Technical Report No. 14-03

Kensington Gold Mine Tailings Treatment Facility Studies, 2013

by

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and

Katrina M. Kanouse

February 2014

Alaska Department of Fish and Game **Division of Habitat**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in reports by the Divisions of Habitat, Sport Fish and of Commercial Fisheries. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	\$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

TECHNICAL REPORT NO. 14-03

KENSINGTON GOLD MINE
TAILINGS TREATMENT FACILITY STUDIES, 2013

by

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February 2014

This project was fully financed by Coeur Alaska, Inc. through Reimbursable Services Agreement No. 1029540 with the Alaska Department of Natural Resources, Office of Project Management and Permitting.

Cover: Aerial photo of the Kensington Gold Mine project area: tailing treatment facility (right), Upper Slate Lake (center), Spectacle Lakes (left), and Berners Bay (background). Copyright Alaska Department of Fish and Game.

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This document should be cited as:
Willson-Naranjo, G. R. and K. M. Kanouse. 2014. Kensington Gold Mine tailings treatment facility studies, 2013. Alaska Department of Fish and Game, Technical Report 14-03, Douglas, Alaska.

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ACKNOWLEDGEMENTS

The Alaska Department of Fish and Game thanks Coeur Alaska, Inc. Kensington Gold Mine for providing financial support. Coeur Alaska, Inc. Environmental staff, Kevin Eppers, Pete Strow, Ryan Bailey, and Kristi Asplund provided logistical support, and Mr. Bailey and Ms. Asplund collected data for this project.

Alaska Department of Fish and Game Division of Habitat staff assisted with this year's effort. Greg Albrecht assisted with development and implementation of our dive plan. Mr. Albrecht, Ben Brewster, Matt Kern, Tally Teal, and Tess Quinn provided support during project planning and implementation. Mr. Brewster, Mr. Albrecht, Mr. Kern, and Rick Hoffman sorted and identified benthic macroinvertebrates, and Nicole Legere was our alternate diver for the project. Division of Habitat Deputy Director Dr. Al Ott, Southeast Regional Supervisor Jackie Timothy, and Ms. Legere reviewed the report, and Amy Carroll of the Commercial Fisheries Division prepared the report for publication.

We also thank Kyle Hebert and Jeff Meucci of the Commercial Fisheries Division, whose guidance, assistance, and expertise allowed for the creation of the Division of Habitat's first dive team.

Thank you all very much. We could not have completed this work without your help.

EXECUTIVE SUMMARY

In 2013, Coeur Alaska, Inc. (Coeur) developed the Tailings Treatment Facility (TTF) Environmental Monitoring Plan in consultation with Alaska Department of Fish and Game (ADF&G) Division of Habitat, Alaska Department of Environmental Conservation Division of Water, and U.S. Forest Service (USFS) staff to satisfy study requirements in Coeur's Fish Habitat Permit and the USFS project record of decision (Appendix A). The plan includes studies to investigate, among others, benthic macroinvertebrate succession in the TTF after closure, and the results will be used to finalize a TTF closure plan designed to achieve the reclamation goal of restoring and improving aquatic productivity in the TTF, formerly known as Lower Slate Lake.

In 2013, the first year of plan implementation, we studied tailings geochemistry, benthic macroinvertebrate colonization of tailings and upland soil, and measured dissolved oxygen, temperature, and pH throughout the water column in Upper Slate Lake.

The tailings samples collected at the mill generally contained greater concentrations of metals, nonmetals, metalloids, and others, than the tailings samples collected in the TTF. All tailings samples collected in 2013 were nonacid generating. We observed more benthic macroinvertebrates in the upland soil sample trays compared to the paired reference sample trays, and fewer benthic macroinvertebrates among the tailings sample trays compared to the paired reference sample trays. In August and in the deeper areas of Upper Slate Lake, we observed a thermocline between 3 m and 6 m depth, a rapid decrease in dissolved oxygen below 7 m depth, and near anoxic waters close to the lakebed.

In 2014, we will sample tailings geochemistry, benthic macroinvertebrates in late spring and late fall, and measure temperature, dissolved oxygen, and pH in late winter and late summer. We will also investigate ways to improve benthic macroinvertebrate sample tray retrieval and measure tailings compaction, sort tailings sample trays onsite immediately after retrieval to efficiently dispose waste tailings in the TTF, and report Shannon Diversity and Evenness indices for the benthic macroinvertebrate results as another metric for data interpretation.

