ 950 feet from tailings	66.6	121	0.303	22.5	3.62	0.134	61.3
SC44	3a-6	~ 1,750 feet from tailings	66.4	157	0.0544	19.1	3.39	0.168	64.5
CONTROL SITE									
SC58	4-1	10.9 feet above MLLW	57.0	21.4	0.0072	14.7	2.71	0.0533	50.0
SC62	4-2	15.0 feet above MLLW	49.8	22.2	0.0181	18.5	3.01	0.0591	52.1
SC53	4-4	15.5 feet above MLLW	57.8	27.8	0.0183	13.5	2.07	0.0423	44.4
SC54	4-4	duplicate of sample SC53	47.7	23.1	0.0073	16.1	2.68	0.0910	46.4
Effects range low - ERL ¹			81	34	0.15	20.9	46.7	1.0	150
Effects range medium - ERM ¹			370	270	0.71	51.6	218	3.7	410

¹Trace metal guidelines for sediments in marine and estuary environments (Long and others, 1995).

Bolded numbers refer to analytical values that exceed the ERM for a particular metal.

Appendix table 3.- Analytical results from 1995/1997 water samples.

Metal	WA01 (1995) main adit	WA02 (1995) downstream	WA03 (1995) background	WA04 (1997) Lake Ellen Creek; downstream	WA05 (1997) Lake Ellen Creek; upstream	WA06 (1997) same location as WA02	WA07 (1997) duplicate of WA06	WA08 (1997) same location as WA03	Alaska State Freshwater Criteria	National Toxics Rule
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	6 µg/l	14 µg/l
Arsenic	1.8 µg/l	ND	ND	ND	ND	ND	ND	ND	50 µg/l	0.18 µg/l
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	4 µg/l	
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	hardness dependent $e^{(0.7852(\ln \text{hardness}) - 3.490)}$	
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	11 µg/l	
Copper	60 µg/l	4.9 µg/l	ND	2.1 µg/l	3.1 µg/l	3.9 µg/l	4.9 µg/l	ND	hardness dependent $e^{(0.8545(\ln \text{hardness}) - 1.465)}$	
Lead	ND	ND	ND	ND	ND	ND	ND	ND	hardness dependent $e^{(1.273(\ln \text{hardness}) - 4.705)}$	
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	0.012 µg/l	0.14 µg/l
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	hardness dependent $e^{(0.76(\ln \text{hardness}) + 1.06)}$	
Selenium	11 µg/l	ND	ND	ND	ND	ND	ND	ND	35 µg/l	
Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.12 µg/l	
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	2 µg/l	1.7 µg/l
Zinc	19 µg/l	11 µg/l	ND	ND	ND	ND	ND	ND	47 µg/l	
Hardness	91 mg/l	14 mg/l	13 mg/l	85 mg/l	95 mg/l	12 mg/l	ND	13 mg/l		

¹ bold numbers indicate exceedances relative to the standards depicted in this table.

Appendix table 4. - Analytical results from character samples of mill tailings (1995).

Sample Number	Map Number	Chromium	Copper	Mercury	Nickel	Lead	Silver	Zinc
SC28	3-1	49	979	0.050	14	< 2	0.8	44
SC11	3-2	36	1150	0.070	20	2	1.0	44
SC39	3-3	52	1485	0.060	19	4	0.6	50
SC12	3-4	27	3160	0.050	16	2	2.0	62
SC24	3-5	33	3880	0.090	16	58	2.0	66
SC33	3-6	37	1330	0.060	15	2	< 0.2	40
SC19	3-7	31	1475	0.030	16	4	0.2	40
SC13	3-8	20	3180	0.050	17	2	1.8	46
SC23	3-9	23	1255	0.070	17	< 2	0.6	60
SC37	3-10	31	2520	0.040	16	2	1.0	46
SC14	3-11	25	1135	0.030	16	< 2	< 0.2	52
SC20	3-12	54	737	0.010	14	2	0.2	36
SC32	3-13	28	637	0.040	16	2	< 0.2	50
SC9	3-14	36	1445	0.040	17	2	0.2	44
SC34	3-15	36	1085	0.080	17	2	0.2	58
SC15	3-16	34	1290	0.040	16	2	1.0	42
SC21	3-17	25	512	0.030	12	< 2	< 0.2	46
SC8	3-18	41	975	0.040	16	< 2	0.6	36
SC27	3-19	31	641	0.070	16	16	0.2	50
SC38	3-20	64	852	0.040	16	4	< 0.2	56
SC16	3-21	26	804	0.030	16	4	0.2	50
SC22	3-22	54	664	0.040	13	2	0.2	48
SC7	3-23	23	794	0.040	14	2	< 0.2	42
SC35	3-24	39	1080	0.040	15	2	0.6	56
SC31	3-25	66	677	0.060	15	8	< 0.2	50
SC17	3-26	24	751	0.090	16	2	0.4	60
SC18	3-26	17	721	0.080	16	2	0.2	56
SC26	3-27	39	769	0.050	14	2	0.2	52
SC3	3-28	31	672	0.070	12	2	< 0.2	60
SC29	3-29	29	1490	0.060	15	2	0.6	50
SC25	3-30	37	1290	0.040	15	6	0.4	56

Sample Number	Map Number	Chromium	Copper	Mercury	Nickel	Lead	Silver	Zinc
SC6	3-31	29	653	0.060	15	<2	0.2	54
SC36	3-32	28	1240	0.080	16	2	0.4	58
SC30	3-33	74	803	0.030	17	4	0.2	60
SC5	3-34	45	1415	0.020	18	<2	0.8	42
SC2	3-35	67	452	0.040	14	<2	< 0.2	58
SC67	3-36	82	80	0.020	16	2	< 0.2	68
SC4	3-37	70	229	0.050	14	2	< 0.2	56
SC70	3-38	85	53	0.010	15	4	< 0.2	70
SC68	3-39	74	64	0.010	14	4	< 0.2	74
SC69	3-40	77	39	0.030	13	6	< 0.2	50
SC1	3-41	83	55	0.020	12	2	< 0.2	56
ERL guidelines		81	34	0.15	20.9	46.7	1.0	150

ERL - Effects range low guidelines for marine and estuary sediments, Long and others, 1995.
 Bolded numbers refer to values that meet or exceed the ERL for that particular metal.

Appendix table 4a.- Analytical results from TCLP test (1995) (results given in mg/l).

Sam #	Map #	Cu	Zn	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
SC11	3-2	0.75	0.48	< 0.50	0.08	< 0.005	< 0.01	< 0.10	< 0.002	< 0.50	< 0.01
SC24	3-5	1.37	0.63	< 0.50	0.15	0.006	< 0.01	< 0.10	< 0.002	< 0.50	< 0.01
SC21	3-17	6.87	0.46	< 0.50	0.13	< 0.005	< 0.01	< 0.10	< 0.002	< 0.50	< 0.01
SC35	3-23	1.73	0.54	< 0.50	0.16	< 0.005	< 0.01	< 0.10	< 0.002	< 0.50	< 0.01
Reg. Limit		NA	NA	5	100	1	5	5	0.2	1	5

Copper and zinc values are bolded for emphasis, but there are no regulatory limits for these metals in a TCLP test.

Appendix B.- Inventory examination summary report.

Background: The Salt Chuck Mine was discovered in 1905 and operated on a small scale (hand-sorted shipments) until 1915. A 30-ton per day mill was constructed in 1915 and an adit tunnel was driven 1,200 feet to intersect the orebody 300 feet below its surface exposure. Mill capacity was increased to 130 tons per day by 1923 and operations continued until 1926. Exploratory drilling was performed from 1929 until 1931, but production ceased during this time. In 1934 the Alaska Gold and Metals Company reopened the mine and production continued until 1941. Most of the ore mined at Salt Chuck was removed from three separate ore shoots contained within a large glory hole. Mineralized rock consists of gabbro and pyroxenite with bornite being the principal ore mineral. Chalcopyrite, pyrite, and magnetite are present in lesser quantities. Production from the mine totaled 326,000 tons of ore at an average grade of 0.95% copper, 0.063 oz/t palladium, 0.036 oz/t gold, and 0.17 oz/t silver. Copper recovery from the flotation mill averaged 85%. Several companies explored the Salt Chuck area in the 1980's and early 1990's, and established geophysical and geochemical grids to obtain targets for core-drilling operations. There are currently no active mining claims on the site. Bureau of Mines geologists evaluated the Salt Chuck for physical and chemical hazards on July 20, 21 and September 11, 14, and 15, 1995.

Main Features: Five mine workings were found during the current investigation including one adit and a tunnel (W1, W3), a large glory hole (W2) and two shafts (W4, W5). Two short adits are reportedly located 1,400 feet SW of the glory hole, but were not found during this investigation. W1 and W3 were found open and are 1,200 feet and 120 feet long, respectively. W1 is located at 100 feet elevation, about 1,200 feet from the millsite. The portal is partially caved and water is pooled to 3 feet deep, preventing a thorough examination. This working undercuts the glory hole from the SSE and was used mainly as a haulage level to bring ore to the mill. W3 intersects the glory hole from the NE at an elevation of 300 feet. This tunnel leads directly into the glory hole (and a 100-foot drop) and is located less than 200 yards from a well-traveled logging road. The glory hole measures nearly 250 feet by 175 feet at its widest points and is nearly 200 feet deep in its connection with W1 haulage adit. A trail encircles the perimeter of the glory hole. W4 and W5 are open shafts located less than 60 feet from the east edge of the glory hole. W4 has dimensions of 4 by 4 feet and is 6 to 8 feet deep. W5 is a corkscrew raise that connects with the 100-level of the mine about 200 feet below the rim of the glory hole. The opening for W5 is about 5 by 6 feet, but an overgrown pit that measures 15 by 20 feet envelops the actual working. A raise similar to W5 is found adjacent to the NW side of the glory hole, but it is very conspicuous.

Waste rock from the mine has been placed in 13 separate dumps distributed from the NE side of the glory hole to the millsite, almost 0.5 miles away. The dumps range in size from over 100 yd³ (D9) to over 4,000 yd³ (D12). A large amount of material was used to create the tramway bed leading from W1 to the millsite, but was not included in waste rock volume calculations. Most of the rock in the dumps is greater than cobble size (2"-6") and some dumps contain large boulders that become unstable when walked over. The dumps above the millsite (D2-D5) and

south of the glory hole (D12) are good examples of this. Hazards from unstable waste rock at D2 are compounded by the presence of a large gyratory crusher and the hollow foundation on which it is placed. There is a 2-by 3-foot-wide opening that drops into a 3 foot+ deep hole below the crusher located next to the trail leading down the dump. There are large pieces of rusty metal equipment on some of the dumps (D1, D3, D12, D13) which aggravate the physical hazard already generated by unstable footing.

There are at least 25 separate structures in various stages of disrepair at Salt Chuck (see map). The majority of these are in poor to bad shape and are lying in a heap of boards, planks, tarpaper, etc. Most of these structures are either clustered near the beach, along the tramway leading from W1 to the mill, upstream along the creek that flows past the portal of W1, or near the glory hole. Several of these structures appear to be cabin sites used to house and feed the workers (C7-C9, C11, C16-C19). There is also a large millsite (C25), a superintendent's house (C1), general office (C2), a blacksmith or machine shop (C15), and platforms used to load and transfer rock (C12, C23). Several piles of garbage were found near the cabin sites at the beach and along the creek. These contain bottles, tin cans, bed springs and frames, metal parts, electrical wire, toys, equipment, etc. A wide variety of equipment and debris is found along the tramway between the mill and the haulage adit. A complete list of the structures and possible uses is provided in the Region 1 form.

The millsite is the largest structure at Salt Chuck and is in poor to bad condition. Over one-half of the shell of the building is standing, but precariously at that. Pieces of the tin-siding flap in the breeze and parts of the building frame are likely to collapse. The east and south sides of the mill have completely collapsed, the floor has caved in and large piles of beams, boards, tin siding, heavy equipment and rusty metal pieces are present. The west side of the mill retains some structural integrity, and the floor that supported the main diesel engines is still largely intact, though holes in the wood planking are present. The upper portion of the mill framing is intact, but conveyor equipment is piled randomly amongst beams, planks and siding. The amount and size of equipment at the millsite is noteworthy and a full cultural assessment is warranted prior to any remediation effort. The area could be fenced off while a management decision is made.

Chemical hazards related to the soil and water pathways were evaluated at Salt Chuck. The Salt Chuck mill operated until 1941 and was powered by 4 separate banks of Fairbanks Morse diesel engines. These engines were placed on a concrete platform overlying a floor where fuel tanks are located. These tanks have rusted and corroded on the top, but it is not known if they are perforated on the bottom or sides. A thick, gooey sludge has accumulated on the floor beneath these tanks and a sample taken of this material (SO01) smelled strongly of petroleum. Analysis of this sample revealed high levels of diesel range organic contamination with TEPH readings approaching 16.3%. The side of the mill just west of the tanks is stained black and the soil here is similarly discolored. The sludge appeared to have migrated into the intertidal zone where a second soil sample was taken (SO02). Analysis of this sample revealed that the sludge was actually vegetative in origin and contained only 86 mg/kg TEPH. It is not known how much material has spilled. A follow up investigation would more precisely determine the quantity of

sludge material present and its extent. In addition, electrical power generated by these engines was used to operate machinery and electrify many of the structures throughout the mine complex. PCB's may have been used in power generation and distribution equipment (transformers), and a return visit to sample for PCB's is warranted.

A composite sample of mill tailings was taken directly in front of the mill (SO03). Analysis reveals high levels of copper (7.3%) and silver (43 ppm). There are two piles of mill tailings located west of the millsite, on opposite sides of the main creek that drains the site (D14, D15). Tailings were also found in the creek. Two samples were taken of this material (SO04, SO05) These tailings are virtually identical to the main tailings pile that covers an 800 by 1,000 foot area in the intertidal zone. Sample SO04 contained 1,085 ppm copper and 451 ppm vanadium. Sample SO05 contained 493 ppm copper and 219 ppm vanadium.

Tailings piled in the intertidal zone were thoroughly sampled (SC1-SC39) and leaching tests (TCLP) were also done. The TCLP tests detected copper and zinc in concentrations up to 6.87 mg/l and 0.63 mg/l, respectively. However, regulatory limits have not been established for these two metals. The tailings cover an area roughly 700 feet by 700 feet with depths ranging from 15 feet near mill and decreasing to less than one-foot thick near the main creek to the south. The majority of the tailings were devoid of life. Grasses, seaweed, mussels, and barnacles were found along the edges of the tailings, where the metal concentrations were much lower. Samples were taken to determine the extent of contamination and not the absolute depth and volume of contaminated material. Over half of the samples taken contained in excess of 1,080 ppm copper; the largest value obtained was 3,880 ppm copper. Anomalous amounts of gold and palladium were also found in the samples. A mathematical average of copper from all 39 samples was 1,184 ppm.

Water emanating from mine workings and subsequently flowing into the creek that drains the area was field screened (WFS1-WFS5) for pH, conductivity (μ S), and temperature ($^{\circ}$ C). Background water quality was also tested/sampled. Field screening parameters ranged from pH 6.6 to 7.7, conductivity from 20 μ S to 190 μ S, and temperature from 6 $^{\circ}$ C to 15.5 $^{\circ}$ C. The water draining W1 had a pH of 7.7 and a conductivity of 190 μ S (WFS1). This mine water mixes with water from the main creek less than 30 feet away (at the end of the open cut in front of the adit). A sample from this mixed water (WFS3) contained a pH of 7.0 and conductivity of 30 μ S. The upstream water sample (WFS5) yielded the lowest pH of 6.6. Three samples were taken to determine total metals in the water (WA01-WA03). Samples were taken of water draining W1 (WA01), in addition to upstream (WA03) and downstream samples (WA02).

Analytical results from the water sampling disclose the presence of arsenic, copper, selenium, and zinc in varying quantities. The sample taken from water draining W1 contained 1.8 μ g/l arsenic, 60 μ g/l copper, 11 μ g/l selenium, and 19 μ g/l zinc at a hardness of 91 mg/l (measured as CaCO_3). The copper level exceeds the Alaska Freshwater standard for this metal. The arsenic concentration exceeds the National Toxics Rule standard for this metal. The selenium and zinc values are below established standards. The downstream sample (WA02) contained 4.9 μ g/l

copper and 11 µg/l zinc at a hardness of 14. The copper concentration exceeds the Alaska Freshwater Criteria for this metal, and the zinc is well within established guidelines. The upstream sample (WA03) did not contain measurable quantities of any metals. The following table depicts this analytical information.

Sample Number	Sample Description	Metal	Alaska Freshwater Criteria	National Toxics Rule	Analytical results
KT3WA01	draining W1	As	50 µg/l	0.18 µg/l	1.8 µg/l
		Cu	10.9 µg/l at 91 hardness		60 µg/l at 91 hardness
		Se	35 µg/l		11 µg/l
		Zn	47 µg/l		19 µg/l
KT3WA02	downstream	Cu	2.2 µg/l at 14 hardness		4.9 µg/l at 14 hardness
		Zn	47 µg/l		11 µg/l

The mine water flowing from W1 should be diverted or buffered as it contains excessive copper that is contaminating downstream water. This stream supports minor fish populations and abundant frogs. Deer prints were seen along the banks of this creek. Salmon spawn in the larger creek located south of the mine site.

Hazards: There are many physical hazards present including dangerous mine openings, unstable waste rock dumps, over 25 structures in various stages of disrepair, and scattered metal parts, equipment, and debris. The portal of W1 is partially caved and water is pooled to 3 feet deep. W3 opens directly into the glory hole, about a 100-foot fall. W4 and W5 are open shafts located less than 60 feet from the east edge of the glory hole. W5 descends several hundred feet before it connects with the 100 level in W1. The majority of the structures are in poor to bad shape and are found lying in a heap of boards, planks, tarpaper, etc. The millsite is in especially bad condition and is the epitome of an attractive nuisance. Besides the physical hazard at the millsite, an unconfined oil-sludge spill was identified that has possibly spread into the intertidal zone. Copper concentrations up to 3,880 ppm were found in soil samples taken from tailings in the intertidal zone. TCLP tests indicated that copper and zinc are leaching from the tailings found in the intertidal zone. Downstream water samples contained copper in concentrations exceeding the Alaska Freshwater Criteria for this metal.

Mitigation Recommendations: The Salt Chuck Mine contains the widest array of mine-related artifacts found on USFS land in the Tongass. The site has historical significance in that it was the only hard-rock mine producing palladium in the U.S. in its time. The site is accessible by road, trail, and water, and there is evidence that people regularly visit the site. Obvious hazards requiring remediation include blocking the opening to the glory hole from the end of W3 tunnel

(fence); boarding up the opening to the corkscrew raise located east of the glory hole (W5); cleaning up the sludge and fuel spill at the millsite; erecting a fence around the millsite until a final determination can be made; and cleaning up the garbage and rusty equipment with no historical value. All of the other remains should be evaluated by a team of archaeologists and mining historians and the site should be restored and made into an interpretive site for the many visitors to Prince of Wales Island.

The water leaving W1 contains excessive copper and should be treated. There is little possibility of preventing water from entering this working as W2 (glory hole) collects water and funnels it into W1. The tailings are contaminated with copper and should be removed from this location.

Future Study Recommendations: Mine tailings placed in the intertidal zone contain high concentrations of copper. Leach tests revealed that copper and zinc are leaching into the marine environment, but regulatory limits have not been established for these metals. Biological testing of benthic organisms is recommended to determine if bioaccumulation of copper is taking place in this portion of Karta Bay. Results from this study will determine if tailings removal is warranted.



MONTGOMERY LABORATORIES

5438 Shaune Dr.
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(907) 780-6668

Laboratory Report

for

**U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550**

Juneau, AK 99802-0550

Attention: Ed Gensler



MONTGOMERY LABORATORIES

5438 Shaune Drive
Juneau, Alaska 99801
907 780 6668

Laboratory Report

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951577 Sample ID KT3 WA01 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 200.9)	) mg/l	ND				0.0005	04-oct-1995	evb	11-oct-1995	ddw
Arsenic by furnace - Total (EPA 200.9)	) mg/l	0.0018				0.0005	04-oct-1995	evb	06-oct-1995	ddw
Beryllium by furnace - Total (EPA 200.9)	) mg/l	ND				0.001	04-oct-1995	evb	09-oct-1995	ddw
Cadmium by furnace - Total (EPA 200.9)	) mg/l	ND				0.0002	04-oct-1995	evb	10-oct-1995	ddw
Chromium by flame - Total (EPA 218.1)	) mg/l	ND				0.02	04-oct-1995	evb	09-oct-1995	jrs
Copper by furnace - Total (EPA 200.9)	) mg/l	0.060			2	0.004	04-oct-1995	evb	12-oct-1995	ddw
Hardness as CaCO3, Titrimetric (EPA 130.2)	) mg/l	91				10			07-oct-1995	evb
Mercury by CV - Total (EPA 245.2)	) ug/l	ND				0.2	26-sep-1995	chr	27-sep-1995	chr
Nickel by furnace - Total (EPA 200.9)	) mg/l	ND				0.01	04-oct-1995	evb	11-oct-1995	ddw
Lead by furnace - Total (EPA 200.9)	) mg/l	ND				0.002	04-oct-1995	evb	08-oct-1995	ddw
Antimony by furnace - Total (EPA 200.9)	) mg/l	ND				0.005	04-oct-1995	mac	09-oct-1995	ddw
Selenium by furnace - Total (EPA 200.9)	) mg/l	0.011				0.005	04-oct-1995	evb	09-oct-1995	ddw
Thallium by furnace - Total (EPA 200.9)) mg/l	ND				0.001	04-oct-1995	evb	07-oct-1995	ddw
Zinc by flame - Total (EPA 289.1)) mg/l	0.019				0.01	04-oct-1995	evb	09-oct-1995	jrs

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907 780 6658

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951577 Sample ID KT3 WA01 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00428	86
LCS2	Silver by furnace - Total	mg/l	0.005	0.00434	87
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00383	77
MSD	Silver by furnace - Total	mg/l	0.005	0.00410	82
LCS1	Arsenic by furnace - Total	mg/l	0.005	0.00471	94
LCS2	Arsenic by furnace - Total	mg/l	0.005	0.00489	98
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.005	0.00461	92
MSD	Arsenic by furnace - Total	mg/l	0.005	0.00504	101
LCS1	Beryllium by furnace - Total	mg/l	0.005	0.0050	100
LCS2	Beryllium by furnace - Total	mg/l	0.005	0.0048	96
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.005	0.0056	112
MSD	Beryllium by furnace - Total	mg/l	0.005	0.0058	116
LCS1	Cadmium by furnace - Total	mg/l	0.002	0.00203	102
LCS2	Cadmium by furnace - Total	mg/l	0.002	0.00189	94
MBLK	Cadmium by furnace - Total	mg/l	ND	ND	
MS	Cadmium by furnace - Total	mg/l	0.002	0.00180	90
MSD	Cadmium by furnace - Total	mg/l	0.002	0.00188	94
LCS1	Chromium by flame - Total	mg/l	0.2	0.185	92
LCS2	Chromium by flame - Total	mg/l	0.2	0.176	88
MBLK	Chromium by flame - Total	mg/l	ND	ND	
MS	Chromium by flame - Total	mg/l	0.2	0.196	98
MSD	Chromium by flame - Total	mg/l	0.2	0.199	100
LCS1	Copper by furnace - Total	mg/l	0.020	0.0227	114
LCS2	Copper by furnace - Total	mg/l	0.020	0.0210	105
MBLK	Copper by furnace - Total	mg/l	ND	ND	
MS	Copper by furnace - Total	mg/l	0.020	0.0209	104
MSD	Copper by furnace - Total	mg/l	0.020	0.0205	102
LCS1	Hardness as CaCO3, Titrimetric	mg/l	25	28.0	112

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Laboratory Report
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U.S. Bureau of Mines
 Alaska Field Operations Center
 Juneau Branch
 P.O. Box 20550
 Juneau, AK 99802-0550
 ATTN: Roger Baer

Sample # 951577 Sample ID KT3 WA01 Project _____
 Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

**Single Determination Analytes
 Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
LCS2	Hardness as CaCO ₃ , Titrimetric	mg/l	25	29.0	116
MBLK	Hardness as CaCO ₃ , Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO ₃ , Titrimetric	mg/l	25	19.4	78
MSD	Hardness as CaCO ₃ , Titrimetric	mg/l	25	20.0	80
LCS1	Mercury by CV - Total	ug/l	2.0	2.31	116
LCS2	Mercury by CV - Total	ug/l	2.0	2.20	110
MBLK	Mercury by CV - Total	ug/l	ND	ND	
MS	Mercury by CV - Total	ug/l	2.0	2.19	110
MSD	Mercury by CV - Total	ug/l	2.0	2.35	118
LCS1	Nickel by furnace - Total	mg/l	0.04	0.0402	100
LCS2	Nickel by furnace - Total	mg/l	0.04	0.0388	97
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.04	0.0361	90
MSD	Nickel by furnace - Total	mg/l	0.04	0.0368	92
LCS1	Lead by furnace - Total	mg/l	0.02	0.0215	108
LCS2	Lead by furnace - Total	mg/l	0.02	0.0211	106
MBLK	Lead by furnace - Total	mg/l	ND	ND	
MS	Lead by furnace - Total	mg/l	0.02	0.0202	101
MSD	Lead by furnace - Total	mg/l	0.02	0.0209	104
LCS1	Antimony by furnace - Total	mg/l	0.05	0.0555	111
LCS2	Antimony by furnace - Total	mg/l	0.05	0.0526	105
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.05	0.0544	109
MSD	Antimony by furnace - Total	mg/l	0.05	0.0557	111
LCS1	Selenium by furnace - Total	mg/l	0.05	0.0523	105
LCS2	Selenium by furnace - Total	mg/l	0.05	0.0518	104
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.05	0.0535	107
MSD	Selenium by furnace - Total	mg/l	0.05	0.0553	111
LCS1	Thallium by furnace - Total	mg/l	0.010	0.00893	89
LCS2	Thallium by furnace - Total	mg/l	0.010	0.00891	89

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MONTGOMERY LABORATORIES

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Laboratory Report

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951578 Sample ID KT3 WA02 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Parameter	Units	Result	Conc.	%Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 200.9)	mg/l	ND				0.0005	04-oct-1995	evb	11-oct-1995	ddw
Arsenic by furnace - Total (EPA 200.9)	mg/l	ND				0.0005	04-oct-1995	evb	06-oct-1995	ddw
Beryllium by furnace - Total (EPA 200.9)	mg/l	ND				0.001	04-oct-1995	evb	09-oct-1995	ddw
Cadmium by furnace - Total (EPA 200.9)	mg/l	ND				0.0002	04-oct-1995	evb	10-oct-1995	ddw
Chromium by flame - Total (EPA 218.1)	mg/l	ND				0.02	04-oct-1995	evb	09-oct-1995	jrs
Copper by furnace - Total (EPA 200.9)	mg/l	0.0049				0.002	04-oct-1995	evb	12-oct-1995	ddw
Hardness as CaCO3, titrimetric (EPA 130.2)	mg/l	14				10			07-oct-1995	trb
Mercury by CV - Total (EPA 245.2)	ug/l	ND				0.2	26-sep-1995	chr	27-sep-1995	chr
Nickel by furnace - Total (EPA 200.9)	mg/l	ND				0.01	04-oct-1995	evb	11-oct-1995	ddw
Lead by furnace - Total (EPA 200.9)	mg/l	ND				0.002	04-oct-1995	evb	08-oct-1995	ddw
Antimony by furnace - Total (EPA 200.9)	mg/l	ND				0.005	04-oct-1995	evb	09-oct-1995	ddw
Selenium by furnace - Total (EPA 200.9)	mg/l	ND				0.005	04-oct-1995	evb	09-oct-1995	ddw
Thallium by furnace - Total (EPA 200.9)	mg/l	ND				0.001	04-oct-1995	evb	07-oct-1995	ddw
Zinc by flame - Total (EPA 289.1)	mg/l	0.011				0.01	04-oct-1995	evb	09-oct-1995	jrs

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U.S. Bureau of Mines
Alaska Field Operations Center
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Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951578 Sample ID KT3 WA02 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00428	86
LCS2	Silver by furnace - Total	mg/l	0.005	0.00434	87
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00383	77
MSD	Silver by furnace - Total	mg/l	0.005	0.00410	82
LCS1	Arsenic by furnace - Total	mg/l	0.005	0.00471	94
LCS2	Arsenic by furnace - Total	mg/l	0.005	0.00489	98
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.005	0.00461	92
MSD	Arsenic by furnace - Total	mg/l	0.005	0.00504	101
LCS1	Beryllium by furnace - Total	mg/l	0.005	0.0050	100
LCS2	Beryllium by furnace - Total	mg/l	0.005	0.0048	96
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.005	0.0056	112
MSD	Beryllium by furnace - Total	mg/l	0.005	0.0058	116
LCS1	Cadmium by furnace - Total	mg/l	0.002	0.00203	102
LCS2	Cadmium by furnace - Total	mg/l	0.002	0.00189	94
MBLK	Cadmium by furnace - Total	mg/l	ND	ND	
MS	Cadmium by furnace - Total	mg/l	0.002	0.00180	90
MSD	Cadmium by furnace - Total	mg/l	0.002	0.00188	94
LCS1	Chromium by flame - Total	mg/l	0.2	0.185	92
LCS2	Chromium by flame - Total	mg/l	0.2	0.176	88
MBLK	Chromium by flame - Total	mg/l	ND	ND	
MS	Chromium by flame - Total	mg/l	0.2	0.196	98
MSD	Chromium by flame - Total	mg/l	0.2	0.199	100
LCS1	Copper by furnace - Total	mg/l	0.020	0.0227	114
LCS2	Copper by furnace - Total	mg/l	0.020	0.0210	105
MBLK	Copper by furnace - Total	mg/l	ND	ND	
MS	Copper by furnace - Total	mg/l	0.020	0.0209	104
MSD	Copper by furnace - Total	mg/l	0.020	0.0205	102
LCS1	Hardness as CaCO3, Titrimetric	mg/l	25	28.0	112

Report #: 22988



Laboratory Report
MONTGOMERY LABORATORIES

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907 780 6668

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951578 Sample ID KT3 WA02 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS2	Hardness as CaCO3, Titrimetric	mg/l	25	29.0	116
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	19.4	78
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	20.0	80
LCS1	Mercury by CV - Total	ug/l	2.0	2.31	116
LCS2	Mercury by CV - Total	ug/l	2.0	2.20	110
MBLK	Mercury by CV - Total	ug/l	ND	ND	
MS	Mercury by CV - Total	ug/l	2.0	2.19	110
MSD	Mercury by CV - Total	ug/l	2.0	2.35	118
LCS1	Nickel by furnace - Total	mg/l	0.04	0.0402	100
LCS2	Nickel by furnace - Total	mg/l	0.04	0.0388	97
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.04	0.0361	90
MSD	Nickel by furnace - Total	mg/l	0.04	0.0368	92
LCS1	Lead by furnace - Total	mg/l	0.02	0.0215	108
LCS2	Lead by furnace - Total	mg/l	0.02	0.0211	106
MBLK	Lead by furnace - Total	mg/l	ND	ND	
MS	Lead by furnace - Total	mg/l	0.02	0.0202	101
MSD	Lead by furnace - Total	mg/l	0.02	0.0209	104
LCS1	Antimony by furnace - Total	mg/l	0.05	0.0555	111
LCS2	Antimony by furnace - Total	mg/l	0.05	0.0526	105
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.05	0.0546	109
MSD	Antimony by furnace - Total	mg/l	0.05	0.0557	111
LCS1	Selenium by furnace - Total	mg/l	0.05	0.0523	105
LCS2	Selenium by furnace - Total	mg/l	0.05	0.0518	104
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.05	0.0535	107
MSD	Selenium by furnace - Total	mg/l	0.05	0.0553	111
LCS1	Thallium by furnace - Total	mg/l	0.010	0.00893	89
LCS2	Thallium by furnace - Total	mg/l	0.010	0.00891	89

Report #: 22988



Laboratory Report
MONTGOMERY LABORATORIES

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U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau , AK 99802-0550
ATTN: Roger Baer

Sample # 951578 Sample ID KT3 WA02 Project _____
Sample Type Water Sampled 14-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
MBUK	Thallium by furnace - Total	mg/l	ND	ND	
MS	Thallium by furnace - Total	mg/l	0.010	0.00892	89
MSD	Thallium by furnace - Total	mg/l	0.010	0.00930	93
LCS1	Zinc by flame - Total	mg/l	0.1	0.090	90
LCS2	Zinc by flame - Total	mg/l	0.1	0.088	88
MBLK	Zinc by flame - Total	mg/l	ND	ND	
MS	Zinc by flame - Total	mg/l	0.1	0.090	90
MSD	Zinc by flame - Total	mg/l	0.1	0.090	90

Report #: 22988



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Laboratory Report

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951579 Sample ID KT3 WA03 Project _____
Sample Type Water Sampled 15-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 200.9)	mg/l	ND				0.0005	04-oct-1995	evb	11-oct-1995	ddw
Arsenic by furnace - Total (EPA 200.9)	mg/l	ND				0.0005	04-oct-1995	evb	06-oct-1995	ddw
Beryllium by furnace - Total (EPA 200.9)	mg/l	ND				0.001	04-oct-1995	evb	09-oct-1995	ddw
Cadmium by furnace - Total (EPA 200.9)	mg/l	ND				0.0002	04-oct-1995	evb	10-oct-1995	ddw
Chromium by flame - Total (EPA 218.1)	mg/l	ND				0.02	04-oct-1995	evb	09-oct-1995	jrs
Copper by furnace - Total (EPA 200.9)	mg/l	ND				0.002	04-oct-1995	evb	12-oct-1995	ddw
Hardness as CaCO3, Titrimetric (EPA 130.2)	mg/l	13				10			07-oct-1995	trb
Mercury by CV - Total (EPA 245.2)	ug/l	ND				0.2	26-sep-1995	chr	27-sep-1995	chr
Nickel by furnace - Total (EPA 200.9)	mg/l	ND				0.01	04-oct-1995	evb	11-oct-1995	ddw
Lead by furnace - Total (EPA 200.9)	mg/l	ND				0.002	04-oct-1995	evb	08-oct-1995	ddw
Antimony by furnace - Total (EPA 200.9)	mg/l	ND				0.005	04-oct-1995	evb	09-oct-1995	ddw
Selenium by furnace - Total (EPA 200.9)	mg/l	ND				0.005	11-oct-1995	mac	10-oct-1995	ddw
Thallium by furnace - Total (EPA 200.9)	mg/l	ND				0.001	04-oct-1995	evb	07-oct-1995	ddw
Zinc by flame - Total (EPA 289.1)	mg/l	ND				0.01	04-oct-1995	evb	09-oct-1995	jrs

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Alaska Field Operations Center
Juneau Branch
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Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951579 Sample ID KT3 WA03 Project _____
Sample Type Water Sampled 15-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

**Single Determination Analytes
Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00428	86
LCS2	Silver by furnace - Total	mg/l	0.005	0.00434	87
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00383	77
MSD	Silver by furnace - Total	mg/l	0.005	0.00410	82
LCS1	Arsenic by furnace - Total	mg/l	0.005	0.00471	94
LCS2	Arsenic by furnace - Total	mg/l	0.005	0.00489	98
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.005	0.00461	92
MSD	Arsenic by furnace - Total	mg/l	0.005	0.00504	101
LCS1	Beryllium by furnace - Total	mg/l	0.005	0.0050	100
LCS2	Beryllium by furnace - Total	mg/l	0.005	0.0048	96
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.005	0.0056	112
MSD	Beryllium by furnace - Total	mg/l	0.005	0.0058	116
LCS1	Cadmium by furnace - Total	mg/l	0.002	0.00203	102
LCS2	Cadmium by furnace - Total	mg/l	0.002	0.00189	94
MBLK	Cadmium by furnace - Total	mg/l	ND	ND	
MS	Cadmium by furnace - Total	mg/l	0.002	0.00180	90
MSD	Cadmium by furnace - Total	mg/l	0.002	0.00188	94
LCS1	Chromium by flame - Total	mg/l	0.2	0.185	92
LCS2	Chromium by flame - Total	mg/l	0.2	0.176	88
MBLK	Chromium by flame - Total	mg/l	ND	ND	
MS	Chromium by flame - Total	mg/l	0.2	0.196	98
MSD	Chromium by flame - Total	mg/l	0.2	0.199	100
LCS1	Copper by furnace - Total	mg/l	0.020	0.0227	114
LCS2	Copper by furnace - Total	mg/l	0.020	0.0210	105
MBLK	Copper by furnace - Total	mg/l	ND	ND	
MS	Copper by furnace - Total	mg/l	0.020	0.0209	104
MSD	Copper by furnace - Total	mg/l	0.020	0.0205	102
LCS1	Hardness as CaCO ₃ , Titrimetric	mg/l	25	28.0	112

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Laboratory Report
MONTGOMERY LABORATORIES

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Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Mines
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 951579 Sample ID KT3 WA03 Project _____
Sample Type Water Sampled 15-sep-1995 Received 18-sep-1995 Reported 18-oct-1995

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS2	Hardness as CaCO3, Titrimetric	mg/l	25	29.0	116
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	19.4	78
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	20.0	80
LCS1	Mercury by CV - Total	ug/l	2.0	2.31	116
LCS2	Mercury by CV - Total	ug/l	2.0	2.20	110
MBLK	Mercury by CV - Total	ug/l	ND	ND	
MS	Mercury by CV - Total	ug/l	2.0	2.19	110
MSD	Mercury by CV - Total	ug/l	2.0	2.35	118
LCS1	Nickel by furnace - Total	mg/l	0.04	0.0402	100
LCS2	Nickel by furnace - Total	mg/l	0.04	0.0388	97
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.04	0.0361	90
MSD	Nickel by furnace - Total	mg/l	0.04	0.0368	92
LCS1	Lead by furnace - Total	mg/l	0.02	0.0215	108
LCS2	Lead by furnace - Total	mg/l	0.02	0.0211	106
MBLK	Lead by furnace - Total	mg/l	ND	ND	
MS	Lead by furnace - Total	mg/l	0.02	0.0202	101
MSD	Lead by furnace - Total	mg/l	0.02	0.0209	104
LCS1	Antimony by furnace - Total	mg/l	0.05	0.0555	111
LCS2	Antimony by furnace - Total	mg/l	0.05	0.0526	105
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.05	0.0546	109
MSD	Antimony by furnace - Total	mg/l	0.05	0.0557	111
LCS1	Selenium by furnace - Total	mg/l	0.05	0.0523	105
LCS2	Selenium by furnace - Total	mg/l	0.05	0.0518	104
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.05	0.0535	107
MSD	Selenium by furnace - Total	mg/l	0.05	0.0553	111
LCS1	Thallium by furnace - Total	mg/l	0.010	0.00893	89
LCS2	Thallium by furnace - Total	mg/l	0.010	0.00891	89

Report #: 22988



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907 780 6668

Laboratory Report

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970870 Sample ID KT3 WA04 Project _____
Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

