U.S. ARMY CORPS OF ENGINEERS,
ALASKA DISTRICT
AND
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, ALASKA REGION

URS Project No. 26219528

Final Work Plan
Preliminary Assessment/ Site Investigation (PA/SI) For Apex and El Nido Mines
Tongass National Forest, Alaska

Prepared By:

URS

May 2003

FINAL WORK PLAN
PRELIMINARY ASSESSMENT /SITE INVESTIGATION
APEX AND EL NIDO MINES
TONGASS NATIONAL FOREST, ALASKA

Prepared for

U.S. ARMY CORPS OF ENGINEERS – ALASKA DISTRICT

AND

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE – ALASKA REGION

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Alaska District	Environmental Engineering Branch, Alaska District, U.S. Army Corps of Engineers
AWQC	ambient water quality criteria
BLM	U. S. Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Procedure
CoC	Chain-of-Custody
COPCs	chemicals of potential concern
DRO	diesel range organics
DQOs	data quality objectives
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
Forest Service	U.S. Forest Service, Alaska Region
FSP	Field Sampling Plan
HNO_3	nitric acid
HSP	Health and Safety Plan
MDL	method detection limit
MPA	maximum potential acidity
NNP	net neutralization potential
OSHA	Occupational Safety and Health Administration
PA/SI	Preliminary Assessment/Site Investigation
PQL	Practical Quantitation Limit
QAOs	Quality Assurance Objectives
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RRO	residual range organics
SI	Site Investigation
site	Apex and El Nido Mines and mill site
SOW	Statement of Work
TCLP	toxicity characteristic leaching procedure
URS	URS Corporation
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service

1.0 INTRODUCTION

This Work Plan details the approach and procedures for completion of a Preliminary Assessment (PA) and Site Investigation (SI) for the Apex and El Nido Mines and mill site in the Tongass National Forest of Southeast Alaska (Figure 1). This document was prepared for the Environmental Engineering Branch Alaska District U. S. Army Corps of Engineers (Alaska District) under Contract DACW85-00-D-0004, Task Order No. 07 (27 November 2002) and the U.S. Department of Agriculture (USDA) Forest Service in accordance with URS Corporation's (URS) Revised Proposal No. 03003986 (24 January 2003).

The USDA Forest Service (USFS) has tasked the Alaska District to perform this PA/SI to identify conditions that may pose a risk to human health and the environment as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The purpose of the PA/SI will be to analyze site conditions and recommend whether a removal action should be conducted. The PA will be based on existing information about the sites, including information obtained from USDA Forest Service files kept in Hoonah Alaska, and Bureau of Mines site files maintained at the Bureau of Land Management, Douglas Alaska. This information will be combined with contemporary data obtained during a site investigation to produce a PA/SI report.

This Work Plan outlines the scope of work for conducting the PA/SI, and provides details of field work required to complete the project in accordance with 40 CFR Part 300.410 and all applicable U.S. Environmental Protection Agency (EPA) guidance documents for preparation of an integrated site assessment (EPA directive No. 9345.1-16FS, Sept. 1993). This Work Plan is broken into three components: a Project Plan, a Field Sampling Plan (FSP), and a Quality Assurance Project Plan (QAPP). A brief description of each of these components is as follows:

The **Project Plan** (Section 2.0) includes a description of the site location and history, a summary of previous investigations a description of the goals and scope of this project; and a schedule for completing the project.

The **Sampling and Analysis Plan** (Section 3.0), prepared in accordance with Engineer Manual EM 200-1-3, includes a description of the sampling and data collection activities to be performed, and field sampling and data collection procedures to be followed.

The **Quality Assurance Project Plan** (Section 4.0) describes data quality objectives (DQOs), laboratory testing methodology and detection limits, sample handling and custody procedures, data reduction and validation, the appropriate laboratory certifications, and qualifications of participating personnel. The QAPP also identifies laboratories to be used for sample testing.

A project-specific **Health and Safety Plan** (HSP) was also prepared for this project in accordance with 40 CFR Part 300.150 and all applicable Occupational Safety and Health Administration (OSHA) requirements described in 29 CFR 1910. The HSP is submitted under separate cover.

2.0 PROJECT PLAN

2.1 SITE LOCATION AND HISTORY

2.1.1 Site Location

The Apex and El Nido Mines and mill site (site) are located on Lisianski Inlet, on Chichagof Island, south-southwest of Pelican, Alaska. The site is located within Sections 13, 23, and 24 of Township 45 South, Range 56 East, of the Copper River Meridian, Alaska (Figure 1). The properties are situated in a glacial basin below timberline along the Cann Creek drainage, which lies on the south side of Lisianski Inlet approximately three miles southwest of the city of Pelican. Both the mill site and upper mine sites are accessible by an unimproved trail or by helicopter.

The remnants of at least 9 structures are at present at the mine site (Figure 2). The buildings are located at an upper camp near the El Nido Mine, and along Cann Creek. The buildings include a cabin, bunkhouse, bathhouse, privy, dining hall, a watchman's cabin, and a 10-stamp mill. A former "industrial area" is also apparently present at the upper camp. Additional features also present at the mine site include the remains of an aerial tram, pneumatic lines, a winch, a pick-up truck chassis, a barge, and a cook stove.

2.1.2 Site History

Captain John Hartely Cann discovered the Apex Mine in 1919 and then the El Nido Mine in 1920. Initially, two companies were organized to work these properties separately. Eventually, the two companies merged to form the Apex-El Nido Mining Company and the mines were worked together and carried ownership of the properties until the death of Mrs. Jenny Cann in about 1953 (Kimball, 1982). Initially a camp was built at the beach near the mouth of Cann Creek and a barge landing was constructed in the associated inlet. An upper camp was constructed at the 800 to 900-foot level. A powerhouse, jigback tram, and compressor plant were erected in 1921. Between 1920 and 1922, nearly 1,400 feet of tunnel were driven at the 870-foot elevation, and a level drift was advanced along a gold bearing vein at the 1,227-foot elevation. In 1923 a 10-stamp mill was constructed at the 450-foot elevation and the USFS helped to complete a corduroy road a mile in length from the beach to the mill site. An aerial tram once connected both mines with the mill downstream on Cann Creek. The Apex and El Nido Mines produced nearly 17,000 ounces of gold and 2,400 ounces of silver in the period 1924-28, 1934-35, and 1937-39 (Kimball, 1982).

In 1954 Clell Hodson of Pelican took hold of the Apex Mine and Joe Ott, also of Pelican, took hold of the El Nido Mine. Joe Ott renamed the El Nido Mine the Ariel Mine (Williams, 1955). The Apex and El Nido Mines have been held by Apex-El Nido Gold Mines, a Juneau based company, since 1968.

In 1975 the Apex-El Nido Gold Mining Company reactivated their interest in the Apex and El Nido Mine sites and submitted a letter of "Intent to Operate" to the USFS Hoonah Ranger District. However, the project file for the proposed mining efforts was closed in the fall of 1995 as a result of lack of follow-up and acquisition of required state and federal permits. The USFS Hoonah Ranger District continues to receive calls from the Apex-El Nido Gold Mining Company but to date has not received a new letter of "Intent to

Operate." Although there has been much recent exploration at the Apex and El Nido Mine sites, no known production has occurred since the late 1930's. It also appears that claims have not been staked in the vicinity of the mine sites since 1985.

2.2 PREVIOUS INVESTIGATIONS

The following section summarizes the previous investigations conducted at the site.

The USFS conducted an Environmental Assessment (EA) of the Apex and El Nido Mine sites in 1992 and 1993 (USFS, 1993). To complete the EA, an interdisciplinary team was formed and field studies occurred in 1992 and 1993. The interdisciplinary team provided a series of reports to the USFS Hoonah District Ranger including a detailed report on the cultural resource survey of the mine sites, an inventory report on the site geology and mineralogy, a watershed report, and an aquatic habitat report. These reports will be discussed in detail in the PA/SI report. A short summary for each of the reports is provided below.