INTRODUCTION

The Kensington Gold Mine is a remote underground mine located 72.5 km north of Juneau by air at the southern end of the Kakuan Range (Coeur 2005) and the base of Lions Head Mountain in the Tongass National Forest. Coeur owns and operates the mine and began production on June 24, 2010, with an estimated mine life of 10 years (Coeur 2005).

The Kensington Gold Mine operates a mill onsite and uses two ball crushers and a froth-floatation system that relies on chemical collectors and frothing agents to separate the gold-bearing minerals from the barren rock. Tailings are disposed as slurry from the mill to the TTF, formerly known as Lower Slate Lake, and permanently deposited under at least 2.7 m of water (Coeur 2005). The TTF impoundment, planned to be built in three phases, increases the storage capacity of the natural basin, allowing for disposal of 2,000 tons of tailings per day over a period of about 10 years. The impoundment will reach maximum design height (26.2 m) after construction of the third phase, with a final crest height of 225 m elevation (Coeur 2005). At closure, the TTF will be flooded to about 213 m elevation and tailings will be submerged under about 8.5 m of water (KCHE 2013).

At the project site, mineralization occurs in erratic and discontinuous quartz veins that form a low-grade bulk mineable ore body; the amount of gold is directly related to the volume of pyrite, the main sulphide mineral in the ore body (Echo Bay Exploration Inc. 1990). Oxidation of sulphides in the presence of water can have potentially deleterious effects on freshwater ecosystems (Gray 1997, Niyogi et. al. 2002). The tailings produced at the Kensington Gold Mine, however, are relatively inert because the majority of sulphides remain in the gold concentrate that is shipped off site for additional processing (Coeur 2005). Furthermore, studies have demonstrated that subaqueous tailings disposal can retard sulphide oxidation and reduce the amount of dissolved metals released to the environment (Rescan Environmental 1990–1991; Pederson et al. 1993; SNC-Lavalin Environment Inc 2006; R. K. Mugo, D. McDonald, and G. W. Poling, 1999, unpublished data).

Though the submerged tailings are expected to be nonacid generating at closure, we do not know if the fine tailings substrate will provide habitat for benthic macroinvertebrate recolonization after closure. Coeur's reclamation goal for the TTF is to restore and improve aquatic productivity in Lower Slate Lake. In their current reclamation plan (KCHE 2013), Coeur is required to cap the deposited tailings with at least 15 cm of topsoil unless studies demonstrate the cap is not necessary to achieve the reclamation goal. The studies we complete under the TTF Environmental Monitoring Plan will provide information on conditions in the TTF at closure and inform resource agencies during development of the final TTF closure plan.

PURPOSE

The purpose of this technical report is to summarize the 2013 data collected during the first year of studies required by the Tailings Treatment Facility Environmental Monitoring Plan for the Kensington Gold Mine.

STUDY AREA

Slate Creek drains a 10.5 km^2 watershed (Coeur 2005) into Slate Cove on the northwest side of Berners Bay in southeast Alaska (Figure 1). About 1 km upstream of the stream mouth, waterfalls prevent anadromous fish passage to the East and West Forks. The East Fork drainage includes two lakes, Upper Slate Lake and Lower Slate Lake. Prior to project development, Upper Slate Lake drained to Lower Slate Lake, which had one outlet; East Fork Slate Creek (Figure 1).

Prior to TTF development, Lower Slate Lake was the largest of the two lakes with a surface area of about 8 ha and a maximum depth of about 15 m, while Upper Slate Lake, upstream of mine influence, has a surface area of about 4 ha and a maximum depth of about 13 m (Kline 2005). To isolate the TTF during tailings disposal, water from Upper Slate Lake is diverted around the TTF and into East Fork Slate Creek. Downstream fish passage from Upper Slate Lake to East Fork Slate Creek is afforded through a diversion pipeline.