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Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 272.2)	mg/l	ND				0.0005	07-Aug-1997	ees	11-Aug-1997	saw
Arsenic by furnace - Total (EPA 206.2)	mg/l	ND				0.0005	07-Aug-1997	ees	14-Aug-1997	saw
Beryllium by furnace - Total (EPA 210.2)	mg/l	ND				0.001	07-Aug-1997	ees	21-Aug-1997	saw
Cadmium by furnace - Dissolved (EPA 213.2)	mg/l	ND				0.0002			05-Aug-1997	saw
Chromium by furnace - Dissolved (EPA 218.2)	mg/l	ND				0.015			09-Aug-1997	saw
Copper by furnace - Dissolved (EPA 220.2)	mg/l	0.0021				0.002			09-Aug-1997	saw
Diss. Hardness as CaCO3, Tit. (EPA 130.2)	mg/l	85				10			01-Aug-1997	saw
Hardness as CaCO3, Titrimetric (EPA 130.2)	mg/l	86				10			01-Aug-1997	saw
Mercury by CV - Dissolved (EPA 245.1)	ug/l	ND				0.2	07-Aug-1997	ees	31-Jul-1997	ees
Nickel by furnace - Total (EPA 249.2)	mg/l	ND				0.01	07-Aug-1997	ees	13-Aug-1997	saw
Lead by furnace - Dissolved (EPA 239.2)	mg/l	ND				0.002			05-Aug-1997	saw
Antimony by furnace - Total (EPA 204.2)	mg/l	ND				0.005	07-Aug-1997	ees	19-Aug-1997	saw
Selenium by furnace - Total (EPA 270.2)	mg/l	NR				0.005	07-Aug-1997	ees	20-Aug-1997	saw
Thallium by furnace - total (EPA 279.2)	mg/l	ND				0.001	07-Aug-1997	ees	25-Aug-1997	saw
Zinc by Furnace - Total (EPA 289.2)	mg/l	ND				0.007	07-Aug-1997	ees	20-Aug-1997	saw



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U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970872 Sample ID KT3 WA06 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00519	104
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00499	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00244	98
LCS1	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00246	98
LCS2	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00265	106
MBLK	Cadmium by furnace - Dissolved	mg/l	ND	ND	
MS	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00276	110
MSD	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00231	92
LCS1	Chromium by furnace - Dissolved	mg/l	0.025	0.0262	105
LCS2	Chromium by furnace - Dissolved	mg/l	0.025	0.0269	108
MBLK	Chromium by furnace - Dissolved	mg/l	ND	ND	
MS	Chromium by furnace - Dissolved	mg/l	0.025	0.0287	115
MSD	Chromium by furnace - Dissolved	mg/l	0.025	0.0272	109
LCS1	Copper by furnace - Dissolved	mg/l	0.025	0.0243	97
LCS2	Copper by furnace - Dissolved	mg/l	0.025	0.0255	102
MBLK	Copper by furnace - Dissolved	mg/l	ND	ND	
MS	Copper by furnace - Dissolved	mg/l	0.025	0.0282	113
MSD	Copper by furnace - Dissolved	mg/l	0.025	0.0289	116
LCS1	Diss. Hardness as CaCO3, Titr.	mg/l	50	50.4	101

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Laboratory Report
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U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970872 Sample ID KT3 WA06 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
LCS2	Diss.Hardness as CaCO3, Titr.	mg/l	50	50.4	101
MBLK	Diss.Hardness as CaCO3, Titr.	mg/l	ND	ND	
MS	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.8	99
MSD	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.0	96
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.0	96
LCS1	Mercury by CV - Dissolved	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Dissolved	ug/l	2.0	1.93	96
MBLK	Mercury by CV - Dissolved	ug/l	ND	ND	
MS	Mercury by CV - Dissolved	ug/l	2.0	2.26	112
MSD	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0259	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Dissolved	mg/l	0.025	0.0230	92
LCS2	Lead by furnace - Dissolved	mg/l	0.025	0.0247	99
MBLK	Lead by furnace - Dissolved	mg/l	ND	ND	
MS	Lead by furnace - Dissolved	mg/l	0.025	0.0241	96
MSD	Lead by furnace - Dissolved	mg/l	0.025	0.0238	95
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0199	84
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111

Report #: 35885



MONTGOMERY LABORATORIES

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Laboratory Report

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970873 Sample ID KT3 WA07 Project _____
Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 272.2)	mg/l	ND				0.0005	07-Aug-1997	ees	11-Aug-1997	sew
Arsenic by furnace - Total (EPA 206.2)	mg/l	ND				0.0005	07-Aug-1997	ees	14-Aug-1997	sew
Beryllium by furnace - Total (EPA 210.2)	mg/l	ND				0.001	07-Aug-1997	ees	21-Aug-1997	sew
Cadmium by furnace - Dissolved (EPA 213.2)	mg/l	ND				0.0002			05-Aug-1997	sew
Chromium by furnace - Dissolved (EPA 216.2)	mg/l	ND				0.015			09-Aug-1997	sew
Copper by furnace - Dissolved (EPA 220.2)	mg/l	0.0049				0.002			09-Aug-1997	sew
Diss Hardness as CaCO ₃ , Titr. (EPA 130.2)	mg/l	ND				10			01-Aug-1997	sew
Hardness as CaCO ₃ , Titrimetric (EPA 130.2)	mg/l	ND				10			01-Aug-1997	sew
Mercury by CV - Dissolved (EPA 265.1)	ug/l	ND				0.2	07-Aug-1997	ees	31-Jul-1997	sew
Nickel by furnace - Total (EPA 249.2)	mg/l	ND				0.01	07-Aug-1997	ees	13-Aug-1997	sew
Lead by furnace - Dissolved (EPA 259.2)	mg/l	ND				0.002			07-Aug-1997	sew
Antimony by furnace - Total (EPA 204.2)	mg/l	ND				0.005	07-Aug-1997	ees	19-Aug-1997	sew
Selenium by furnace - Total (EPA 270.2)	mg/l	ND				0.003	07-Aug-1997	ees	20-Aug-1997	sew
Thallium by furnace - total (EPA 279.2)	mg/l	ND				0.001	07-Aug-1997	ees	25-Aug-1997	sew
Zinc by Furnace - Total (EPA 269.2)	mg/l	ND				0.007	07-Aug-1997	ees	20-Aug-1997	sew

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Laboratory Report
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U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970873 Sample ID KT3 WA07 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00519	104
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00499	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00244	98
LCS1	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00246	98
LCS2	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00265	106
MBLK	Cadmium by furnace - Dissolved	mg/l	ND	ND	
MS	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00276	110
MSD	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00231	92
LCS1	Chromium by furnace-Dissolved	mg/l	0.025	0.0262	105
LCS2	Chromium by furnace-Dissolved	mg/l	0.025	0.0269	108
MBLK	Chromium by furnace-Dissolved	mg/l	ND	ND	
MS	Chromium by furnace-Dissolved	mg/l	0.025	0.0287	115
MSD	Chromium by furnace-Dissolved	mg/l	0.025	0.0272	109
LCS1	Copper by furnace - Dissolved	mg/l	0.025	0.0243	97
LCS2	Copper by furnace - Dissolved	mg/l	0.025	0.0255	102
MBLK	Copper by furnace - Dissolved	mg/l	ND	ND	
MS	Copper by furnace - Dissolved	mg/l	0.025	0.0282	113
MSD	Copper by furnace - Dissolved	mg/l	0.025	0.0289	116
LCS1	Dis.Hardness as CaCO3, Titr.	mg/l	50	50.4	101

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

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Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970873 Sample ID KT3 WA07 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
LCS2	Diss.Hardness as CaCO3, Titr.	mg/l	50	50.4	101
MBLK	Diss.Hardness as CaCO3, Titr.	mg/l	ND	ND	
MS	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.6	99
MSD	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.0	96
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.0	96
LCS1	Mercury by CV - Dissolved	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Dissolved	ug/l	2.0	1.93	96
MBLK	Mercury by CV - Dissolved	ug/l	ND	ND	
MS	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
MSD	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0259	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Dissolved	mg/l	0.025	0.0265	106
LCS2	Lead by furnace - Dissolved	mg/l	0.025	0.0263	105
MBLK	Lead by furnace - Dissolved	mg/l	ND	ND	
MS	Lead by furnace - Dissolved	mg/l	0.025	0.0253	101
MSD	Lead by furnace - Dissolved	mg/l	0.025	0.0247	99
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0159	64
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shaune Drive
 Juneau, Alaska 99801
 907 780 6668

U.S. Bureau of Land Management Alaska Field Operations Center Juneau Branch P.O. Box 20550 Juneau , AK 99802-0550 ATTN: Roger Baer

Sample # 970873 Sample ID KT3 WA07 Project _____
 Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

Single Determination Analytes Quality Control
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Control	Parameter	Units	Actual	Found	XRecv
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.025	0.0302	121
MSD	Selenium by furnace - Total	mg/l	0.025	0.0290	116
LCS1	Thallium by furnace - total	mg/l	0.025	0.0245	98
LCS2	Thallium by furnace - total	mg/l	0.025	0.0245	98
MBLK	Thallium by furnace - total	mg/l	ND	ND	
MS	Thallium by furnace - total	mg/l	0.025	0.0250	100
MSD	Thallium by furnace - total	mg/l	0.025	0.0236	94
LCS1	Zinc by Furnace - Total	mg/l	0.110	0.162	129
LCS2	Zinc by Furnace - Total	mg/l	0.110	0.122	111
MBLK	Zinc by Furnace - Total	mg/l	ND	ND	
MS	Zinc by Furnace - Total	mg/l	0.010	0.0125	125
MSD	Zinc by Furnace - Total	mg/l	0.010	0.0120	120

Report #: 35885



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Laboratory Report

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970874 Sample ID KT3 WA08 Project _____
Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

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Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 272.2)	mg/l	ND				0.0005	07-aug-1997	ees	11-aug-1997	saw
Arsenic by furnace - Total (EPA 206.2)	mg/l	ND				0.0005	07-aug-1997	ees	14-aug-1997	saw
Beryllium by furnace - Total (EPA 210.2)	mg/l	ND				0.001	07-aug-1997	ees	21-aug-1997	saw
Cadmium by furnace - Dissolved (EPA 213.2)	mg/l	ND				0.0002			05-aug-1997	saw
Chromium by furnace - Dissolved (EPA 216.2)	mg/l	ND				0.015			09-aug-1997	saw
Copper by furnace - Dissolved (EPA 220.2)	mg/l	ND				0.002			09-aug-1997	saw
Diss. Hardness as CaCO3, Titr. (EPA 130.2)	mg/l	ND				10			01-aug-1997	saw
Hardness as CaCO3, Titrimetric (EPA 130.2)	mg/l	ND				10			01-aug-1997	saw
Mercury by CV - Dissolved (EPA 245.1)	ug/l	ND				0.2	07-aug-1997	ees	31-Jul-1997	cdw
Nickel by furnace - Total (EPA 249.2)	mg/l	ND				0.01	07-aug-1997	ees	13-aug-1997	saw
Lead by furnace - Dissolved (EPA 239.2)	mg/l	ND				0.002			07-aug-1997	saw
Antimony by furnace - Total (EPA 204.2)	mg/l	ND				0.005	07-aug-1997	ees	19-aug-1997	saw
Selenium by furnace - Total (EPA 270.2)	mg/l	ND				0.005	07-aug-1997	ees	20-aug-1997	saw
Thallium by furnace - total (EPA 279.2)	mg/l	ND				0.001	07-aug-1997	ees	25-aug-1997	saw
Zinc by furnace - Total (EPA 289.2)	mg/l	ND				0.007	07-aug-1997	ees	20-aug-1997	saw

Report #: 35885



Laboratory Report
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 907 780 6668

U.S. Bureau of Land Management
 Alaska Field Operations Center
 Juneau Branch
 P.O. Box 20550
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 ATTN: Roger Baer

Sample # 970874 Sample ID KT3 WA08 Project _____
 Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
 Quality Control**

Control	Parameter	Units	Actual	Found	ZRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00519	100
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00499	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00244	98
LCS1	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00246	98
LCS2	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00265	106
MBLK	Cadmium by furnace - Dissolved	mg/l	ND	ND	
MS	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00276	110
MSD	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00231	92
LCS1	Chromium by furnace - Dissolved	mg/l	0.025	0.0262	105
LCS2	Chromium by furnace - Dissolved	mg/l	0.025	0.0269	108
MBLK	Chromium by furnace - Dissolved	mg/l	ND	ND	
MS	Chromium by furnace - Dissolved	mg/l	0.025	0.0287	115
MSD	Chromium by furnace - Dissolved	mg/l	0.025	0.0272	109
LCS1	Copper by furnace - Dissolved	mg/l	0.025	0.0243	97
LCS2	Copper by furnace - Dissolved	mg/l	0.025	0.0255	102
MBLK	Copper by furnace - Dissolved	mg/l	ND	ND	
MS	Copper by furnace - Dissolved	mg/l	0.025	0.0262	113
MSD	Copper by furnace - Dissolved	mg/l	0.025	0.0289	116
LCS1	Diss. Hardness as CaCO3, Titr.	mg/l	50	50.4	101

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shaune Drive
Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970874 Sample ID KT3 WA08 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
LCS2	Diss.Hardness as CaCO3, Titr.	mg/l	50	50.4	101
MBLK	Diss.Hardness as CaCO3, Titr.	mg/l	ND	ND	
MS	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.8	99
MSD	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.0	96
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	96
LCS1	Mercury by CV - Dissolved	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Dissolved	ug/l	2.0	1.93	96
MBLK	Mercury by CV - Dissolved	ug/l	ND	ND	
MS	Mercury by CV - Dissolved	ug/l	2.0	2.26	112
MSD	Mercury by CV - Dissolved	ug/l	2.0	2.26	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0257	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Dissolved	mg/l	0.025	0.0265	106
LCS2	Lead by furnace - Dissolved	mg/l	0.025	0.0263	105
MBLK	Lead by furnace - Dissolved	mg/l	ND	ND	
MS	Lead by furnace - Dissolved	mg/l	0.025	0.0253	101
MSD	Lead by furnace - Dissolved	mg/l	0.025	0.0247	99
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0159	64
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shaune Drive
 Juneau, Alaska 99801
 907 780 6668

U.S. Bureau of Land Management
 Alaska Field Operations Center
 Juneau Branch
 P.O. Box 20550
 Juneau , AK 99802-0550
 ATTN: Roger Baer

Sample # 970874 Sample ID KT3 WA08 Project _____
 Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
 Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.025	0.0302	121
MSD	Selenium by furnace - Total	mg/l	0.025	0.0250	116
LCS1	Thallium by furnace - total	mg/l	0.025	0.0245	98
LCS2	Thallium by furnace - total	mg/l	0.025	0.0245	98
MBLK	Thallium by furnace - total	mg/l	ND	ND	
MS	Thallium by furnace - total	mg/l	0.025	0.0250	100
MSD	Thallium by furnace - total	mg/l	0.025	0.0236	94
LCS1	Zinc by Furnace - Total	mg/l	0.110	0.162	129
LCS2	Zinc by Furnace - Total	mg/l	0.110	0.122	111
MBLK	Zinc by Furnace - Total	mg/l	ND	ND	
MS	Zinc by Furnace - Total	mg/l	0.010	0.0125	125
MSD	Zinc by Furnace - Total	mg/l	0.010	0.0120	120

Report #: 35885



MONTGOMERY LABORATORIES

5438 Shauna Drive
Juneau, Alaska 99801
907 780 6668

Laboratory Report

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970875 Sample ID KT3 WA09 Project _____
Sample Type Water Sampled 23-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

Parameter	Units	Result	Conc.	%Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 272.2)	mg/l	ND				0.0005	07-Aug-1997	acs	11-Aug-1997	sdw
Arsenic by furnace - Total (EPA 206.2)	mg/l	ND				0.0005	07-Aug-1997	acs	14-Aug-1997	saw
Beryllium by furnace - Total (EPA 210.2)	mg/l	ND				0.001	07-Aug-1997	acs	21-Aug-1997	sdw
Cadmium by furnace - Total (EPA 213.2)	mg/l	ND				0.0002	07-Aug-1997	acs	18-Aug-1997	saw
Chromium by furnace - Total (EPA 218.2)	mg/l	ND				0.015	07-Aug-1997	acs	09-Aug-1997	sdw
Copper by furnace - Total (EPA 220.2)	mg/l	ND				0.002	07-Aug-1997	acs	09-Aug-1997	saw
Hardness as CaCO3, Titrimetric (EPA 130.2)	mg/l	ND				10			01-Aug-1997	sdw
Mercury by CV - Total (EPA 245.1)	ug/l	ND				0.2	07-Aug-1997	acs	31-Jul-1997	cdw
Nickel by furnace - Total (EPA 249.2)	mg/l	ND				0.01	07-Aug-1997	acs	11-Aug-1997	sdw
Lead by furnace - Total (EPA 239.2)	mg/l	ND				0.002	07-Aug-1997	acs	21-Aug-1997	saw
Antimony by furnace - Total (EPA 204.2)	mg/l	ND				0.005	07-Aug-1997	acs	19-Aug-1997	saw
Selenium by furnace - Total (EPA 270.2)	mg/l	ND				0.005	07-Aug-1997	acs	20-Aug-1997	saw
Thallium by furnace - Total (EPA 272.2)	mg/l	ND				0.001	07-Aug-1997	acs	23-Aug-1997	sdw
Zinc by Furnace - Total (EPA 289.2)	mg/l	ND				0.007	07-Aug-1997	acs	20-Aug-1997	saw

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Laboratory Report
MONTGOMERY LABORATORIES

5438 Shaune Drive
Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970875 Sample ID KT3 WA09 Project _____
Sample Type Water Sampled 23-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00519	104
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00499	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00244	98
LCS1	Cadmium by furnace - Total	mg/l	0.0025	0.00264	106
LCS2	Cadmium by furnace - Total	mg/l	0.0025	0.00272	109
MBLK	Cadmium by furnace - Total	mg/l	ND	ND	
MS	Cadmium by furnace - Total	mg/l	0.0025	0.00267	107
MSD	Cadmium by furnace - Total	mg/l	0.0025	0.00287	115
LCS1	Chromium by furnace - Total	mg/l	0.025	0.0267	107
LCS2	Chromium by furnace - Total	mg/l	0.025	0.0265	106
MBLK	Chromium by furnace - Total	mg/l	ND	ND	
MS	Chromium by furnace - Total	mg/l	0.025	0.0266	106
MSD	Chromium by furnace - Total	mg/l	0.025	0.0269	108
LCS1	Copper by furnace - Total	mg/l	0.025	0.0253	101
LCS2	Copper by furnace - Total	mg/l	0.025	0.0248	99
MBLK	Copper by furnace - Total	mg/l	ND	ND	
MS	Copper by furnace - Total	mg/l	0.025	0.0235	94
MSD	Copper by furnace - Total	mg/l	0.025	0.0243	97
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shauna Drive
Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970875 Sample ID KT3 UA09 Project _____
Sample Type Water Sampled 23-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.0	96
LCS1	Mercury by CV - Total	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Total	ug/l	2.0	1.93	96
MBLK	Mercury by CV - Total	ug/l	ND	ND	
MS	Mercury by CV - Total	ug/l	2.0	2.24	112
MSD	Mercury by CV - Total	ug/l	2.0	2.26	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0259	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Total	mg/l	0.025	0.0270	108
LCS2	Lead by furnace - Total	mg/l	0.025	0.0274	110
MBLK	Lead by furnace - Total	mg/l	ND	ND	
MS	Lead by furnace - Total	mg/l	0.025	0.0273	109
MSD	Lead by furnace - Total	mg/l	0.025	0.0255	102
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0159	64
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111
MBLK	Selenium by furnace - Total	mg/l	ND	ND	
MS	Selenium by furnace - Total	mg/l	0.025	0.0302	121
MSD	Selenium by furnace - Total	mg/l	0.025	0.0290	116
LCS1	Thallium by furnace - total	mg/l	0.025	0.0245	98
LCS2	Thallium by furnace - total	mg/l	0.025	0.0245	98

Report #: 35885

BATTELLE MARINE SCIENCES LABORATORY
 1529 West Sequim Bay Road
 Sequim, WA 98382-9099
 360/681-3604

BUREAU OF LAND MANAGEMENT - JUNEAU, ALASKA
 METALS IN TISSUE
 (Samples Received 11/5/97)

(concentrations in µg/g - blank corrected)

MSL Code	Sponsor ID	Percent Dry Wt	Cr	Cu	Hg	Ni	Pb	Ag	Zn
			ICP-MS	ICP-MS	CVAF	ICP-MS	ICP-MS	ICP-MS	ICP-MS
1152-12	SCM4	10.6	0.813	10.7	0.0717	1.27	0.261	0.135	113
1152-13	SCM5	10.0	0.862	11.6	0.0873	0.808	0.277	0.0598	88.9
1152-14	SCM9	10.5	1.37	22.8	0.101	1.48	0.404	0.0443	86.0
1152-15	SCM13	9.58	0.821	4.08	0.0458	0.727	0.194	0.0772	80.2
1152-16r1	SCM13M	10.9	0.631	4.38	0.0438	0.758	0.153	0.0867	82.7
1152-16r2	SCM13M	10.9	0.717	4.54	0.0417	0.789	0.217	0.0932	79.5
1152-17	SCM14	9.26	0.716	4.23	0.0512	0.746	0.180	0.141	76.5
1152-18	SCM18	10.3	0.705	4.72	0.114	0.737	0.151	0.0733	81.9
1152-19	SCM22	6.38	1.12	48.3	0.0450	0.984	0.368	0.122	123
1152-20	SCC1	10.6	2.00	9.58	0.0597	6.95	0.257	0.0345	103
1152-21	SCC2	9.85	0.812	13.2	0.0780	4.66	0.103	0.03 U	104
1152-22	SCC6	10.4	1.09	5.40	0.0482	5.24	0.115	0.127	90.6
1152-23	SCC10	11.3	0.980	5.32	0.0506	4.91	0.109	0.0842	101
1152-24	SCC11	10.2	1.20	5.44	0.0724	4.81	0.116	0.103	91.9
1152-25	SCC3A	9.53	1.95	48.0	0.140	2.78	0.442	0.0605	157
1152-26	SCC12	7.41	0.897	5.31	0.0434	1.39	0.124	0.437	139
1152-27	SCC13	8.56	1.21	29.8	0.145	1.51	0.110	0.0591	134
Blank			0.490	0.05 U	0.001 U	0.03 U	0.0121 J	0.0287 J	0.3 U
DETECTION LIMIT			0.06	0.05	0.001	0.03	0.05	0.03	0.3

Approvals: Ed Pauling Date: 12/19/97
 Project Manager: [Signature] QA/QC Officer: [Signature]

BATTELLE MARINE SCIENCES LABORATORY
 1529 West Sequim Bay Road
 Sequim, WA 98382-9099
 360/681-3604

BUREAU OF LAND MANAGEMENT - JUNEAU, ALASKA
 METALS IN TISSUE
 (Samples Received 11/5/97)

(concentrations in µg/g - blank corrected)

MSL Code	Sponsor ID	Percent Dry Wt	Cr ICP-MS	Cu ICP-MS	Hg CVAF	Ni ICP-MS	Pb ICP-MS	Ag ICP-MS	Zn ICP-MS
STANDARD REFERENCE MATERIAL									
1566a			1.43	57.8	0.0603	1.47	0.494	1.61	706
		certified value	1.43	66.3	0.0642	2.25	0.371	1.68	830
		range	±0.46	±4.3	±0.0067	±0.44	±0.014	±0.15	±57
		percent difference	0%	13%	6%	35% #	33% #	4%	15%
MATRIX SPIKE RESULTS									
Amount Spiked			5.00	5.00	5.00	5.00	5.00	5.00	5.00
1152-16	SCM13M	10.9	0.674	4.46	0.0428	0.774	0.185	0.0900	81.1
1152-16 MS			5.80	8.61	4.72	5.19	4.63	4.50	118
Amount Recovered			5.13	4.15	4.68	4.42	4.45	4.41	36.9
Percent Recovery			103%	83%	94%	88%	89%	88%	738% SL
REPLICATE ANALYSIS									
1152-16r1	SCM13M	10.9	0.631	4.38	0.0438	0.758	0.153	0.0867	82.7
1152-16r2	SCM13M	10.9	0.717	4.54	0.0417	0.789	0.217	0.0932	79.5
		RPD	13%	4%	5%	4%	35% #	7%	4%

- J Reported below DL shown
- U Not detected at or above DL shown
- SL Inappropriate spike level
- RPD Relative percent difference
- # Outside QC limits of ±25%

Tissue

BATTELL MARINE SCIENCES LABORATORY
 1529 West Sequim Bay Road
 Sequim, WA 98382-9099
 360/681-3604

BUREAU OF LAND MANAGEMENT - JUNEAU, ALASKA
 METALS IN SEDIMENT
 (Samples Received 11/4/97)

(concentrations in µg/g - blank corrected)

MSL Code	Sponsor ID	Percent Dry Wt	Cr XRF	Cu XRF	Hg CVA	Ni XRF	Pb ICP-MS	Ag ICP-MS	Zn XRF
1152-1	SC43	70.1	66.6	121	0.303	22.6	3.62	0.134	61.3
1152-2	SC44	76.3	66.4	157	0.0544	19.1	3.39	0.168	64.5
1152-3	SC47	78.4	69.6	43.0	0.0354	20.1	3.42	0.0863	67.9
1152-4	SC49	84.2	86.8	154	0.0342	27.8	3.42	0.130	80.9
1152-5	SC53	68.7	57.8	27.8	0.0183	13.5	2.07	0.0423	44.4
1152-6r1	SC53M	63.2	41.5	27.3	0.0168	13.2	2.27	0.0465	47.0
1152-6r2	SC53M	63.2	42.4	24.9	0.0189	12.2	2.15	0.0351	42.1
1152-7	SC54	67.7	47.7	23.1	0.0073	16.1	2.68	0.0910	46.4
1152-8	SC58	80.7	57.0	21.4	0.0072	14.7	2.71	0.0533	50.0
1152-9	SC62	76.8	49.8	22.2	0.0181	18.5	3.01	0.0591	52.1
1152-10	SC66	63.8	137	501	0.185	30.3	3.30	0.234	87.5
1152-11	SC71	77.1	93.8	159	0.0308	28.3	3.80	0.132	71.7
Blank			NA	NA	0.0016 U	NA	0.03 U	0.02 U	NA
MDL			5	4	0.0016	2	0.03	0.02	2
STANDARD REFERENCE MATERIAL									
MESS 2			114	38.6	0.0996	47.5	19.7	0.232	171
	certified value		106	39.3	0.092	49.3	21.9	0.18	172
	range		±8.0	±2.0	±0.009	±1.8	±1.2	±0.02	±16
	percent difference		8%	2%	8%	4%	10%	29%	1%

Approvals: Ed Reelley Date: 12/19/97
 Project Manager QA/QC Officer

BATTELLE MARINE SCIENCES LABORATORY
 1529 West Sequim Bay Road
 Sequim, WA 98382-9099
 360/681-3604

BUREAU OF LAND MANAGEMENT - JUNEAU, ALASKA
METALS IN SEDIMENT
 (Samples Received 11/4/97)

(concentrations in µg/g - blank corrected)

MSL Code	Sponsor ID	Percent Dry Wt	Cr XRF	Cu XRF	Hg CVAA	Ni XRF	Pb ICP-MS	Ag ICP-MS	Zn XRF
MATRIX SPIKE RESULTS									
Amount Spiked			NA	NA	5.00	NA	5.00	5.00	NA
1156-6	SC53M	63.2	NA	NA	0.0179	NA	2.21	0.0408	NA
1152-6 MS			NA	NA	5.16	NA	7.28	4.61	NA
Amount Recovered			NA	NA	5.14	NA	5.07	4.57	NA
Percent Recovery			NA	NA	103%	NA	101%	91%	NA
REPLICATE ANALYSIS									
1152-6r1	SC53M	63.2	41.5	27.3	0.0168	13.2	2.27	0.0465	47.0
1152-6r2	SC53M	63.2	42.4	24.9	0.0189	12.2	2.15	0.0351	42.1
	RPD		2%	9%	12%	8%	5%	28%	11%

U Not detected at or above DL shown
 NA Not applicable/available
 RPD Relative percent difference



811 W. 8th Avenue, Anchorage, AK 99501 • (907) 258-2155 • FAX (907) 258-6634

MONTGOMERY LABORATORIES
712 W 12TH STREET
JUNEAU, AK 99801

Attn: MS. DEBORAH BOYLEN

Order #: A5-09-107
Date: 10/24/95 11:16
Work ID: U.S. BUREAU OF MINES
Date Received: 09/28/95
Date Completed: 10/24/95

SAMPLE IDENTIFICATION

<u>Sample</u> <u>Number</u>	<u>Client Description</u>
01	KT3 S001

<u>Sample</u> <u>Number</u>	<u>Client Description</u>
02	KT3 S002

Enclosed are the analytical results for the submitted samples. All analyses met quality assurance objectives, except where noted in the case narratives. If you have any questions regarding the analyses, please feel free to call.

Earl L. Crapps
Laboratory Supervisor

The EPH samples were extracted on 09/28/95. Due to the matrix and contamination level of sample KT3 S001, approximately 1 gram was used for the EPH extraction rather than the normal 40 grams per Analytica Alaska's SOP.

Sample KT3 S001 exhibits high levels of diesel range organic (C10-C28) contamination arising from a chromatographic pattern extending into the residual range and indicative of a heavier lubrication oil or grease type contaminant. Sample KT3 S002 shows a chromatographic pattern more indicative of vegetative organic type contamination.

The EPH surrogate recovery reported as not calculated (NC) is due to the contamination level of the sample and the required extract dilution, resulting in a surrogate concentration below the calibration range of the instrument.

All results are reported on a dry weight basis. The EPA recommended analytical and extraction holding times are met for all samples. The quality control (QC) data is from another sample set of similar matrix prepared and analyzed concurrently with your samples. The QC data are indicative of acceptable method and instrument performance, except as noted above. The method blank is within acceptable limits. The samples were received properly packed at 6° C and were refrigerated upon receipt.

Sample: 01A KT3 S001

Collected: 09/15/95 Matrix: SOIL

<u>Test Description</u>	<u>Method</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>Analyzed</u>
DRO\EPH in soil by AK102.	3550\AK102				
EPH	3550\AK102	163000	12000	mg/Kg	10/20/95
Surrogates, % Recovery					
o-Terphenyl		NC	Min:	50	Max: 150

Sample: 02A KT3 S002

Collected: 09/15/95 Matrix: SOIL

<u>Test Description</u>	<u>Method</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>Analyzed</u>
DRO\EPH in soil by AK102.	3550\AK102				
EPH	3550\AK102	86	8.3	mg/Kg	10/20/95
Surrogates, % Recovery					
o-Terphenyl		79	Min:	50	Max: 150



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers

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Nevada, U.S.A. 89431
PHONE: 702-356-5395 FAX: 702-355-0179

T - J.S. BUREAU OF MINES
ALASKA FIELD OPERATIONS CENTER
P.O. BOX 20550
JUNEAU, ALASKA
99802-0550

Project: CHATHAM AIM
Comments: ATTN: PETER BITTENBENDER*

Page Number: 1-A
Total Pages: 1
Certificate Date: 25-OCT-95
Invoice No.: 19531113
P.O. Number: B4650067
Account: JOW

**PLEASE NOTE

CERTIFICATE OF ANALYSIS A9531113

SAMPLE	PREP CODE	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppb	K %	La ppm	Mg %	Mn ppm	Mo ppm
KT38003	205 226	43.0	1.42	4	30	< 0.5	Intf*	1.27	1.0	25	21	>10000	9.56	< 10	130	0.07	< 10	1.18	440	2
KT38004	205 226	0.6	1.74	2	20	< 0.5	< 2	1.61	< 0.5	26	50	1085	8.23	< 10	80	0.10	< 10	1.30	505	< 1
KT38005	205 226	0.2	2.48	6	30	< 0.5	2	1.44	< 0.5	24	40	493	4.37	< 10	440	0.10	< 10	1.62	825	< 1



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Page Number : 1-B
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Account : JOW

Project : CHATHAM AIM
Comments: ATTN: PETER BITTENBENDER

**PLEASE NOTE

CERTIFICATE OF ANALYSIS A9531113

SAMPLE	PREP CODE	Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
KTJ3003	205 226	0.02	21	150	98	8	4	107	0.16	< 10	< 10	401	10	230
KTJ3004	205 226	0.03	17	250	2	2	6	164	0.18	< 10	< 10	451	< 10	64
KTJ3005	205 226	0.08	15	730	12	< 2	7	139	0.17	< 10	< 10	219	< 10	92

88



Analytica Group company

Bureau of Land Management
Juneau Field Office
P.O. Box 20550
Juneau, AK 99802
Attn: Ken Maas

325 Interlocken Parkway
Suite 200
Broomfield, CO 80021
(303) 469-8868
(800) 873-8707
FAX: (303) 469-5254

Order #: 97-08-061
Date: 08/28/97 13:24
Work ID: KETCHIKAN AIM
Date Received: 08/08/97
Date Completed: 08/27/97

SAMPLE IDENTIFICATION

<u>Sample Number</u>	<u>Client Description</u>	<u>Sample Number</u>	<u>Client Description</u>
01	KT8 SO02	05	KT8 SO06
02	KT8 SO03	06	KT8 SO07
03	KT8 SO04	07	KT8 SO08
04	KT8 SO05	08	KT3 SO10

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. A listing of data qualifiers and analytical codes is located on the TEST METHODOLOGIES page at the end of the report.

If you have any questions regarding the analyses, please feel free to call.

Sincerely,

Claire K. Toon
Project Manager



Analytica Alaska, Inc.

811 W. 8th Ave. Anchorage, AK 99501 Phone-(907)258-2155 FAX-(907)258-663

tabular sample report - TRPH

AAI Project ID: A708022

Client: MONTGOMERY LABORATORIES

19-Aug-97

Project Name: KETCHIKAN BLM

Sample ID	Client Sample ID	Matrix	Total Recoverable Petroleum Hydrocarbons	Units
A708022-01	KT36006	SOIL	U (2600)	mg/Kg
A708022-02	KT36007	SOIL	9100 (3800)	mg/Kg
A708022-03	KT36009	SOIL	U (440)	mg/Kg

06

The number in parentheses is the reporting limit. "U" indicates analyte was not detected. "()" indicates analyte was not analyzed for. "J" indicates value is estimated.

The Science of Analysis, The Art of Service

Order # 97-08-061
ANALYTICA, INC.

Bureau of Land Management
TEST RESULTS by SAMPLE

Page 9

Sample: 08A KT3 S010

Collected: 07/25/97 Matrix: SOIL

<u>Test Description</u>	<u>Method</u>	<u>Result</u>	<u>Q</u>	<u>Limit</u>	<u>Units</u>	<u>Analyzed</u>
Antimony, Total	SW 7041	1.0		0.50	mg/Kg	08/26/97
Lead, Total	SW 7421	21	D	1.0	mg/Kg	08/20/97

THE FOLLOWING CODES APPLY TO THE ANALYTICAL REPORT

RESULT field...

ND = not detected at the reported limit

NA = analyte not applicable (see case narrative/methods for discussion)

Q (qualifier) field...

GENERAL:

* = Recovery or %RPD outside method specifications

H = value is estimated due to analysis run outside EPA holding times

E = reported concentration is above the instrument calibration range

D = analyte was diluted to bring within instrument calibration range or
to remove matrix interferences

ORGANIC ANALYSIS DATA QUALIFIERS:

B = analyte was detected in the laboratory method blank

J = analyte was detected above the instrument detection limit (IDL)
but below the analytical reporting limit (CRDL)

INORGANIC ANALYSIS DATA QUALIFIERS:

B = analyte was detected above the instrument detection limit (IDL)
but below the analytical reporting limit (CRDL)

A = post digestion spike did not meet criteria (70-130%), therefore the
reporting limit was raised by a factor of two to reflect spike failure

S = reported value determined by the Method of Standard Additions

HG_CTS:	MERCURY, Total (CVAA) prepared and analyzed according to EPA 245.5 and/or SW-846.	METHOD: 245.5/7471
3050_G:	Acid Digestion of Sediments, Sludges, and Soils for GFAA Metals	METHOD: 3050A
3050_I:	Acid Digestion of Sediments, Sludges, and Soils for ICP Metals	METHOD: 3050A
AG_GTS:	SILVER, Total (GFAA)	METHOD: 3050/7761
AS_GTS:	ARSENIC, Total (GFAA)	METHOD: 7060
CD_GTS:	CADMIUM, Total (GFAA)	METHOD: 7131
PB_GTS:	LEAD, Total (GFAA)	METHOD: 7421
SB_GTS:	ANTIMONY, Total (GFAA)	METHOD: 7041
SE_GTS:	SELENIUM, Total (GFAA)	METHOD: 7740
TL_GTS:	THALLIUM, Total (GFAA)	METHOD: 7841
ICP_TS:	METALS, Total (ICP)	METHOD: 6010



MONTGOMERY LABORATORIES

5438 Shaune Dr.
Juneau, Alaska 99801
(907) 780-6668

SC

Laboratory Report

for

U.S. Bureau of Mines
P.O. Box 20550

Juneau, Alaska 99802

Attn: Roger Baer



METHOD REFERENCES

Analytes	Soil/Groundwater				Wastewater			
	ICP	Flame	Furnace	CV	ICP	Flame	Furnace	CV
Aluminum	6010	7020	-	-	200.7	202.1	-	-
Antimony	6010	7040	7041	-	200.7	-	204.2	-
Arsenic	6010	-	7060	-	200.7	-	206.2	-
Barium	6010	7080	7081	-	200.7	208.1	208.2	-
Beryllium	6010	7090	7091	-	200.7	210.1	210.2	-
Boron	6010	-	-	-	200.7	-	-	-
Cadmium	6010	7130	7131	-	200.7	213.1	213.2	-
Calcium	6010	7140	-	-	200.7	215.1	-	-
Chromium, Total	6010	7190	7191	-	200.7	218.1	218.2	-
Cobalt	6010	7200	-	-	200.7	219.1	-	-
Copper	6010	7210	-	-	200.7	220.1	-	-
Iron	6010	7380	-	-	200.7	236.1	-	-
Lead	6010	7420	7421	-	200.7	239.1	239.2	-
Magnesium	6010	7450	-	-	200.7	242.1	-	-
Manganese	6010	7460	-	-	200.7	243.1	-	-
Mercury	-	-	-	7470/7471	-	-	-	245.1
Molybdenum	6010	7480	-	-	200.7	246.1	-	-
Nickel	6010	7520	-	-	200.7	249.1	-	-
Potassium	-	SM3500D	-	-	-	SM3500D	-	-
Selenium	6010	-	7740	-	200.7	-	270.2	-
Silver	6010	7760	7761	-	200.7	272.1	272.2	-
Sodium	6010	SM3500D	-	-	200.7	SM3500D	-	-
Strontium	6010	-	-	-	200.7	-	-	-
Thallium	6010	7840	7841	-	200.7	279.1	279.2	-
Tin	6010	-	-	-	200.7	-	-	-
Titanium	6010	-	-	-	200.7	-	-	-
Vanadium	6010	7910	7911	-	200.7	286.1	286.2	-
Zinc	6010	7950	-	-	200.7	289.1	-	-

SW846, "Test Methods for Evaluating Solid Waste", 3rd Ed., December 1987.