Cultural Resource Survey (Myron and Iwamoto, 1993) - A Level III Cultural Resource Inventory was conducted at the Apex and El Nido Mine sites in 1993 by the USFS. The inventory included both a historic literature search of the sites as well as fieldwork where specific historic mine relicts were cataloged in great detail as well as mapped. The USFS has recommended that the "Apex-El Nido Mine Complex" be determined "Eligible" for inclusion on the National Register of Historic Places.

Geology, Minerals and Caves Inventory Report (Baer, 1993) - This report summarizes information relative to the mineral and geologic resources of lands within the Apex and El Nido Mine proposed Plan of Operations Project Area. Besides summarizing the geological and mineral significance of the area, the report discusses the existing waste rock dumps at both the Apex and El Nido Mine sites. The Apex dump was approximately 50 to 60 feet high, constructed on a moderate slope, and contained an estimated 15,000 to 18,000 cubic yards of material. The El Nido waste rock dump was constructed on a relatively steep slope above Cann Creek and contained an estimated 8,000 to 10,000 cubic yards of material.

Apex-El Nido Watershed Report (Beilharz, 1993) - The objective of the report was to determine whether past mining activities have resulted in unacceptable water quality, either through acid rock drainage or elevated metal levels. The analysis of the consequences of past mining activity in the area shows that the only lasting change to water quality is a small increase in arsenic levels in the mine drainage. In the past, the arsenic level has increased as more arsenic-containing rock comes into contact with water.

Aquatic Habitat Report; Apex-El Nido EA (Reily, 1993) - Various biological samples were collected from the Apex and El Nido Mine sites during a site visit in 1993, including blue mussels, estuarine and riverine fish and micro-invertebrates. Water quality was deemed high as a result of finding 13 highly sensitive micro-invertebrate species in Cann Creek. Bioaccumulation analysis of blue mussels from Cann Creek indicated that seven out of the ten heavy metals tested for exist in concentrations low enough for their combined background and pollution concentrations to be indicative of high water quality. It was noted that arsenic values were relatively higher than expected but may be due to biological factors of the species. However, elevated arsenic levels have been measured exiting the Apex portal.

2.3 PA/SI TASKS

In addition to the preparation of this Work Plan and the Health and Safety Plan, this PA/SI will include the following tasks:

Preliminary Assessment - An initial screening of available information on the Apex and El Nido Mines will be performed. The screening will include a review of available historical data. Data to be reviewed includes: mining claim ownership available from U. S. Bureau of Land Management (BLM) records; and plans of operation, special use permits, and reports documenting previous site investigations located at the USFS Juneau and Hoonah District Offices. The main purpose of the screening is to determine whether these sites require further action under CERCLA.

Site Investigation - An investigation of the site will be completed, and data will be collected to address the following:

- The nature and extent of hazardous substance/waste releases or the threat of future releases;
- Potential threats to public health, welfare or the environment;
- Factors to be considered in determining the need for any removal actions;
- Collection and review of existing data;
- The presence, location, and nature of sensitive environments and other environmental factors; and,
- The subjective condition and integrity of existing surface mine features. Information contained in the previous Forest Service cultural resource investigation report of the mine will be used as a guide for the field crew to determine the number and location of features that will be investigated during the site visit. Field personnel will not enter any underground workings as part of this investigation.

Removal Action Assessment - Information collected during the PA/SI will be evaluated in accordance with 40 CFR 300.415 to determine the appropriate extent of action to be taken. This evaluation will be based on the following eight criteria:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- Actual or potential contamination of drinking water supplies or sensitive ecosystems;
- Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or bulk storage containers that may pose a threat of release;
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;
- Threat of fire or explosion;

- The availability of other appropriate federal or state response mechanisms to respond to the release; and
- Other situations or factors that may pose threats to public health or welfare of the United States or the environment.

Preliminary Site Assessment/Site Investigation Report - A PA/SI Report will be prepared to summarize the results of the PA/SI. The report will contain recommendations for whether or not removal actions should be pursued for mine tailings, waste rock and contaminated soil, and will include the following elements:

- A description of the site, including location, size and access;
- Site background, including operational and ownership history, local geology and soils, surface hydrology and ecological setting;
- A detailed review and summary of previous investigations conducted at the site;
- Potential sources of contamination, migration pathways, and potentially affected targets;
- A description of the PA/SI sampling program, analytical results, and their influence on potential receptors;
- A Removal Action Assessment;
- Conclusions and recommendations for additional investigation or evaluation;
- Site photographs and photographic log;
- Original field notes;
- Laboratory analytical data;
- References/bibliography; and
- Figures.

2.4 SCHEDULE

A preliminary schedule for completion of the PA/SI is provided in Figure 3. The schedule is based on information provided in the statement of work (SOW), and on subsequent conversations with the Forest Service. However, the schedule as presented is largely determined by the timing of the field effort. The fieldwork is currently scheduled for July 9 through 13, 2003. Due to potential conflicts with other Forest Service projects and Forest Service personnel availability, the dates for the fieldwork may change. Because of the dates of the fieldwork have not been finalized by the Forest Service, the completion date for the project may by later than originally shown in the SOW.

3.0 SAMPLING AND ANALYSIS PLAN

This section describes specific activities that will be conducted during the PA/SI field data collection efforts. The general scope of work addressed in this FSP includes the following tasks:

- Task 1 – Surface Soil/Tailings Evaluation
- Task 2 – Waste Rock Evaluation
- Task 3 – Surface Water Evaluation
- Task 4 – Physical Site Characteristics and Hazards Evaluation
- Task 5 – Data Evaluation

A description of each of these tasks is provided in the following sections.

3.1 SURFACE SOIL EVALUATION

3.1.1 Soil Sampling and Analysis Activities

Up to thirteen primary soil samples will be collected during the site investigation for the purpose of evaluating the presence, nature and extent of hazardous substances as described previously. Five of the samples collected will be background soil samples. The remaining eight samples will be collected from the mine and mill site. The specific locations of the samples will be determined based on visual or anecdotal evidence of impacts. Soil sample depth (surface vs. subsurface) will also be determined based on site conditions. Shallow subsurface soil samples may be collected to evaluate the vertical distribution of target analytes. The total number of soil samples collected from the mine and mill site will not exceed eight. All soil samples will be discrete and no compositing will be performed. Dedicated sampling equipment will be utilized. Care will be taken during soil sampling to avoid impacts to cultural resources.

Eleven of the soil samples, including the five background samples and six mine and mill site samples, will be analyzed for eight Resource Conservation and Recovery Act (RCRA) listed metals by EPA Method 6000/7000 series. After receipt of the laboratory analytical results for the RCRA metals analysis, the two of the six non-background metals samples with the highest concentrations of metals will also be analyzed according to the Toxic Characteristic Leaching Process (TCLP) for all eight RCRA listed metals. The remaining two mine and mill site soil samples will be analyzed for Diesel Range Organics (DRO) and Residual Range Organics (RRO) by Alaska Methods AK 102 and AK 103, respectively. No background organic analysis will be preformed.

In addition to the thirteen primary soil samples, field duplicate quality control samples at a rate of one per ten primary samples. Matrix spike quality control samples will be analyzed by the laboratory at a rate of at least one per twenty primary samples. Based on these criteria, it is anticipated that two duplicate soil samples will be collected and analyzed, one for metals and one for fuels, and one matrix spike sample will be analyzed.

3.1.2 Soil Sampling Procedures

Sampling will be conducted in a step-wise manner utilizing dedicated equipment. Plastic scoops will be used to obtain surface soil samples that will be analyzed for metals. Stainless steel scoops will be used for soil samples that will be analyzed for petroleum hydrocarbons. A shovel or hand auger will be used to collect subsurface samples after collection of surface soil samples. Surface soil sampling (upper 6 inches) will be performed in accordance with procedures noted in the EPA document, *"A Compendium of Superfund Field Operations Methods"* (USEPA, 1987a).

The following procedures will be observed:

- Record the date and time of arrival, general site conditions, and other applicable field observations related to the site.
- Care should be taken during soil sampling to avoid impacts to cultural resources.
- Loosen the top 6 inches of soil with the appropriate scoop. If necessary, loosen the soil with a precleaned spade or shovel.
- Record a physical soil/grain size description of the sample based on the Unified Soil Classification System (USCS).
- Fill one 8-ounce jar per sample.
- After collection, label the sample and record sample collection information and location on the sampling form. Sample information should include date/time sampled, soil color, grain size, and odors (if any).
- Discard contaminated personal protective clothing (e.g., latex gloves) and disposable scoop, as required. Decontaminate any non-dedicated sampling equipment used.