Dolly Varden char *Salvalinus malma*, and threespine stickleback *Gasterosteus aculeatus*, existed in Lower Slate Lake prior to TTF development. Since development, Division of Habitat biologists have documented threespine stickleback in the TTF every year, and have not observed Dolly Varden char since 2010.[ab] In a 2001 study, Earthworks Technology (2002) estimated the

[a] Tally Teal, Habitat Biologist, ADF&G Division of Habitat, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Kensington Gold Mine Tailings Habitability Study Preliminary Field Work; dated 10/16/12.

Lower Slate Lake Dolly Varden char population at 996 ± 292 fish and reported a benthic macroinvertebrate community in Lower Slate Lake dominated by chironomids (nonbiting midges) and amphipods (crustaceans). Kline (2001) documented benthos nearly devoid of macroinvertebrates at a depth of 15 m and Earthworks Technology (2002) reported three dipterans (midges) and one amphipod in three samples taken at that depth. Earthworks Technology (2002) sampled at 4 m depth and found benthic macroinvertebrates in quantities consistent with those of Mousavi and Amundsen (2012) and Babler et al. (2008)—studies documenting a decrease in benthic macroinvertebrate abundance and richness as lake depth increases.

Dolly Varden char and threespine stickleback are present in Upper Slate Lake. In 2010, Coeur (2012) estimated the Upper Slate Lake Dolly Varden char population at 945 ± 58 fish. Little other biological data exists for Upper Slate Lake. Kline (2005) studied temperature and dissolved oxygen in Lower Slate Lake and Upper Slate Lake in August and October of 2003, finding similar results for both lakes and suggested the dimictic[c] lakes contained a zone of low dissolved oxygen near the lakebed in deeper areas of the lakes.

Given the geographical and biological similarities between Lower Slate Lake and Upper Slate Lake, the plan specifies using Upper Slate Lake as the study site for investigating benthic macroinvertebrate colonization of TTF substrates and physiochemical profiles of the water column.

2013 Studies

During 2013, year four of mining operations, we

- studied the geochemistry of tailings samples collected at the mill and the TTF to evaluate sulphide content, acid generating potential, metals, nonmetals, metalloids, and other properties;
- implemented a two-year study in Upper Slate Lake to investigate benthic macroinvertebrate colonization of tailings and upland soil;[d]
- deployed sample trays on the north and south sides of the lake at shallow (2–3 m) and deep (7–9 m) depths;[e]
- retrieved 40 sample trays in October after four months of submersion; and
- measured dissolved oxygen, temperature, and pH at several locations throughout the water column in Upper Slate Lake.

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[b] Ben Brewster, Habitat Biologist, ADF&G Division of Habitat, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Tailings Treatment Facility Threespine Stickleback study; dated 10/2/13.

[c] Dimictic refers to mixing of deep and shallow lake water due to seasonal changes in temperature. In summer, the lake surface warms and the water tends to stratify by temperature. In winter, the lake surface temperature cools until reaching the maximum density at 4 °C, at which point the cooler water sinks and causes the deeper, less dense water to rise to the surface.

[d] These substrates will be present in the reclaimed TTF.

[e] These are the expected depths of flooded upland soil and tailings substrates after closure of the TTF.