EPA-600, "Methods for Chemical Analysis of Water and Wastes", March 1984.

Standard Methods for the Examination of Water and Wastewater", 17th Edition, 1989.



**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11531-003
Description : #SC 11
Sample Date : 23-AUG-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Arsenic	5	< 0.50	0.50	98.0	11-SEP-95	
Barium	100	0.08	0.01	88.0	08-SEP-95	
Cadmium	1	< 0.005	0.005	94.0	08-SEP-95	
Chromium, Total	5	< 0.01	0.01	96.0	08-SEP-95	
Lead	5	< 0.10	0.10	96.0	08-SEP-95	
Mercury	0.2	< 0.002	0.002	91.2	13-SEP-95	
Selenium	1	< 0.50	0.50	100.0	08-SEP-95	
Silver	5	< 0.01	0.01	79.0	08-SEP-95	

SOURCE CHARACTERIZATION FORM

STAINED SOILS

Number of areas:

Size*(s) 1) 70' x 70' - 10 12 areas

Size*(s) 2) 100 x 30

Size*(s) 3) 50 x 20 (minim TH) - no iron staining

Size*(s) 4)

Size*(s) 5)

*Size = Estimate area or give dimensions

Method of measurement (pacing, metal tape measure, or reference):

tape compass

Is the stained soil in a drainage ditch (pathway) leading off site? (explain):

minim iron staining in uncovered stream; add drains on fueling pile

Source of contamination for each stained area (indicate by number):

fueling

Sample data:

Copper up to 3500 ppm

Accessibility (fenced):

no fencing present

Residents, school, daycare, or workers within 200 feet? (explain):

NO

Comments:

bioa samples reveal minimal bioavailability
Capping may be more practical remediation technique

Photodocument and sketch areas of stained soils on site sketch.



MONTGOMERY WATSON LABORATORIES

Madison Division
1 Science Court
Madison, Wisconsin 53711
Tel: 608 231 4747
Fax: 608 231 4777

**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample #: L11944-003
Description : SC 11
Sample Date : 23-JUL-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Copper	-	0.75	0.01	102.0	02-NOV-95	
Zinc	-	0.48	0.01	108.0	02-NOV-95	



**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11531-004
Description : #SC 21
Sample Date : 23-AUG-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Arsenic	5	< 0.50	0.50	98.0	11-SEP-95	
Barium	100	0.13	0.01	88.0	08-SEP-95	
Cadmium	1	< 0.005	0.005	94.0	08-SEP-95	
Chromium, Total	5	< 0.01	0.01	96.0	08-SEP-95	
Lead	5	< 0.10	0.10	96.0	08-SEP-95	
Mercury	0.2	< 0.002	0.002	91.2	13-SEP-95	
Selenium	1	< 0.50	0.50	100.0	08-SEP-95	
Silver	5	< 0.01	0.01	79.0	08-SEP-95	



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**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11944-004
Description : SC 21
Sample Date : 23-JUL-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Copper	-	6.87	0.01	102.0	02-NOV-95	
Zinc	-	0.46	0.01	108.0	02-NOV-95	

chk'd: *P* App'd: *BAH*
Date App'd: *11/8/95*



**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11531-001
Description : #SC 24
Sample Date : 23-AUG-95

Test	Regulatory Limit (ng/L)	Analytical Result (ng/L)	Reporting Limit (ng/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Arsenic	5	< 0.50	0.50	98.0	11-SEP-95	
Barium	100	0.15	0.01	88.0	08-SEP-95	
Bismuth	1	0.006	0.005	94.0	08-SEP-95	
Chromium, Total	5	< 0.01	0.01	96.0	08-SEP-95	
Lead	5	< 0.10	0.10	96.0	08-SEP-95	
Mercury	0.2	< 0.002	0.002	91.2	13-SEP-95	
Selenium	1	< 0.50	0.50	100.0	08-SEP-95	
Silver	5	< 0.01	0.01	79.0	08-SEP-95	

chk'd: *Kab* App'd: *UAW*
Date App'd: *9/29/95*
revised



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**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11944-001
Description : SC 24
Sample Date : 23-JUL-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Copper	-	1.37	0.01	102.0	02-NOV-95	
	-	0.63	0.01	108.0	02-NOV-95	

chk'd: App'd:
Date App'd: 11/18/95



**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229.0313

Lab Sample # : L11531-005
Description : #SC 35
Sample Date : 23-AUG-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Arsenic	5	< 0.50	0.50	98.0	11-SEP-95	
Barium	100	0.16	0.01	88.0	08-SEP-95	
Cadmium	1	< 0.005	0.005	94.0	08-SEP-95	
Chromium, Total	5	< 0.01	0.01	96.0	08-SEP-95	
Lead	5	< 0.10	0.10	96.0	08-SEP-95	
Mercury	0.2	< 0.002	0.002	91.2	13-SEP-95	
Selenium	1	< 0.50	0.50	100.0	08-SEP-95	
Silver	5	< 0.01	0.01	79.0	08-SEP-95	



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**TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
METHOD 1311
INORGANIC REPORT**

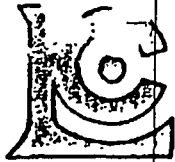
MONTGOMERY LABORATORIES-ALASKA

Project Number: 2229-0313

Lab Sample # : L11944-005
Description : SC 35
Sample Date : 23-JUL-95

Test	Regulatory Limit (mg/L)	Analytical Result (mg/L)	Reporting Limit (mg/L)	Matrix Spike Recovery (%)	Analysis Date	Footnote
Copper	-	1.73	0.01	102.0	02-NOV-95	
Zinc	-	0.54	0.01	108.0	02-NOV-95	

Chk'd: *CP* App'd: *BAB*
Date App'd: *11/8/95*



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U.S. BUREAU OF MINES
 ALASKA FIELD OPERATIONS CENTER
 P.O. BOX 20550
 JUNEAU, ALASKA
 99802-0550

Project: CHATHAM AIM
 Comments: ATTN: PETER BITTENBENDER

Par mber : 1-A
 Tr - ages : 2
 Certificate Date: 14-SEP-95
 Invoice No. : 19527122
 P.O. Number : B4650067
 Account : JOW

CERTIFICATE OF ANALYSIS A9527122

SAMPLE	PREP CODE	Au ppb AFS	Pt ppb AFS	Pd ppb AFS	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bl ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppb	K %	La ppm
SC-01	205 226	-----	-----	-----	< 0.2	2.08	8	40	< 0.5	< 2	4.93	< 0.5	8	83	55	2.92	< 10	70	0.17	< 10
SC-02	205 226	-----	-----	-----	< 0.2	1.85	6	30	< 0.5	2	1.97	< 0.5	19	67	452	5.10	< 10	40	0.14	< 10
SC-03	205 226	-----	-----	-----	< 0.2	1.70	6	20	< 0.5	2	6.76	< 0.5	19	31	672	4.29	< 10	70	0.08	< 10
SC-04	205 226	-----	-----	-----	< 0.2	1.91	8	20	< 0.5	< 2	1.24	< 0.5	13	70	229	3.70	< 10	50	0.12	< 10
SC-05	205 226	-----	-----	-----	0.8	1.49	2	20	< 0.5	2	1.52	< 0.5	27	45	1415	10.80	< 10	20	0.12	< 10
SC-06	205 226	144	25	516	0.2	1.64	< 2	20	< 0.5	2	1.61	< 0.5	24	29	653	5.91	< 10	60	0.10	< 10
SC-07	205 226	172	35	654	< 0.2	1.29	4	10	< 0.5	< 2	1.38	< 0.5	24	23	794	6.82	< 10	40	0.08	< 10
SC-08	205 226	256	35	1030	0.6	1.48	2	20	< 0.5	< 2	1.88	< 0.5	24	41	975	9.46	< 10	40	0.11	< 10
SC-09	205 226	420	35	900	0.2	1.79	2	20	< 0.5	< 2	2.08	< 0.5	27	36	1445	9.43	< 10	40	0.13	< 10
SC-10	205 226	1390	60	1830	0.4	1.83	2	30	< 0.5	2	1.86	< 0.5	29	35	1880	9.68	< 10	40	0.15	< 10
SC-11	205 226	800	40	1520	1.0	1.49	2	20	< 0.5	< 2	1.52	< 0.5	31	36	1155	12.90	< 10	70	0.12	< 10
SC-12	205 226	546	35	800	2.0	2.29	< 2	30	< 0.5	< 2	2.52	< 0.5	27	27	3160	7.10	< 10	50	0.16	< 10
SC-13	205 226	364	40	888	1.8	1.67	< 2	20	< 0.5	< 2	2.19	< 0.5	26	20	3180	8.02	< 10	50	0.10	< 10
SC-14	205 226	182	30	580	< 0.2	1.91	2	20	< 0.5	< 2	2.42	< 0.5	26	25	1135	6.96	< 10	30	0.10	< 10
SC-15	205 226	230	40	1010	1.0	1.74	< 2	30	< 0.5	< 2	2.33	< 0.5	25	34	1290	8.95	< 10	40	0.15	< 10
SC-16	205 226	198	30	632	0.2	1.82	4	20	< 0.5	< 2	2.05	< 0.5	27	26	804	7.21	< 10	30	0.12	< 10
SC-17	205 226	144	25	496	0.4	2.17	2	30	< 0.5	< 2	2.42	< 0.5	29	24	751	6.73	< 10	90	0.14	< 10
SC-18	205 226	-----	-----	-----	0.2	1.96	8	20	< 0.5	< 2	2.52	< 0.5	28	17	721	6.99	< 10	80	0.13	< 10

CERTIFICATION:

Current Rain



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers

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ALASKA FIELD OPERATIONS CENTER
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Page Number : 1-B
Total Pages : 2
Certificate Date: 14-SEP-91
Invoice No. : 19527122
P.O. Number : B465005
Account : JOW

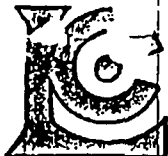
Project : CHATHAM AIM
Comments: ATTN: PETER BITTENBENDER

CERTIFICATE OF ANALYSIS A9527122

SAMPLE	PREP CODE	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
SC-01	205 226	1.17	510	< 1	0.19	12	1300	2	< 2	6	257	0.13	< 10	< 10	112	< 10	56
SC-02	205 226	1.41	410	< 1	0.13	14	590	< 2	< 2	7	136	0.16	< 10	< 10	276	< 10	58
SC-03	205 226	1.38	510	< 1	0.15	12	660	2	< 2	5	489	0.14	< 10	< 10	223	< 10	60
SC-04	205 226	1.38	415	2	0.11	14	780	2	< 2	6	90	0.14	< 10	< 10	164	< 10	56
SC-05	205 226	1.21	410	< 1	0.06	18	290	< 2	< 2	7	125	0.18	< 10	< 10	635	< 10	42
SC-06	205 226	1.42	415	< 1	0.06	15	440	< 2	< 2	6	97	0.17	< 10	< 10	335	< 10	54
SC-07	205 226	1.10	360	< 1	0.04	14	250	2	< 2	5	94	0.15	< 10	< 10	397	< 10	42
SC-08	205 226	1.09	400	< 1	0.07	16	180	< 2	< 2	8	171	0.16	< 10	< 10	558	< 10	36
SC-09	205 226	1.33	455	< 1	0.05	17	240	2	< 2	9	204	0.18	< 10	< 10	551	< 10	44
SC-10	205 226	1.33	445	< 1	0.04	15	250	4	< 2	8	199	0.20	< 10	< 10	590	< 10	46
SC-11	205 226	1.17	440	< 1	0.04	20	210	2	< 2	7	144	0.20	< 10	< 10	801	< 10	44
SC-12	205 226	1.55	495	< 1	0.05	16	250	2	< 2	9	203	0.18	< 10	< 10	407	< 10	62
SC-13	205 226	1.31	425	< 1	0.04	17	210	2	< 2	7	105	0.16	< 10	< 10	464	< 10	46
SC-14	205 226	1.52	450	< 1	0.04	16	300	< 2	< 2	7	153	0.18	< 10	< 10	400	< 10	52
SC-15	205 226	1.39	450	< 1	0.07	16	220	2	< 2	10	178	0.18	< 10	< 10	540	< 10	42
SC-16	205 226	1.41	450	< 1	0.04	16	280	4	< 2	7	153	0.18	< 10	< 10	423	< 10	50
SC-17	205 226	1.70	520	< 1	0.05	16	330	2	< 2	9	186	0.21	< 10	< 10	399	< 10	60
SC-18	205 226	1.58	510	< 1	0.04	16	320	2	< 2	8	168	0.19	< 10	< 10	391	< 10	56

CERTIFICATION:

Conrad P. ...



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Total : 2
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Project: CHATHAM AIM
Comments: ATTN: PETER BITTENBENDER

CERTIFICATE OF ANALYSIS A9527122

SAMPLE	PREP CODE	Au ppb AFS	Pt ppb AFS	Pd ppb AFS	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppb	K %	La ppm
SC-19	205 226	380	30	1120	0.2	1.69	2	30	< 0.5	2	1.81	< 0.5	26	31	1475	8.83	< 10	30	0.15	< 10
SC-20	205 226	-----	-----	-----	0.2	1.48	4	30	< 0.5	< 2	1.95	< 0.5	23	54	737	7.21	< 10	10	0.13	< 10
SC-21	205 226	-----	-----	-----	< 0.2	1.84	2	40	< 0.5	2	2.13	< 0.5	25	25	512	5.66	< 10	30	0.18	< 10
SC-22	205 226	-----	-----	-----	0.2	1.83	8	30	< 0.5	< 2	1.89	< 0.5	24	54	664	6.01	< 10	40	0.15	< 10
SC-23	205 226	-----	-----	-----	0.6	1.92	4	30	< 0.5	< 2	2.14	< 0.5	30	23	1255	7.05	< 10	70	0.14	< 10
SC-24	205 226	858	55	1230	2.0	1.85	4	30	< 0.5	< 2	1.70	< 0.5	29	33	3880	7.34	< 10	90	0.12	< 10
SC-25	205 226	-----	-----	-----	0.4	1.81	4	20	< 0.5	< 2	1.74	< 0.5	26	37	1290	7.08	< 10	40	0.12	< 10
SC-26	205 226	256	35	814	0.2	1.72	2	20	< 0.5	< 2	1.60	< 0.5	25	39	769	6.67	< 10	50	0.11	< 10
SC-27	205 226	214	20	514	0.2	1.55	2	20	< 0.5	2	1.37	< 0.5	26	31	641	6.81	< 10	70	0.09	< 10
SC-28	205 226	788	45	1900	0.8	1.96	6	40	< 0.5	< 2	2.06	< 0.5	25	49	979	6.98	< 10	50	0.18	< 10
SC-29	205 226	208	40	782	0.6	1.75	< 2	20	< 0.5	2	1.87	< 0.5	26	29	1490	6.26	< 10	60	0.10	< 10
SC-30	205 226	-----	-----	-----	0.2	2.73	6	50	< 0.5	< 2	2.16	< 0.5	20	74	803	6.23	< 10	30	0.22	< 10
SC-31	205 226	-----	-----	-----	< 0.2	1.94	2	30	< 0.5	2	2.16	< 0.5	24	66	677	6.84	< 10	60	0.16	< 10
SC-32	205 226	-----	-----	-----	< 0.2	1.48	2	20	< 0.5	2	1.28	< 0.5	25	28	637	7.37	< 10	40	0.09	< 10
SC-33	205 226	394	45	1310	< 0.2	1.64	2	30	< 0.5	2	1.76	< 0.5	25	37	1330	8.16	< 10	60	0.13	< 10
SC-34	205 226	186	35	716	0.2	1.78	2	20	< 0.5	< 2	1.80	< 0.5	30	36	1085	7.31	< 10	80	0.11	< 10
SC-35	205 226	148	20	628	0.6	2.00	4	30	< 0.5	< 2	2.24	< 0.5	28	39	1080	6.43	< 10	40	0.17	< 10
SC-36	205 226	188	30	576	0.4	1.76	4	20	< 0.5	< 2	1.88	< 0.5	30	28	1240	6.44	< 10	80	0.11	< 10
SC-37	205 226	712	40	1350	1.0	2.02	6	30	< 0.5	< 2	2.38	< 0.5	28	31	2520	8.55	< 10	40	0.17	< 10
SC-38	205 226	-----	-----	-----	< 0.2	2.18	6	30	< 0.5	< 2	2.04	< 0.5	27	64	852	7.25	< 10	40	0.17	< 10
SC-39	205 226	3560	35	1880	0.6	1.94	< 2	40	< 0.5	2	2.19	< 0.5	31	52	1485	10.60	< 10	60	0.17	< 10

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CERTIFICATION:

Carver Bain



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Project: CHATHAM AIM
Comments: ATTN: PETER BITTENBENDER

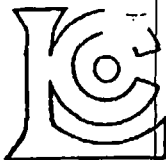
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Account : JOW

CERTIFICATE OF ANALYSIS A9527122

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			%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
SC-19	205	226	1.20	400	< 1	0.04	16	210	4	< 2	8	190	0.16	< 10	< 10	562	< 10	40
SC-20	205	226	1.16	365	< 1	0.04	14	220	2	< 2	8	150	0.15	< 10	< 10	456	< 10	36
SC-21	205	226	1.43	405	< 1	0.06	12	240	< 2	< 2	9	173	0.16	< 10	< 10	372	< 10	46
SC-22	205	226	1.47	400	< 1	0.08	13	280	2	< 2	9	166	0.17	< 10	< 10	391	< 10	48
SC-23	205	226	1.71	480	< 1	0.06	17	320	< 2	< 2	9	121	0.20	< 10	< 10	458	< 10	60
SC-24	205	226	1.59	440	< 1	0.06	16	410	58	< 2	7	114	0.19	< 10	< 10	465	< 10	66
SC-25	205	226	1.50	410	1	0.10	15	350	6	< 2	8	141	0.19	< 10	< 10	446	< 10	56
SC-26	205	226	1.41	400	< 1	0.07	14	310	2	< 2	7	140	0.18	< 10	< 10	419	< 10	52
SC-27	205	226	1.32	370	1	0.04	16	300	16	< 2	6	113	0.17	< 10	< 10	430	< 10	50
SC-28	205	226	1.53	435	< 1	0.06	14	310	< 2	< 2	11	215	0.18	< 10	< 10	439	< 10	44
SC-29	205	226	1.40	400	< 1	0.07	15	290	2	< 2	7	134	0.17	< 10	< 10	392	< 10	50
SC-30	205	226	1.66	495	< 1	0.13	17	660	4	< 2	11	243	0.18	< 10	< 10	368	< 10	60
SC-31	205	226	1.48	420	< 1	0.08	15	260	8	< 2	10	208	0.17	< 10	< 10	438	< 10	50
SC-32	205	226	1.27	365	1	0.07	16	310	2	< 2	6	101	0.17	< 10	< 10	467	< 10	50
SC-33	205	226	1.19	385	< 1	0.06	15	190	2	< 2	8	194	0.16	< 10	< 10	516	< 10	40
SC-34	205	226	1.59	445	< 1	0.06	17	360	2	< 2	8	118	0.20	< 10	< 10	469	< 10	58
SC-35	205	226	1.67	455	< 1	0.08	15	310	2	< 2	10	166	0.19	< 10	< 10	413	< 10	56
SC-36	205	226	1.59	430	< 1	0.04	16	310	2	< 2	7	117	0.19	< 10	< 10	408	< 10	58
SC-37	205	226	1.49	460	< 1	0.06	16	250	2	< 2	10	213	0.18	< 10	< 10	543	< 10	46
SC-38	205	226	1.66	465	< 1	0.13	16	530	4	< 2	11	190	0.19	< 10	< 10	448	< 10	56
SC-39	205	226	1.55	490	< 1	0.08	19	270	4	< 2	11	205	0.21	< 10	< 10	684	< 10	50

CERTIFICATION:

Lauren B. Ginn



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Page Number : 1-B
Total Fees : 1
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Invoice No. : 19744722
P.O. Number :
Account : JOW

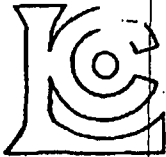
Project :
Comments: ATTN: KEN MAAS

CERTIFICATE OF ANALYSIS A9744722

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SC 67	214 229	0.27	16	1250	2	< 2	6	98	0.16	< 10	< 10	143	< 10	68
SC 68	214 229	0.27	14	930	4	< 2	6	88	0.16	< 10	< 10	141	< 10	74
SC 69	214 229	0.30	13	740	6	2	4	65	0.12	< 10	< 10	95	< 10	50
SC 70	214 229	0.27	15	1460	4	< 2	6	95	0.15	< 10	< 10	132	< 10	70

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CERTIFICATION: Hart Bichler



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U.S. BUREAU OF LAND MANAGEMENT
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99802-0550

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Total Pages : 1
Certificate Date: 05-OCT-97
Invoice No. : 19744722
P.O. Number :
Account : JOW

Project :
Comments: ATTN: KEN MAAS

CERTIFICATE OF ANALYSIS A9744722

SAMPLE	PREP CODE	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppb	K %	La ppm	Mg %	Mn ppm	Mo ppm
SC 67	214 229	< 0.2	2.57	12	30	< 0.5	< 2	1.21	0.5	15	82	80	4.01	< 10	20	0.12	< 10	1.61	870	3
SC 68	214 229	< 0.2	2.55	6	30	< 0.5	< 2	1.57	0.5	15	74	64	3.89	< 10	10	0.12	< 10	1.72	590	< 1
SC 69	214 229	< 0.2	1.83	2	20	< 0.5	< 2	1.07	0.5	9	77	39	2.59	< 10	30	0.11	< 10	1.21	430	1
SC 70	214 229	< 0.2	2.48	6	30	< 0.5	< 2	1.28	0.5	15	85	53	3.89	< 10	10	0.14	< 10	1.70	690	< 1

CERTIFICATION: Hunter Bickler

110

Appendix C. - Field Notes and Original Analytical Data.



MORMERY LABORATORIES
 5438 S. Seward Drive
 Juneau, Alaska 99801
 907-780-6668

CHAIN OF CUSTODY/TRANSMITTAL RECORD

CUSTODY SEAL?	PROJECT NAME: <u>Ketchikan MM</u>				ANALYSIS REQUIRED						GROUP # <u>35885</u> (lab use only)				
	SAMPLER(S): <u>Ken MAAS</u>	PHONE#: <u>364-1559</u>	ADDRESS: <u>PO Box 20550 Juneau AK 99802</u>	TIME	DATE	SITE DESCRIPTION/IDENTIFIER	MATRIX	NUMBER OF CONTAINERS	TPH	Cu, Cd, Co, Pb, Mn, Hg		Sb, Se, Ni, As, Sr, Ag, Tl, Zn	headers	13 prior pollutants plus headers	LAB #	COMMENTS
<input checked="" type="checkbox"/>				825	7/25/97	KT3 5006	soil	1	X						
				900	7/25/97	KT3 5007	soil	1	X						
				1410	7/25/97	KT3 WA04(F)	water	1		X		X		970870	HNO ₃ added
				1415	"	KT3 WA04	water	1			X	X		970870	
				1445	7/25/97	KT3 WA05(F)	water	1		X		X		970871	
				1450	7/25/97	KT3 WA05	water	1			X	X		970871	
				1510	7/25/97	KT3 WA06(F)	water	1		X		X		970872	
				1515	7/25/97	KT3 WA06	water	1			X	X		970872	
				1530	7/25/97	KT3 WA07(F)	water	1		X		X		970873	
				1535	7/25/97	KT3 WA07	water	1			X	X		970873	
				1600	7/25/97	KT3 WA08(F)	water	1		X		X		970874	take matrix spike from this
				1605	7/25/97	KT3 WA08	water	1			X	X		970874	take matrix spike from this
				1510	7/23/97	KT3 WA09	water	1					X	970875	✓

RELINQUISHED BY: (signature)	DATE	TIME	RECEIVED BY: (signature)	DATE	TIME	CUSTODY SEAL INTACT?	COMMENTS
<i>[Signature]</i>	7/24/97	13:38	<i>[Signature]</i>	7/31/97	1338	YES NO	Hand-delivered
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			YES NO	
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			YES NO	
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			YES NO	
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			YES NO	

*COMMENTS should include condition of samples or kit upon receipt, temperature, shipping method, etc.

Keweenaw Salt Chuck KT 3 7/23/97

X.M.D.C./S.J.

1/43

- ✓ sent w/ photo 6C
- water sample W.A. 6
- bio ~~sent~~ samples SCBL 2 (water chms)
- bio samples SCML 2 (mussels)
- intertidal soil sample SC5040
- uplands T.V. SC66

weather: low clouds, rain, slight breeze
from SE temp in the 50s
been raining for several days

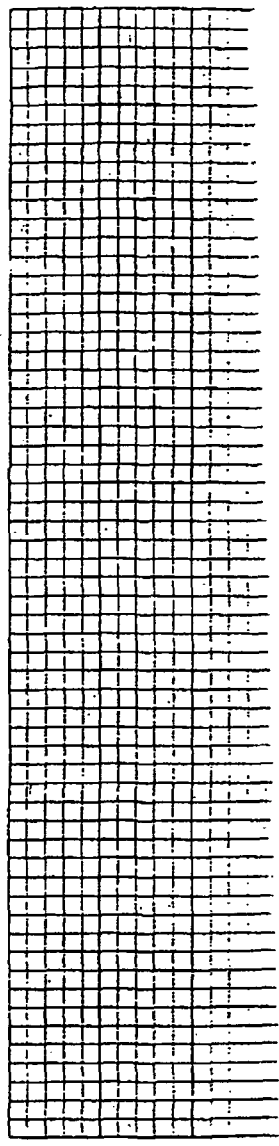
7:10 leave Tomsco for Kaptin Bay

7:30 arrive Kaptin Bay
looked at beach area for
possible waterward zones

8:00 mobilize gear under mill, etc
and take a recon walk to survey
pt @ where we re-established a
base for shellfish sampling

8:10 walked out toward SC1 pt
to view density of crithoids
and possible sample pits

- lots of mussels, barnacles, few
clams



Kentville

Km 106/15

7/13/97

2/43

830 survey from rock on grassy spit
out toward low-tide mark

bearing 730 for 750
planting stakes at 250' intervals

at 450 went 16.5' eq. direction
at 500 off line

these 27 are for sediment samples

randomly selected pt along 750' line
to set up quads for shell fish
sampling

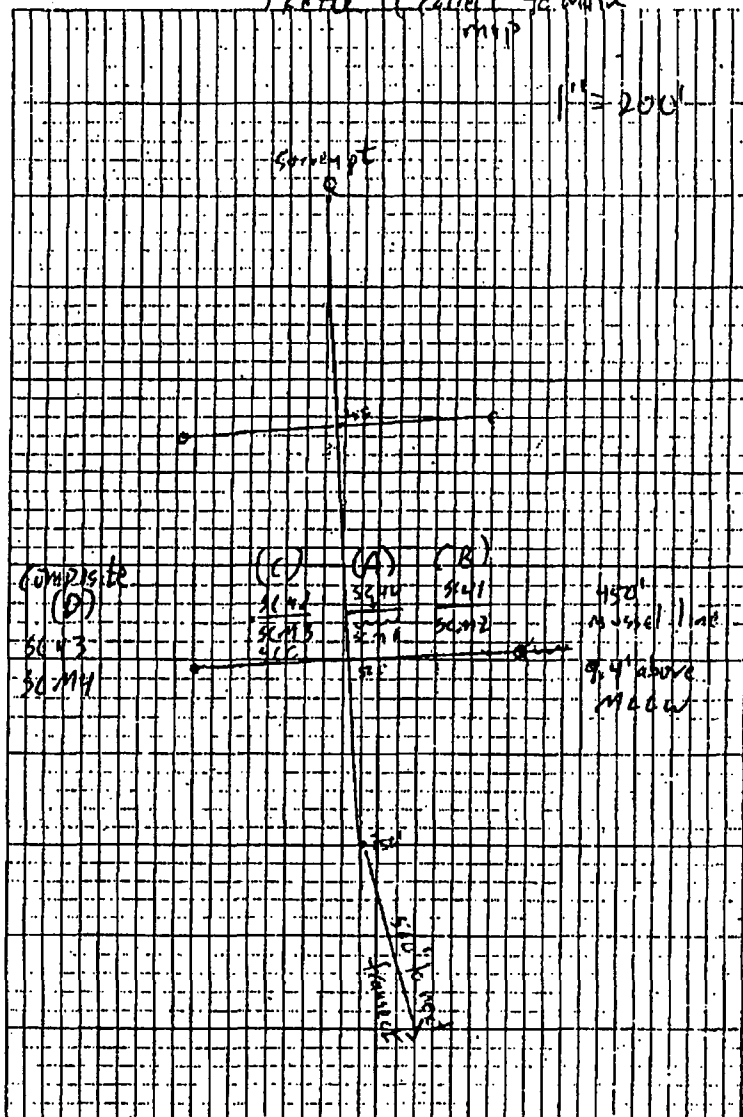
49' from survey pt @

go 30' in, 100' eq. direction off
of this pt to create
a line/trajectory for
shell fish, sediment sampling

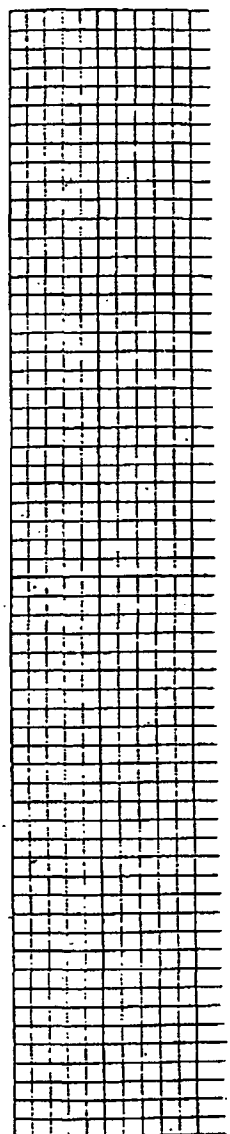
from each pt we use first 60' of
line for sampling

Kentville

Km 106/15 7/13/97 2/43
Sketch (connect to main
map)



	Yeast/Allen	KM/1/5	7/12/92	3/1/93
9:40	SC40	- grab/composite of soil, pool 15'		
	SCM1	- grab/composite of mussels, pool 15'		
		taken from zone A		
	SC40:	soil taken from 1-4" down		
		scrape barnacles, seaweed, mussels		
		from surface		
		small pebbles, det. organic, some Fest		
		in soil sample		
	photo 60	: closeup of soil taken from		
	roll 9#1	hole closest to center line		
		Fest - fragments of pebbles, mainly		
		green brown sands		
	SCM1	= mussels taken around each		
		sediment hole		
		approx 10-15 taken, average size 1-1.5"		
		no broken shells, no gaping between		
		shells, try to ensure taking only		
		live critters		
	photo 61-63	: looking 95° at sampling area,		
		One SCM1 line		
	9/1	30	45	60
	sed. mussels			



Keatts M. KML/SS 7/13/97 4/43

1000 SC41 taken from zone B along
SCM2 same 450' mussel line

SC41: numerous worms, Fest
soil, gets more E3 toward E.
patches of more consistent soil,
less baccharis, mussel on top but
equal E3 of shell fragments present

photo 64: looking 102 at mix of
sampling material for SC41

SCM2: more Fuchus here than
in zone A, C3 of this
↑ as we move east along, we
lose mussels associated w/ this
Fuchus, otherwise pretty
consistent E3 in remainder of line

photo 65: looking 093 at Fuchus
and mussel sampling in zone
B

Kenneth Allen KML/DC/SJ 7/23/97 5/43

1015 SC 42 taken from zone C along
SC 13 450' mussel line

SC 42: soil was more f-g here than
in other 2 zones along
this transect: no East
noticed

less pebbles & shell fragments

photo 66: typical hole along zone C

SC 13: pretty regular transect except
for lack of mussels at 15'. This
caused sampler to move 5 or about 20'
to get back into mussels.
abundant fishes from 20-40' along line

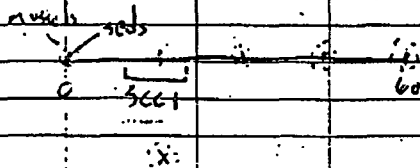


photo 67: looking 125' at sample SC 13
near full pool at end of zone C

Kent Island KMDCLST 7/23/97 6/03

1030 SC43 Composite from zones
SC44 A-C along 450' mussel
line

photo 68: looking 089 along transect line

1040 SCC1 taken from zone "C"
along 450' mussel line

from 7-18' along zone

trapesium devoid of mussels &

fauna and had abundant

clam shells on top

dig down ~ 1' to uncover

wide variety of clams including

butter, little neck, cockles, bent nose

This sample will be the only one

taken in this transect for clams

photo: 73 looking 70 at SCC1 zone

5.5m shell, dirt pile, pool

1055 took advantage of low tide and
went eastward 500' from end of
1st center line 75' from survey pt Q
went 500' @ 165°

went 60' east from this pt &

sampled along this line (zone D)

this pt is 7.7' above mean low water

Remediation 10/10/01 2/23/97 7/43

1105 SC44 taken each 15' along line
 SCMS 60' line

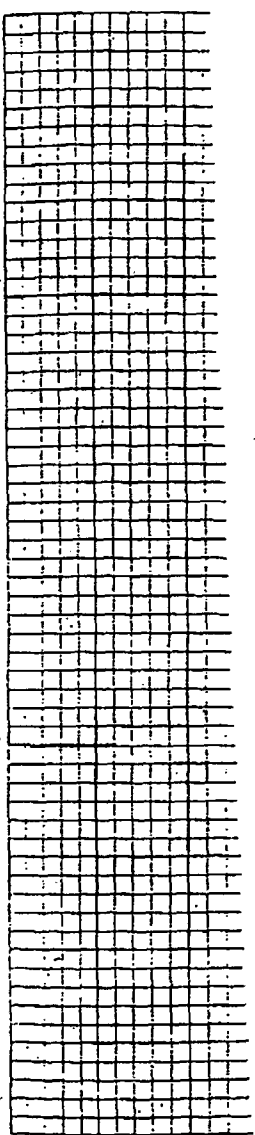
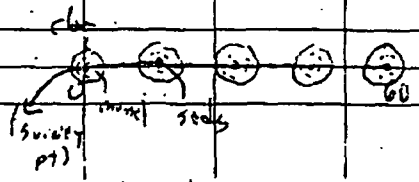
general notes: more mussels here than
 in previous sites
 rockweed is dense

SC44: soil looks a bit darker,
 shell fragments present, pebbles
 present
 black grey below light brown

photo 69: looking 115' at soil
 sampling along SC44 line

SCMS: mussels thicker here -
 some larger than further up
 toward pt Q.
 pass picking

photo 70: looking 210' at sample
 SCMS w/ abundant fossils &
 mussels



Kennel Me. Kml/uc/sj 7/23/97 8/43

1110 SCL 2 clam sample taken
along zone "D" transect
This was taken at 15' intervals
Similarly to shells & mussels

predominantly little necks here,
one bent nose c. 1. bigger clam but
these were discarded

little necks are roughly 1" diam.

photos 71.72 looking 26.7 along
transect at clam sorting
activities

1130 down all equip used so far

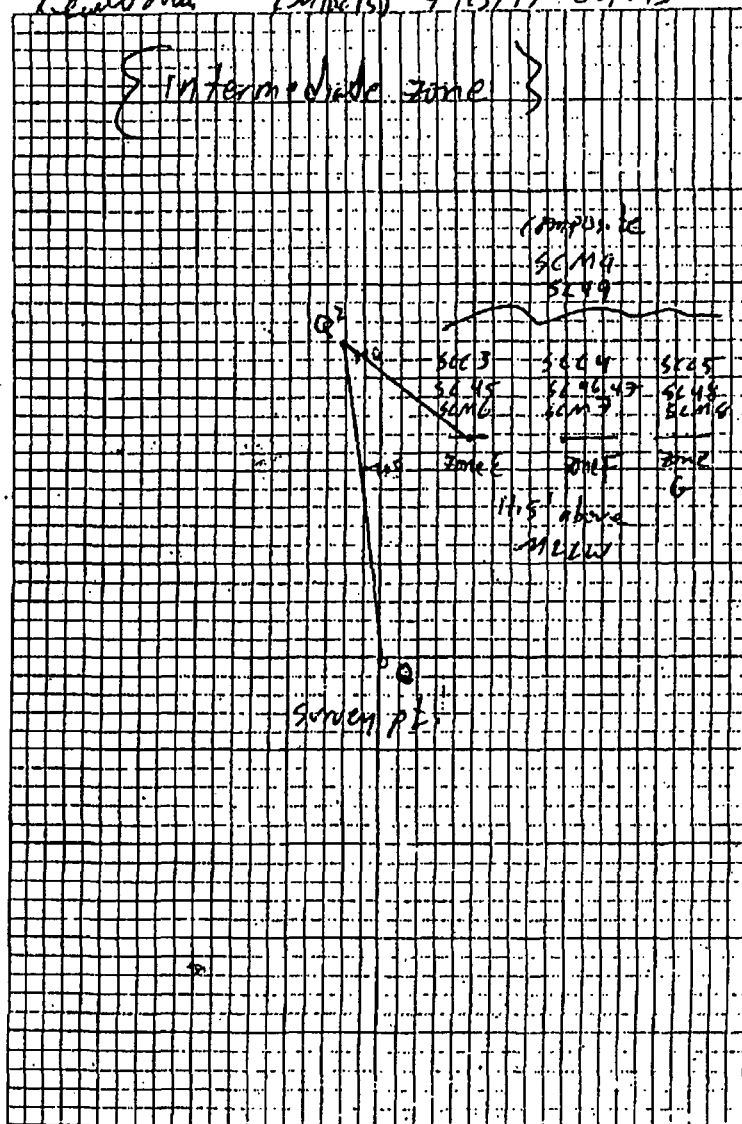
return to survey pt. Q to
at the intermediate zone

1145 survey from pt. Q back to
continuous stream @ 353°
at 120' along line, transition zone
starts

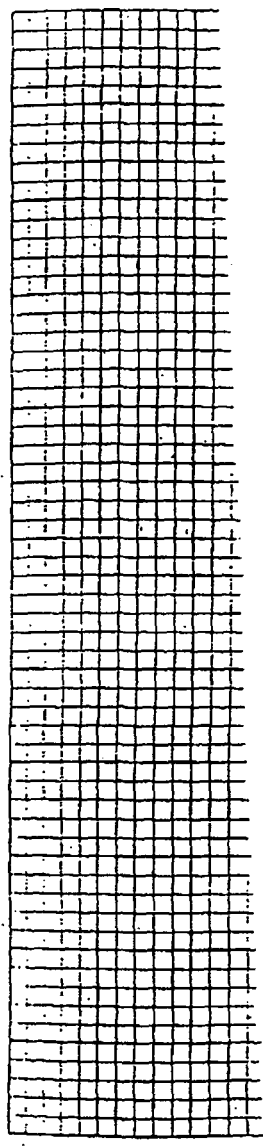
walked out 340' along Dursline
and placed a stake to construct
transect 1 to