3.2 WASTE ROCK ASSESSMENT

3.2.1 Waste Rock Sampling and Analysis Activities

Up to three waste rock samples during the site visit. The specific locations of the samples will be determined based on observed site conditions, and will be selected to provide as full a characterization of the waste rock stockpiles as possible. The waste rock samples will be analyzed for acid/base accounting by the Sobek Method. Parameters included in the analysis include net neutralization potential (NNP), maximum potential acidity (MPA), neutralization potential and fizz rating, ratio (neutralization potential: MPA), paste pH, and total sulfur.

3.2.2 Waste Rock Sampling Procedures

To the extent possible, waste rock samples will be collected in such a way as to provide the maximum representation of the pile being sampled. The degree to which a sample will be representative of the overall pile being sampled will be dependant to some extent on the homogeneity of the pile and the homogeneity of mineralization in individual rocks within the pile.

The following procedures will be observed during waste rock sampling:

- Record the date and time of arrival, general site conditions, and other applicable field observations related to the site.
- Visually identify the limits of the waste rock pile to be sampled.
- Visually evaluate the homogeneity of the overall pile, and of the individual rocks within the pile.
- Based on the distribution of rocks within the pile being sampled, select several locations that appear to be representative of the overall waste rock pile. The more homogeneous the pile, the fewer locations will be warranted.
- In each identified representative location, remove the outer-most rocks that have been most exposed to weathering.
- From the exposed rock at each identified representative location, collect several approximately fist-sized rocks of varying lithologies to provide the most representative sample possible. Each waste rock sample should total between 2 and 5 lbs.
- Place the waste rock sample in a clean re-sealable plastic bag, and place that bag in an additional cloth outer bag.
- Label each waste rock sample as described in Section 3.4.5.

3.3 WATER QUALITY ASSESSMENT

3.3.1 Surface Water Sampling and Analysis Activities

Up to four primary surface water samples during the site visit. The general locations of the samples will be as follows:

- One sample upstream of the site;
- One sample downstream of the site;
- One sample effluent from the tailings piles; and,
- One sample at a location to be determined in the field.

The specific locations of surface water samples and streamflow data collection points will be determined in the field, based on observed conditions. Physical water parameters including pH, temperature, conductivity and salinity will be measured with a direct reading instrument at the time of sample collection. The water samples will be analyzed for eight RCRA listed metals, both total and dissolved, in accordance with EPA Method 6000/7000 series. Filtration of water samples for dissolved metals will be performed in the field.

In addition to the four primary water samples, URS will collect field duplicate quality control samples at a rate of one per ten primary samples. Matrix spike quality control samples will be performed by the laboratory at a rate of at least one per twenty primary samples.

3.3.2 Surface Water Sampling Procedures

Prior to arriving at the sample location, all monitoring equipment (including pH and conductivity meters) will be calibrated. Instrument calibration information, field observations, notes, and measurements will be recorded daily in waterproof ink by each field worker in all-weather field books. Each field book page will be signed and dated. Upon arrival at the sample site, the following procedures will be followed:

- Record the date and time of arrival, general site conditions, and other applicable field observations related to the site.
- Streams will be accessed for sampling by wading. Pond samples will be collected near shore at locations accessible by wading.
- Measure physical water quality parameters (pH, temperature, salinity, and conductivity) in situ for all water samples at the time of sampling.
- Streamflow measurement will be conducted in creeks by spanning the creek's flow width perpendicular to the flow with a fiberglass tape measure. Depth will be measured in feet at two-foot intervals across the width of the stream. Flow velocity will then be measured in feet per second by recording the travel time of an object (stick, orange, etc.) from upstream to downstream over a known distance. An estimate of the flow will be calculated using the following formula: Flow = (width of stream) x (average depth) x (velocity).
- For larger streams, a depth-integrated sampling technique will be used to collect and composite samples. Position the mouth of the sampling container facing upstream of the person conducting the sampling. Discrete samples will be collected at several locations across the stream and composited in a clean 1-liter plastic bottle.

  During high flow, it may not be possible to span the entire channel with the depth-integrated sampler. In this case, depth-integrated samples will be collected as far into the main channel as possible from each bank. These samples will be composited in the same manner as above. Two to three locations from each bank will be obtained.

  For smaller streams and/or seeps, samples will be collected as practical from pools or falls. If necessary, a depression around the shallow stream or seep location will be manually dug to allow for sample collection by submerging a precleaned 1-liter polyethylene bottle into the pool. Once measurements of pH, conductivity, and temperature have stabilized and sediment has settled out, the water sample will be collected from the depression.

  Once field measurements and field tests are completed, collect sample aliquots in a precleaned 1-liter polyethylene bottle. Sample containers will be filled from the jug once all sample aliquots are composited. Sample containers will be filled in the following order:

Analysis	Sample Container Type

Total Recoverable Metals	1-liter polyethylene bottle with nitric acid (HNO_3)
Dissolved Metals, Hardness	Following field filtering*, 1-liter polyethylene bottle with nitric acid (HNO_3)

* Once the total metals sample bottle has been filled, the dissolved metals aliquot will be filtered using a peristaltic pump, silicon tubing, and 0.45-micron filter. The sample aliquot will be pumped directly from the 1-liter polyethylene bottle via silicon tubing through the 0.45-micron filter to a 1-liter polyethylene bottle containing nitric acid for preservation. The sample must not be preserved until the filtering process has been completed.

- Record sample collection information and sample locations on the sampling form. Note in the field book the sample location collected.

3.4 GENERAL FIELD PROCEDURES

3.4.1 Documentation

A bound field book will be maintained by each sampler to provide a daily record of events. At the beginning of each logbook entry, the following will be recorded:

- Date
- Time
- Meteorological conditions
- Field personnel present
- Level of personnel protection
- List of onsite visitors and the level of personal protection
- Signature of the person making the log book entry

Field book entries will be in as much detail as necessary so that essential information is properly documented. All documentation in field books will be in ink. If an error is made, it will be corrected by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

If sample locations cannot be indicated on field maps, a simple drawing of the location (not to scale) will be included in the field book to provide an illustration of all sampling points.

The cover of each field book used will contain:

- Person and organization to whom the book is assigned
- Book number
- Start date

- End date

Daily activities and documentation of sampling procedures will be made in the field books. Data to be included on the field books will include travel time, time at the site, a summary of activities, and observations. Entries in the field book will include, at a minimum, the following for each date of sampling:

- Site identification
- Location and description of sampling points
- A brief sketch of sampling points
- Sample identification numbers
- Number of samples taken
- Time of sample collection
- Number of quality assurance/quality control samples taken
- Collector's names
- Field observations
- Documentation of photographs taken
- All field measurements made (e.g., pH, temperature, conductivity, salinity)

3.4.2 Procedures to Prevent Cross Contamination

Personnel collecting samples for chemical analyses will take the following precautions to minimize sample contamination or cross-contamination between samples:

- Disposable nitrile gloves will be used while collecting all samples. New gloves will be worn for each separate sampling event.
- Sampling personnel will not touch the inside of the sampling container.
- Sampling personnel will not walk over any areas where samples are to be collected.
- Only equipment that has been properly decontaminated will be used for environmental sample collection.
- Decontamination procedures will be completed while wearing disposable gloves.

Immediately following the collection of the sample, the container will be sealed and the sample will be labeled and entered in the field logbook and/or appropriate sampling record forms.

3.4.3 Calibration of Water Quality Meters

Equipment to be used during the field investigation will include a Horiba water meter that measures temperature, pH, conductivity, and salinity. This meter will be used to measure these parameters in all water samples collected during the field effort. The Horiba instrument will be rented for use on the project, and contain manufacturer-supplied calibration solution that will calibrate the meter over the full instrument range of pH, conductivity, and salinity. Field calibrations will be documented in the field notebook. Entries will be made at the beginning of each sampling or measuring effort and when each instrument is calibrated.