Kennel Me. Kml/uc/sj 7/23/97 8/43

Intermediate zone



Keweenaw	km/oc/st	7/23/97	7/03
1205	turns out that there is a shortage of mussels in this part of the intermediate zone	we decided to search out a reasonable concentration of mussels and sample there. The transect will be abandoned and we will sample where we can	
1215	planted stake at 1270 - 175' from Q ² and set up for sample SCM6 along zone E.	SC45 40' transect line in mid of this pt where a band of mussels was found	
SC45	less material to scrape up trying to get mussels below mussel site,		
SCM6	mussels sparse, generally smaller ~1" max - substrate is foraging abundant. UNBIV. EB is common	samples taken every 8' ft when possible	
zone E	sed	none here (mussel)	



Keat/Mu KM/DC/SJ 7/23/77 10/40

photo 74: looking 090 at zone E and sample SC45

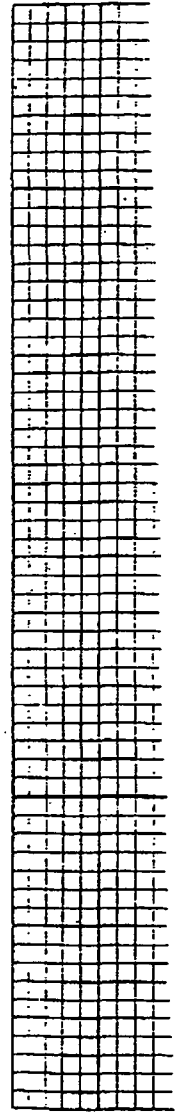
1230 SC43 taken from several holes along zone E
"Macoma" species
very different from clams found in other zones
maybe bent nose "macoma nasuta"
these were 1 1/2 - 2" variety
very concentrated
- burrowed into very Fe-stained soil

photo 75: clam holes in Fe-st soil

1240 survey 90° for 100' from zone E stake to get to zone F

1250 SC46 taken along 60' line in zone F

SC46 taken from holes spaced 15' apart
dark brown, pebbly material
average shell frags - no worms
abundant ^{small} minor crabs,



Kenneth Miller

KM/DC/SJ 7/23/97

11/4/97

SCM7

lots of juvenile
clungress scab in furrows
mussels (3) in furrows
loose furrows patch on beach
no problem w/ quantity of
mussels

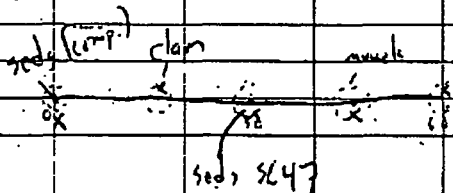
Photo 76 looking down zone F toward
east at SCM7, SC46
S. 025

1300 SCC4 taken at beachwise
Clams from zone F

analyzed nearly 1/2 in fr
seeds which contain material
that looks a lot like faeces
Fast/olive green, sandy material

SC47 taken from this material
hi-grade

1305 SC47 - sed from zone F
Fast/olive green



Kennel/Ma KM/oct 1977 12/43

1320 survey from stake on zone "F"
100' due East to begin
new transect on zone "G"

1325 SC48 taken at 15' intervals
SCM8 along transect 60'
long - zone "G"

general: abundant furcus,
varicosa,

SC48: scrape away furcus
lots of fines, few pebbles
few shell frags, lots of worms,
H-dk brown - olive

SCM8: fairly thick furcus bed
abundant juvenile crabs under
seaweed mat
mussel #3 is good - no
problem obtaining sample

photo 77 - mixing SC48 from
zone "G"

photo 78 - picking thru furcus for
mussels at SCM8

Kennel/Ma KM/oct 1977 12/143

SC49 } composite samples
SCM9 } taken from transect
combining zones G, F, G

Kennel, M. W. / OC / SJ 7/23/97 13/43

1335 SCCS taken from zone 6"
dug into sandy material
N of line, outside of
fences, benches
- not as many clams as in
zones E & F

1345 - raked tide back across creek
and remobilized on mill site

1400 - well-deserved lunch

1435 - set up decontamination station E,
clean all the stainless
steel sampling equip

1510 - rinse sample
WAP 9 - total metals HMs added
taken off on stainless shroud
used to dry clams in SCCS
location

photo 79 - decont procedures
near mill, looking N

Kenneth Allen KMDCL 2/22/47 1-1/43

1530 - finish work & inventory
of pump & samples

1600 - hi-hole went to remainder
of workings and shipped
DC/SJ the rest of the job
at hand

NOTE: The stream is gushing
way more than when we
sampled it previously; there
may not be a copper
exceedance this time around

1610 - return to bench & await
chopper

1630 - pickup

1700 - Give Tomson

1830 - Fell to airport to Gold Struck
samples back to Jones

2

Kenebeck K/12/155 7/24/47 15/43

Salt Chuck Control site

weather: overcast, rainy, slight breeze
very similar to 7/13 weather

730 Leave Tenison for Korte Bay
in search of site to use for
background sampling

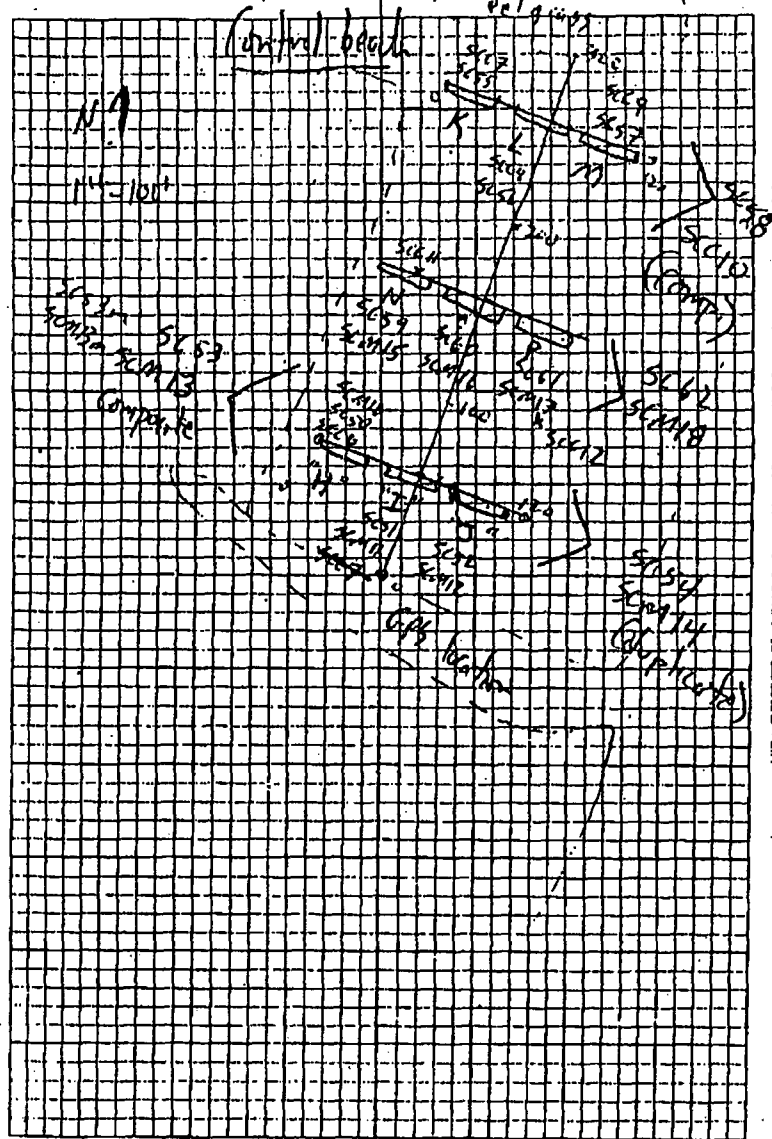
GPS lat 55° 35' 09"
long 112° 32' 42"

site located between 2 islands
south of Salt Chuck site
relative safe as we are far
away north of any influence
from Paul Young Creek

840 mobilized all our gear from
mill site to this location -
walked around site & set up
survey center line

850 went 200' from GPS point
and set up stakes at 100'
interval at 020 bearing

Kenebeck K/12/155 7/24/47 15/43



Kentville xmas/10 7/21/97 16/43

900 set up first transect at
60' along dkr line.
ran a line 120' evenly split
a long center line, because of
irregular nature of beach that we
are working on

we set up zones that are
30' wide w/ a 10' buffer
between them, i. labelled
them H, I, J

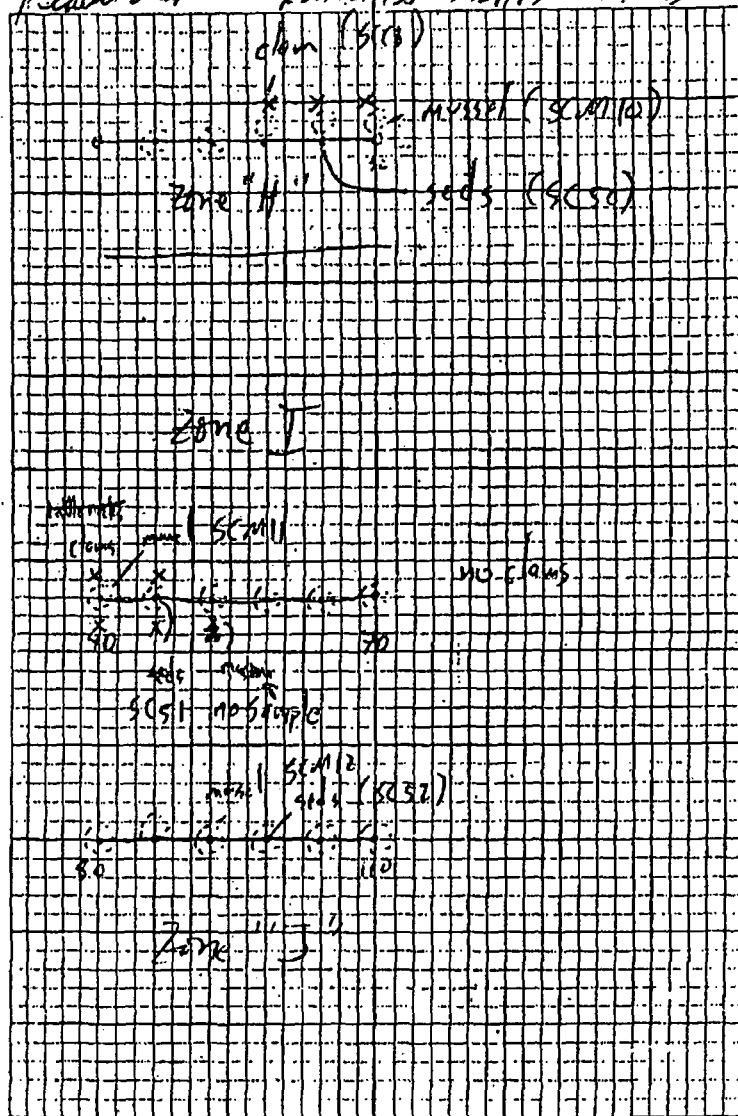
910 begin sampling along "H" zone
with 1st normal sample

SCM10 taken at 6'
SC4950 intervals along zone "H"

SC50: abundant shell fragments
few pebbles, sandy, medium
gray

SCM10: mid. finches, bad, numerous small
fragments (?) in finches
numerous clam shells bottom 1.5m
mod. density mussels; selection
size ~ 1/2"

Kentville xmas/15 7/21/97 16/43



Kearney/Klein km/oct/ST 7/24/97 17/43

photo 80. lacking 295 at zone H
82 sampling
showing seed & mussel collection
spotty nature of fishing

930 SCC 6 clam sample taken
from zone H

clams most abundant from
18'-30' along line

but little necks most abundant
species here, used for sample
"1-2"

butter clams also present, but
no bent nose or cackles here

940 move on to zone "I"
from 40'-90' along this line

SC51 taken from 6' intervals
SCM 11 along this zone
SCC 7

Xenopus/KM/DC/SJ 7/21/97 18/42

SC51 - very similar to SC50
shell frags, gray sand, few pebbles
H₂S smell
no barnacles, little scraping
sample down about 2'

SCM11 - same situation as in
SCM10, except that there
is more consistent mat
of fucius along this zone
1 1/2 - 2" size range
juvenile dumplings (?) present

photo 83 - looking at mussel gathering
in thick fucius along zone
" "

photo 84 - clam & mussel gathering along
zone I - looking 24.5°

SC67: ^{some} abundant clams near start
of zone (pairs of standing water here)
E.S. tubes off near end of zone
little necks are found in isolated
area near start of zone period
but they are too small
mainly clam shells, porous

Kenneth Allen

K.M/OCLST 7/24/97 19/43

1010

SC52
SCM12

taken from 30' zone J
in 6' intervals

SC52: shell frags, fg shell seeds,
minor pebbles, H₂S odor -
decreasing organics

photo 85 - looking 170 at sampling
along SC52 - moving for lens
out of way - for presentation
photo

SCM12 - very similar to SCM11
by { } of forams, abundant
1/2 - 2" mollusks; abundant juveniles
ostracods (?)

photo 86 - looking 240 at mussel
sampling on zone "J"

1020

SC53

Composite from a line, Ous
line, includes zone H, I, J

(1045)

SC54

duplicate for SC53

1045

SC53M

matrix spike

Kendall R.M./OC/SJ 7/24/97 20/47

1030 SCM 13 composite sample
from zones H, I, J

SCM 13 m matrix spike
from this sample

1045 SCM 14 duplicate from
SCM 13

1050 decom spoons & shovels from
1st line

1110 set up transect further down
beach toward 10-tide area

- As tide went out eel grass
came into beach picture at 300'
we certainly want to be above
zone of eel grass as this is
a completely different
turns out that eel grass starts
just below 300' survey pt. along
center line

- next transect will start at
260' from GPS location on
spit

Kennettville 10/10/55 7/21/97 2/43

photo 87 looking 020 from
G.C.S. location down to
low-tide mark on beach

This transect will include zones
"K", "L" & "M" (turned out 10.9'
above MLLW)

Sampling will cover clams & sds,
there are no mussels here

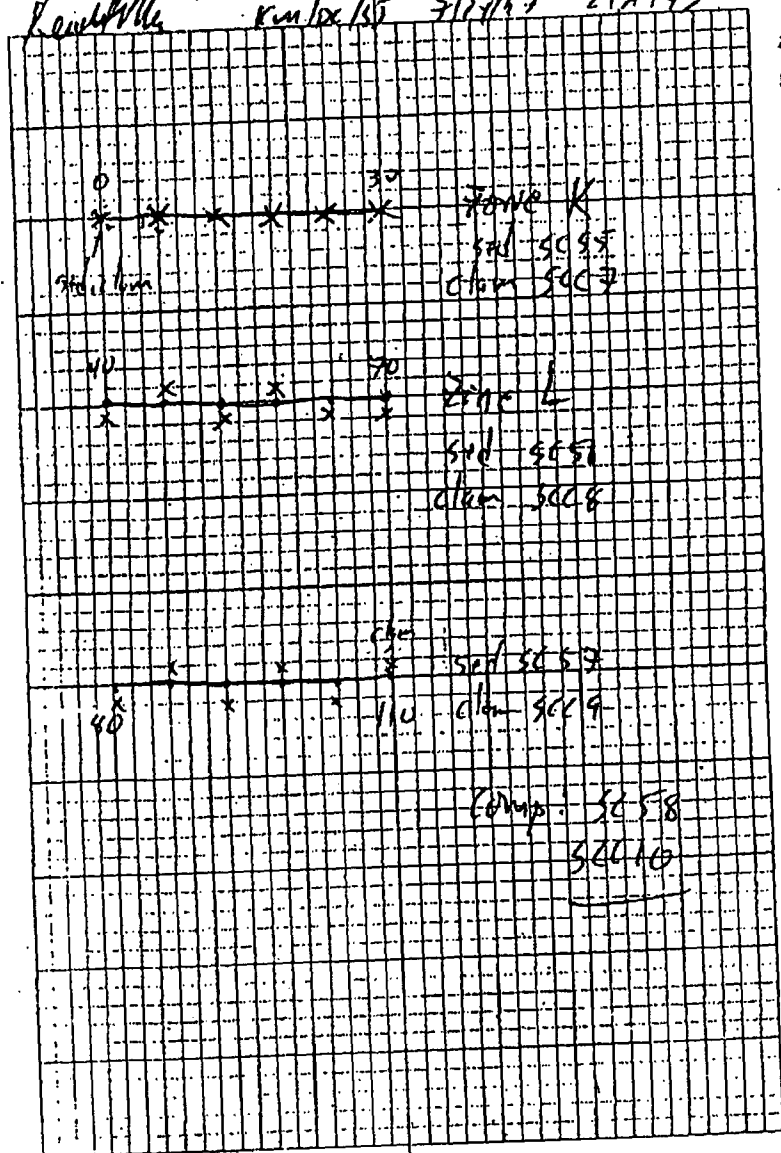
1115 SC55 taken from 0-30' along
SCC 7 transect in zone K at 6' intervals

SC 55: gravelly gray sand-silt
less shell frags on top layer

photo 88, 89 looking 290 at
zone K sed & clam sampling
bare beach, no furcs, scattered
seaweed, but mainly shells,
pebbles, boulders to 8" diam

SCC 7 mainly little rocks 1-2"
various, minor butte clams
found from 2-6" down
prime environment for Phase
5 yrs

Kennettville Kennettville 7/21/97 21A/43



Kentville 201/PC/SJ 7/21/47 22/47

1135 SCS6 taken from zone "L"
 SCC4 along transect at 6' intervals

SCS6 same general
 character of sands =
 gravelly sand, minor shell
 frags. on top layer

SCC4 abundant little necks,
 minor butter clams

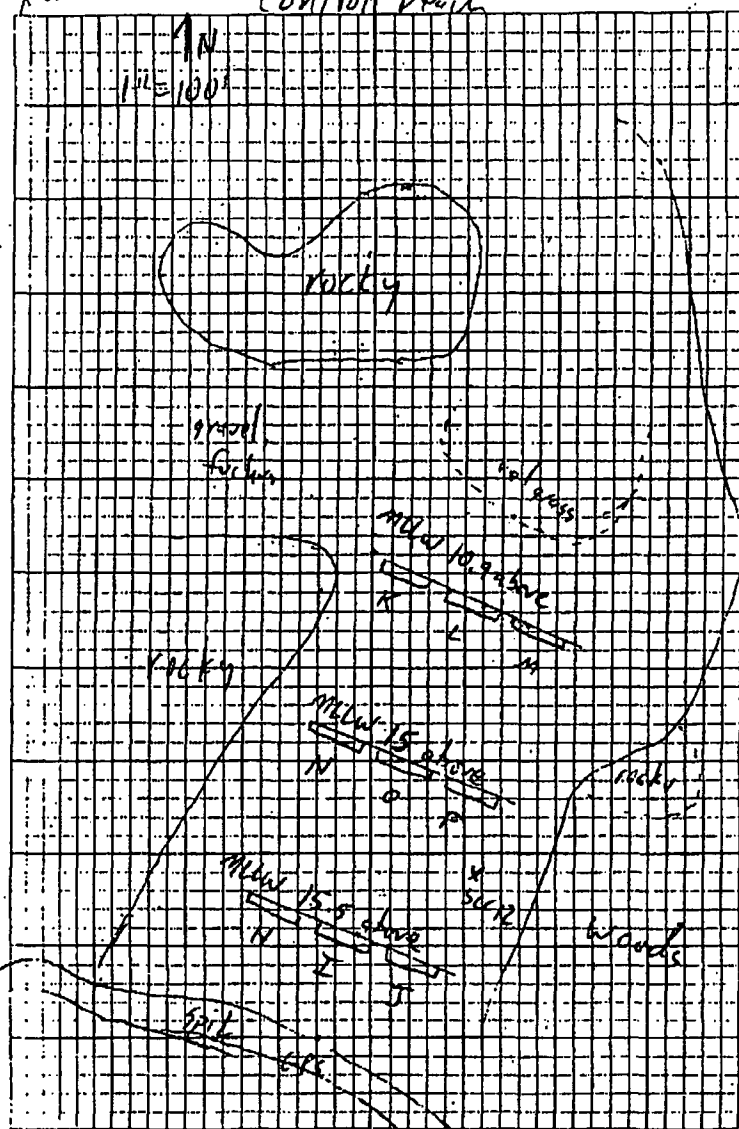
1150 SCS7 taken from zone "M"
 SCC9 along transect at 6' intervals

photos 90 - taken along entire transect
 line looking 110
 no cover, broken shells, sand

SCS7 same character sands as
 SCS6, SCC5, shell frags,
 less gravel (only because density
 of clams has ↑), dk sands

SCC9 - abundant little neck clams
 '2-1/2" variety - few butter clams

Kentville Control Beach 7/21/47 22A/43



Kentville km/dec/55 7/24/42 23/42

1200 Lunch break



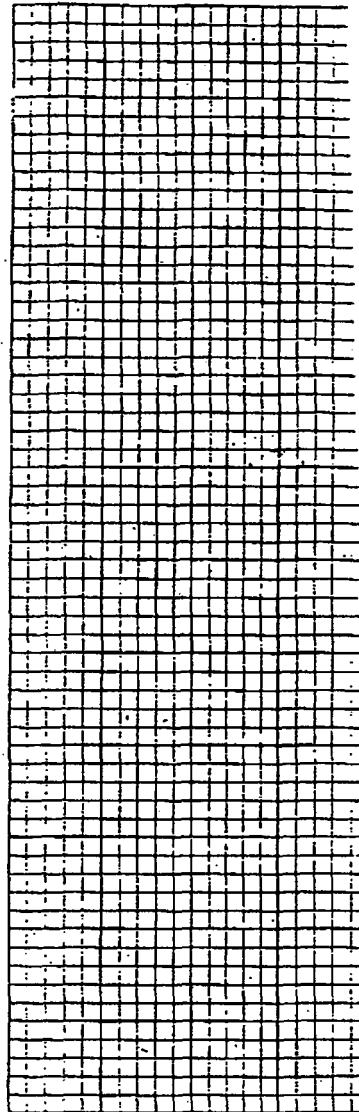
Kamille

Km/100 155 7/12/197 24/183

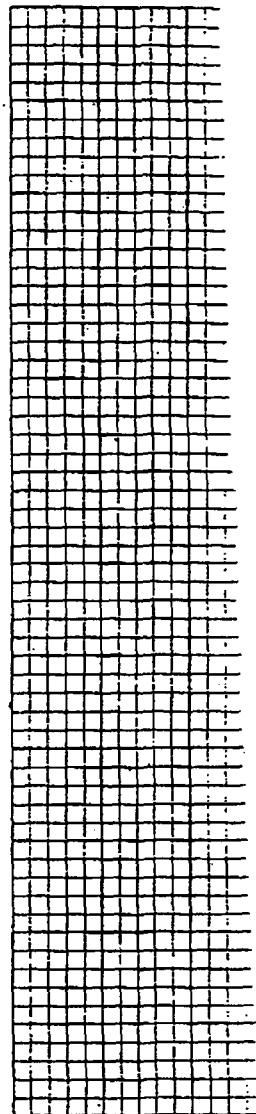
1/10/1971 1/10/1971 235

4-9301-570010

Kentville	km/or/SJ	7/24/47	26/43
photo 92	looking across entire transect line at zones N, O, & P view 290		
12:15	SC60 SC616	taken from zone "O" along transect at 5' intervals	
	SC60	very similar to SC59 shell frags, sandy, coarse grey few pebbles	
	SC616	mussel E3 is less along this zone; smaller size as well 1" or less	
13:10	SC61 SC617	taken from zone "I" along intervalled transect	
	SC61	brown color sed mixed in w/ grey coarse sandy material shell frags but no clams (white)	



Xenotricha	KIC/DC/S	7/14/78	28/43
1400	clean up transect area, remove rocks & set up decomposition		
1420	<p>started digging in the control zone to accumulate small macoma variety clams for a single composite to represent the entire area</p> <p>As macoma enjoy a much more organic, muddy silt, we E 3 over search in one area just below the upper zone (1st transect)</p> <p>SCC 12: grabbed about 1 dozen 2-3" macoma variety from this site</p> <p>- abundant furrows covering this zone; no other clams living here</p>		
1430	<p>completed work at the control zone</p> <p>tide is nearly up to the spit where we set up shop</p>		



Kenilby KM/A/SJ 2/14/97 29/11/97

1400 hr

1500 take equip over to LZ and
await arrival of chopper

1630 chopper arrived, hi-tide almost
caught us by surprise as it came
within 2' of totally submerging
our LZ

1715 return to Temera

1830 Take Ferry to airport to ship
samples back to JNU

Keokuk 15M/DC/SJ 7/15/97 30/43

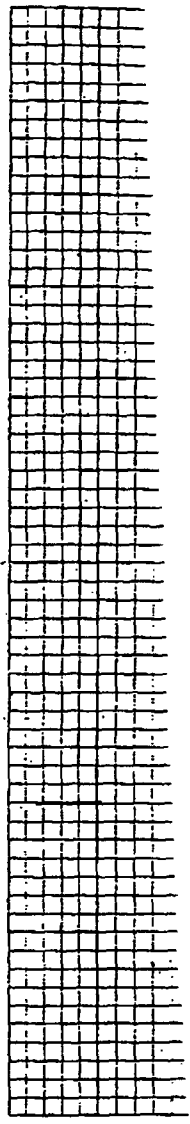
weather: partial clearing, calm, temp in 50s.
best of three days so far

730 plan: TPT samples
ICB, keokuk
water samples: up - 14vins down
hot zone shellfish
sed samples: 700' rock Q - S
200-300' each side
Q-P (16vins) 300' from rock Q - S
center line E 200' each side
300' from rock Q - N
2 samples - centerline

730 leave Temp w/ A. Shaw
800 arrive Salt Creek mill site

calibrate equipment
pH 7.2-7.0, 7.0, 7.0
mS 100 mS, 100 mS, 100 mS

815 walk over to fuel barrel caches for
sampling of possible TPT
dig 3 holes in front of each empty barrel cache
825 SOP6: a composite from these 6
holes in front of F1 & G2



1 km/12/51 7/25/97 31B/93

photo 94 looking 220 at G1 fuel barrels & sample site S086 (very dark for photo)

holes in front of G1 were dug through weed foundation of cache about 6" into humus, rotten wood & soil. 1 of the holes did give off an odor of possible T.P.H. odor was mainly from brown humus roots, topsoil.

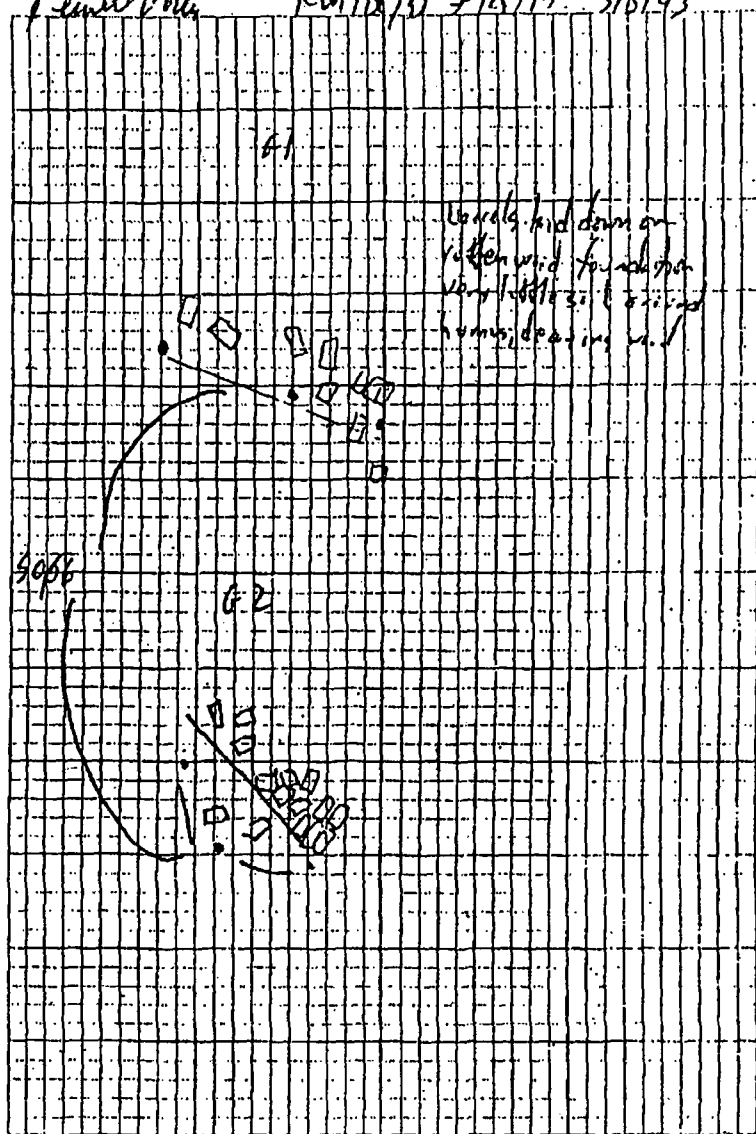
holes dug by G2 did not give off odor; comp of barrels are coated w/ dried petroleum much that gives off an odor when scraped.

soils did not look very oil-soaked odor was very minimal - could be minor contamination, but nothing to rush out & contain.

photo 95 - looking 290 at sampling in G2 cache for S086

850 going up to main tanks tank 1 for similar sample

1 km/12/51 7/25/97 31B/93



Kenilworth

RM/DC/SJ 7/25/47

3/9/43^{km}

Three tanks are standing on a wooden platform

Large Tanks



dig several holes to determine extent of contaminated soil - not extensive or concentrated

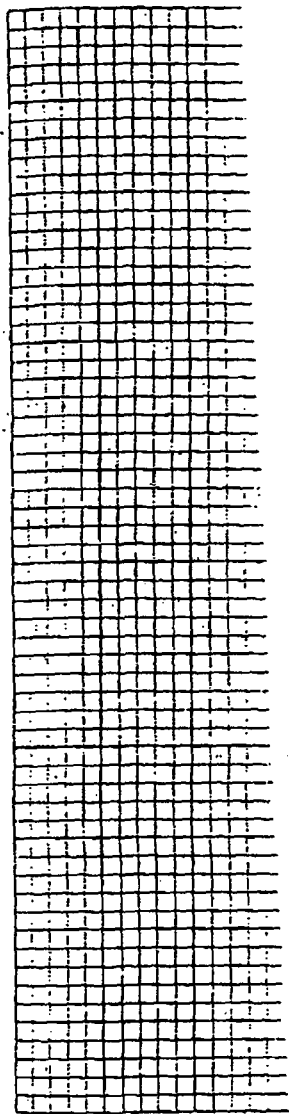
note: no kill zone, no strong odors

This sample is merely toxic, to degree if there is a larger area of spill than just under the tanks chemicals

⊗ dig some test holes directly under tanks and the soil was stained, but the odor was not strong; did not include this in sample as material present is in small quantity

900 Sample 5007
taken from 4 holes around tanks

photo 96 Sampling at 5007



Kenneth Miller KML/DLSJ 7/15/97 32/43

910 arrive at electric locomotive at
end of tracks, above mill site

locomotive contains batteries that
still have fluids in them

what has contaminated the soils?

we will sample here, a grab
taken downhill 5 ^{km} ~~feet~~ ^{feet} composite ~~ground~~
from the locomotive ~~car~~ ^{car}
sample enough for 2 jars
analyze for PCBs, acids & metals

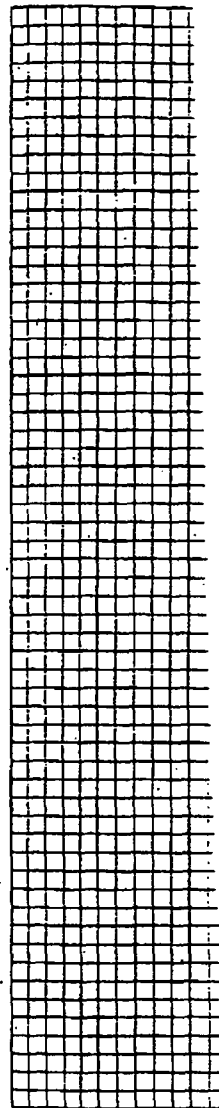
925 S008 - taken ^{downhill from} ~~from~~ this
locomotive, actually there is
a narrow gully formed that would
channel materials from the
car itself & it heads for the mill
analyze this for PCBs

930 S009 - same spot, analyze for acid

935 S010 - metals

photo 97 looking ZSD at sample sites
S008-S010 (used ZSD)
also took it w/ a flush

K. Waller	K. Waller	7/2/97	33/43
	soil from 5008-5010 was lt-dk brown sandy suds w/ human cat feces, etc		
950	set up decon station & wash down shovels & spades used for previous samples		
1000	survey center thru hot zone 500' @ 162' from middle of jetty		
	we want to take a transect between 300' & 500' along this center line, but really the 3 of mussels will determine where we sample		
	* transect will be at 400' along this line		
	walked 100' @ 257' from center line and set up first zone "Q"		
1035	SC63 taken along a 60' interval SCM19 at 15' increments along "Q"		



Kendallville

KM/5/DC

7/25/97

34/43

SC63

seeds are mainly olive brown
 tubings scraped from top 1"
 seeds underneath mussel patches
 are a bit darker (more organic),
 than the ordinary tubings

SCM19

mussels are spotty, patches
 exist where tubings are somehow
 stuck to the substrate
 size is 1.5-2" max, they are
 not really much smaller than
 in intermediate zone

photo 99 - looking 230 at sample site
 SC63 & SCM19

attempted to dig clams along this
 zone C, there weren't any
 abundant clams are related to worms
 1100 dig clams on other side
 of downstream stream about 10'
 from stream edge, macoma variety
 no little necks

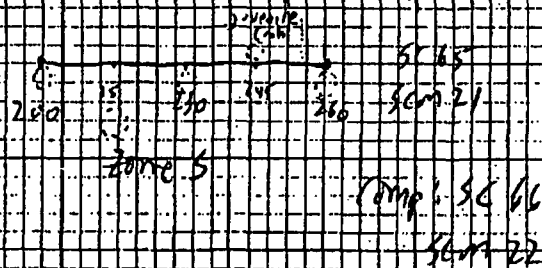
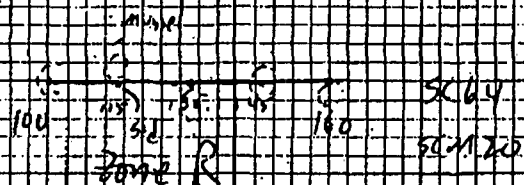
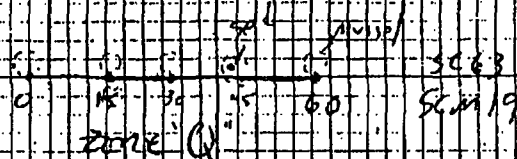
Kendallville

KM/DC/5

7/25/97

34A/43

hot zone



Kenneth Mea kmloc/SJ 7/26/47 36/43

1120 set up for zone S at 200-260
along transect line

1130 SC65 taken at 15' intervals
SCM21 along zone S in hot zone

photo 100 looking 250 at
zone S and SC65 sampling

SC65 some general character
as previous samples,
except that last 30' of zone
had a thinner gov-zone
worm channels, etc consistent
throughout entire transect

SCM21 consistent w/ other
2-zones along transect
spotty furhis/twigs that have
rotted and allowed mussels to
grow here
at 215' had to go 10' off
line to get sample, otherwise
greatly good

1145 SC66 - sed comp from zones Q, R, E, S
SCM27 - mussel comp from " "

Kennelville km/dcls 7/25/97 39/43

SC 69 sample dug into very fast
sands, sandy, few pebbles,
silt, minor black layers in this
profile as well
hole down ~ 18"
sample taken across profile

photo 103 - closeup of sample
SC 69

1230 SC 70 taken 300 W of
centerline
material looks a lot like
fillings - no pebbles, some shell frags
consistent texture, dk brown - olive
color
hole down 15" - hit water table
Shale fisher bed all around this
sample location;

photo 104: closeup of SC 70

1235 - return to millsite for lunch

June 16 '44

KM/IX/BJ 7/25/47

39/43

1215-1245

collected 3 samples
of mucous from opposite
side of slough from hot
zone (absolute hot clams
location to tailings. Hot clams
were found) worms found on
other side of slough

~~SCC 13~~

~~SCC 14~~

~~SCC 15~~

These were composited

into one sample SCC # 13
clams ~ 2-2 1/2" in size

took sed samples as well

Survey from 500' marker used

in hot zone to SCC 13

144° @ 161°

8255 SC 71

sed sample comp from
3 area where clams were
dig: coarse, granular sand
Frost w/ some black patches
fish present

photo 105

looking E 70 at sampling
zone for SCC 13 & SC 71

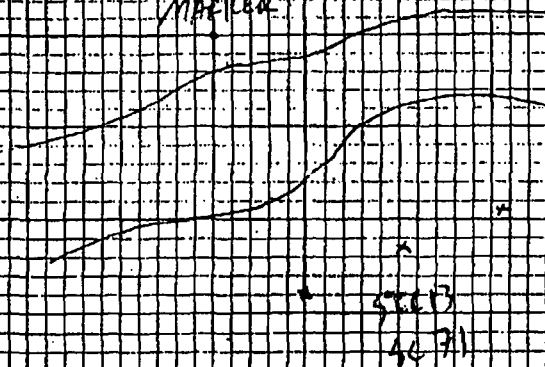
June 16 '44

KM/IX/BJ 7/25/47 39A/43

1-N

1" = 100'

MARKER (500')



Keweenaw Mts Kml/cfs 2/25/97 40/43

1310 remobilized gear from slough
back up to mill site

1315 Lunch break

1340 beam equip used for
earlier activities

1400 water sampling using
filtered samples

1410 KTBWA04 (F) collected in
1415 WA04

slough downstream
from confluence w/ exceedance
creek (see map)

pH 8.1

as 930 μ S

T₀₁ 18 °C

water is tannin color

slight desiccation along banks

slight - mod sedimentation

Flow: $(55 \times 0.5 \times \frac{4}{6}) = 20 \text{ cfs}$

photo 106: looking 785 upstream at
sample site WA04

Location	km/or/ST	Date	Time
Kendallville	km/or/ST	7/25/97	41/43
1445	WAD5 (A)		
1450	WAD5		
<p>moved upstream in this slough above confluence about 200' but still via salt H₂O inflow</p>			
<p>sampled creek water that is very tannin colored (coming from lake?)</p>			
<p>pH 8.1 MS 1500 MS TCL 190C</p>			
<p>no Fest boulder lined banks, one mid-bay fracture along shore / be in need of a This area is clearly upstream from influence from Salt Creek Mine</p>			
<p>Flow: est 15-20 cfs</p>			
<p>photo 107: looking upstream samp site WAD5 view is 312°</p>			

Kennel	km/dct/S	7/25/93	6/2/43
1510	WA06(F)	downstream sample	
1515	WA06	on USFS land	
		Same spot as	
		WA02 from previous	
		work	
	pH	8.0	
	ms	30ms	
	TOC	18°C	
15			
1530	WA07(F)	duplicate for WA06	
1535	WA07(F)		
		tannin colored water	
		no fast	
		rubbles along bank	
		Flow ($20 \times 0.5 \times 20$) = 10 cfs	
		(there is more flow than when	
		we initially sampled here)	
1540		walk upstream for last H ₂ O sample	
	photo 108	looking 285 at	
		sample site WA06/07	

Handwritten notes at the top of the page, including "Kendallville" and "7/25/92".

1600 WAD9(F)

1605 WAD8 upstream sample
Same location as WAD3

pH 8.3
TDS 30mg/L
T°C 18°C

rapid flow - tannin colored
actually overflowing banks
boulder-lined bed
no fast
rest flow 8 cfs

photo 109 looking upstream
at WAD8

1615 return to mill site &
clean up - prepare for
pickup

Kent/Blair
Salt Chuck
KT3
9/1/45
1/45

surface features survey

leave Tempu @ 10:35
Arrive site @ 11:00

weather: cloudy low ceiling in KTN (Tongass Narrows, improved markedly at Volcaner Pt.), patchy blue of Ketchikan Bay - rained overnight. Temp in 50s, low 60s

Begin survey at edge of mill

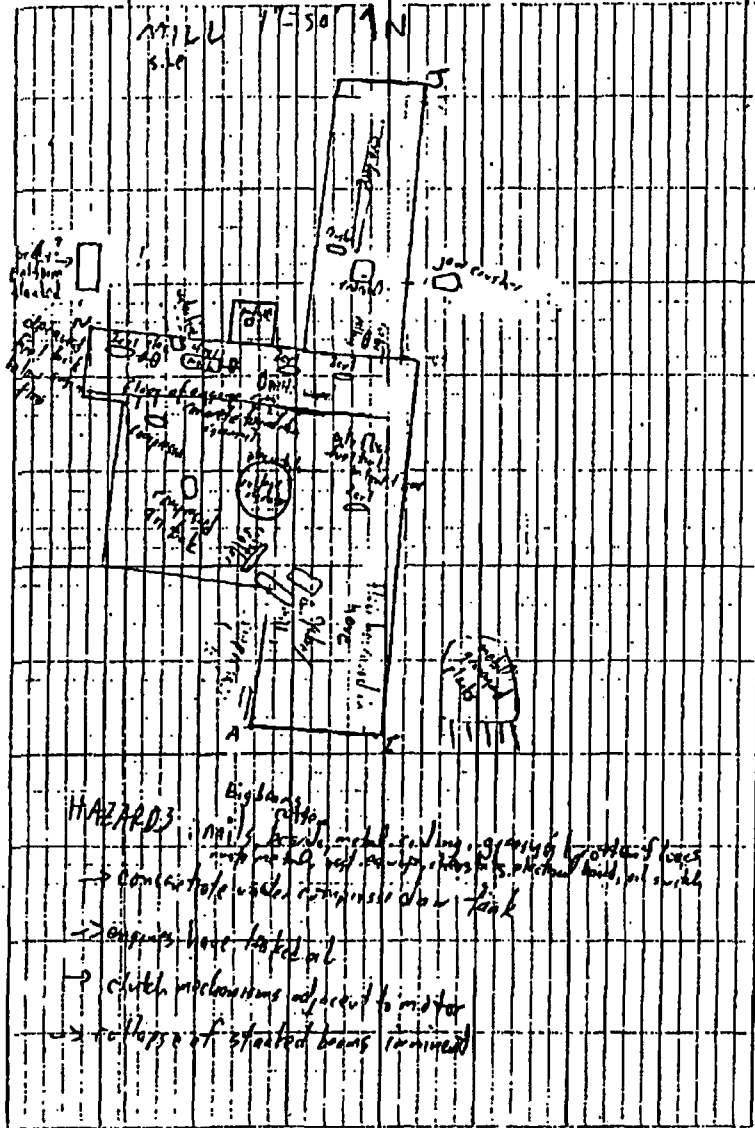
From	To	Distance	Bearing	ΔH	Comments
A	B	110'	S10E	-5' vert	corner of mill to edge of base (4 ft high)
B	C	200'	S84E	0	edge of base to super's house (C1)
					is on back fringe which runs to upper end of base (see fig. for D)
D	E	45'	S50E	0	On this way point
E	F	215.2'	N47E	0	corner of C2
F	G	44'	S84E	0	C2 -> C3 corner
G	H	210'	parallel w/		old road, now trail, ends at remains of store trail goes into tide water
			h. tide line		some remains of concrete pipe for mill h ₂ O
			10-25' in.		

Kent/Blair
From A I
To J
Bearing S85E
N5E
Distance 75
120+60'

at 120' - jaw crusher on E side mill building, upper level begins
at 120' building is 25' across (N-S)
mill sections may not all align
at 140' through L goes off
12x72' on little jay starting 10' from wall of 100'
(see figure) - entire mill surrounded by waste rock

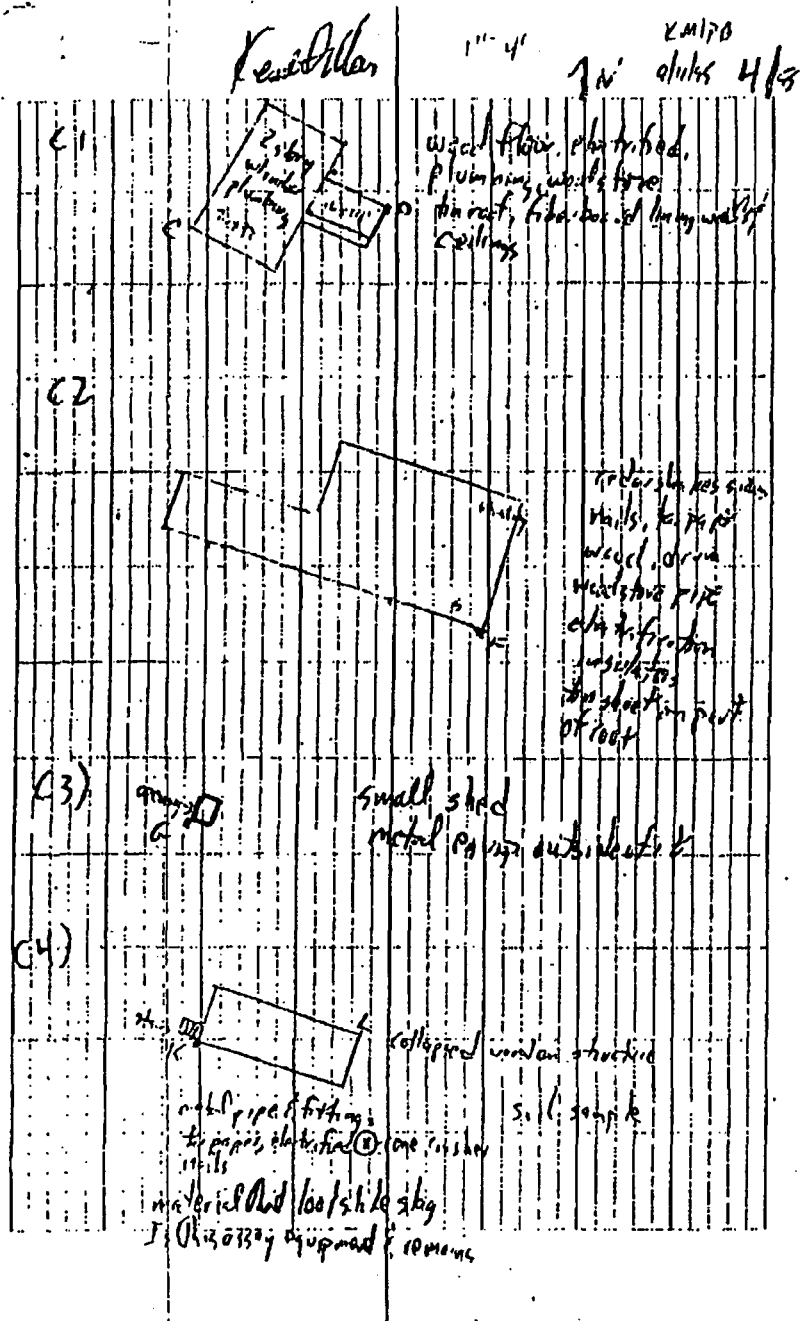
From	To	Bearing	Distance	Comments
I	K	S89E	48'	edge of mill base of waste rock structure (C4)
L	M	N2E	128'	from NE corner of main building to S. (Waste)
			748' (cut off by pipe)	
			73' (2nd ground 230)	
			0-22' 1" around 17 poles (70' wide)	
N	O	N79W	54'	corner of mill to road
O	P	W	77'	on road which
			at 48'	about 10' off is steel pipe
P	Q	N30W	28'	to 6-7 structure C5
P	R	N56W	125'	to mid-grader (see C5 sketch)
			at 180' begin filling (11 will be)	
R	S	N66W	77'	line is still along rd
			boiler on pedestal along this line (L)	
			at 95' (12' area)	6.5 x 3' pedestal (N42)

Kentucky KM100 status 1A



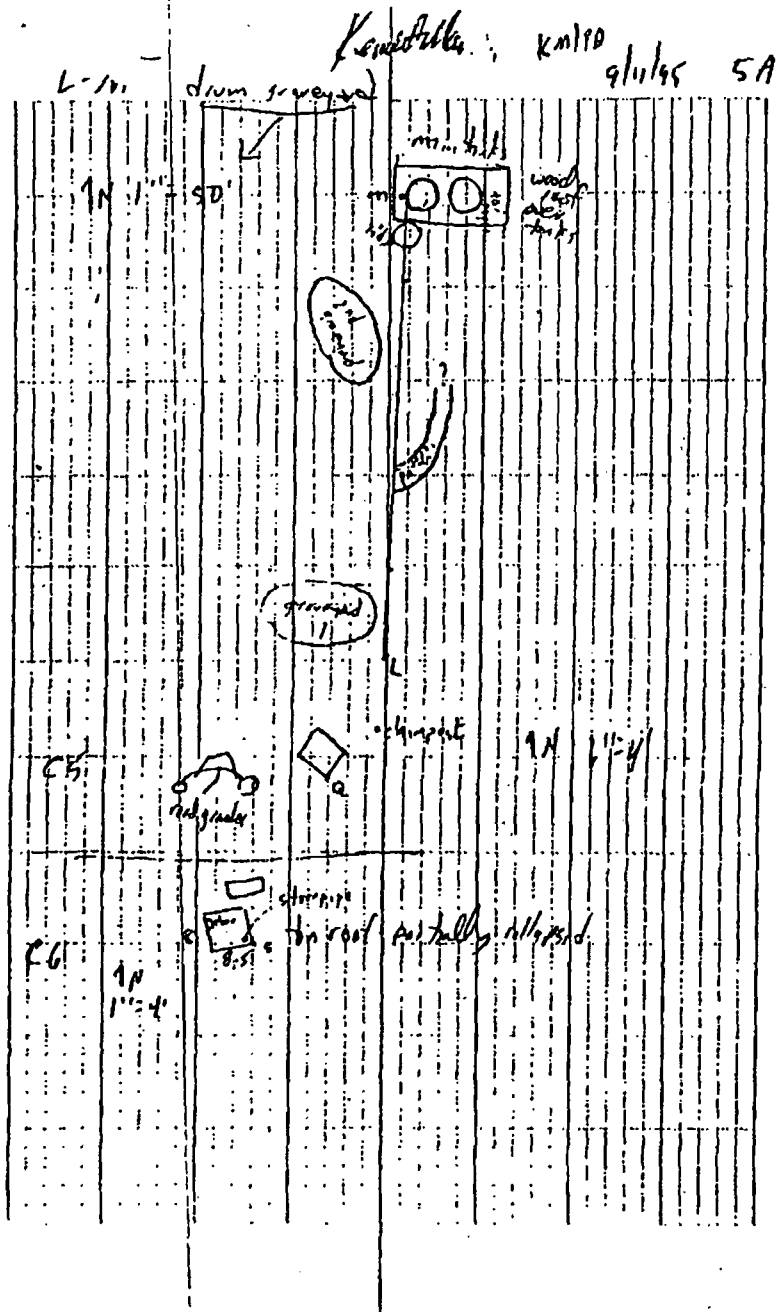
HAZARDS: Big bangs
 → concrete under inspection done
 → engines have started
 → clutch mechanisms adjacent to motor
 → collapse of structural beams terminated

From	To	Distance	Bearing	Comments
S	off "L"	49'	S...	from corner of C6 to old corner of corner of C1
L	T	99'	S34W	old L to pile of debris - to corner of 7
T	U	60'	S16W	to corner of 8
U	V	65'	S	to corner of (9 corner to corner of C10 (to 11))
V	W	44'	S15E	
X	Y	26'	S4E	
Z	AI	54'	S35E	to SW corner of C11



Kentville
structures E of mill
KALI
2 1/2' x 3 1/2' dikes 5/8

- C1) 20' x 32' (1270) w/ 1000' above
pile of home rubble taken on E. side of house
nicest cabin left on property Good's house
- C2) 65' x 24' w/ 1/2' shrapnel
electrified, E side is standing, rest is
ruining
- C3) out house size standing bldg (?) (storage shed?)
6'10" x 5' x 4' metal equip outside
- C4) 13' x 31' (1310) wood blys, shingles, tin paper
main fuel drum cache N of structure
road went in front of this house & behind
super's & matched up w/ road to total area
F → H
→ slag-like material found below base
Is this assay house? - take soil sample
none crusher lies another side of rd.



234

Kenidulla Kenid 9/11 - 6/95
Drum graveyard (7th residue on ends)
in 2nd row

- 1) "Cora products refining CO."
- 2) 2 graveyards 1 w/ 17+
1 w/ 30+
drums mostly rusted out, perforated - no
liquids inside
- 3) 2 large tanks at top of graveyard
8' diameter x 10.5 tall
W. tank lid on (H₂O in it) broken lid 3' x 4'
E. tank lid off (empty) no shov
no stressed vegetation or kill zones

(4) 6' x 7' structure w/ screened window & tarpaper
(HSSU) collapsed structure

old pipe & compressor tank & boiler located 25' upslope
of boiler
3' x 7' tall

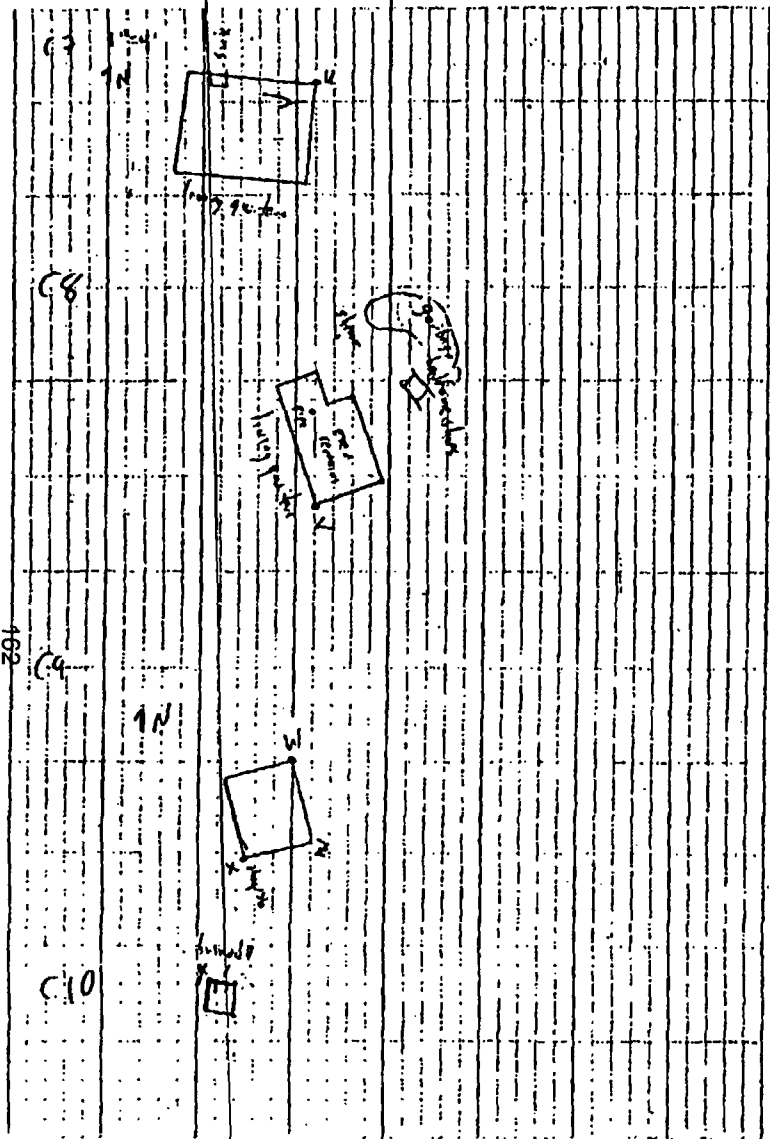
C6

photo 1 looking NBBW at C6
roll 17.931
8' x 8.5' (sloping roof)
small archy like box behind it
4x8

wall
standing -
boards between visible
structure
vis through thin walls or
1" x 1" side
nails, bumpy
both structures built on shingles near creole

A11 Keweenaw
1" = 4'

9/11/45
KMPB 6A



Keweenaw

9/11/45
7/5

C7

structure on W side of c.k.
plumbed, sint, piping, tarp, electrified
77 x 22'
(SSW)
cabin is in ruins
white trim, nails, spikes,
cedar shake sides

C6

572 W
15' x 26' w/ 818 square
fully 100
totally collapsed wooden
structure w/ 70 paper
above plumbed, nails
straps w/ rips equipment (etc.)
glass, rot per plate, half frame
pane garage, tires, etc.
"7 ft. electric meter" w/ wires...
5 amp. 110 volts
radiation pipe: possibly built in heat

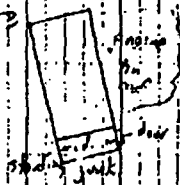
C9

18' x 14'
SSW
partially collapsed
roof has fallen onto floor, but
roof trusses are intact
tarp on roof, plumbed
cedar shake siding over tarpaper
- single storm w/ a loft

C10

5.5 x 6'
(SSW)
on roof, cedar shake sides
bldg is in good shape
hole crapper still in out-house
house sitting on log foundation

Kentville KMLPB
9/11/95 7A



Garage

Large
junk pile

163

Kentville

9/11/95 KMLPB

plumbing
electrical, bad springs, no paper on sides
standing wall (new dry room)
interlocking granite to roof
woodstove, nails, drawers

13' x 30'
(size)

roof has fallen to E on ground
rusted blazo fuel can

large junk pile - 30' away both
historic & modern garbage

several CMR cedar all over the place
stripped bark pencils

1342

Wentville Salt Chuck Kml 7B 9/14/95

weather: mostly cloudy, patches of blue, minimal breeze, drizzle to inc rain - high in low 60s

Leave Temple: 7:30
Arrive Salt Chuck beach @ 7:51

8:00 Calibration pt. 7 6.9, 7.0, 7.0
pH 4 4.0, 4.0, 4.0
conductivity 150, 150, 150 μ S

8:10 continue survey, starting w/ dumps
ground mill site

684: Lat 59° 37.57' POP 4.4
Long 132° 32.32' 46 sat. lbs

From	To	Bearing	Distance	4V (LIR)	Comments
5	B1	N25W	64'		from corner of the corner of the corner (777)
		conveyor from crusher to top of mill about 1/2 width			
B14	B2	N30W	48'	(D2)	at to top of dump
B12	B7	N44E	31'		
B3	B1	N72E	11'	(D3)	to very top (1)
B4	B5	S56E	124'		to end of dump
B5	B2	S30W	15'		on top of dump to height 3 (D4)

1342

From B4 TO B7
Bearing N57E
Distance 441'
Lentzville
Kml 7B 9/14/95
4V (LIR) comments
up to 100 ft
rail line

electric engine at B7 - rail-line to
exit w/1
rail-line pieces between trucks & dumps

train engine: 45 battery cells found (see B's)
2 large battery blocks
control panel found as well
Cutter Hammer Mtg Co (Milwaukee, WI)

photo 2: looking at train engine & battery
cells (view 530E)
roll 19, #36

photo 3: view of control panel, linkage & cells
under escape of engine
N75E
roll 19, #37
engine sits atop pit which may have and
10' wide culvert runs in cul
at 31' goes up to host/water line
73' goes to D5 (to be land)

B7	B8	Bearing	Distance	Comments
		N68W	94'	short metal bars, rail line, large pipe along rail line
	B9	N40W	105'	30-40' (12) about 20' off line along rail line
	B10	N30W	160'	at 75' some off 35' to water line water line runs S75E at 75' some off 35' to water line water line runs S75E all kinds of things can be found along this line (battery cells in tank, short metal bars, and water drum found)

165

FROM	TO	DISTANCE	BEARING	REMARKS
B10	B11	165'	N 22W	along rail line
B11	B12	165'	N 23W	along rail line
B12	B13	165'	N 25W	along rail line
B13	B14	100'	N 33W	along rail line
B14	B15	86'	N 43W	along rail line
B15	B16	165'	N 11W	along rail line
B16	B17	76'	some	along rail line

165

FROM	TO	DISTANCE	BEARING	REMARKS
B15	B18	86'	S 11W	along rail line
B18	B19	53'	S 64W	along rail line
B19	B20	60'	S 25W	along rail line
B20	B21	44'	W	along rail line
B21	B22	60'	S 57W	along rail line

Kenneth Allen
KMP/13 photos 3/9

water table at (W1)
WFS 1 pit 7.7
ms 170 ms
T/C 6°C

11:00
WAD1
photo 8 roll 20, #5
Looking NW at portal of W1 and sample site WAD1 (stream vs. trap W1)

photo 9 roll 20, #6
Looking NW at portal of W1

11:15 WFS 2
pit 7.1
ms 30 ms
T/C 15.5°C
from upstream on creek flowing into W1 water

11:20 WFS 3
pit 7.0
ms 30 ms
T/C 15.5
after water from stream has moved w/ W1 effluent

bed of ore
3 ore cars at 100' → 119' (ore)

photo 6 roll 20, #3
Looking N 35W at ore car string

ore car pieces, ore cars, pit, and scoop

at 147' stream crosses track
at 141' stream crosses track
E.g. stream will water existing W1 and... W1
also this when track is 47'

to adjacent outflow

to portal

Kenneth Allen
KMP/13 photos 4/9

at 33' track ends at Ch. line and connects with
at 45' dump join line to
to 117-118
to 119-120
to 121-122

40 across dump
17: along to

Kenneth Blau 9/11/95 8/9

Tyding near W. Creek (vegetation change)
 L-T line
 113' @ S51E crossing T p 35'
 37' from L-T line S - adjacent to both
 banks of creek

14:15 WTS U
 WAT 2/1
 - downstream water sample
 from Cr. on W side property
 - Fe-st on intertidal portion of dk wt
 near tailings
 pH 6.7
 us 30
 fish in intertidal - bivalve
 150C
 TOL 150C

- photo 27 looking N 20 W upstream at
 sample site WAT 2
- photo 28 view NW of tarpaper, sink, pipe, barrels
 of C7 (NW corner of bldg)
- photo 29 view N70E of C9 - dilapidated
 cabin, garbage, k paper, barrels, fire roof
- photo 30 closeup of garbage pile near C11
 size
 bottles, cans, bowls, metal, etc
- photo 31, 32 view SW of recent
 garbage pile S of C11
 plastic, rope, viscous
- photo 33 looking SW out C11 platform and
 roll 26 # 30
 standing structure

Kenneth Blau

- 3:05 arrived back at edit / creek continues
 walked up creek from head
- 3:10 walk up to glory hole
- photo 34 closeup of jack log drift site
 roll 20 # 31 above creek near pond S70E
- photo 35 looking at edit pond
 roll 20 # 32 glory hole N75E
 dikes, Cu-stk visible
- photo 36, 37 aerial of glory hole
- photo 38, 39 aerial of mill site facilities
 roll 20 # 36

Keweenaw K.M.I.S. 3/15/75 1/7

Silt Chuck

Leave Teasee 7:35
Arrive Silt Chuck 7:57

Weather mostly clear, winds from N-NW, no. sea for 4 days, temp in hrs: 50s - 60s

4:05 calibration
pH 7: 7.0, 7.0, 7.0
pH 4: 4.1, 4.1, 4.0
conductivity: 150, 150, 150

take 2 soil samples for oil - one in mill area, one in tideflats below mill

8:25 K13 S001 taken from intertidal area in front of barge opposite from thales
soil is black, ornamental, sewer-like smell
photo 40 looking w. at sample site S001
w/ 21, #1 specimen in muck

8:40 K13 S002 taken from W corner of mill below pumphouse, fatty substance & 1/2 ft deep wood, rot, really smelly, water beads up on thru. side of
photo 41 looking N10W at this location of S002 shows fuel tanks & black stain around cement

Keweenaw K.M.I.S. 3/15/75 2/7

S002 from win engine in floor is fatty substance, very strong petroleum smell 25' x 4' by 2.3' but it quickly has spread the entire length of the mill and it has reached out into the intertidal zone

"SLOOP OF THE GOOP"

C16 - living qtrs near rail line 25' x 36' w/ L-shape
B24 B26 580W 110' SE corner of C16

photo 42 looking N40W at C16 showing foundation trees, pilings, garbage
w/ 21, #3

B26 B27 574E 37' to NW corner of C17

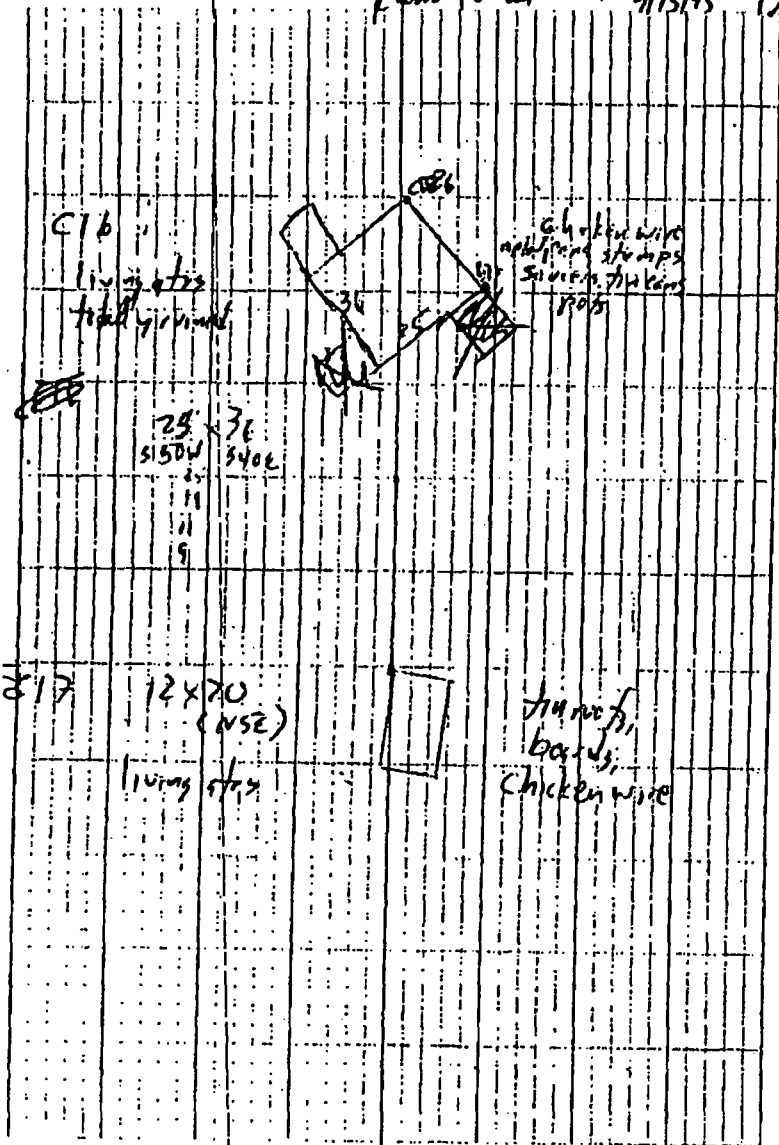
C17 - living qtrs near C16 pilings, chicken wire, tra. roof, boards totally in ruins

9:20 upstream water sample taken beyond living qtrs found along sk. travelling away from site (L11)

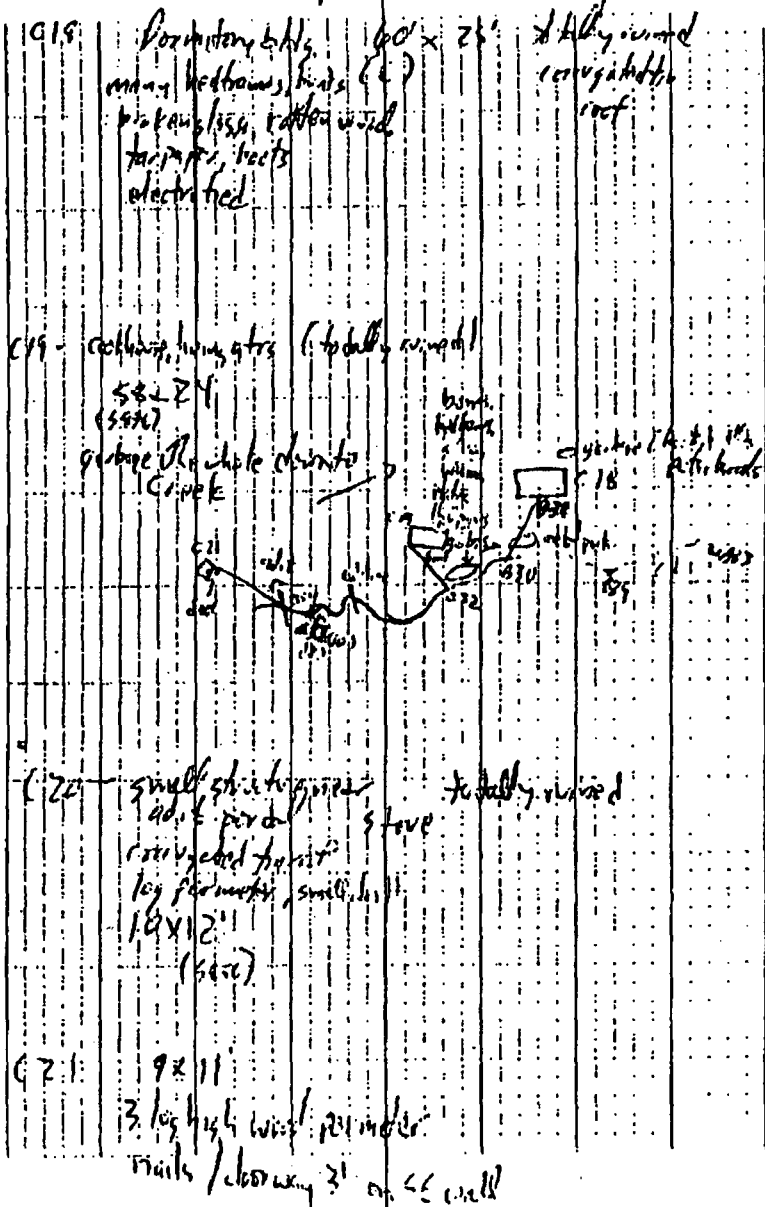
W/ 25 pH 6.6
W/ 23 pH 7.0
pH 1576

189

Kemulblen 9/15/95 1A/19



Kemulblen 9/15/95 1A/19



Kendallville 12/1/95 3/7

photo 43: Looking N35E upstream at
sample site WAD3

survey from WAD3 back to orbit along creek
including living trees

B28	B29	85'	S80W	
B29	B30	100'	N80W	small creek to N35E crosses at 75'
B30	B31	64'	N22E	creek uphill to C18

photo 44: Looking N70W at bed frames on E. side
of C18

B30	B32	85'	S77W	trash in creek along this survey (uphol parts, pieces)
B32	B33	51'	N30W	to corner of C19
B32	B34	150'	S82W	
B34	B35	10'	S20E	to the corner of C19
B34	B36	25'	N85W	

overhead wires seen along rail line
post open cut (2 wires)

distinct stream B37 54' N60W to S corner of C21

10:15 stroll on up to C19 site

Kendallville 12/1/95 4/7

part of house
in C19 hole

height on
pit

B38 B39

S20E

S40E

S68E

(elongate structure)

45' side of hole
toward D11

to top of dump 40' diameter,
point on top elongated slightly
S10W

B39 B40

S22W

93' D11-D12
top-top

dump sits at least 75' high
shelves longest to S20E 100'

B40 B41

N48E

30'

top of D12
to corner
of structure
and top of dump

platform structure is 25' across S80E
but 180' → 28' across E70' (33')

This structure has huge brush-logs behind it
and a hole or tunnel to N or S (sideline)

photo 45
roll 2, # 7

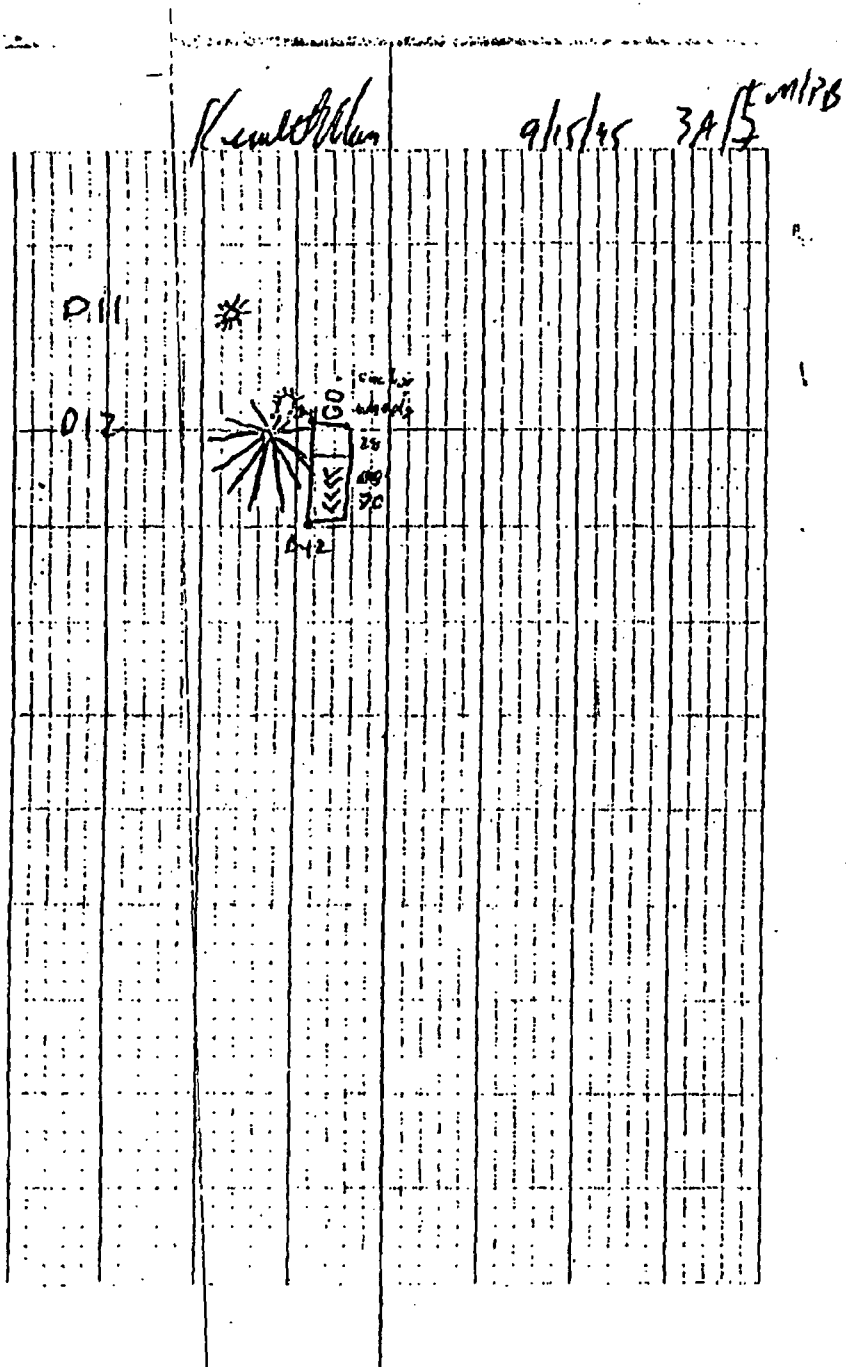
looking N60E at structure
timber, rails, sheet metal

photo 46
roll 7, # 11

looking N10E up at D12
from near bottom of fan
straggled veg between

photo 47

looking S20W up at
elongated part of rail at bottom
of fan of D12



Kent Allen KMLPB 9/15/45 2/7
 B42 B43 S-SE 941
 bottom of
 suspension
 to drill platform

drill platform of casing intact

photo 48 - looking S20°E down on
 drill platform - recent explosion has
 wood only w/ metal casing
 plywood is busted up, log base is

11:15 - found 2 shafts behind Glory Hole on
 SE side

- 1 is very deep - probably connects
 w/ 100 level within Glory hole.

This needs to be covered

photo 49 - looking ^{S30°E} into W4 shaft
 behind Glory hole.

survey from adit in Glory Hole to Sedge
 S31E

60' @ S30E
 36' @ N81E

S. edge to W4 ^{118' ±}
 Sedge to WS 4.4

photo 50 - view S81W of WS opening

Kentel Man 6/7
K.M. 17B
11/5/15

from port of adit to ^{W3} open cut 25'
N40E to edge of dump 62'

S 10E. 50' crossing line at 30'

photo S1 looking N40E along dump from W3
showing rail pipe, rocks

photo S2 S40W into port of W3 leading
into glory hole

photo S3 close up of insulator along rail line
leading from glory hole to main
adit

double electric wire strung in trees

spikes sticking out of log supports
along entire length of rail line
(NSW)

other drawing in rail line from glory hole
port structure 22.70' about 25' from ck
C22 (1940)
(transl)

reverse of this rail line w/ main line at
3000-4000' = 50'

Kentel Man 7/7
K.M. 17B
11/5/15

17:30 S003 : from around main mill

13:40 S004 - dry tailings taken around C6
area

12:50 S005 tailings w/in stream and bars
few tailings pile near WFS4? W402

all composite samples

110 pickup at Su H' Chuck

En Mausl Peter H. Heber

Intertidal work

1/3

2/3

Thursday, July 20, 1995

Have plan to salt chuck
Took quick look around
will survey high-tide line in
both directions from will.