3.4.4 Sample Designation

Samples collected during this PA/SI will be designated a unique sample number according to the following criteria:

Surface Soil Samples: Surface soil samples will be labeled with the prefix AM (for Apex Mine), followed by SS (for surface soil) and consecutive numbers. For example, the first soil sample collected will be designated AMSS#1. Background surface soil samples will be labeled in the same fashion; however, the designator BG (for background) will be added to the end of the sample number. For example, if the fifth surface soil sample collected is a background sample, the designation will be AMSS#5BG.

Waste Rock Samples: Waste rock samples will be labeled with the prefix AM (for Apex Mine); followed by WR (for waste rock), and consecutive numbers. For example, the first waste rock sample collected will be designated AMWR#1.

Surface Water Samples: Surface water samples will be labeled with the prefix AM (for Apex Mine), followed by SW (for surface water) and consecutive numbers. All surface water samples, including stream samples, seep samples, flowing adit water samples, and spring samples will be numbered in this fashion, and the specific location of each sample will be documented in the field notebook. Background surface water samples will be labeled in the same fashion; however, the designator BG (for background) will be added to the end of the sample number. For example, if the fourth surface water sample collected is a background sample, the designation will be AMSW#4BG.

Field Quality Assurance/Quality Control (QA/QC) Samples: Field QA/QC samples expected to be collected include field duplicates, and Matrix Spikes.

Field duplicate samples will be labeled in the same way as primary samples, but as the next applicable sequential number. For example, the duplicate of surface soil sample AMSS#3 would be labeled AMSS#4. Documentation of the collection of duplicate samples will be made in the field notebooks.

3.4.5 Sample Identification and Labeling

Each sample shall be identified in the field book and on the sample container label. Sample labels will be formatted as follows:

Site:____________________ Job#:____________________

Client:____________________ Sampler:____________________

Date Collected:____________________ Time:____________________

Source:____

Analysis:____

Unpreserved, Preserved:________________________________

The label shall be filled out as follows:

1. Site – Apex and El Nido Mines (preprinted)
2. Job Number 256219528 (preprinted)
3. Sampler's initials appear in the upper right corner
4. Client - URS (preprinted)
5. Date Collected - date of sample collection
6. Time - time of sample collection (for composite samples, use the time of final aliquot collected)
7. Source - sample number and matrix (e.g. soil, water)
8. Analysis - (preprinted)
9. Unpreserved, Preserved - (preprinted)

3.4.6 Sample Containers, Preservation and Storage

All sample containers will be provided clean by the laboratory and handled in such a way as to prevent accidental contamination prior to use. All necessary preservative will be placed in appropriate sample containers by the laboratory prior to collection of samples. The types of sample containers that will be used are based on the analytical plan for each media to be collected. Table 1 lists the type of analysis, sample preservation (including storage conditions), and holding time requirements.

3.4.7 Sample Packaging

Samples collected must be handled and shipped in a manner that will protect against any detrimental effects to the samples or the environment due to breakage, leakage, or spoilage. Sample handling procedures will be closely supervised and recorded to minimize the potential for loss modification, or tampering during shipment of the analytical laboratory. Package labeling specification will depend on the type of materials being sent, and will be in accordance with U.S. Department of Transportation regulations (49 CFR, Parts 171 through 177) and EPA’s Contract Laboratory Program guidance (USEPA, 1988). Samples of hazardous materials will be stored and handled in accordance with all applicable federal and state requirements.

3.4.8 Sample Shipping

Shipping dates, method of shipment, and shipment identification numbers will be recorded in the field log book and on the Chain-of-Custody (CoC) forms. Samples will be stored in the field in coolers containing blue ice or gel packs to maintain appropriate temperature and sample integrity in accordance with *"Users*

Guide to the Contract Laboratory Program" (USEPA, 1988a). Samples will be packaged for shipping as described in the following Section. Sample coolers will be delivered by URS personnel to a shipper for transfer to the laboratories. Copies of the shipping receipts will be retained in the central job file. Shipping samples from remote areas of southeast Alaska is highly dependent on cooperative weather, and all precautions and contingency plans will be used to the extent possible to meet holding times and to insure that the cooler arrives at the laboratory with the proper internal temperature.

3.4.9 Sample Custody Procedures

Sample custody and documentation procedures will include completion of CoC forms, transportation tracking, and laboratory acceptance procedures. Sample integrity will be maintained through strict adherence to these procedures. CoC forms will be completed on a daily basis and will be maintained separately from all other documentation. This form will be filled out by the sample collector before releasing each cooler containing samples for transportation to the laboratory. Analytical requests will be identified on the CoC. The information for each sample on the CoC will duplicate information provided on each sample container label. The form will be taped to the inside lid of the cooler containing samples prior to transportation to the laboratory. The laboratory will receive the original CoC plus a carbon copy. A copy of the CoC will be retained in the central job files.

3.4.10 Laboratory Receipt

When samples arrive at the laboratories, the laboratory personnel receiving the sample cooler will evaluate the integrity of the samples and sign the CoC form. The laboratory will assign work order numbers to the samples to be used in its internal tracking system. The status of a sample can be checked at any time by referring to the laboratory numbers on the CoC form and the laboratory work order numbers in their log books. Both the laboratory and sample numbers will be cited when analytical results are reported. The laboratories will send a copy of each signed CoC along with the analytical data package to the Project Manager. Damaged sample containers, cooler temperatures, and sample labeling discrepancies between samples and CoC, and analytical request discrepancies will be noted on the form. The laboratory will contact the Project Manager for problem notification and resolution.

3.5 PHYSICAL SITE CHARACTERISTICS AND HAZARD ANALYSIS

Physical site characteristics and hazards will be evaluated during the PA/SI field investigation. Activities included under this task will focus on the following:

- Estimate the volume of tailings, waste rock piles.
- Document the condition, size, and location of abandoned structures and equipment.
- Confirm the number, condition, and locations of underground mine portals and aboveground mine workings.
- Document physical hazards to field teams and the general public.
- Document the number, location, and probable contents of drums/containers of hazardous materials.

The above site characteristics will be inventoried, assessed, and included in a Removal Action Assessment. The following subtasks will be included in this assessment:

Waste Rock and Tailings Volume Assessments - During the PA/SI field investigation, thickness and volume estimates of the waste rock dumps and tailings piles will be made using visual techniques.

Abandoned Structures and Equipment Documentation – Abandoned structures and equipment onsite will be inventoried to document current site conditions. The descriptions, size, and location of structures and equipment will be made in the field. Building materials will also be recorded to the extent practical, and potential asbestos containing materials and lead-based paint will be identified; however, no detailed building material survey will be performed.

Mine Portals and Workings Documentation - A cursory examination of the mine features will be conducted. Mine portals and aboveground workings will be located and inventoried. The presence or absence of water at portals and aboveground mine workings will be documented. Site conditions such as accessibility, structural condition, and associated physical hazards that may affect the evaluation of chemical hazards will be documented.

Drums and Debris Documentation - Drums and debris observed onsite will be inventoried. The inventory will include the number and location of drums or other containers. The contents of the drums, if known, will be documented, and stenciling or other text on drums/containers will be noted. Where there is uncertainty of drum contents, this will be noted as well. Drum locations will be documented in field notes and on site figures. Drums will not be moved or opened during this field effort. No categorization or volume estimates of potential hazardous materials will be conducted.

4.0 QUALITY ASSURANCE PROJECT PLAN

This Section describes QA/QC procedures that will be implemented during data collection activities associated with the field investigation/site characterization at the Apex and El Nido Mines. QA/QC procedures govern all aspects of data collection and analytical efforts to ensure that the data collected are representative of conditions in the field, and that analytical results are valid and accurately reported.

4.1 QUALITY ASSURANCE OBJECTIVES

The overall Quality Assurance Objectives (QAOs) for this PA/SI are to develop and implement procedures to obtain and evaluate various levels of data that can be used to satisfy the goal of identifying potential risks to human health or the environment as defined by CERCLA. Because no risk evaluation is being performed as part of this project, the basis for the evaluation of "potential risk" will be State of Alaska Method 2 cleanup levels as specified in 18 AAC 75 for soil, and appropriate Alaska Department of Environmental Conservation (ADEC) and EPA ambient water quality criteria (AWQC) for water. The AWQCs used are generally the most stringent. Table 2 summarizes the overall DQOs for the project and presents data uses, chemicals of potential concern (COPCs), general levels of concern, and critical samples to be evaluated during the data collection. Quantitative QAOs are presented in Tables 3 through 5.

4.2 ANALYTICAL OBJECTIVE AND RATIONALE

This section discusses the overall rationale for the analytical plan for each media. Based on the known history of the site, COPCs that may require assessment and may influence the recommendations for future removal actions include metals and fuel-related organic compounds. The rationale for the analytical plan is based on: the COPCs and analytical data requirements required to appropriately assess the data with associated regulatory guidance.

The analytical plan is designed to obtain high quality chemical results by collecting "definitive data" (USEPA, 1983). Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. The proposed analytical methodologies by media are provided in Table 1. The analytical plan will include analyses using *"Test Methods for Evaluating Solid Waste"* (USEPA, 1986), *"Methods for Chemical Analysis of Water and Wastes"* (USEPA, 1983), and ADEC petroleum hydrocarbon methods (ADEC, 1999). Sample reporting limits will be at or below State of Alaska Method 2 cleanup levels wherever possible. Matrix effects, such as moisture content, salinity, dissolved solids, and coextractives, may impact the ability to achieve detection limits at or below the regulatory guidance.

4.3 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENTS

Quantitative QAOs for the measurement of various analytes are based on method detection limits, precision, accuracy, and completeness. The definition of each term is provided below (USEPA, 1986, 1987b, 1988b).

Method Detection Limit (MDL): The lowest concentration for which there is at least a 95 percent chance that an analyte will be positively detected.

Practical Quantitation Limit (PQL): The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Precision: The agreement of a set of results among themselves, and a measure of the ability to reproduce a result.

Accuracy: An estimate of the difference between the true value and the determined mean value. The accuracy of a result is affected by both systematic and random errors.

Representativeness: The degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at the sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program.

Comparability: A qualitative parameter expressing the confidence with which one data set can be compared to another. This goal is achieved through using standard techniques to collect and analyze representative samples, and by reporting analytical results in appropriate units.

Completeness: The total number of samples collected for which acceptable analytical data are generated, divided by the total number of samples analyzed, and multiplied by 100.

Quantitative QAOs for the project analytical methods are provided in Tables 3 through 5. These include: MDLs, PQLs, precision, accuracy, completeness, and QC limits for initiating corrective action for each method (if available).

Qualitative QAOs include determining the representativeness and comparability of the data to be collected. Representativeness is established by selecting procedures that will produce results that accurately, precisely, and reliably depict the measured matrix and conditions. The representativeness of a result is associated with developing and following proper protocols for: sample handling (storage, preservation, packaging, custody, and transportation); sample documentation; and laboratory sample handling and storage procedures.

Comparability of the data will be maintained using established EPA and ADEC procedures for sampling activities and analytical methods. Actual MDLs and PQLs reported by the laboratory may vary due to the nature of individual samples.

4.4 DETECTION LIMIT GOALS

An objective of the analytical program is to collect high quality analytical data from each media sampled. Where technically feasible, the analytical objective is to achieve sample detection limits at or below available regulatory guidance. Tables 3 through 5 show detection limit goals for each COPC. A comparison between detection limits (MDLs, PQLs) and detection limit goals indicates that detection limits will be low enough to meet the needs of the project for all COPCs except arsenic in water. For arsenic in water, the MDL and PQL are higher than the QAO listed in Table 4. In the event that arsenic is not detected, with the MDL and PQL above the AWQC, an assessment will be made as to the significance of that result and the likelihood of arsenic being present at concentrations in excess of the AWQC. This assessment will consider the comparison of dissolved vs. total arsenic results for the sample location in question, the presence or absence and/or concentration of arsenic in potential source areas and other water samples, and the applicability of the selected AWQC based on observed field conditions at the location sampled.

4.5 SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME

The types of sample containers that will be used are based on the analytical plan for each media to be collected. Table 1 lists the type of analysis, sample preservation (including storage conditions), and holding time requirements that will govern sample-handling procedures.

4.6 FIELD SAMPLING QUALITY CONTROL SAMPLES

Field QA/QC samples will be collected during sampling efforts. This will include field duplicates, matrix spike, and trip blanks. The number of field QA/QC samples to be collected during the sampling activities includes the following:

- Field duplicates will be collected at a rate of one duplicate per ten samples per media.
- Matrix spike will be collected at a frequency of one per twenty primary samples.

4.7 ANALYTICAL PROCEDURES

4.7.1 Laboratory Analyses

The analytical procedures that will be used for sample collected during the PA/SI investigation are provided in Table 1. The Project Manager will be responsible for scheduling analyses and will serve as the primary contact for all laboratory issues and problem resolution.

The chemical analyses of soil and water samples will be performed by Columbia Analytical (Columbia) of Kelso, Washington. Columbia is certified by the ADEC and the Alaska District. Copies of the certifications are presented in Appendix A. Waste rock samples will be analyzed by ALS Chemex of Vancouver, British Columbia, Canada. Quality Assurance Programs and standard operating procedures for these laboratories are available for review upon request.

4.7.3 Data Validation

Internal laboratory data validation checks will be performed by the laboratory and reviewed by the Project Manager for all laboratory analyses. The following guidelines will be used for data validation reviews of all analyses performed:

- *"Test Methods for Evaluating Solid Waste,"* SW-846 (USEPA, 1986).
- *"USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review,"* EPA 540/R-94-013 (USEPA, 1994a), where appropriate.
- *"USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review,"* EPA 540/R-94-012 (USEPA, 1994b), where appropriate.
- *"Methods for Chemical Analysis of Water and Wastes,"* EPA-600/4-79-020 (USEPA, 1983).
- State of Alaska Department of Environmental Conservation, Petroleum Hydrocarbon Methods (AK 102 and AK 103 – ADEC, 1999).

Components of the data validation checks will include an evaluation of: holding times, initial and continuing calibrations, system performance, method blanks, matrix spike/matrix spike duplicates, field duplicates, compound identification, compound quantification, and reported detection limits. Data qualifiers will follow those used in the EPA's Contract Laboratory Procedure (CLP) program. Data validation will be performed based on QA/QC criteria specified to each method.

A "summary" CLP-equivalent data review will be performed by a URS chemist, and reviewed by the Project Manager, for all data received from the laboratory. The summary review will involve evaluating the data summary and QA/QC summary sheets provided by the laboratory with each data package. The summary review does not include spot checking the raw data packages or calculations. If the summary review indicates potential problematic areas within a data set, a "standard" review, to include checking raw data and calculations, will be performed.

4.8 FIELD QA/QC SAMPLE EVALUATION

During the field investigation and following the data validation reviews of each analytical data set, field procedures and QA/QC sample results will be evaluated. This will provide information regarding the potential introduction of artificial contaminants during the sample collection process, cross-contamination, and field variability. If the introduction of contaminants is indicted by the QA/QC data, specific data will be flagged and qualified as appropriate. Discussion of the QA/QC data will be included in the PA/SI report.

4.9 DATA REDUCTION AND REPORTING

Data obtained in the field will be recorded daily in bound field log books and will be maintained by the Project Manager. The field data package will be reviewed by the Project Manager to determine if the field records are complete, and measurements specified in the FSP and QAPP have been performed. Data validation and review of laboratory and field measurement analytical data collected during the sampling efforts will be conducted as described previously. Field and laboratory measurements will be tabulated and reviewed as part of the data validation and reduction efforts.

4.10 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks will be performed for field sampling activities and laboratory activities. Internal QC checks of sampling procedures will be performed by submittal and evaluation of field QA/QC samples.

Laboratory analytical internal QC checks will consist of QA/QC criteria and QC limits specified for each methodology, and QC checks outlined in each analytical methodology. The frequency of laboratory QC sample analyses, such as laboratory method blanks, duplicate analyses, matrix spike/matrix spike duplicate analysis, will be based on specifications outlined in each specific methodology.