Tailings: common, f.g., greenish
sands. Not much grows/lives
on tails. Windy today; tails
are being picked up by wind

Quite a bit of evidence of
faunal presence on no-growth zones
- deer, bear, bird tracks
- insects + birds catching insects

The difference between the grn.
and brn sediments can be misleading
- commonly, the brn areas are formed
by a thin layer of brn mud on grn
sediment
- brn mud smells v. organic, like normal
f.g. intertidal zone

SC9 → 500' from ^{toward A} L., 300' mark by Ken
- mainly grn sands, thin (<1/4") layer of
blk mud + fest. layer on top.
15" deep hole
~12" down is a 2"-4" zone of lenses of lgt gray clay
- no evid of life in hole

From	To	Bearing	Dist.	Remarks
A	B	S80E	400'	End of "ring" B: edge of grass
B	C	S43E	138'	C: turn, color Δ
C	D	S27E	117'	D: tree
D	E	S15W	207'	E: point
E	F	S34E	185'	F: point
F	G	S63E	105'	G: point
F	H	N62W	61'	H: end of fillings
H	I	N37W	565'	I: corner pilings
A	J	N90W	18'	J: corner of large
J	K	N40W	168'	K: near will, dump
K	L	N68W	298'	L: in cut, is high
L	M	S5E	655'	M: point
M	N	S34W	127'	N: point
N	O	S19W	242'	O: high tide line - off end of will

SCA (cont'd) → more beach apparatus than
 SC 8. Some barnacles on rock near hole

A - B 180' hs

280' hs in woods

H → I along creek on side of piling road

I ~ on A-B line

I - A also along line of pilings

I - A → 86' 1080.0

L → M 22' crk

97' crk corner

121' end crk corner

147' top of rock bank

182' projected
 → line of pilings
 that crk flows around

N → O 60' end area, big sands

98' big channel

190' crk

175

N → O

O → P

P → P

O

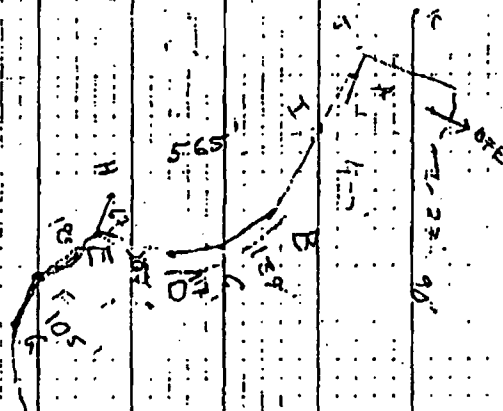
not high tide line

is " " "

is not up

→ to larger high tide line

P center of pit



Q → R

S → T

R → S → 200' edge of gir

→ mix of flats

→ rain gutter + clams + barnacles

→ S edge of channel

3/3

From	To	Bearing	Dist	Remarks
O	P	S36E	462'	P: point
P	Q	S70E	390'	Q: rk on "ridge" out on flats
Q	R	S11E	700'	R: edge of upper channel
Q	S	N62E	535'	S: edge of channel off "P"
S	G	N0°		for closure
S	T	N52W	335'	T: edge of channel
T	U	N75W	258'	U: edge of channel
U	A	N10W	742'	
T	V	N87W	61'	V: W. edge of pile
V	W	N27W	47'	W: E end of tail pile
W	X	S58W	67'	X: wedge of top of tail pile
X	Y	S211W	100'	Y: wedge of tail pile
J-V+W	Z	S8E	259'	Z: S end of tail pile

Date	Location	Notes
Fr., July 21 st , 1995		
		Have flown to Salt Chuck wy Ed from MU in 19L.
		Will finish up today, mainly sampling.
		Next sampler line will be X-75' toward W // to U: Alive
	SC 13	100' SIDE OF X-75'
		17" deep hole, sampled across 17"
		?' from top = ~1" fest layer
		- No growth in area at all
		- picture # 29 of hole
		- just above from log tail pile (20') that sits above high tide line
	SC 14	200' SIDE OF X-75'
		- sampled across 17" hole
		- ~1/4" clay layers 6" or 8' from top
		- bottom of hole = sev. clay layers
		- No growth at all in area
		- @ 710" down = fest sands covered, but not in distinct layers
	SC 15	300' SIDE OF X-75'
		- sampled across 16" hole
		- ~1" clay + wood fest in top 2"
		- 1 1/2 - 2" clay layer, 11" down
		- minor lines of bit sand at bottom of hole

clay is 1st study

T → U

150'

198'

edge of channel
middle of channel
flowing flow (20)

T 15 (cont'd)
 - upper 2' of sample from 15' nearly
 - part of 15' 50' to 15' 10'
 SC 16 150' 15' 10' 15' 25'
 1" hole
 2" clay layers @ 11" & 12" down
 1" 1" layers @ 13" down by a
 2" 2" of sand area between
 = scattered small pebbles
 = some scattered of sand
 = some fine white fine clay layers
 = some fine white top clay layer
 = top clay layer 1" thick in a hole
 up to details of clay; both
 clay over 1" thick
 photo # 29
 SC 13 60' 15' 10' 15'
 15' deep hole & sample
 - sand from 11" to 15' 10'
 - 1" clay layers to 5"
 - some below flow 2 1/2"
 - 2 1/2" = 0.5" sand
 - no gravel near hole
 - below 1" sand
 - 15' 10' 15' patch of detrital

2/3

SC 24: 700' N. LOW OF U
(sample taken 10' W of 700' spot
because v. swampy ground standing
water)

15" hole sampled

- all black, v. organic-rich sands
- piece of wood @ botm of hole
- some twigs, grass, ? included in sample
- seaweed growing 10' E of sample hole (@ 700' marker) & along drainage to SE

SC 25: 500' SIDE OF B-100

17" hole sampled

- taken 0' E of 500' site due to standing water at 500' mark
- dk gray, organic-rich sand
- 1/2" olive grn mud on top
- 1/4" layer of v. blk mud below grn top layer
- 1" to water table (water seeped into hole after sampling)
- seaweed, clam burrows, barnacles present

SC 26: 400' SIDE OF B-100

16" hole sampled

- 1/4" olive-grn mud on top
- blk (dk gray) sand to botm
- twigs & sticks in hole
- earthworms, barnacles, clam burrows & shell frags present
- water table ~ 6" @ 1" in

10

600' FROM
SC 36: N. AT 100' (toward B)

- 5" hole sampled
- 1/2" olive-grn mud, then 2" grn sand, then 3" gray sand, then 6" of blk or gray banded sands, then ~ 4" of med gray sand grading into med gray clay.
- Below clay at botm of hole is sand & gravel

- barnacles, muscles, seaweed in area, also clam burrows
- 1" - 2" clams @ 100'

SC 35: 400' SE OF AT 100'

15" hole sampled

- top is 1/2" of olive-grn mud
- then ~ 3" dk gray sand then 4" of banded blk sand, gray sand & lgt gray clay
- botm of hole is grn sand, below water table
- minor barnacles, muscles, seaweed in area (gen. sparse stalks)

SC 37: S 2 E, 33' FROM STAY

17" hole sampled

- top 3" = olive grn
- next 1" = " " , fest
- " 1" = blk sand, fest
- " 2" = blk, g. grn sand, patchy ch.
- " 3" = olive grn & minor blk mud
- " 1" = clay over

TOP of muds finally started along
distance. Silt at end of fillings

ST 27 - @ SEN D

- Sampled top 11" of hole
- 3/4" of silt sand w/
- 1/4" of olive green mud on top
- Below silt sand is 2"-3" layer
- of lg gray clay
- Below clay is coarse sediment
- of sand gravel & pebbles
- Sample shows signs of
- grass along shoreline high-
- tide line.
- beach signages, tall grass
- with 10' to 15' some bamboo
- close by. Wind - breeze

ST 32 - @ C-10" (toward D)

- Sampled top 12" of hole
- olive green layer (1") on top
- grass & downward from blk to
- dk blk green to blk sand &
- then to lg gray clay.
- 1" layer of clay @
- 12" down
- Below clay is sand, gravels
- with 3" of small grass
- scattered scattered, low bushes

- 5' to fast seepage (5' toward C)

1" of blk sand & olive green sand

- Bottom 5" of olive green sand
- with small apparatus along
- 1" to 1.5" to 2" to 3"
- to allow growth on top of
- sandy beach pit

ST 39 - 76" (toward D)

- 10" hole sampled
- top is lg green mud sand over
- then 2" of mixed green, blk &
- red (low) sand
- then 1" blk sand
- then 1" lg sand of fast patches
- 1" 3" coarse green sand
- bottom of hole in lg gray clay
- & red gray sand
- 1" place, top 6" is blk sand
- area has moderate growth of
- grasses

Salt Creek 2/20/7/21

- arrived ~ 7:40 am. took quick tour of mill and tracks leading to lower adit

- This site will make an incredibly complex AVM site

- took brief walking tour of beach to determine hi-tide zone and create a sketch of the intertidal zone.

→ on partial walk around note areas w/ veg, no veg, soil color change, sea urchins, shells, Fe-stain

→ several fixed objects/items will establish positions throughout survey

From	To	Bearing	Distance	remarks
Beach	→ Tree		hi-tide just to left of line	
Tree	→ Tree		w/ soil color change occurring	
Tree	→ Tree		on hi-tide mark (creek just to rt of line)	
Tree	→ Point			

SC1: taken at survey spot. R abundant muscles, barnacles ^{present} on surface
 Sample material taken from 4-14" down material is dark brown soil w/ Fe-stained patches & abundant shell frags
 tide flats go out 250-300' from this point facing to the south

SC2 - taken at survey point 9
 - mat material taken from Fe-rich layer 2-5' down 15" hole (sandy)
 - bottom of hole contains black mucky material (silt-clay size)
 - top 1-3" contains abundant shell frags - live clam got water of one excavated from 5' down
 - top material is sparsely covered w/ muscled barnacles / seaweed - notes muscles at SC1
 - site is next to stream which cuts thru nose of tailings fan

SC3 - 75' from N toward creek - about 10' from creek itself
 - hole is 16" deep - top 3" is silty mud - black organic rich mucky thin grey-brown interbeds bottom 1" is cogwheel type broken shells in sand.
 - sample represents all surface contains sparse clumps of beach asparagus & seaweed w/ barnacle-clad rocks - dirt patches are broken (dried mud cracks)
 - deer prints present
 - sample is probably background

SC4 125' N.W. from A to sample site

- sample taken from oozy muck adjacent to slough from main creek.
- sample hole is 13" - top 2" is organic rich black muck - bottom of hole is dark brown gravelly sand - ~~on~~
- no shells in hole
- worm found burrowed in sand/wavelayer
- abundant flies on surface / ~~on~~
- patches of seaweed and clam shells are also present in area - not as many as seen at SC2

SC5 - taken along creek bank at survey pt. U

- black sands; brown-grey sands w/ organic muck -
- minute amounts of algal plant life in vicinity - mussels are nearby barnacles also present
- hole at this location filled w/ water (water table right face)
- 10 feet away on line w/ survey from U → V, the tailing fan ends as this creek has eroded it away forming a gentle bank

SC6 - taken 100' from survey pt V along traverse to mill

- generally barren area w/ small, scattered patches of barnacles / seaweed even sparser than SC4
- 15" hole - first inch was brown clayey material, next 11" were varved clay - mostly black, minor white intervals (iron scale) bottom 3" composed of gravelly sand which is brown in color -
- nearby the fan top is lighter brown than this, but actually this brown is a very thin veneer which contained some black clays below w/ no gravelly layer

SC7 - taken 300' from survey pt U

- few barnacles taking up residence ^{shells} here - a few lonely flintstones have been deposited nearby here (barnacle clusters, 2 mussel shells, seaweed mat, etc)
- hole was 16" deep
- thin veneer of organic humus greche mainly greenish/brown sand/cilts
- a 4-5" Fe-stain band occurs 3-4" down hole -
- a 5" black sand layer occurs 1' down
- some thin laminae of varved clays w/ greenish silt

- SC 8 - taken 400' from summit pt
 - hole went down 16" - all olive green/brown sand - no stratification to speak of - wisps of black sand thru some patches, but discontinuous
 - top 1/2" layer of rust/brown oceanic mud
 - no minimal kinnule seaweed clusters present - less even than SC 9
 - very easy digging here - no clay constituent - appears to be mainly tails

SC 9 - better rock than SC 8

7/21 75 from X (E) is start of second sample line

SC 10 - taken 100' W10W from station pt for this sample line - on opposite side of small creek which is extremely Fe-stain
 - no life when 15' of hole, but at this pt hardy sedge grasses have taken hold
 - hole is 18" deep

- top 4" is olive green/brown sand
 next 1" is magnetite rich black sand
 next 7" is olive green/grey sand (less H₂O)
 next 1" is mag-rich black sand
 bottom 5" is olive green sands

- This material dug easily - all tailings

SC 11 - 50' from new pt on same line

photo 30 - material when meander bend of small creek
 - ocean mud layer on top (very thin 1/2")
 - hole went down 16" - hit H₂O at least 12"

sampled } - 1 1/2" is black sand
 - next 2" is olive green ^{thin} sand
 - next 3" is black sand
 - next 3" is olive green/brown sand
 not sampled - next 3" is grey clays
 - bottom 4" is also grey clay (submerged)
 - patches of grasses & beach asparagus on this meander bend
 - patches of Fe-stain also seen
 - no shell life

183
15 SEP 1971
10:30 AM
TAMPA BAY FLORIDA

SC 12 - taken at new survey pt
 on top of mill tailings pile
 - mill tailings pile is approx
 10' tall near the creek which
 flows behind it
 - sample hole is 18" deep
 - homogeneous olive green / grey sands inside
 - top layer is very dry - used to be
 end appears silty - same material as
 below however just drier, less compact
 - small, stunted spruce has rooted on this
 tailings pile - otherwise devoid of life
 but for a very tiny clump of grass
 driftwood piled on top of this pile
 definitely marks storm high tide mark

SC 17 - 500' from new survey pt.
 hole is 16" deep till hit water table
 top 2" is dark brown / grey / patchy black
 sand
 next 2" is olive green / brown w/ Fe stain
 next 2.5" is varred clayey grey / olive
 next 2" is olive green / brown w/ minor Fe stain
 next 5" is olive green w/ abundant pockets of
 Fe stain, oxidized pyrite layer (intense weathering)
 2.5" of laminated clays

harder to dig hole
 muscles, barometer
 saw wood patches

curious layer

SC 18 - hi-grade of curious layer - Fe patches
 from hole SC 17
 new line 100' from survey pt 15

SC 19 - at 0 on line
 - dry grey / brown w/ black sand in
 upper 3"

digging
 - hole is 19" deep - homogeneous
 throughout except for presence of
 black sand mentioned above
 - no life on this portion of beach
 - about 15' from highest tide mark
 where grasses / sedge begin

SC 20 - 100' from SC 19 on same line
 - no beach life to speak of
 - sample hole is 20" deep
 - alternating olive green / black sand
 layers on a '2-1" scale throughout
 hole

pot digging
 - one thin clayey patch 5" down -
 does not form a separate layer
 - appears to be all tailings in
 hole

NO. 312
WEATHERPROOF
TAMPA BAY FLORIDA

- SC21 - taken 200' along line
 3 - scattered patches of beach asparagus
 2 - but mainly devoid of veg. i.e. forms
 2 1/2 - hole is 20" deep
 6 - top 2" : black sand w/ olive green sand
 next 4" : olive green sand w/ wisps of black
 next 2" : cross bedded clay & olive green sand
 next 5" : olive green sands, minor black
 sand patches
 next 2" : lt grey/brown clay
 bottom 2" : olive green sands

minor Fe-stain on surface around hole
 but none within hole

SC22 - 300' SIDE OF B-100'
 (near pilings line)

- v. black, organic-rich sand
- some twigs, branches in hole
- 18" hole sampled
- shells fragments 11" from top
- top 1/2" = grn sand
- seaweed & barnacle growth in
 area. clam burrows also present

- SC 28 75' @ S 34E from L (survey pt.)
 - hole is 18" deep
 - organic debris (sticks, bark, grasses.)
 contained throughout layers exposed
 in hole
 - top 9" - olive green/dk brown sand
 - 4" of black sands w/ minor olive/brown
 component
 - 3" Fe-st sandy layer
 - 2" black sand & olive green/brown layer

sample taken on opp side of ck from
 small pilings pile in NW corner
 of burrows

- grasses are growing all around the
 barren area which was sampled.
- sample taken at extreme hi-tide zone

- SC 29 - 600' along line from first survey pt
 created 7/21
 - hole is 18" deep (H₂O table)
 top 4" - olive gr./brown/black sand/first layer
 next 3" - varred clays lt grey/black (org-rich)
 11" - olive green/dk brown sands
 water
 - sparse scattered rocks w/ barnacles, sea weed/mussels

2. 30

700' along new survey line

- 15' beyond face of tailings fan adjacent to stream
- hole is 10" deep, then the table
- top 1-1.5" is black olive green tailings sands
- next 8" is sandy gravelly stream bed material
- sparse to moderate quantities of barnacles, mussels, seaweed on rocks - tiny fry in stream
- birds w/ sharp beaks pecking beach

SC 31 - 120' @ S23E from survey pt. D

- hole is 12" deep, then hit major twigs, roots, shells
- top 1" is olive gr / blackish org. sands
- next 11" is all org-rich black sandy material - nice smell
- sparse clumps of grass & seaweed near sample hole
- 20' away is above hi-tide line and mid-heavy { } of grasses, trees
- clam shells are near dry stream about 30' to the west

No.

SC 33

new survey line on W. side of survey house

- near highest tide mark - sparse clumps of drying green moly
- 18" hole
- top 16" - homogeneous olive green / dk brown sand (fauna)
- bottom 2" - varved lt grey / dk grey clay

SC 34

225' from SC 33 along same line

- adjacent to small ck which has created an oasis in this area of drench
- flies abound because of the org-rich muck which is present as is short grass
- clam shells are abundant
- mussels seaweed on limbs, rocks
- hole is 14" deep
- black to grey to lt grey clayey material
- top 1-2" is bottom / olive green sand with muck
- materials completely saturated by creek & associated water table
- water table in bottom of hole

SC 37

135' E N73W from 200' hole on line off tailings pile (1st / 1st today)

Peter has notes

- SC 38 : In line w/ survey pt Y & E
 SC 37 - across ck on
 w. bank ~ 100' away
 - fishes in creek / fast banks
 - hole dug w/in floodplain of ck
 w/ abundant beach spurs and
 grasses
 - no mollusks in neighborhood
 - hole is 13" deep where it hit
 stream gravel
 - top 8" is black org. rich, olive green
 Fe-d b'n gravel
 - next 3" is olive green / dk brown sand
 - next 1" is Fe-d olive green / dk brown
 sand
 - bottom of hole is stream sand / gravel

- | photo | Distance | Remarks |
|------------|--|------------------|
| roll 11 #1 | 70 | Barry |
| 10 #1 | Looking N 20W across ck at tailings & mill
taken between T & V | |
| 11 #2 | Looking S from Q toward R out to
ex. Karta bay: intertidal zone contains
abundant muskies, breams, chin hills, small
fish in pools, etc | |
| 12 #3 | Looking N 15W from Q toward mill | |
| 13 #4 | Looking SE into hole / sample site SC 2 | |
| 14 #5 | Looking N 20E into sample hole SC 2 | |
| 15 #6 | Looking N 30W at mill site in intertidal zone
from site S | |
| 16 #7 | From top of barge looking S 50E out
toward survey pt D viewing tank | |
| 17 #8 | From top of barge out along pilings | |
| 18 #9 | From top of barge out rock jetty | |
| 19 #10 | From top of barge out w to Fe-stain
creek and mill debris / tailings survey pt. 5 | |
| 20 #11 | From K To X looking at layered tails
piled up and adjacent to creek | |
| 21 #12 | On tailings dump (middle), looking S 80E
at color change on far post major
pilings | |

photo

22 #13

taken of sample hole SC 3
showing strat-section

23 #14

taken of sample SC 4 - much gravelly
sand

24 #15

Looking N from SC 4 to mill / facilities

25 #16

Looking NE of SC 6 - dark black clay layers

26 #17

taken at sample site SC 7 -
note Fe-rich layer about 3-4" down
otherwise mostly dark green / brown

27 #18

taken of SC 9 - showing Fe-rich layer

28-29 #19-20 Peter

30 #21

taken of SC 11 showing 9" of tails
on top of grey clay layer which
is clearly marking the top of interface
of base level



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shaune Drive
Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970870 Sample ID K73 WA04 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00539	104
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00499	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00247	98
LCS1	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00246	98
LCS2	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00265	106
MBLK	Cadmium by furnace - Dissolved	mg/l	ND	ND	
MS	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00276	110
MSD	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00231	92
LCS1	Chromium by furnace-Dissolved	mg/l	0.025	0.0262	105
LCS2	Chromium by furnace-Dissolved	mg/l	0.025	0.0269	108
MBLK	Chromium by furnace-Dissolved	mg/l	ND	ND	
MS	Chromium by furnace-Dissolved	mg/l	0.025	0.0287	115
MSD	Chromium by furnace-Dissolved	mg/l	0.025	0.0272	109
LCS1	Copper by furnace - Dissolved	mg/l	0.025	0.0243	97
LCS2	Copper by furnace - Dissolved	mg/l	0.025	0.0255	102
MBLK	Copper by furnace - Dissolved	mg/l	ND	ND	
MS	Copper by furnace - Dissolved	mg/l	0.025	0.0282	113
MSD	Copper by furnace - Dissolved	mg/l	0.025	0.0289	116
LCS1	Diss Hardness as CaCO3, Titr.	mg/l	50	50.4	101

Report #: 35885



Laboratory Report
MONTGOMERY LABORATORIES

5438 Shauna Drive
Juneau, Alaska 99801
907 780 6668

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970870 Sample ID KT3 WA04 Project _____
Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	XRecv
LCS2	Diss.Hardness as CaCO3, Titr.	mg/l	50	50.4	101
MBLK	Diss.Hardness as CaCO3, Titr.	mg/l	ND	ND	
MS	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.8	99
MSD	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.0	96
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.0	96
LCS1	Mercury by CV - Dissolved	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Dissolved	ug/l	2.0	1.95	96
MBLK	Mercury by CV - Dissolved	ug/l	ND	ND	
MS	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
MSD	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0259	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Dissolved	mg/l	0.025	0.0230	92
LCS2	Lead by furnace - Dissolved	mg/l	0.025	0.0247	99
MBLK	Lead by furnace - Dissolved	mg/l	ND	ND	
MS	Lead by furnace - Dissolved	mg/l	0.025	0.0241	96
MSD	Lead by furnace - Dissolved	mg/l	0.025	0.0238	95
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0190	76
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111

Report #: 35885



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Juneau, Alaska 99801
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Laboratory Report

U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Baer

Sample # 970871 Sample ID KT3 WA05 Project _____
Sample Type Water Sampled 25-Jul-1997 Received 31-Jul-1997 Reported 28-Aug-1997

Parameter	Units	Result	Conc.	XRec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Silver by furnace - Total (EPA 272.2)	mg/l	ND				0.0005	07-Aug-1997	aes	11-Aug-1997	saw
Arsenic by furnace - Total (EPA 206.2)	mg/l	ND				0.0005	07-Aug-1997	aes	14-Aug-1997	saw
Beryllium by furnace - Total (EPA 210.2)	mg/l	ND				0.001	07-Aug-1997	aes	21-Aug-1997	saw
Cadmium by furnace - Dissolved (EPA 213.2)	mg/l	ND				0.0002			05-Aug-1997	saw
Chromium by furnace - Dissolved (EPA 218.2)	mg/l	ND				0.015			09-Aug-1997	saw
Copper by furnace - Dissolved (EPA 220.2)	mg/l	0.0031				0.002			09-Aug-1997	saw
Dias. Hardness as CaCO3, Tit. (EPA 130.2)	mg/l	95				10			01-Aug-1997	saw
Hardness as CaCO3, Titrimetric (EPA 130.2)	mg/l	100				10			01-Aug-1997	saw
Mercury by CV - Dissolved (EPA 265.1)	mg/l	ND				0.2	07-Aug-1997	aes	31-Jul-1997	cdh
Nickel by furnace - Total (EPA 249.2)	mg/l	ND				0.01	07-Aug-1997	aes	13-Aug-1997	saw
Lead by furnace - Dissolved (EPA 239.2)	mg/l	ND				0.002			05-Aug-1997	saw
Antimony by furnace - Total (EPA 204.2)	mg/l	ND				0.005	07-Aug-1997	aes	19-Aug-1997	saw
Selenium by furnace - Total (EPA 270.2)	mg/l	ND				0.005	07-Aug-1997	aes	20-Aug-1997	saw
Thallium by furnace - total (EPA 279.2)	mg/l	ND				0.001	07-Aug-1997	aes	25-Aug-1997	saw
Zinc by furnace - Total (EPA 289.2)	mg/l	ND				0.007	07-Aug-1997	aes	20-Aug-1997	saw

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U.S. Bureau of Land Management
 Alaska Field Operations Center
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 P.O. Box 20550
 Juneau, AK 99802-0550
 ATTN: Roger Baer

Sample # 970871 Sample ID KT3 WA05 Project _____
 Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

**Single Determination Analytes
 Quality Control**

Control	Parameter	Units	Actual	Found	XRecv
LCS1	Silver by furnace - Total	mg/l	0.005	0.00519	104
LCS2	Silver by furnace - Total	mg/l	0.005	0.00502	100
MBLK	Silver by furnace - Total	mg/l	ND	ND	
MS	Silver by furnace - Total	mg/l	0.005	0.00551	110
MSD	Silver by furnace - Total	mg/l	0.005	0.00639	100
LCS1	Arsenic by furnace - Total	mg/l	0.0250	0.0276	110
LCS2	Arsenic by furnace - Total	mg/l	0.0250	0.0266	106
MBLK	Arsenic by furnace - Total	mg/l	ND	ND	
MS	Arsenic by furnace - Total	mg/l	0.0250	0.0255	102
MSD	Arsenic by furnace - Total	mg/l	0.0250	0.0248	99
LCS1	Beryllium by furnace - Total	mg/l	0.0025	0.00237	95
LCS2	Beryllium by furnace - Total	mg/l	0.0025	0.00249	100
MBLK	Beryllium by furnace - Total	mg/l	ND	ND	
MS	Beryllium by furnace - Total	mg/l	0.0025	0.00239	96
MSD	Beryllium by furnace - Total	mg/l	0.0025	0.00244	98
LCS1	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00246	98
LCS2	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00265	106
MBLK	Cadmium by furnace - Dissolved	mg/l	ND	ND	
MS	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00276	110
MSD	Cadmium by furnace - Dissolved	mg/l	0.0025	0.00231	92
LCS1	Chromium by furnace-Dissolved	mg/l	0.025	0.0262	105
LCS2	Chromium by furnace-Dissolved	mg/l	0.025	0.0269	108
MBLK	Chromium by furnace-Dissolved	mg/l	ND	ND	
MS	Chromium by furnace-Dissolved	mg/l	0.025	0.0287	115
MSD	Chromium by furnace-Dissolved	mg/l	0.025	0.0272	109
LCS1	Copper by furnace - Dissolved	mg/l	0.025	0.0243	97
LCS2	Copper by furnace - Dissolved	mg/l	0.025	0.0255	102
MBLK	Copper by furnace - Dissolved	mg/l	ND	ND	
MS	Copper by furnace - Dissolved	mg/l	0.025	0.0282	113
MSD	Copper by furnace - Dissolved	mg/l	0.025	0.0289	116
LCS1	Diss.Hardness as CaCO3, Titr	mg/l	50	50.4	101

Report #: 35885



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U.S. Bureau of Land Management
Alaska Field Operations Center
Juneau Branch
P.O. Box 20550
Juneau, AK 99802-0550
ATTN: Roger Beer

Sample # 970871 Sample ID KT3 WA05 Project _____
Sample Type Water Sampled 25-jul-1997 Received 31-jul-1997 Reported 28-aug-1997

Single Determination Analytes
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS2	Diss.Hardness as CaCO3, Titr.	mg/l	50	50.4	101
MBLK	Diss.Hardness as CaCO3, Titr.	mg/l	ND	ND	
MS	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.8	99
MSD	Diss.Hardness as CaCO3, Titr.	mg/l	25	24.0	96
LCS1	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
LCS2	Hardness as CaCO3, Titrimetric	mg/l	50	50.4	101
MBLK	Hardness as CaCO3, Titrimetric	mg/l	ND	ND	
MS	Hardness as CaCO3, Titrimetric	mg/l	25	24.8	99
MSD	Hardness as CaCO3, Titrimetric	mg/l	25	24.0	96
LCS1	Mercury by CV - Dissolved	ug/l	2.0	1.86	93
LCS2	Mercury by CV - Dissolved	ug/l	2.0	1.93	96
MBLK	Mercury by CV - Dissolved	ug/l	ND	ND	
MS	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
MSD	Mercury by CV - Dissolved	ug/l	2.0	2.24	112
LCS1	Nickel by furnace - Total	mg/l	0.025	0.0257	104
LCS2	Nickel by furnace - Total	mg/l	0.025	0.0262	105
MBLK	Nickel by furnace - Total	mg/l	ND	ND	
MS	Nickel by furnace - Total	mg/l	0.025	0.0265	106
MSD	Nickel by furnace - Total	mg/l	0.025	0.0257	103
LCS1	Lead by furnace - Dissolved	mg/l	0.025	0.0230	92
LCS2	Lead by furnace - Dissolved	mg/l	0.025	0.0247	99
MBLK	Lead by furnace - Dissolved	mg/l	ND	ND	
MS	Lead by furnace - Dissolved	mg/l	0.025	0.0241	96
MSD	Lead by furnace - Dissolved	mg/l	0.025	0.0238	95
LCS1	Antimony by furnace - Total	mg/l	0.025	0.0224	90
LCS2	Antimony by furnace - Total	mg/l	0.025	0.0232	93
MBLK	Antimony by furnace - Total	mg/l	ND	ND	
MS	Antimony by furnace - Total	mg/l	0.025	0.0190	76
MSD	Antimony by furnace - Total	mg/l	0.025	0.0159	64
LCS1	Selenium by furnace - Total	mg/l	0.025	0.0276	110
LCS2	Selenium by furnace - Total	mg/l	0.025	0.0277	111

Report #: 35885

Appendix D. - Integrated Assessment Checklist.

INTEGRATED ASSESSMENT CHECKLIST PART I - SITE LOCATION AND ASSESSMENT INFORMATION					CERCLIS #	
Site Name and Address					State	
S&H Chuk Mine; Kasagan Bay, Prince of Wales Island					Alaska	
Nearest City	State	Zip	County	County Code	Cong Dist	
Thorne Bay	AK	99919	—	—	—	
Physical Location (directions to site) <i>North head of Kasagan Bay, POWI</i>						
Latitude <i>55°37'38" N</i>		Longitude <i>132°33'25" W</i>		Quadrangle Name		
Source (<u>topo</u> , GPS)				Craig C-2		
Point on the site at which it was calculated (geographical center of entry gate)				Section	Township	Range
<i>millsite</i>				<i>17</i>	<i>72S</i>	<i>84E</i>
Datum						
<i>NAD '27</i>						
Type of Ownership						
<input type="checkbox"/> Municipal <input type="checkbox"/> Private <input checked="" type="checkbox"/> Federal <input type="checkbox"/> Indian Nation <input type="checkbox"/> State <input type="checkbox"/> County <input type="checkbox"/> Other _____						
Assessment Information Ref. #s)						
Date: <i>7/23-7/25 1997</i> <i>7/20, 7/21, 9/11, 9/14, 9/15 1995</i>		Site Status		Years of Operation		
		<input checked="" type="checkbox"/> Active <input type="checkbox"/> Inactive <input type="checkbox"/> Not Specified <i>active Fed mining claims</i>		<i>production</i> <input type="checkbox"/> Unknown Begin End <i>1905 1941</i>		
Agency Performing Inspections <i>BOM/BLM</i> Ref. #s)						
Primary Inspectors		Title		Organization		Telephone
<i>Ken Maas 1995/1997</i>		<i>Geologist</i>		<i>BLM-JMIL</i>		<i>907-364-1559</i>
<i>Doug Crim 1997</i>		<i>Environmental Engineer</i>		<i>BLM-JMIL</i>		<i>907-364-1507</i>
<i>Peter G. Heiberger 1995</i>		<i>Geologist</i>		<i>BLM-JMIL</i>		<i>907-364-1556</i>
Other Inspectors		Title		Organization		Telephone
<i>Scott Johnson</i>		<i>Biologist</i>		<i>NMFS-Tunna</i>		<i>907-785-6063</i>
Site Representatives Interviewed/Contacted <i>NONE</i>						
Access Gained By						
<input checked="" type="checkbox"/> Verbal Consent <input checked="" type="checkbox"/> Written Consent <input type="checkbox"/> Warrant						
Time <i>0800-1630</i>				Weather <i>overcast, 50s-60s</i> <i>occasional showers</i>		
Site Identified		CERCLIS Identification Date		EPA Contact		
<input checked="" type="checkbox"/> Federal <input type="checkbox"/> State/Local <input type="checkbox"/> Citizen Complaint <input type="checkbox"/> Other						

PART II - SITE BACKGROUND AND REGULATORY STATUS	
Owner/Operator History	Historic Production 1965-1941 (Exploration 1943 - present Ref.#(s): PA report)
Current	Stratix Ventures, Inc.
Previous	Zottback Mfg Co. → AK Pellaheim Mfg Co → Selva Dev. Co → AK Gold & Metals Co
Site Regulatory History	None Ref.#(s):
Permits	NA
<input type="checkbox"/> NPDES <input type="checkbox"/> State Permits <input type="checkbox"/> UIC <input type="checkbox"/> RCRA Part A <input type="checkbox"/> RCRA Part B <input type="checkbox"/> Local Permits <input type="checkbox"/> Air <input type="checkbox"/> TACB <input type="checkbox"/> SPCC Plan <input type="checkbox"/> Other	
Dates and Description of Previous Investigations	
Inventory Exam & extensive sampling in intertidal zone during 1995. - describe/document physical & chemical hazards - survey & sample 7/20, 7/21 & 9/11, 9/14-9/15 1995 inventory summary report completed; file prepared for USFS/Ketchikan	
Dates and Description of Previous Removal Actions	
NA	
Dates and Description of Previous State of RCRA Corrective Actions	
NA	
PART III - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS	
Potential Threat of Fire and/or Explosion	
None	
i.e., unstable hazardous materials stored on-site, reactive materials disposed of together, former military site with unexploded ordnance?	
Potential Threat of Direct Contact With Hazardous Substances	
Copper concentrations in tailings are >ERM standards Copper exceedance in surface water; Arsenic detected, may not exceed new EPA guidelines - Tailings are not capped - susceptible to migration - impractical to fence; fencing needed around mills, be i.e., unrestricted public access to exposed hazardous substances, runoff carries hazardous substances to surface water bodies, hazardous proper substances have migrated onto residential properties, population or workers exposed or injured (date, #)?	
If fencing needed, estimate dimension required: 150 x 200 x 2	
Potential Threat of a Continuous Release of Hazardous Substances	
- water discharging from main w/dt contains copper; constant trickle present mixing w/ unnamed stream & discharging into Kasoon Bay - tailings migration from tail flux: some copper time released into environment (TCUP tests) i.e., sources are poorly contained possibly threatening groundwater, surface impoundments with inadequate diking near a surface water body, contamination of sewers or storm drains, lack of cover to prevent air release?	

Potential Threat of Drinking Water Contamination

Not established supply in area; transient visitors may drink from unnamed stream discharging from main unit

i.e., threatened water intakes, suspected release to groundwater where private residences rely on shallow groundwater for drinking, underground storage tanks near public supply wells, private well users have reported foul-smelling and or tasting water?

Removal Considerations

- remove/ remediate TPH soil near fuel tanks adjacent to mill site
- bioremediate TPH stained soil near mill; remove fuel tanks from within mill site
- cap tailings in intertidal zone; armor unnamed stream & lake Ellen Creek along banks adjacent to tailings

i.e., containerize leaking drums, fences, security, capping, stabilizing waste, physical removal, pumping lagoons, air monitoring, field screening, and preliminary sampling.

PART IV - SAMPLES/FIELD SCREENING INFORMATION

Field Screening

- OVA
- HNu
- XRF
- AIM
- Hazcat
- Monitox
- Air Monitoring
- Field Test Kit
- Draeger Tube (type & tube id#)
- Other

Specify

pH, conductiv., temp

Summary of Field Screening Results

pH: 6.6 - 8.3
 MS: 20 - 1500 μ S
 TOC: 60 - 190C

Samples Collected: Water - soil - character (tailings) - tissue & sediment

Sample Type	Number of Samples Taken	Samples Sent To	Estimated Date Results Available
Groundwater			
Surface Water	3	Montgomery Labs	currently available
Waste			
Air			
Runoff			
Spill			
Soil/sediment	76	604 Chemex Analytical Inc; Battelle Marine Labs	currently available
Vegetation			
Other (tissue)	15	Battelle	currently available

PART V - A. CERCLA ELIGIBILITY

Did the facility cease operations prior to November 19, 1980? If yes, stop, site is CERCLA eligible. If no, proceed to Part B.

Yes

B. RCRA ELIGIBILITY Ref. #(s):

Did the facility file a RCRA Part A application? If yes: **NO**

1. Does the facility currently have interim status?
2. Did the facility withdraw its Part A application?
3. Is the facility a known or possible protective filer?
4. Type of facility: Generator Transporter Recycler Treatment/Storage/Disposal (TSD)

Does the facility have a RCRA operating or post closure permit?

Is the facility a late (after 11/19/90) of non-filer that has been identified by the EPA of State?

If all answers to questions in Part B are NO, stop, the facility is CERCLA eligible. If answers to 2 or 3 are YES, stop, the facility is CERCLA eligible. If answers to 2 and 3 and NO, and any other answer is YES, site is RCRA, continue to Part C.

C. RCRA SITES ELIGIBLE FOR NPL Ref. #(s):

Has the facility owner filed for bankruptcy under federal or state laws? **NO**

Has the facility lost RCRA authorization to operate or shows probable unwillingness to carry out corrective action?

Is the facility a TSD that converted to a generator, transporter or recycler after November 19, 1980?

D. EXEMPTED SUBSTANCES Ref. #(s):

Does the release involve hazardous substances other than petroleum including crude oil or any fraction thereof? If yes, site is CERCLA eligible. **YES**

PART VI - SITE ASSESSMENT RECONNAISSANCE

a. General Site Characteristics Ref. #(s):

Predominant Land Uses Within 1 Mile

<input type="checkbox"/> Industrial	<input type="checkbox"/> Agriculture	<input type="checkbox"/> DOI
<input type="checkbox"/> Commercial	<input type="checkbox"/> Mining	<input type="checkbox"/> Other Federal Facility
<input type="checkbox"/> Residential	<input type="checkbox"/> DOD	
<input checked="" type="checkbox"/> Forest/Fields	<input type="checkbox"/> DOE	<input type="checkbox"/> Other

<p>Types of Site Operations (check all that apply)</p> <p><input type="checkbox"/> Manufacturing (must check subcategory)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lumber and Wood Products <input type="checkbox"/> Inorganic Chemicals <input type="checkbox"/> Plastic and/or Rubber Products <input type="checkbox"/> Paints, Varnishes <input type="checkbox"/> Industrial Organic Chemicals <input type="checkbox"/> Agricultural Chemicals (e.g., pesticides, fertilizers) <input type="checkbox"/> Miscellaneous Chemicals Products (e.g., adhesives, explosives, ink) <input type="checkbox"/> Primary Metals <input type="checkbox"/> Metal Coating, Plating, Engraving <input type="checkbox"/> Metal Forging, Stamping <input type="checkbox"/> Fabricated Structural Metal Products <input type="checkbox"/> Electronic Equipment <input type="checkbox"/> Other Manufacturing <input checked="" type="checkbox"/> Mining <i>historic; currently staked for exploration only</i> <input checked="" type="checkbox"/> Metals <input type="checkbox"/> Coal <input type="checkbox"/> Oil and Gas <input type="checkbox"/> Non-Metallic Minerals 	<ul style="list-style-type: none"> <input type="checkbox"/> Retail <input type="checkbox"/> Recycling <input type="checkbox"/> Junk/Salvage Yard <input type="checkbox"/> Municipal Landfill <input type="checkbox"/> Other Landfill <input type="checkbox"/> DOD <input type="checkbox"/> DOE <input type="checkbox"/> DOI <input type="checkbox"/> Other Federal Facility <input type="checkbox"/> RCRA <input type="checkbox"/> Treatment, Storage, or Disposal <input type="checkbox"/> Large Quantity Generator <input type="checkbox"/> Small Quantity Generator <input type="checkbox"/> Subtitle D <input type="checkbox"/> Municipal <input type="checkbox"/> Industrial <input type="checkbox"/> Converter <input type="checkbox"/> Protective Filer <input type="checkbox"/> Non- or Late-filer <input type="checkbox"/> Not Specified <input type="checkbox"/> Other (specify)
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c) Operational history, background, processes, and waste disposal.

discovered 1905 - hand-sorted ore produced until 1915
 mill constructed in 1917; expanded to 300 tons/day by 1923; mill shut down in 1926
 mine reopened in 1934 - company refracted tailings; mill previously broken ore left in
 stacks; operations ceased by 1941

b. Source Characterization

Indicate type(s) and quantity of sources on-site. Complete and attach a source characterization form (SCF) for each source and summarize the SCF on the following table (photodocument source and mark appropriate location on site sketch).