4.11 QUALITY ASSURANCE REPORTING

QA information that will be reported to the Project Manager and submitted to the project file includes the following:

- Results of data validation reviews.
- Field measurements.
- Equipment calibration and preventative maintenance activities,
- Results of data precision and accuracy calculations.
- Evaluation of data completeness and contract compliance.
- Field and/or laboratory QA problems and recommended and/or implemented corrective actions.

5.0 REFERENCES

ALS Chemex 2003. E-mail communication from Christine Norcross to Mark Vania regarding ALS Chemex Acid-Base Accounting Packages.

Alaska Department of Environmental Conservation (ADEC). 1999. 18 AAC 70, Water Quality Standards. As amended through May 27.

_____. 2002. Guidance for Treatment of Petroleum-Contaminated Soil and Water and Standard Sampling Procedures. December 1.

_____. 2003. Oil and Hazardous Materials Pollution Control (18 AAC 75), as amended through January 30, 2003.

Baer, R.L. 1993. Apex-El Nido Mines Inc. Proposed Mineral Plan of Operations Geology, Minerals and Caves Inventory Report. U.S.D.A. Forest Service, Alaska Region, Chatham Area, Hoonah Ranger District.

Beilharz, M. 1993. Apex-El Nido Watershed Report, 11 November 1993. U.S.D.A. Forest Service, Alaska Region, Chatham Area, Juneau Ranger District.

Columbia Laboratories. 2003. E-mail communication regarding QAOs for soil and water smaples as of May, 2003.

Kimball, A. L. 1982. Mineral Land Assessment of Yakobi Island and Adjacent Parts of Chichagof Island, Southeastern Alaska. Bureau of Mines MLA 97-82, pp. 1-47.

Myron, R.E. and K.S. Iwamoto. 1993. A Level III Cultural Resource Inventory of the Apex-El Nido Exploration Project, Lisianski Strait, Chichagof Island, Alaska. U.S. Forest Service, Tongass National Forest, Chatham Area, Sitka, Alaska. Project #92-056.

Oak Ridge National Laboratory (ORNL). 1997. Preliminary Remediation Goals for Ecological Endpoints. Prepared for the U.S. Department of Energy. Office of Environmental Management. R. A. Efroymson, G. W. Suter II, B. E. Sample, and D. S. Jones., eds. August 1997.

Reily, C. 1993. Aquatic Habitat Report, 26 August 1993. U.S.D.A. Forest Service, Alaska Region, Chatham Area, Hoonah Ranger District.

U.S.D.A. Forest Service. 1993. Environmental Assessment, Decision Notice and Finding of No Significant Impact. U.S.D.A. Forest Service, Alaska Region, Hoonah Area, Juneau Ranger District.

U.S. Environmental; Protection Agency (USEPA). 1983. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79-020. March.

———. 1986. Test Methods for Evaluating Solid Waste. SW-846, Third Edition, Current Revisions. September.

———. 1987a. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/100.

———. 1987b. Data Quality Objectives for Remedial Response Activities Development Process. EPA/540/G-87/004. March.

———. 1988a. Users Guide to the Contract Laboratory Program. EPA/540/8-89-012. December.

———. 1988b. Guidance for Conducting Remedial Investigations and Feasibility Under CERCLA, Interim Final. EPA/540/G-89-004. October.

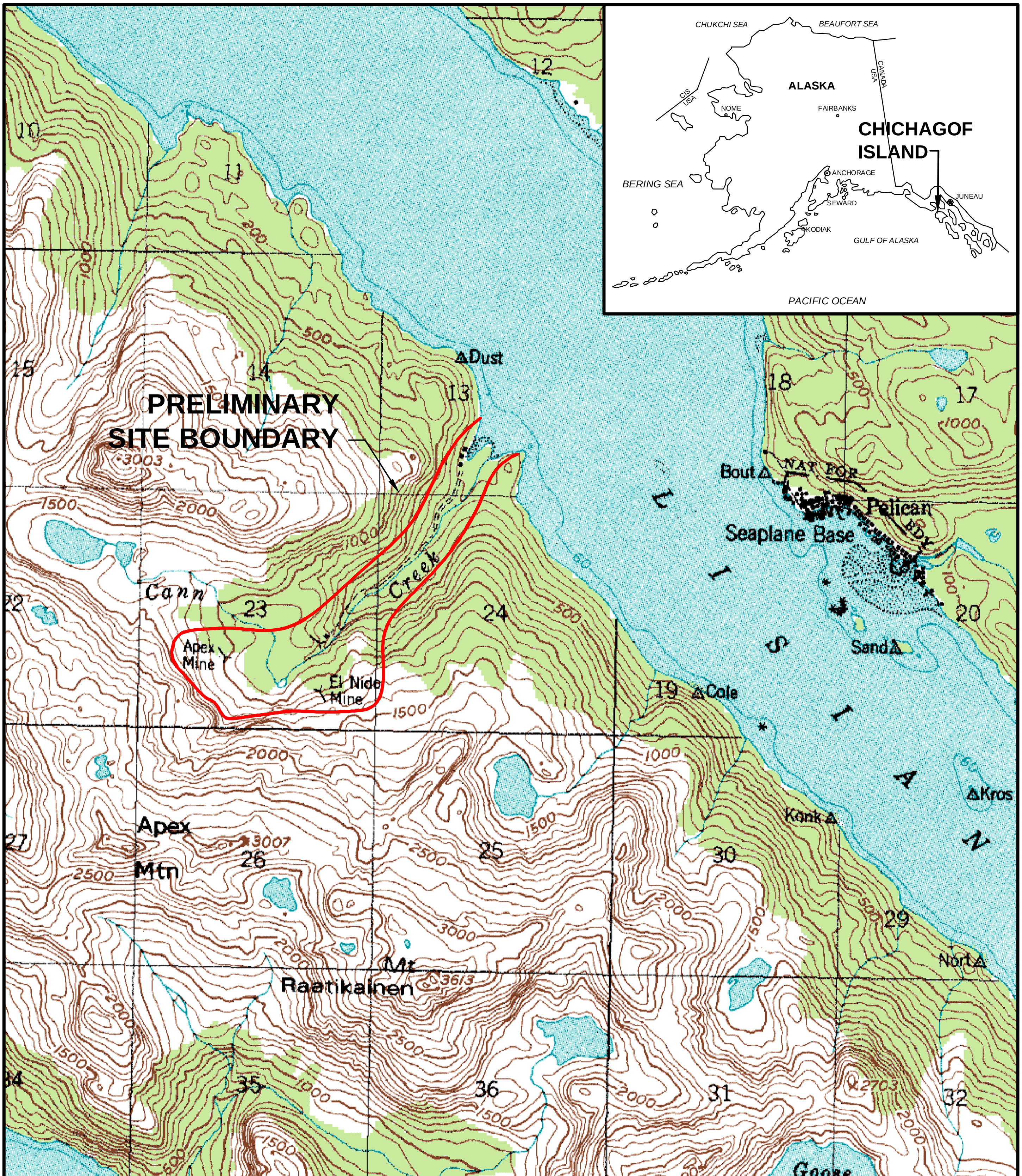
———. 1994a. USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review. February.

———. 1994b. USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review. February.

———. 2002. National Recommended Water Quality Criteria:2002. Office of Water, Publication EPA 822-R-047. November.

Williams, J.A. 1955. Ariel Property, Sitka Quadrangel, Gold and Tungsten. U.S. Bureau of Mines Property Examination Report. 6 pp.