- | | | | |
|---|--|---|---|
| <p>1. Physical States (Enter all that apply by number in Column B)</p> <ul style="list-style-type: none"> 1. Solid 2. Powder, fines 3. Sludge 4. Slurry 5. Liquid 6. Gas 7. Other (specify) | <p>2. Waste Characteristics (Enter all that apply by number in Column C)</p> <ul style="list-style-type: none"> 1. Toxic 2. Corrosive 4. Persistent 5. Soluble 6. Infectious 7. Flammable | <p>3. Treatment, if known (Enter all that apply by number in Column D)</p> <ul style="list-style-type: none"> 8. Ignitable 9. Highly Volatile 10. Explosive 11. Reactive 12. Incompatible 13. Not applicable | <p>3. Treatment, if known (Enter all that apply by number in Column D)</p> <ul style="list-style-type: none"> 1. Incineration 2. Underground Injection 3. Chemical/Physical 4. Biological 5. Waste Oil Processing 6. Solvent Recovery 7. Other Recycling Recovery 8. Other: <i>removal</i> |
|---|--|---|---|

A	B	C	D	E	F	G
Source Type	Enter #(s) from Box 1	Enter #(s) from Box 2	Enter #(s) from Box 3	Active/Inactive	Estimated Quantity, Area, or Volume (include units of measure)	Description or Use Comments
Landfill						
Drums	3	1,4,7		inactive	localized - indiv. drums	remove from site
Surface impoundments						
Soil	7	4	4	inactive	small area: 50x20	bioremediate
Tanks/non-drum containers	1,3	1,4,7,8	7,8,5	inactive	win mill structure	remove & recycle
Land treatment/landfarm						
Piles	1,2	1,4,5	8	active, migration	700x700 + 100x30	cap & stabilize
Fire/burn pits						
Other/additional						

Overall containment of wastes (check one)

- Adequate (Secure)
 Moderate
 Inadequate (Poor)
 Insecure (Unsound, Dangerous)

Estimate the percentage of the site's surface that is

- Exposed soil, 20%
 Covered by buildings, 5%
 Covered by pavement,
 Covered by vegetation, 70-75%
 Covered by water, 20% (tribal stream)
 Waste rock piles 1-2%

List the presence (or absence) and type of plants observed on-site. If known, estimate percentages of different vegetative types (i.e., tree canopy, shrubs, grass, ground cover, or weeds).

typical SE Alaskan flora: forests are thinning; brush is minimal

Describe any evidence or observation of animal species while on site.

fish seen in lake Ellen Creek, sculpins/frogs in unnamed stream
 deer tracks common; bear scat present

Describe any known or observed recreational uses or human presences on the site (e.g., fishing, biking, footprints, tire tracks, or vandalism) and photodocument.

- rock climbers rappel in glory hole; visitors seen on site during these examinations
 - contemporary garbage onsite; decent trail from road to beach

General Types of Waste (check all that apply)

- Metals
- Organics
- Inorganics
- Solvents
- Paints/Pigments
- Laboratory/Hospital Waste
- Radioactive Waste
- Construction/Demolition Waste
- Pesticides/Herbicides
- Acids/Bases
- Oily Waste
- Municipal Waste
- Mining Waste
- Explosives
- Other _____

Specify substances below, if known (active facilities provide manifests, analytical data available)

HAZARDOUS SUBSTANCES

Category	Substance Name	Storage/Disposal Method	Maximum Concentration (include units of measure)
falling/mining waste	Copper	uncondensed	up to 3880 ppm Copper
Oily waste	TPH	uncondensed	samples analyzed to 1623% TPH

PART VII - SITE SKETCH (attached; include north arrow, topography, distances, buildings, drainages, sources, stained soils, and fences)

see figures 2-4

PART VIII - PHOTODOCUMENTATION (labeled photos attached; include panoramas, targets, sources, recreation, stressed vegetation, and sampling locations)

see slide log

PART IX - TARGETS

a. Groundwater Pathway Ref. #(s): NA	Target Distance Limit (TDL) = 4 miles
During the site visit, did you field verify all ground water targets within a 0.5 mile? Yes	Distance to nearest drinking water well NA
Is groundwater used for drinking water within 4 miles? No	Depth to shallowest aquifer on site? NA

Karst terrain present? <i>NO</i>		Nearest designated wellhead protection area <input type="checkbox"/> Underlies site <input type="checkbox"/> > 4 miles <input checked="" type="checkbox"/> None within 4 miles	
Is there a high likelihood of release to groundwater? <i>NO</i>			
Have likely contaminated drinking water wells been identified? If yes, enter potentially affected population. <i>NO</i>			
Population served by drinking water wells within the designated target distances. Note if the water supplies within that target distance radius are Private (P), Community (C or Both (B)). <i>NA</i>			
Distance (miles)	Population	Type of Supply (P, C or B)	
On-site			
0 to 0.25			
0.25 to 0.5			
0.5 to 1			
1 to 2			
2 to 3			
3 to 4			
Description of wells (including usage, blending of water system, depth, age and location). <i>NA</i>			
Is groundwater from any target well within the TDL, for the aquifer evaluated or overlying aquifers, used for the following resources: Irrigation (5 acre minimum) of commercial food crops or forage crops, watering of commercial livestock, ingredient in commercial food preparation, supply for commercial aquaculture, supply for a major or designated water recreation area? <i>NA</i>			
b. Surface Water Pathway Ref. #(s): <i>unnamed creek, Lake Ellen Creek</i>		TDL = <i>15 miles</i>	
Did you verify all surface water targets within 1 stream mile during the site visit? <i>YES</i>		Shortest overland distance from any source to surface water for each watershed: <i>50 ft</i>	
Is there a likelihood of a release to surface water? If yes, explain (e.g., water color, fish kills, stressed vegetation) <i>YES; water samples show copper, arsenic + exceedance</i> <i>NO sign of fish kill or stressed veg</i>		Site is located in <input checked="" type="checkbox"/> No floodplain <input type="checkbox"/> Annual - 10 yr floodplain <input type="checkbox"/> >10 yr - 100 yr floodplain <input type="checkbox"/> >100 yr - 500 yr floodplain <input type="checkbox"/> >500 yr floodplain	Did you observe any fishing or evidence of fishing in surface water bodies on or near the site? If yes, photodocument, specify the name of the water body and its distance from the site. <i>fish jumping in Lake Ellen Creek</i>
Annual Precipitation <i>111 inches</i>	Two Year, 24-Hour Rainfall <i>4.59 inches</i>	Type of surface water draining site and 15 miles downstream (check all that apply) <input checked="" type="checkbox"/> Stream <input type="checkbox"/> River <input type="checkbox"/> Pond <input type="checkbox"/> Lake <input checked="" type="checkbox"/> Bay <input checked="" type="checkbox"/> Ocean <input type="checkbox"/> Other	

Identify the surface water bodies and flow rates (cubic feet per second, cfs) along a 15 stream mile pathway for each watershed. Identify the uses of each surface water body as:

- DW = Drinking water
- F = Fishery
- FP = Ingredient in commercial food preparation
- I = Irrigation of commercial food crops or commercial forage crops
- L = Watering of commercial livestock
- N = None of the above, specify
- R = Major or designated recreation area

Surface Water Body	Begin to End Distance	Stream Flow in cfs	Use(s)
unnamed creek	> 1 mile	from 1-10 cfs	F, R (implied)
Lake Ellen Creek	0.5 miles	15-20 cfs	F, R (implied)

Any drinking water intakes located along 15 mile TDL? **NO**
 If Yes, identify the population served by surface water intakes along the 15 stream mile pathway in the table below.

Probable Point of Entry (PPE) located and noted on site sketch? (PPE is the point where runoff from the site most likely enters surface water)

Surface Water Body	Distance to Intake from PPE	Population Served
NO		

If drinking water system blended? If possible, make a note of percentages of contribution to system per intake (list all fisheries).

Water Body/Fishery Name	Flow (cfs)	On-Site or Distance from PPE	Pounds Fish/Year
Lake Ellen Creek	15-20 cfs	0.5 miles	not documented

Estimated pounds of fish and shellfish collected from each fishery and enter the correct range in the above table.

- 0 lbs 10,000 to 100,000
- > 0 to 100 100,000 to 1,000,000
- 100 to 1,000 > 1,000,000 Specify _____
- 1,000 to 10,000

fish observed on flood tide near mouth of Lake Ellen Creek

Wetlands (as defined in 40 CFR Section 230.3) located along the surface water migration path? If yes list wetlands.

Water Body	Flow (cfs)	Frontage Miles
unnamed creek	1-10 cfs	0.5 miles
Lake Ellen Creek	15-20 cfs	0.2 miles
Kasson Bay	tidal currents	0.75 miles

Other sensitive environments (see 40 CFR) Part 300, Section 4.1, Table 4-23) located along the surface water migration path? If yes, list below.

Sensitive Environments Type	Water Body Type	Distance From PPE/On-Site?
spanning a for Lake Ellet Creek & Lake Ellet	Creek & Lake (upstream)	(0.5 miles)

Is surface water used for one or more of the following resources within the TDL: Irrigation of commercial food or forage crops (≥ 5 acres), watering commercial livestock, ingredient in commercial food preparation, supply for a major or designated water recreation area?

NO

c. Soil Exposure Pathway	Ref. #(s):	TDL =
During the site visit, were targets within 500 feet field verified?	Yes	Number of residents who reside within 200 feet of known or suspected contamination. 0
School or Daycare located within 200 feet of known or suspected contamination? If yes, enrollment.	NO	Number of workers on-site <input checked="" type="checkbox"/> None <input type="checkbox"/> 1 - 100 <input type="checkbox"/> 101 - 1,000 <input type="checkbox"/> > 1,000
Are one of the following present in an area of observed contamination at the site: commercial agriculture, silviculture, livestock production or livestock grazing?	NO	

Have terrestrial sensitive environments been identified on or within 200 feet of known or suspected contamination? If yes, list each terrestrial sensitive environment (see 40 CFR Part 300, Section 5.1, Table 5-5).

State land designated as unique habitat for and high recreational values

Air Pathway	Ref. #(s):	TDL = 4 miles
During the site visit, were air targets within 0.5 miles of field verified?	YES	Distance to nearest regularly occupied building or individual (worker/resident)?
Evidence of blowing dust during site visit?	NO	Enter Total Population on or within _____ On-site _____ 0 - 0.25 Mile _____ > 0.25 - 0.5 Mile _____ > 0.5 - 1 Mile _____ > 1 - 2 Miles _____ > 2 - 3 Miles _____ > 3 - 4 Miles <input checked="" type="radio"/> Total Within 4 Miles
Odors detected while on site?	Minor TPH	
Observed or suspected release to air? If observed, photodocument.	NO	
Predominant wind direction:	SE	
Are there schools within the 1 mile radius? If yes, Enrollment = # Employees =	NO	
Wetlands located within 4 miles of site?	YES	

<p>Estimate the total wetlands area (acres)</p> <p><input type="checkbox"/> <1</p> <p><input checked="" type="checkbox"/> 1 - 50</p> <p><input type="checkbox"/> 50 - 100</p> <p><input type="checkbox"/> 150 - 200</p> <p><input type="checkbox"/> 200 - 300</p> <p><input type="checkbox"/> 300 - 400</p> <p><input type="checkbox"/> 400 - 500</p> <p><input type="checkbox"/> >500 acres</p>	<p>List all sensitive environments within 0.5 mile of the site.</p> <p><i>Intertidal - Kasan Bay, creeks</i></p> <p><u>Sensitive Environment Type</u></p> <p><i>unnamed creek, Lake Elkhart</i></p> <p><i>intertidal zone</i></p> <p><i>Kasan Bay</i></p> <p><u>Distance</u></p> <p>On-Site</p> <p>0 - 0.25 Mile</p> <p>>0.25 - 0.5 Mile</p>	<p>Are one of the following resources present within a half mile of a source on-site: commercial agriculture, silviculture, a major or designated recreation area (including a park)?</p> <p><i>NO</i></p>
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PART X - SOURCES OF INFORMATION

Cite specific information references by number (i.e., state files, sample analysis, ROCs, and reports). At the beginning of each part of this checklist, there is a space to enter the numbers of each reference used in that part section.

SOURCE CHARACTERIZATION FORM

DRUMS

Number of drums: *~30*

On Pallets (Y/N) # *NO* Leaking (Y/N) # *N - any leaking has already occurred*

Stained Soil (Y/N) *Y* Empty/Full/Both # ea. *Empty* Explosion Hazard (Y/N) *N*

Condition of drums: *poor*

Containment (describe): *uncontained*

Maintenance (explain): *NO*

Labels (Y/N) (describe): *NO*

Accessibility (fenced): *easily accessible*

Residents, schools, daycare, or workers within 200 feet? (explain and indicate distances): *NO*

Comments:

- some of drums have thick gooey sludge adhering to inside
- these drums need to be removed from site

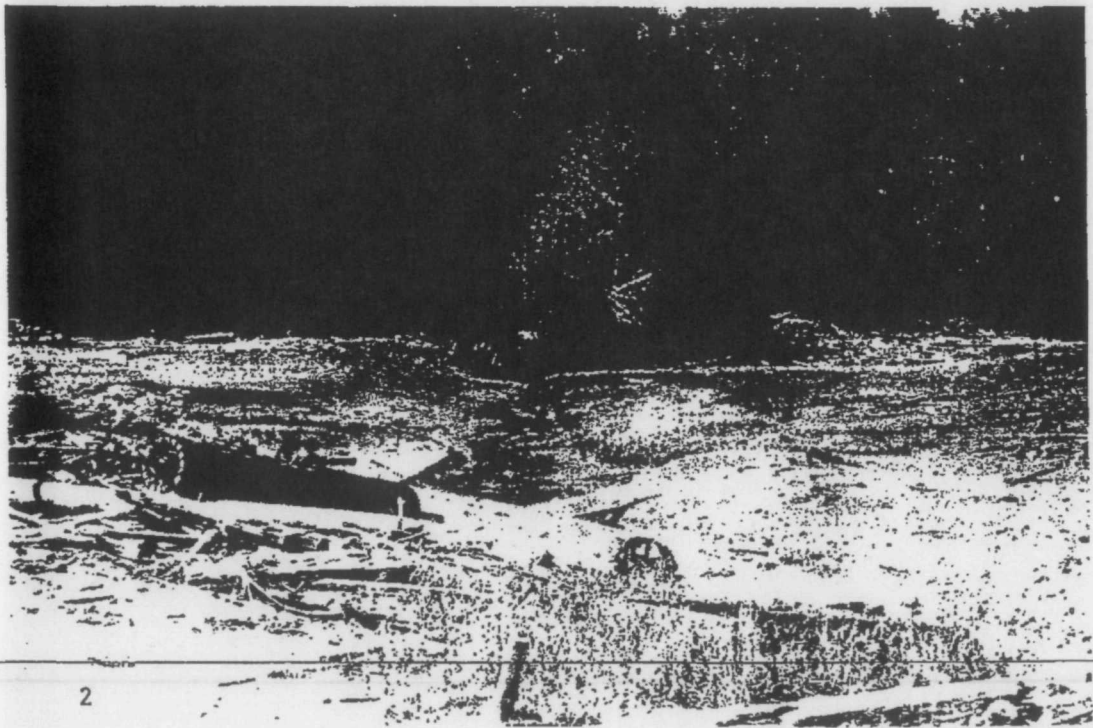
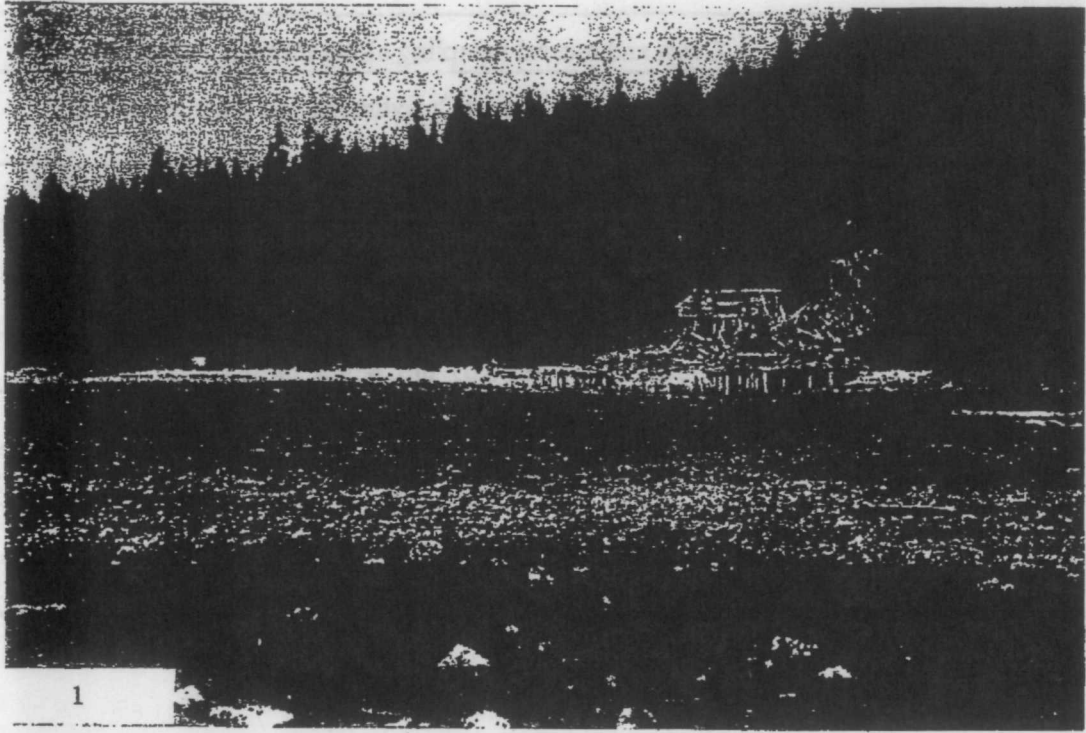
Photodocument and note locations on site sketch.

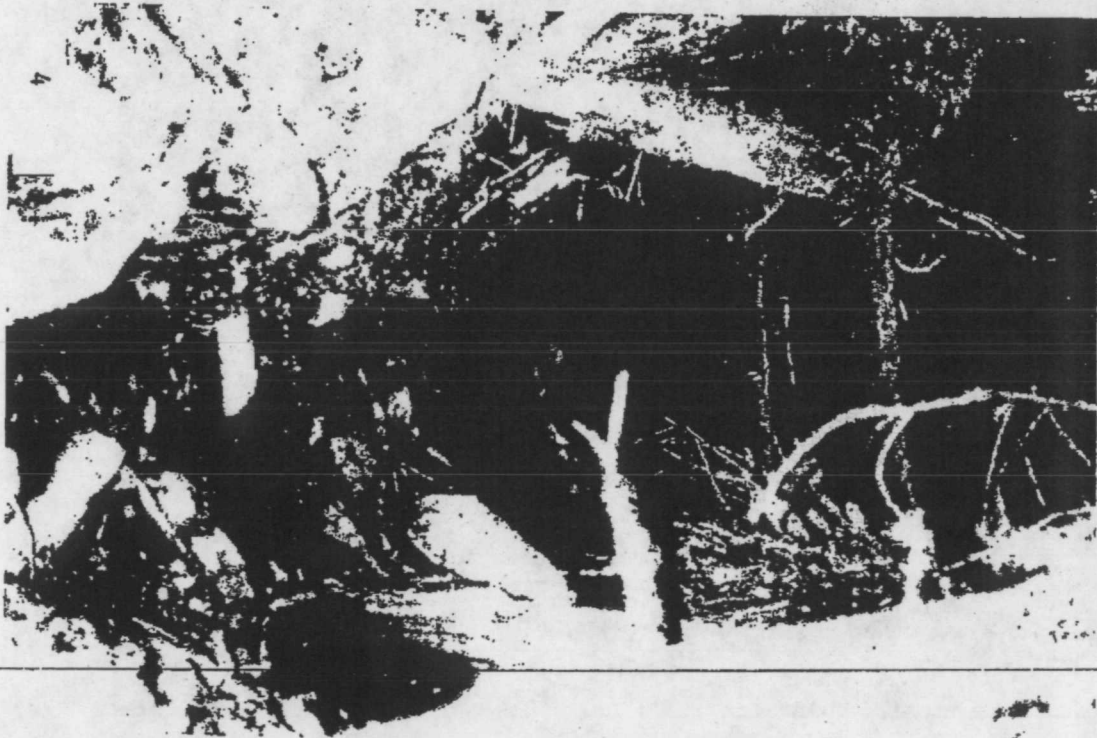
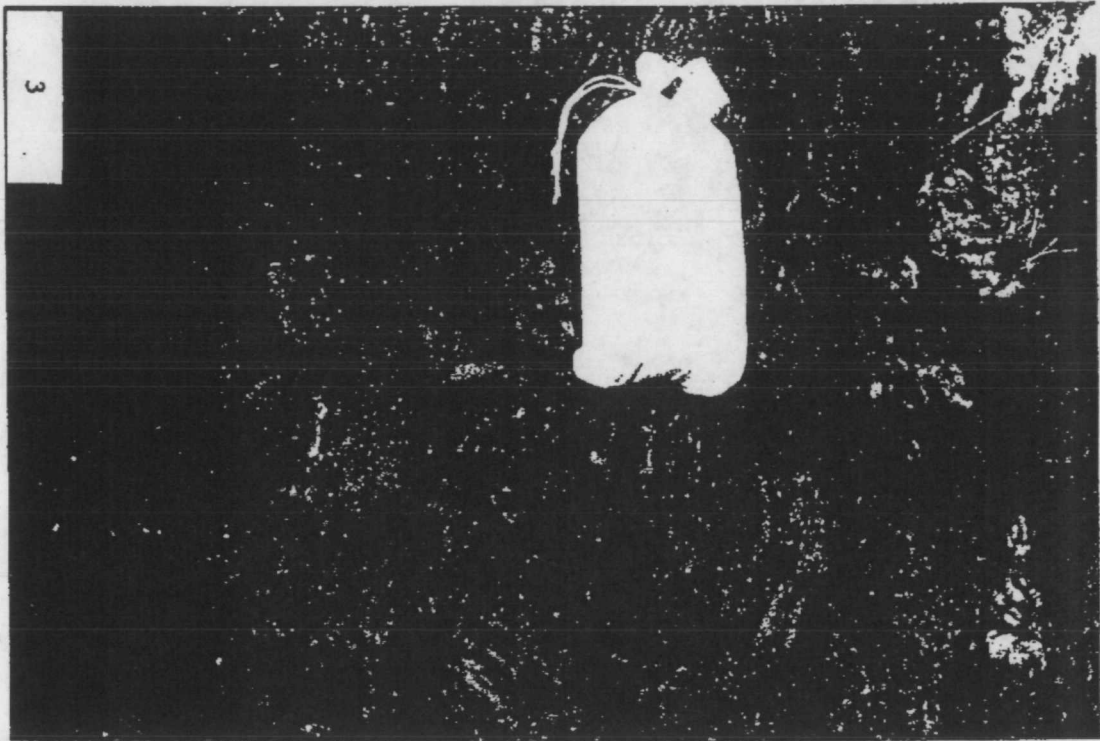
Appendix E

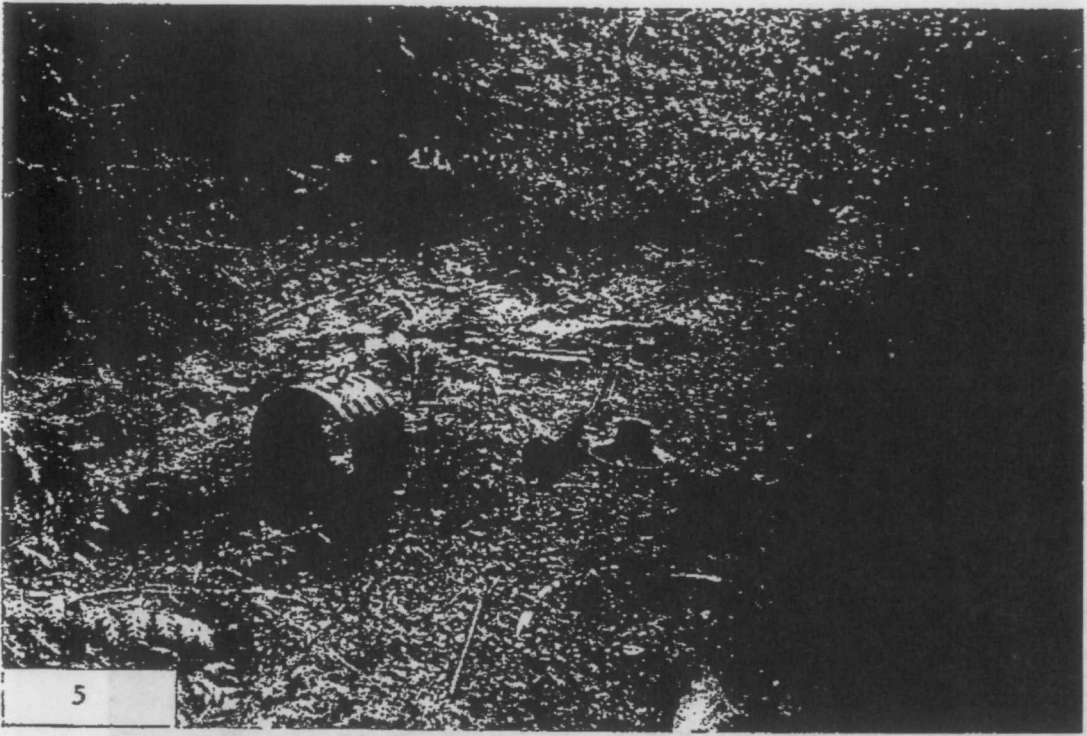
Appendix E. - Slides and Log.

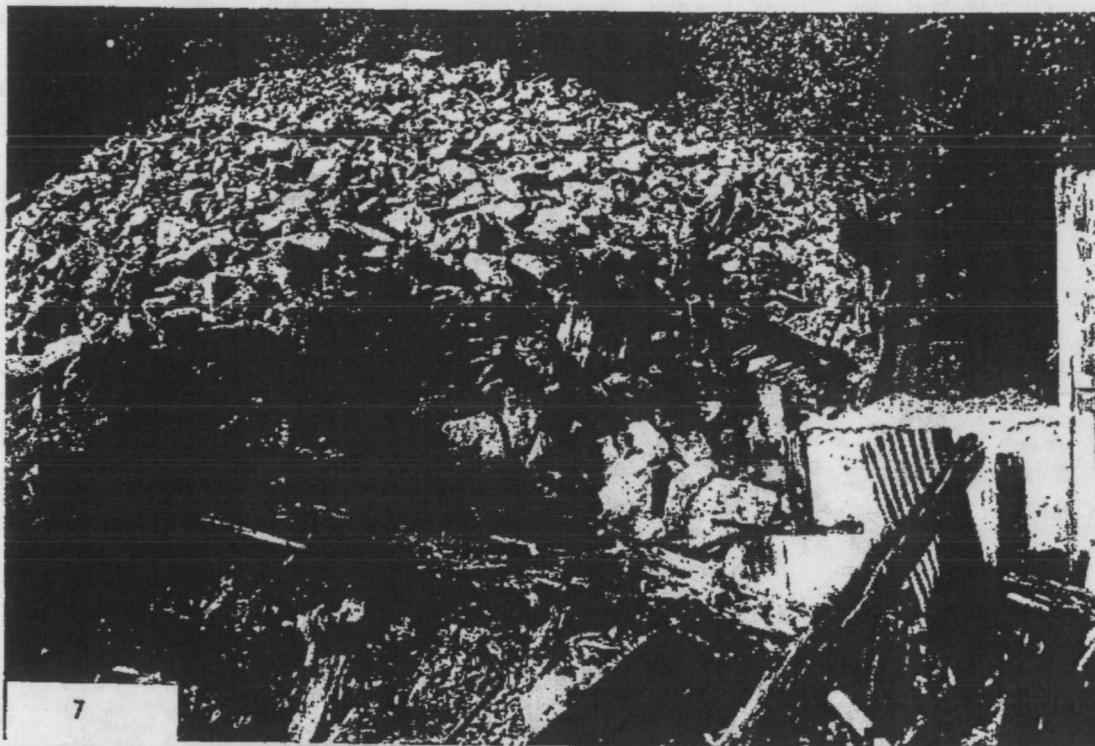
SITE NAME		Salt Chuck	
SITE DESIGNATOR		KT03	
PHOTOGRAPHER		K Maas	
PHOTO	DATE	VIEW	DESCRIPTION
1	7/20/95	350	View across creek at tailings and mill
2	7/20/95	270	Iron-stained creek and mill debris/tailings near station L; taken from top of barge
3	7/20/95		SC6 sample site; dark/black clay layers
4	9/15/95	350	View of portal of W1
5	9/15/95		View from D9 to rails, motor/generator, misc. parts, water pipe, cable
6	9/15/95	north	Looking at front of C1
7	9/15/95	335	View of gyratory crusher and waste rock dump
8	9/15/95	160	View of contemporary garbage, piled and strewn about south of C11
9	9/15/95	140	Looking at C11 platform and standing structure
10	9/15/95	north	Aerial view of Glory Hole
11	9/15/95	220	View into portal of W3
12	9/15/95	045	Mill site at beach
13	7/23/97		Closeup of soil sampled in zone A, near center line
14	7/23/97	095	View at sampling along transect 4
15	7/23/97		Typical hole along transect 4
16	7/23/97	125	Sample site SCM3 near tidal pool at end of transect 4
17	7/23/97	267	Transect line showing clam sorting, transect 5
18	7/23/97	267	Transect along sample line 3a-6
19	7/23/97	270	Sample site 3a-5, broken shells, dirt pile, pools
20	7/23/97		Iron stained soil in transect 3
21	7/23/97	245	Mixing composite sample SC48 from transect 3
22	7/24/97	295	Background location, transect A: seds, mussels, fuchus

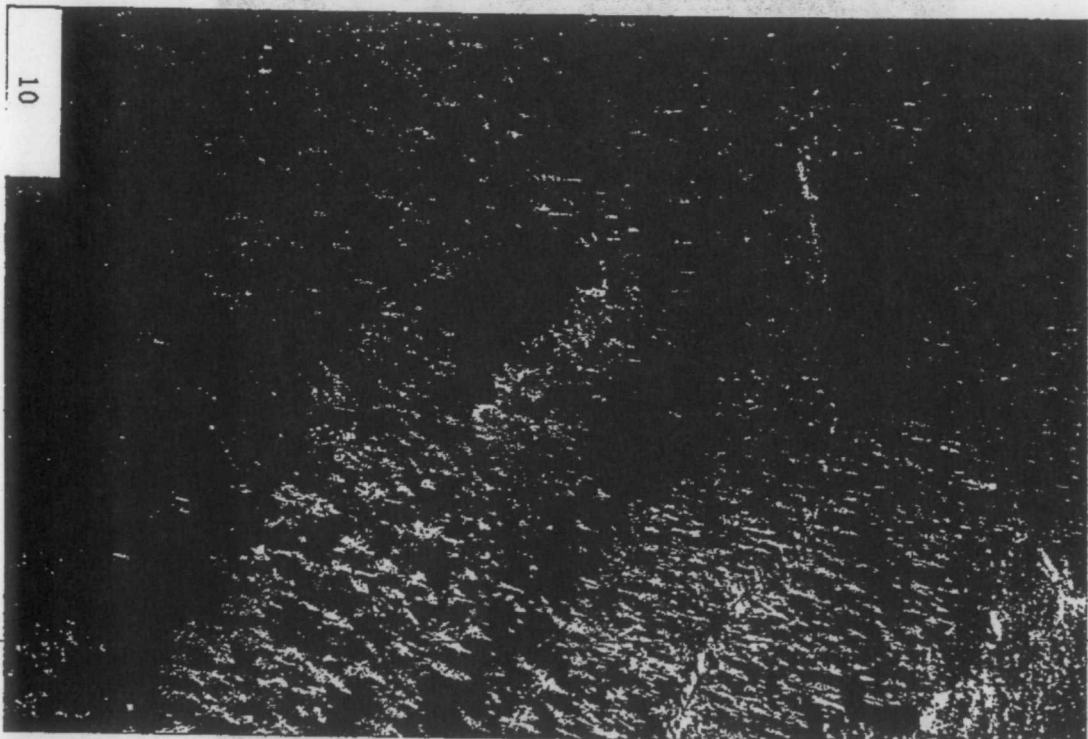
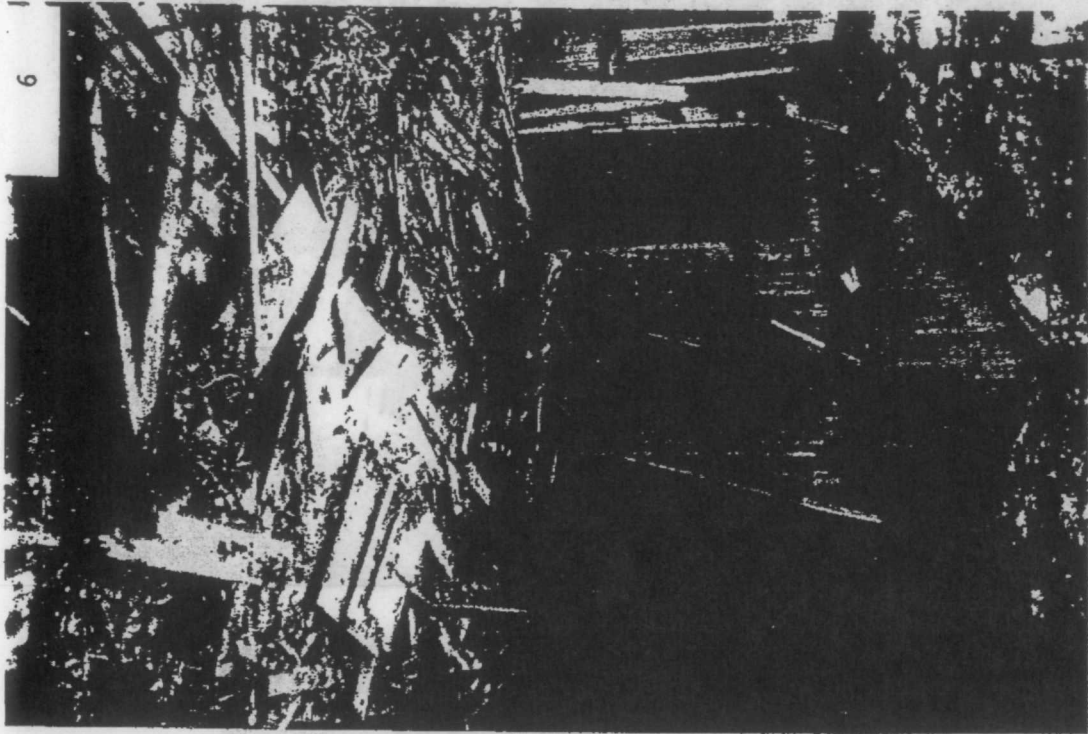
23	7/24/97	245	Clam and mussel sampling along transect A, background
24	7/24/97	290	Background, transect C; sediment and clam sampling; unvegetated beach
25	7/24/97	010	Eel grass at background sampling site
26	7/24/97	110	View of transect C at low-tide mark at background beach
27	7/25/97	220	View of barrels at G1 cache and sample site SO06
28	7/25/97	110	Sampling soil at SO07 site; below large tanks
29	7/25/97	250	Sample site SO08; below electric locomotive
30	7/25/97	230	Sample sites SC63 and SCM19
31	7/25/97	285	View upstream at sample site WA04
32	7/25/97	285	Sample site WA06/WA07 (duplicate)

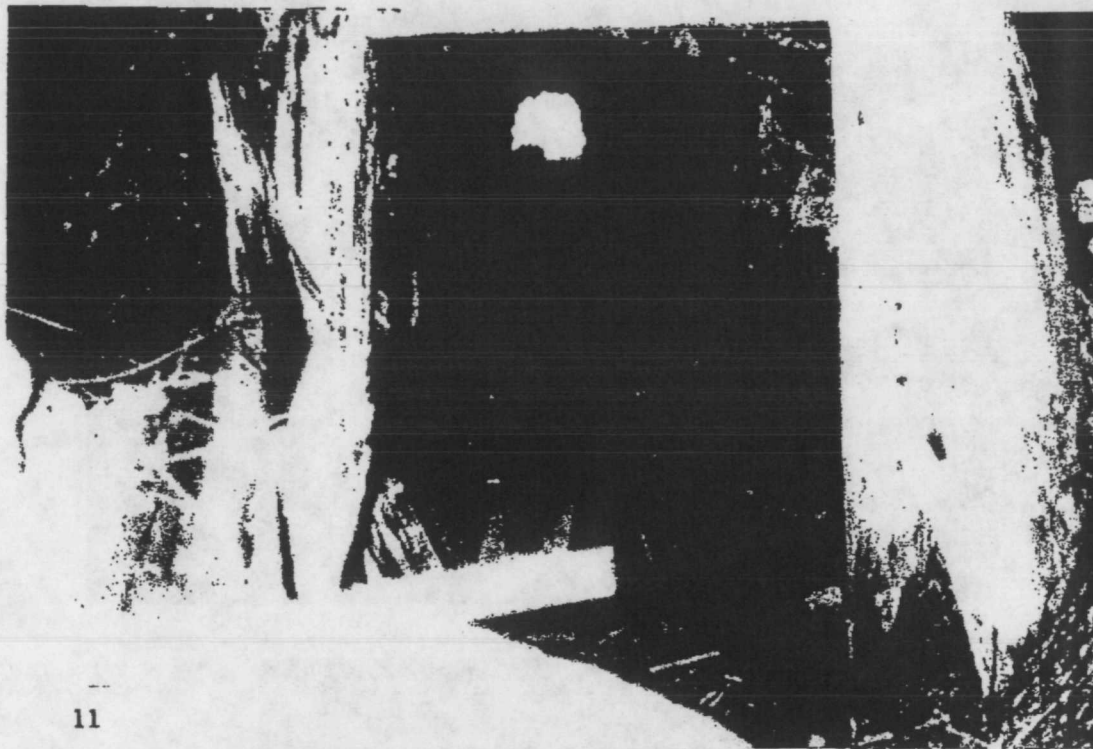




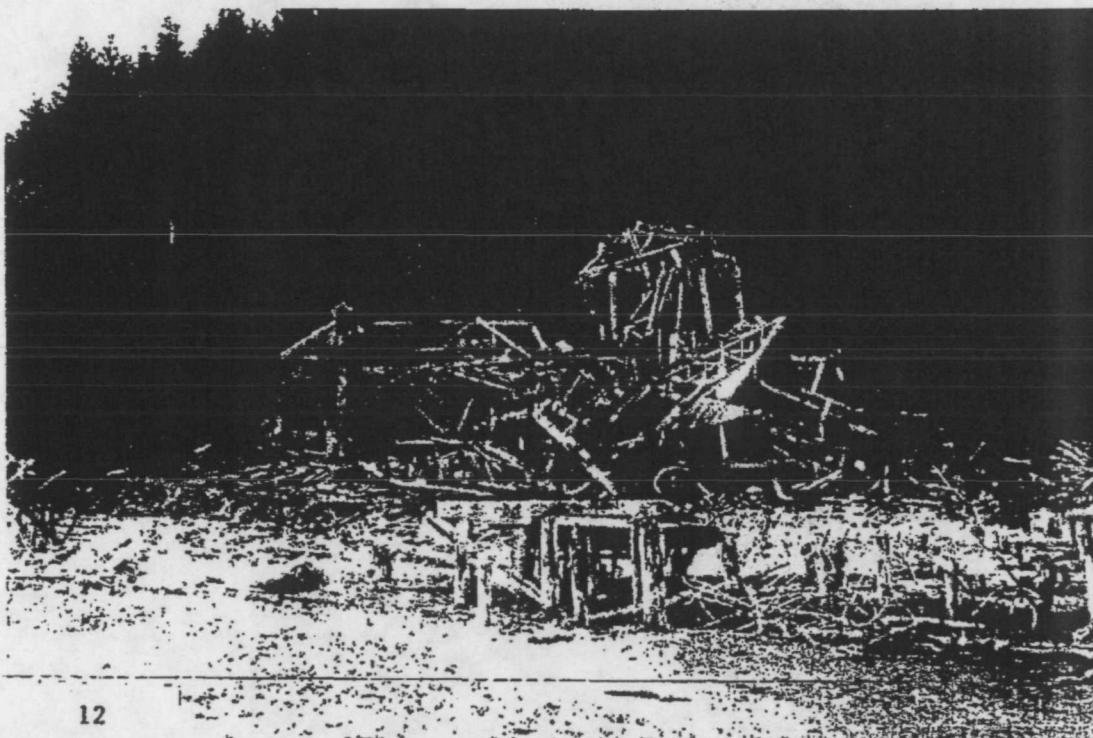




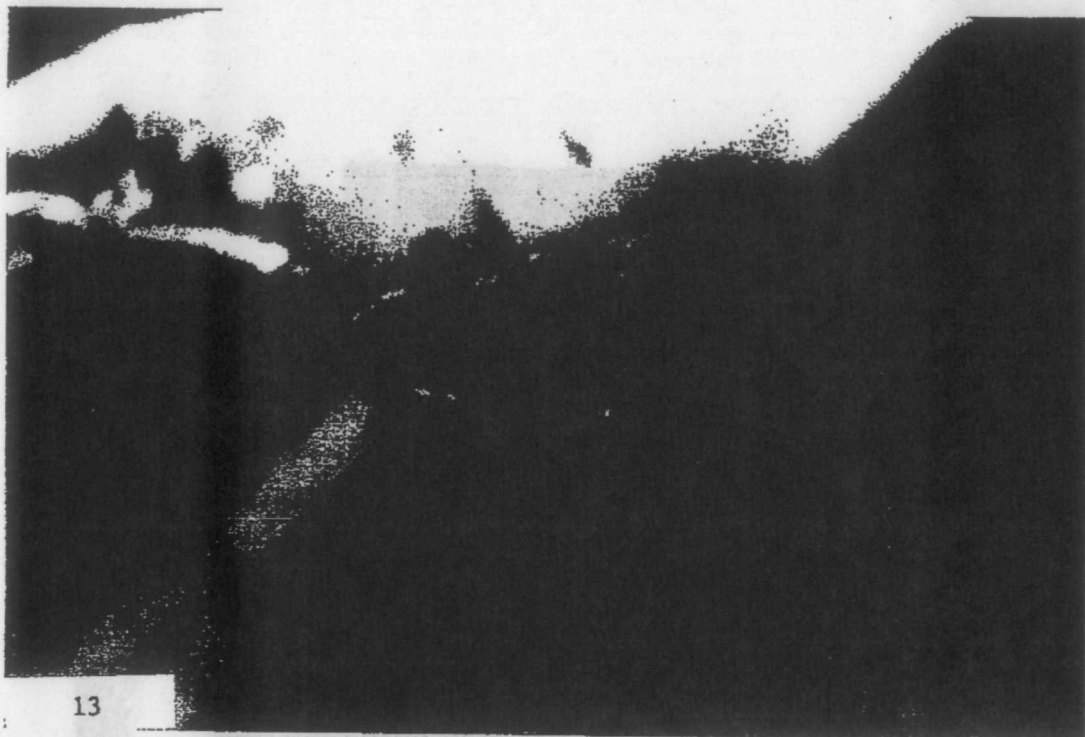




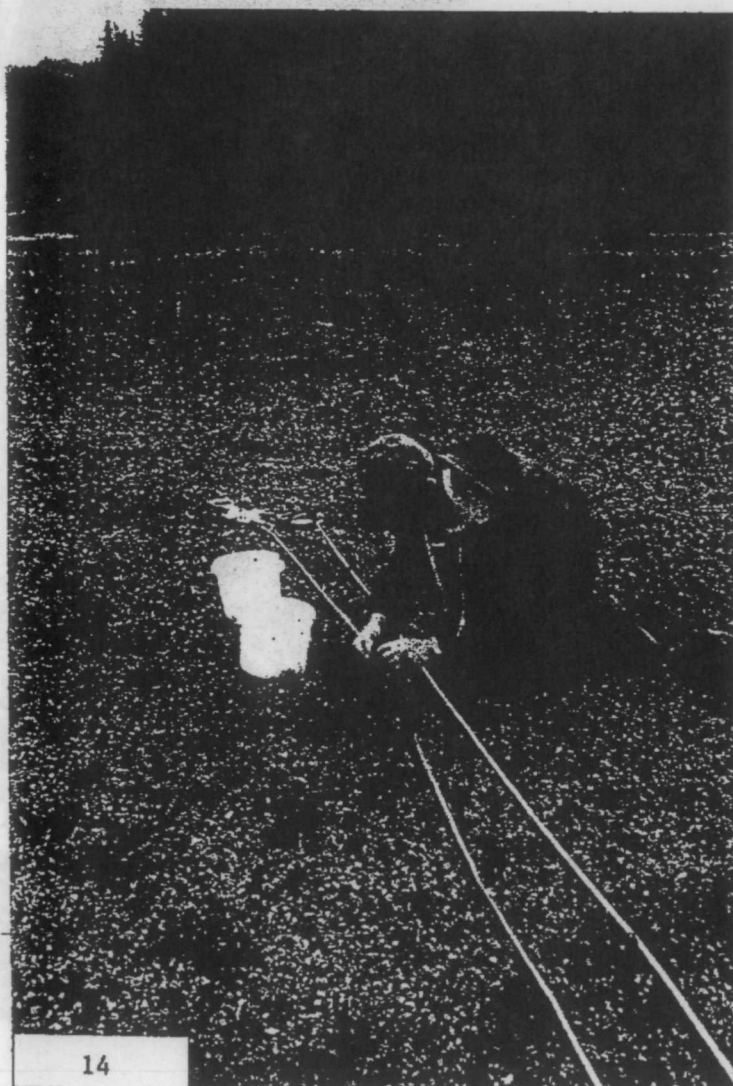
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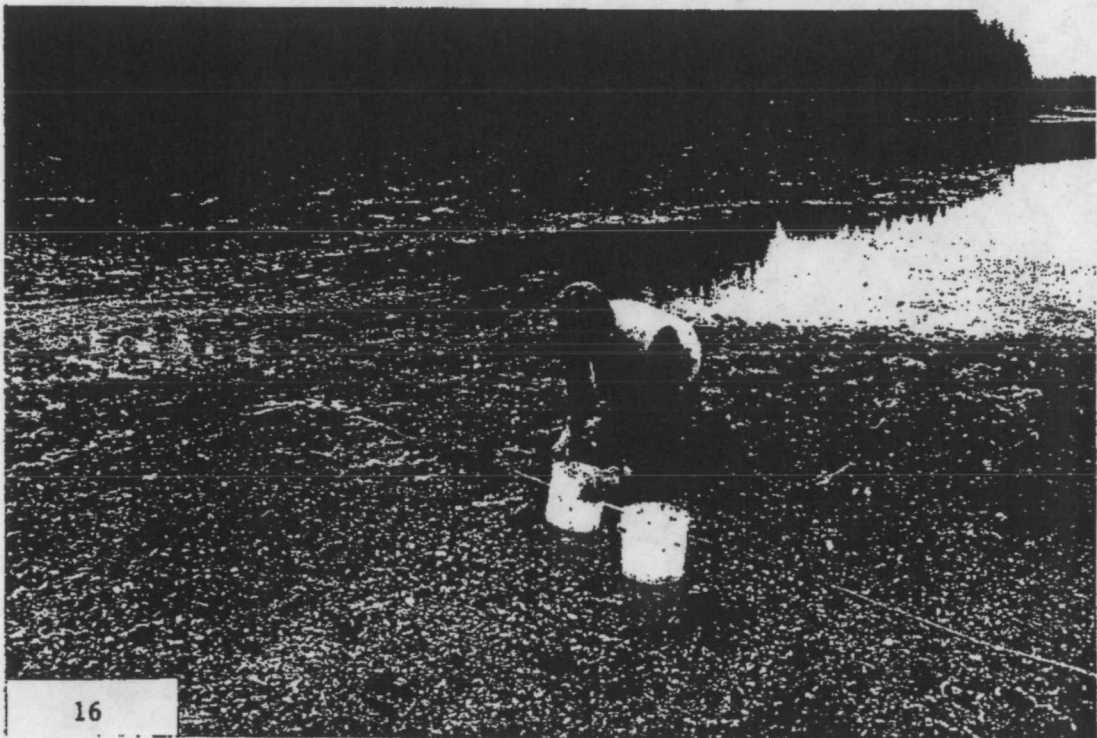
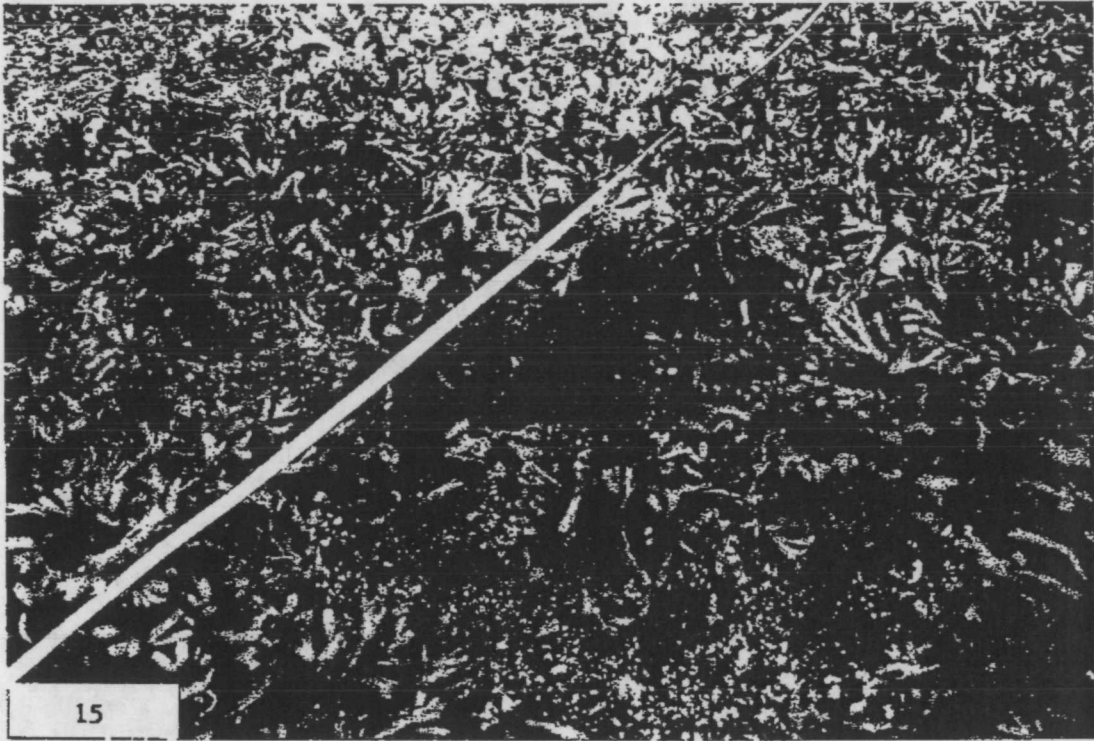
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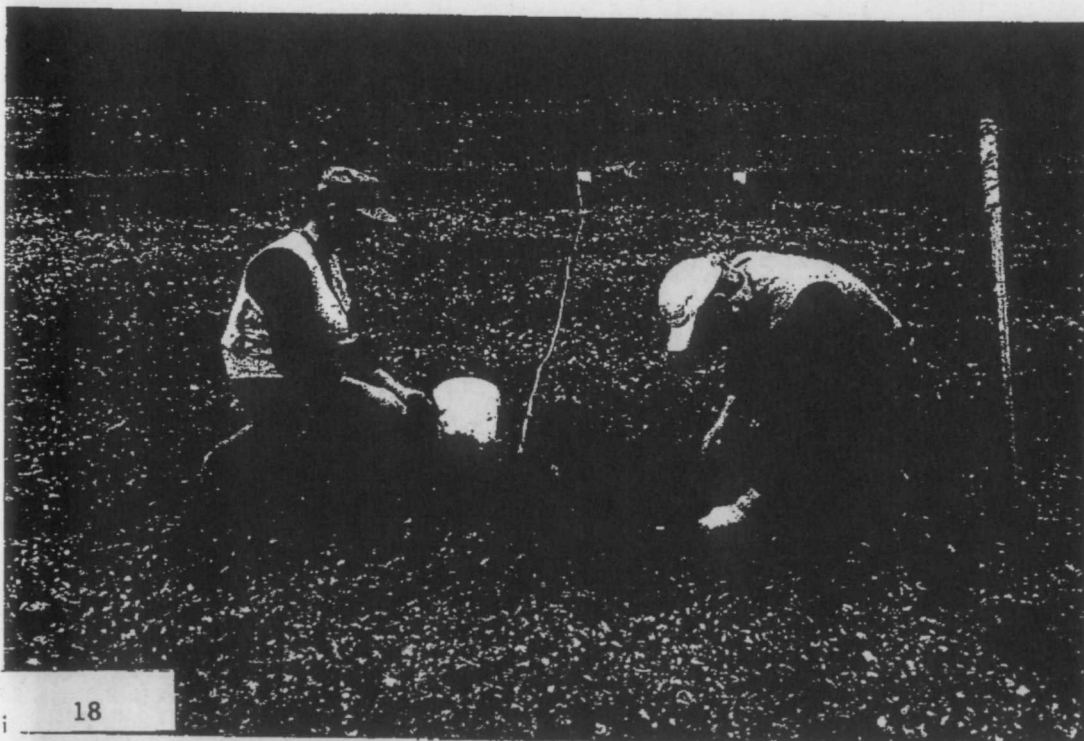
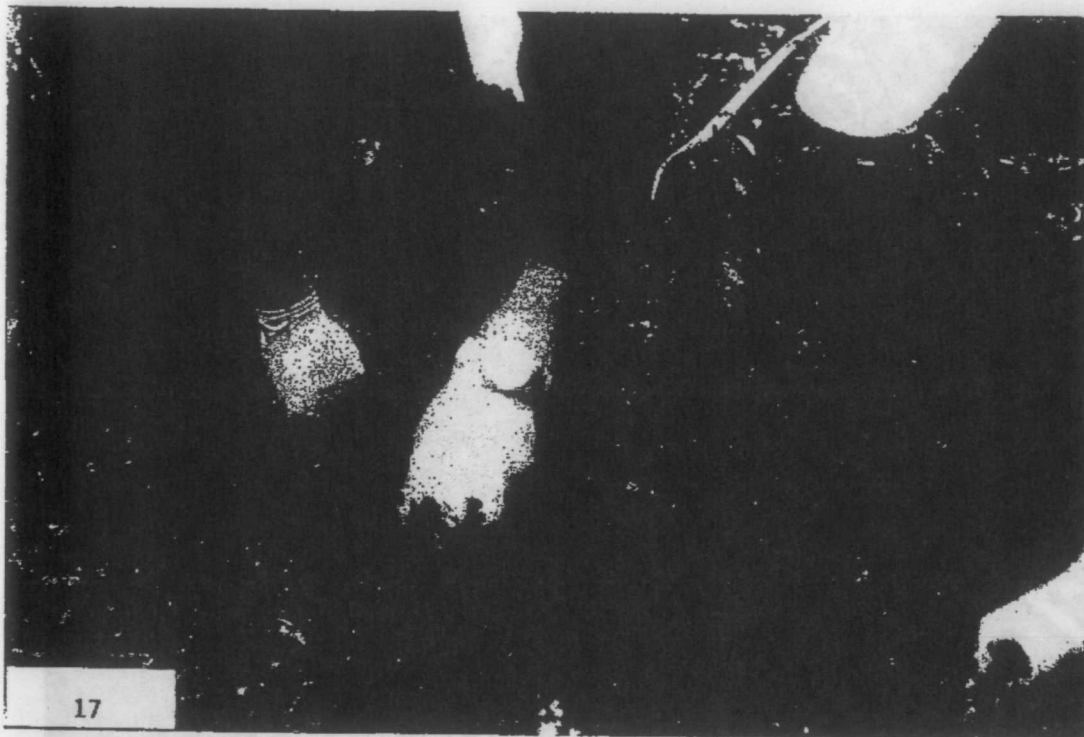


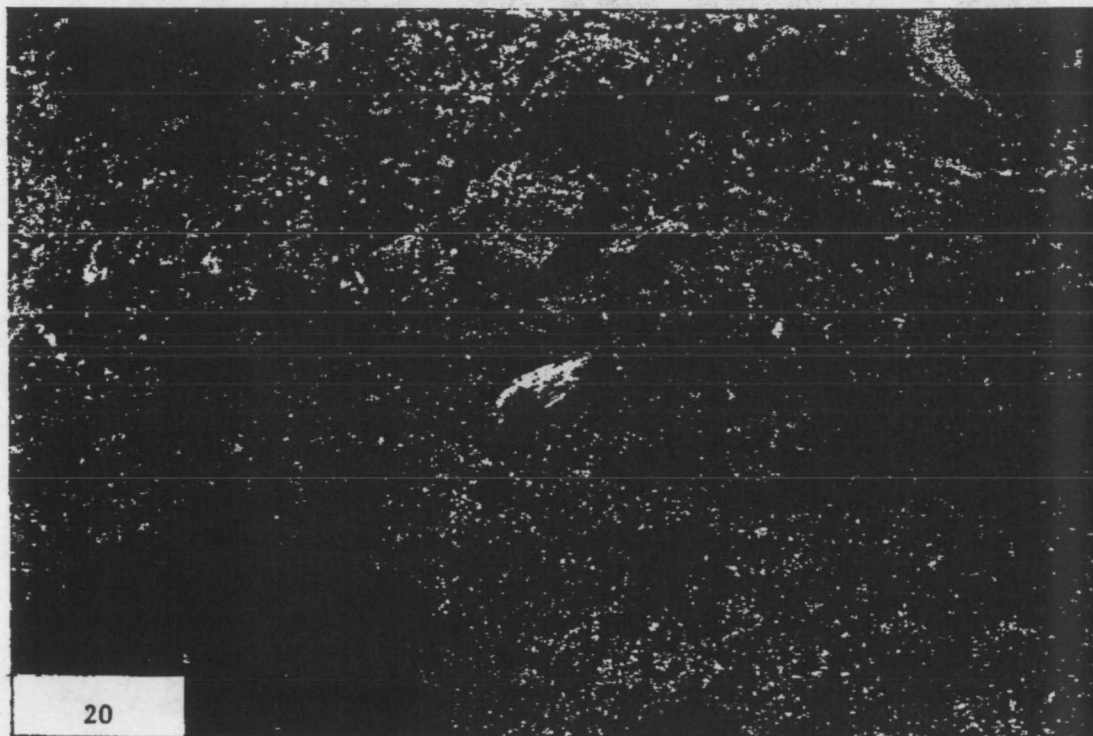
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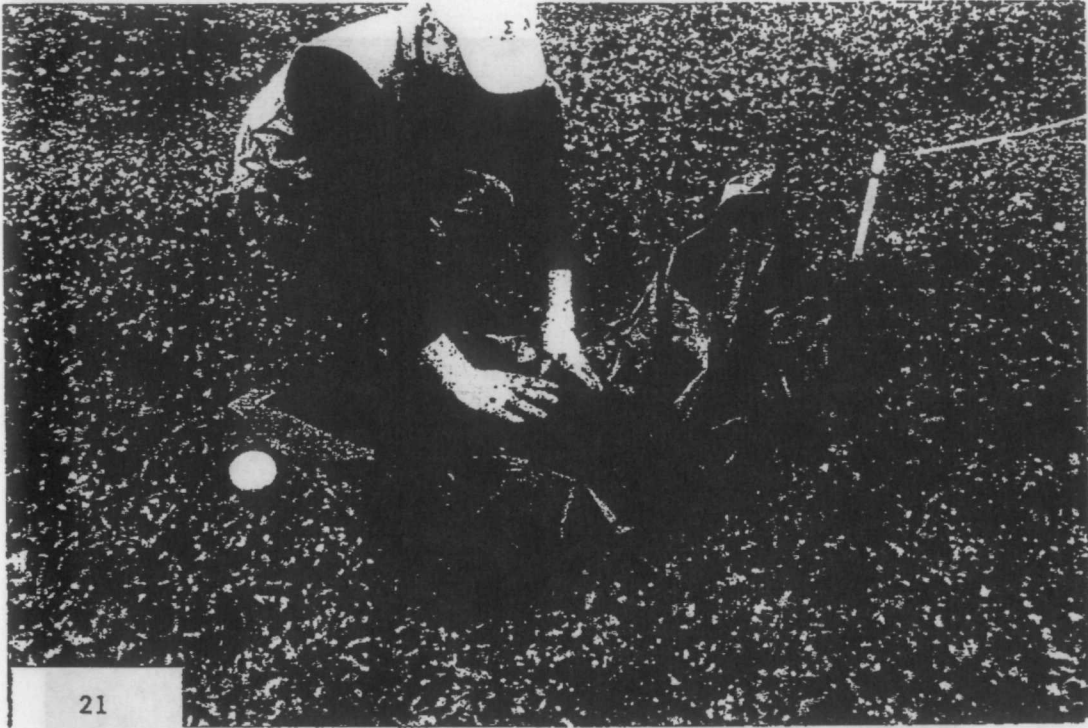


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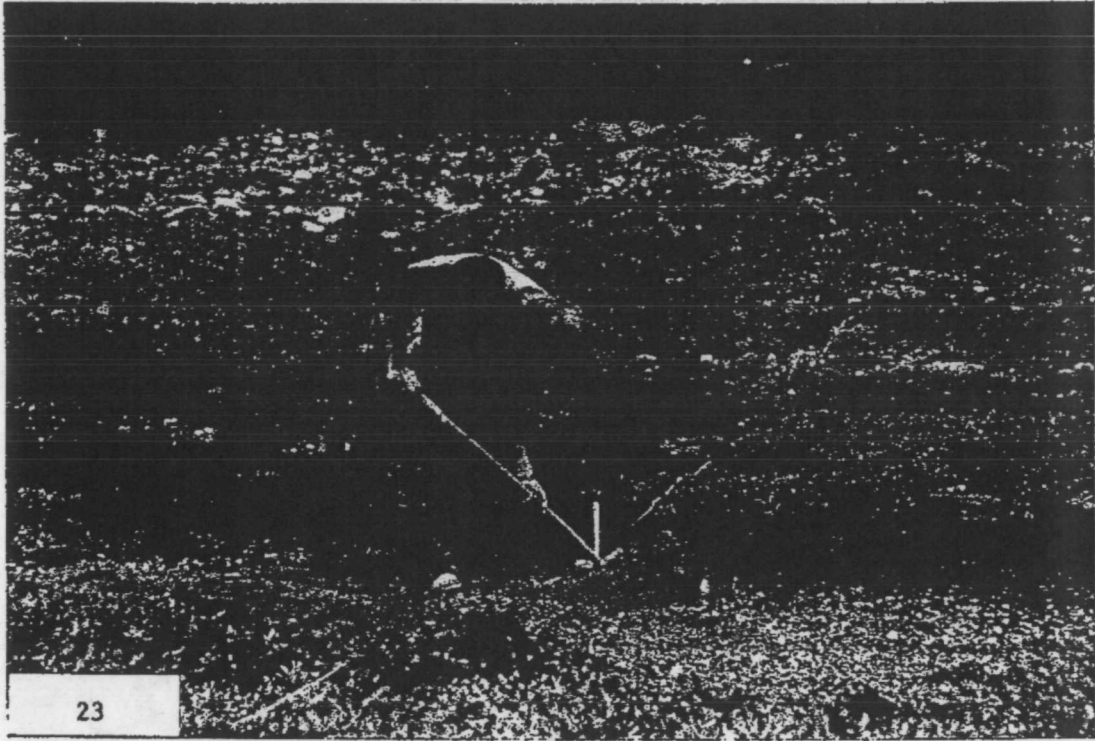


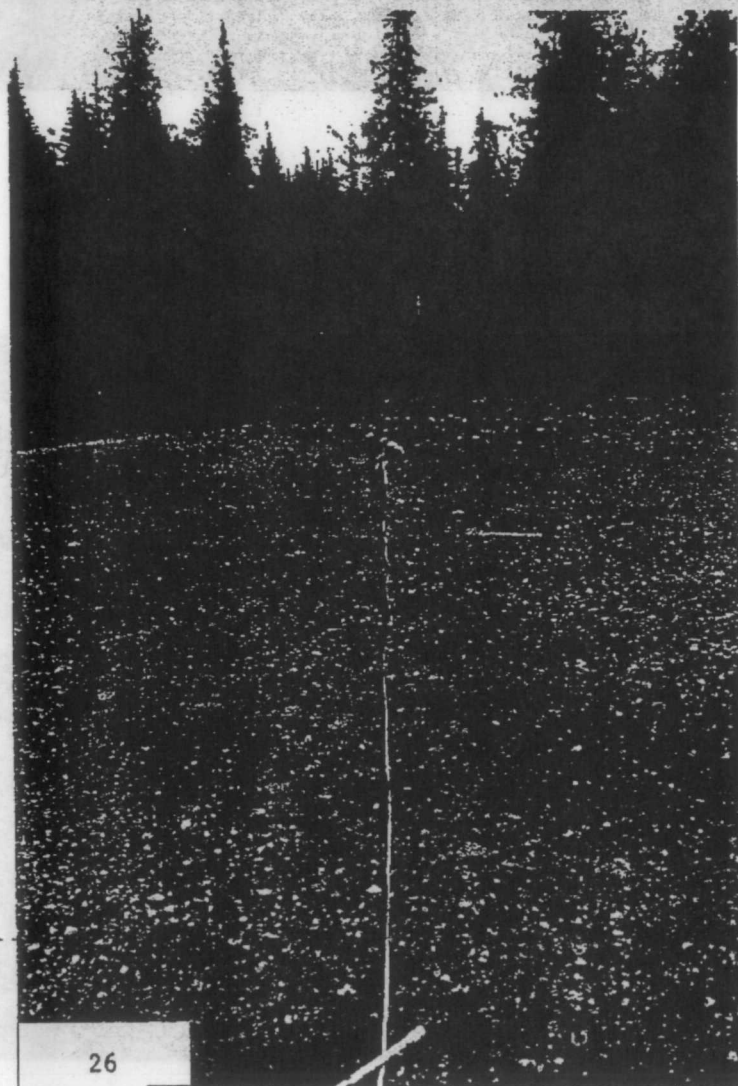
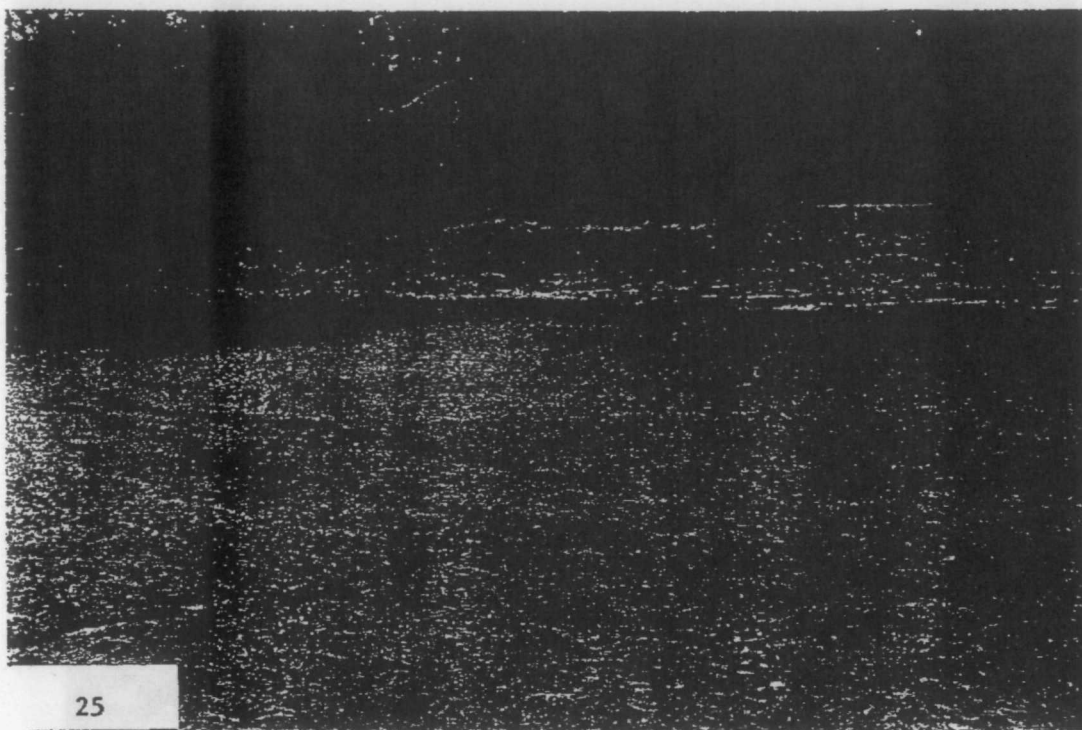


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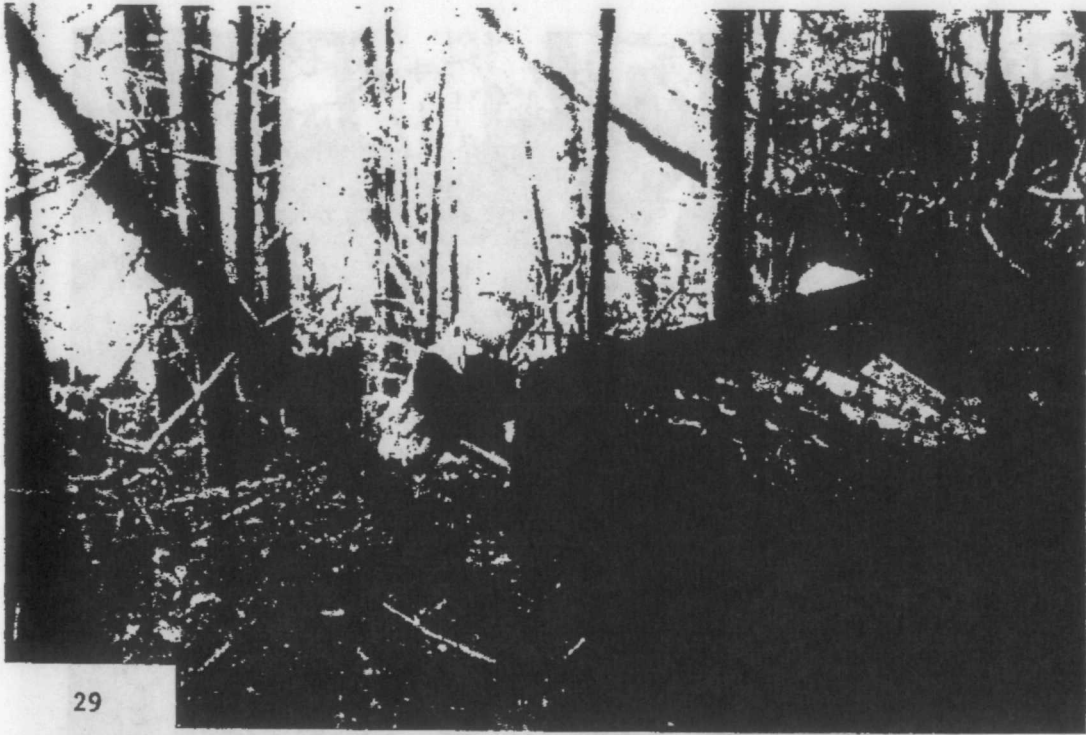


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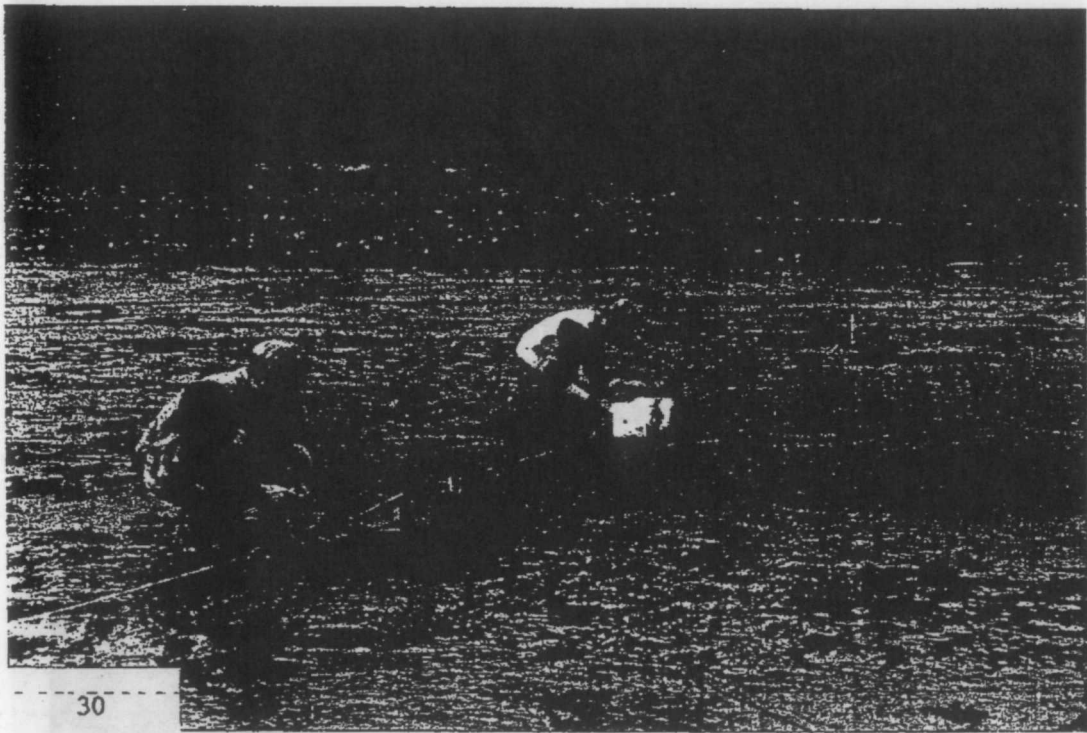








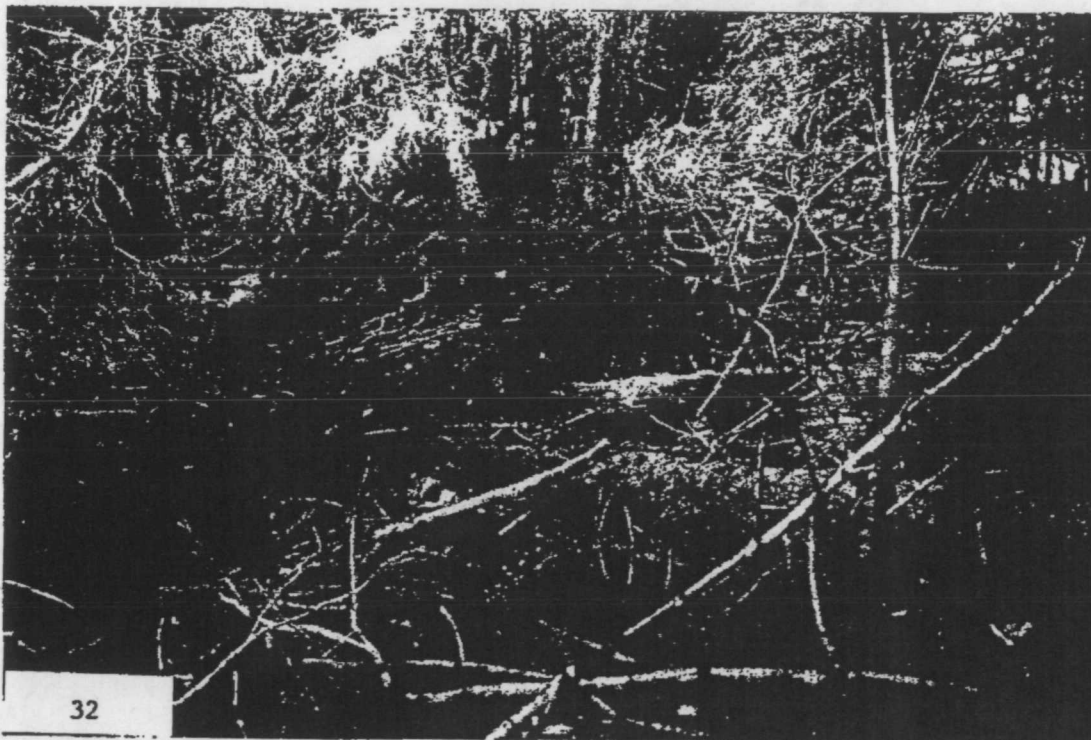
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