FIGURES



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USDA FOREST SERVICE, ALASKA REGION
PRELIMINARY ASSESSMENT/SITE INVESTIGATION

APEX AND EL NIDO MINES
GENERAL LOCATION MAP

TONGASS NATIONAL FOREST, ALASKA

URS

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FIGURE 1

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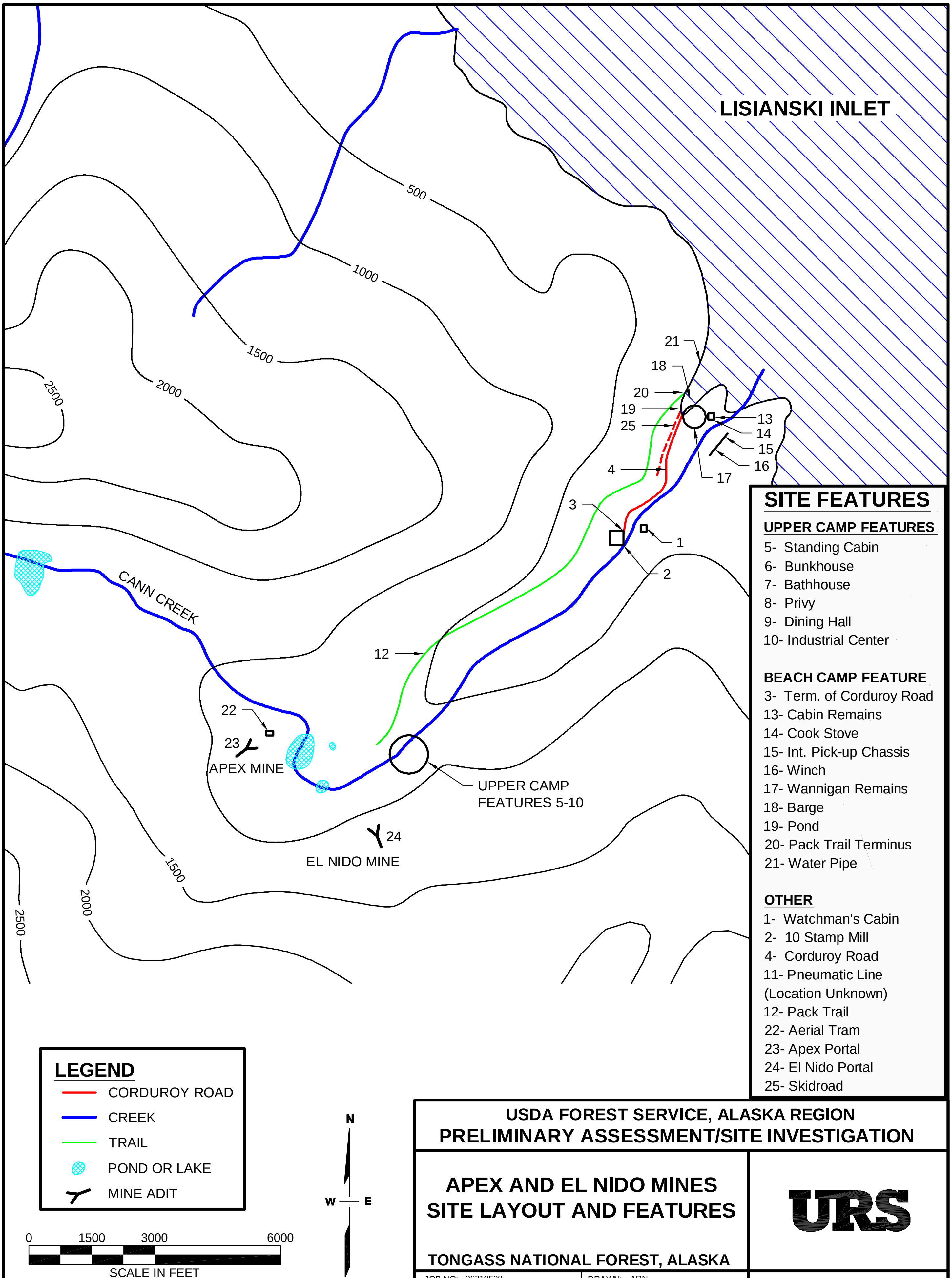

SOURCE: USFS (1993)

USDA FOREST SERVICE, ALASKA REGION

PRELIMINARY ASSESSMENT/SITE INVESTIGATION

APEX AND EL NIDO MINES SITE LAYOUT AND FEATURES

TONGASS NATIONAL FOREST, ALASKA

URS

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FIGURE 2

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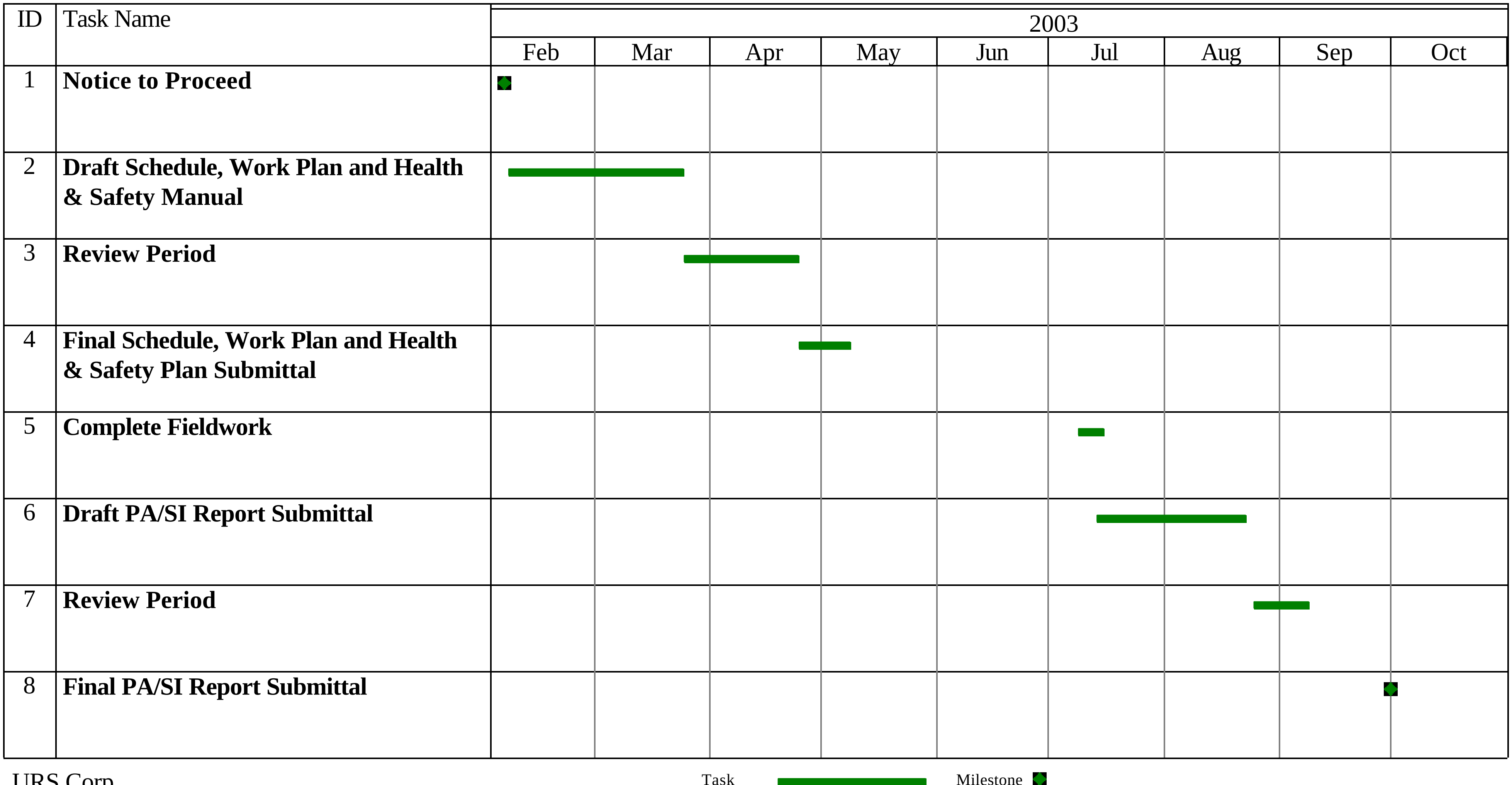
Figure 3
Project Schedule
Preliminary Assessment/Site Investigation
APEX - EL NIDO Mine
Tongass National Forest, Alaska



URS Corp.
Job Number: 26219528
Date: 03/21/03

TABLES

TABLE 1
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES
Apex and El Nido Mines PA/SI – Tongass National Forest, Alaska

Media	Analyses	Method Reference	Method	Container	Preservative	Holding Time
Soil	RCRA Metals	EPA SW846	EPA 6000/7000 Series	4-oz glass jar	Cool to 4 °C	6 months (Hg 28 days)
	TCLP Metals	EPA SW846	TCLP	4-oz glass jar	Cool to 4 °C	6 months (Hg 28 days)
	DRO/RRO	ADEC	AK 102/103	8-oz glass jar	Cool to 4 °C	14 days
Surface Water	Total Recoverable RCRA Metals	EPA SW846	EPA 6000/7000 Series	1 liter poly	HNO_3 (pH<2), Cool to 4 °C	6 months (Hg 28 days)
	Dissolved Metals	EPA SW846	EPA 6000/7000 Series	1 liter poly	HNO_3 (pH<2), Cool to 4 °C	6 months (Hg 28 days)
	Hardness	EPA SW846	EPA 2340B	1 liter poly	HNO_3, cool to 4 °C	6 months
Waste Rock	Acid Generation Potential Evaluation	--	Modified EPA Sobek Method	2 to 5 lbs in cloth bag	None	None

Notes:

ADEC	=	Alaska Department of Environmental Conservation
AK	=	Alaska Method
oz	=	Ounce
°C	=	Degrees Celsius
DRO	=	Diesel range organics
EPA	=	U.S. Environmental Protection Agency
Hg	=	Mercury
HNO_3	=	Nitric acid
PA/SI	=	Preliminary Assessment/Site Investigation
poly	=	Polyethylene bottle/container
RCRA	=	Resource Conservation and Recovery Act
RRO	=	Residual range organics
TCLP	=	Toxic Characteristic Leaching Procedure

TABLE 2
DATA QUALITY OBJECTIVES SUMMARY
Apex and El Nido Mines PA/SI – Tongass National Forest, Alaska

Activity	Media		
	Soil	**Waste Rock**	**Surface Water**
Objectives	To assess potential metals and organic contaminant concerns.	To assess acid generation potential	To expand on, and confirm previous water quality data; assess potential contaminant transport.
Prioritization Data Use(s)	Site characterization.	Site characterization.	Site characterization.
Compounds of Concern	Metals, Petroleum Hydrocarbons	Acid Leachate	Metals
Levels of Concern	Based on appropriate ADEC Method 2 Cleanup Levels.	Qualitative evaluation	Based on chronic exposures to ambient water quality
Critical Samples	All samples, based on field observations	All samples, based on field observations	All samples, based on field observations

Notes: ADEC = Alaska Department of Environtmental Conservation
EPA = Environmantal Protection Agency
PA/SI = Preliminary Assessment/Site Investigation

TABLE 3
QAOs FOR MEASUREMENT OF ANALYTICAL METHODOLOGIES – SOIL
Apex and El Nido Mines – Tongass National Forest, Alaska

Analytical Parameter	Analytical Methodology	Method Detection Limit (MDL)	Practical Quantitation Limit (PQL)	Detection Limit Goals[1]	Completeness (%)	Control Limits (MS/MSD)	
						Accuracy (%)	Precision (%)
RCRA Metals (mg/kg)							
Arsenic	EPA 6020	0.2	0.5	1.8	90	75 – 125	20
Barium	EPA 6020	0.02	0.05	982	90	75 – 125	20
Cadmium	EPA 6020	0.03	0.05	4.5	90	75 – 125	20
Chromium (Total)	EPA 6020	0.04	0.2	23	90	75 – 125	20
Lead	EPA 6020	0.04	0.05	400	90	75 – 125	20
Mercury	EPA 7471A	0.01	0.02	1.24	90	77 – 120	15
Selenium	EPA 6020	0.5	1	3.0	90	75 – 125	20
Silver	EPA 6020	0.008	0.02	19	90	75 – 125	20
Total Petroleum Hydrocarbons (mg/kg)							
Diesel Range Organics (DRO)	AK 102	2.0	10	230	90	60 – 140	50
Residual Range Organics (RRO)	AK 103	10	100	8,300	90	60 – 120	50

Notes:

%	=	Percent
AK	=	Alaska Method
DRO	=	Diesel range organics
EPA	=	U.S. Environmental Protection Agency
MDL	=	Method Detection Limit
mg/kg	=	Milligrams per kilogram
MSD	=	Matrix spike duplicate
QAOs	=	Quality assurance objectives
PQL	=	Practical Quantitation Limit
RCRA	=	Resource Conservation and Recovery Act
RRO	=	Residual range organics
1	=	Detection Limit Goals based on ADEC Method 2 Cleanup Levels for migration to ground water in an area with over 40 inches of annual precipitation.

Source for MDLs, PQLs, and control limits: Columbia Laboratories (2003).

TABLE 4
QAOs FOR MEASUREMENT OF ANALYTICAL METHODOLOGIES – SURFACE WATER
Apex and El Nido Mines PA/SI – Tongass National Forest, Alaska

Analytical Parameter	Analytical Methodology	Method Detection Limit (MDL)[1]	Practical Quantitation Limit (PQL)[1]	Detection Limit Goals[2]	Completeness (%)	Control Limits (MS/MSD)	
						Accuracy (%)	Precision (%)
RCRA Metals (µg/L)							
Arsenic	EPA 6020	0.02	0.05	150	90	75 – 125	20
Barium	EPA 6020	0.02	0.05	4[3]	90	75 – 125	20
Cadmium	EPA 6020	0.01	0.02	0.25	90	75 – 125	20
Chromium	EPA 6020	0.06	0.2	74	90	75 – 125	20
Lead	EPA 6020	0.01	0.02	2.5	90	75 – 125	20
Mercury	EPA 7470	0.1	0.2	0.77	90	77 – 120	15
Selenium	EPA 6020	0.2	1	5	90	75 – 125	20
Silver	EPA 6020	0.01	0.02	3.2[4]	90	75 – 125	20
Other							
Hardness	SM 2340B	NA	NA	NA	90	NA	NA
Salinity	Field Probe	NA	NA	NA	NA	NA	NA
PH	Field Probe	NA	NA	NA	NA	NA	NA
Conductivity (µS/cm)	Field Probe	NA	NA	NA	NA	NA	NA
Temperature (°C)	Field Probe	NA	NA	NA	NA	NA	NA

Notes:
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = micro siemans per centimeter
MDL = Method Detection Limit
MS = Matrix spike
MSD = Matrix spike duplicate
NA = Not Available and/or Not Applicable
% = Percent
PA/SI = Preliminary Assessment/Site Investigation
QAOs = Quality assurance objectives
µg/L = Micrograms per liter

References
1 = Source for MDLs, PQLs, and control limits: Columbia Laboratories (2003).
2 = ADEC (1999)/EPA (2002) AWQC: Freshwater Aquatic Life CCC, unless otherwise noted.
3 = Secondary chronic value as cited in ORNL (1997).
4 = NE, CMC listed.

TABLE 5
QAOs FOR MEASUREMENT OF ANALYTICAL METHODOLOGIES – WASTE ROCK
Apex and El Nido Mines – Tongass National Forest, Alaska

Analytical Parameter	Analytical Methodology	Lower Reporting Limit	Upper Reporting Limit	Units	Method Precision (%)
Net neutralization potential (NNP)	ALS Chemex OA-VOL08	1	1000	t $CaC0_3$/1000 t	10
Neutralization potential	ALS Chemex OA-VOL08	1	1000	t $CaC0_3$/1000 t	10
Maximum potential acidity (MPA)	ALS Chemex OA-VOL08	0.5	2000	t $CaC0_3$/1000 t	10
Ratio (NP: MPA)	ALS Chemex OA-VOL08	0.01	1000	Unity	10
Fizz Rating	ALS Chemex OA-VOL08	1	4	Unity	10
Total Sulfur	ALS Chemex S-IR08	0.01	50	%	5
Paste pH	ALS Chemex OA-ELE07	0.1	14	Unity	10

Notes:
% = Percent
$CaC0_3$ = Calcium Carbonate
t = tonnes
QAOs = Quality assurance objectives

Source : ALS Chemex (2003).