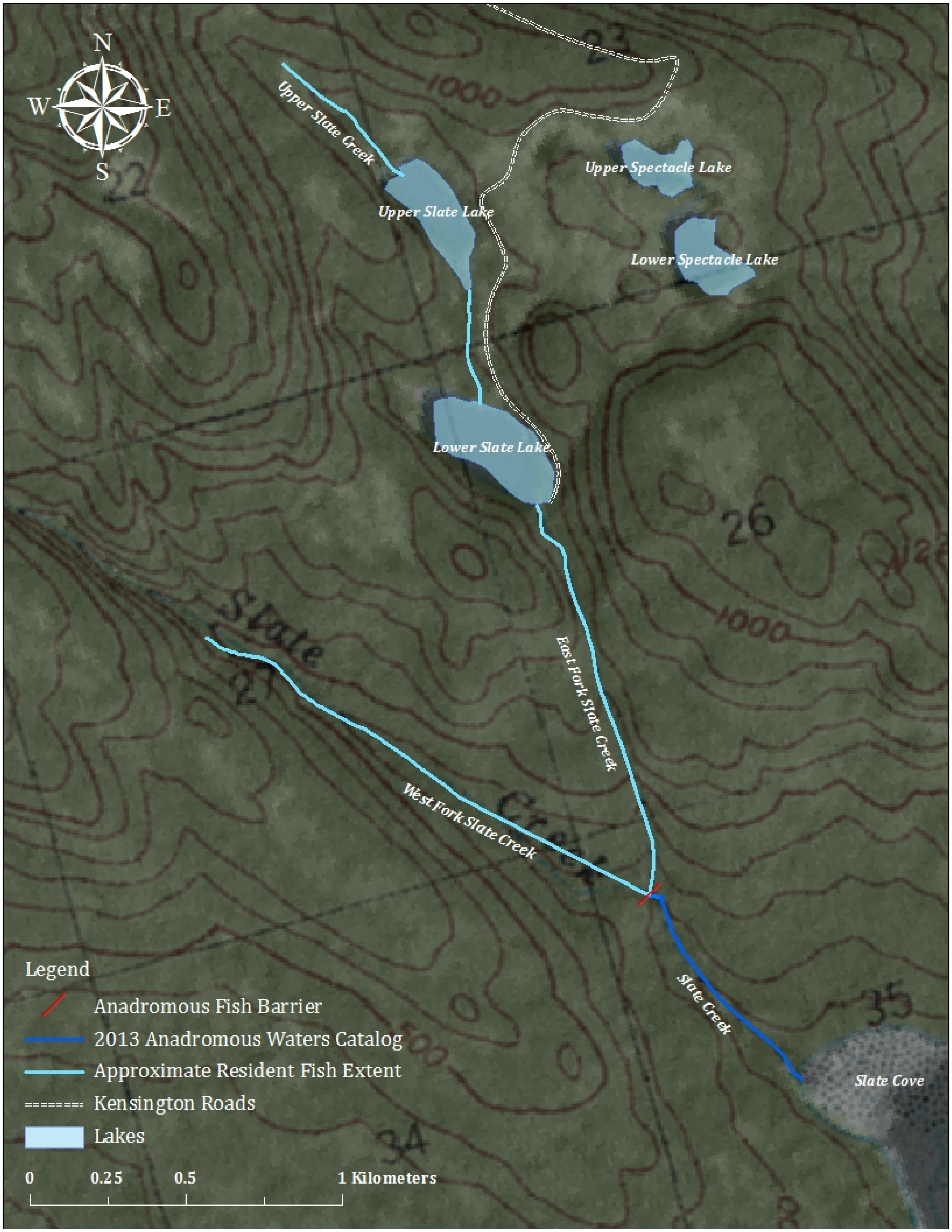

Figure 1.–Slate Creek system prior to TTF development in Lower Slate Lake.

METHODS

TAILINGS GEOCHEMISTRY

Plan Requirement – Section 2.2[f]

The plan requires sampling tailings from the mill and the TTF four times over a period of one year, and analyzing the samples using two different methods.[g] The data will provide information on the metals, nonmetals, metalloids, acid generating potential, and other geochemical properties of the tailings.

Sample Collection and Analysis

Coeur staff used a 10 cm diameter universal core sampler to collect a composite sample of tailings from the TTF at about 3.6 m depth, retaining only the top 7 cm of each core, and also collected a random tailings sample from the mill standpipe. Staff shipped all samples to SVL Laboratories in Kellog, Idaho for analyses using a modified Acid-Base accounting procedure (Table 1) and the Meteoric Water Mobility procedure (Table 2).

Table 1.–Acid-Base accounting parameters for tailings geochemistry analyses.

Parameter	Method	Unit
Paste pH	EPA 150.1	pH
Total Sulfur	Modified ABA	%
Sulfide	Modified ABA	%
Sulfate	Modified ABA	%
Total Inorganic Carbon	Modified ABA	%
Carbonate	Modified ABA	mg/L
Neutralization Potential	Modified ABA	t $CaCO_3$/kt
Acid Generating Potential	Modified ABA	t $CaCO_3$/kt
Net Neutralizing Potential	Modified ABA	t $CaCO_3$/kt
Net Potential Ratio	Modified ABA	t $CaCO_3$/kt

Note: t = ton, kt = kiloton

[f] Coeur will update the plan in 2014 and include measuring other geochemical properties of the tailings, as required by their waste management permit 2013DB0002.

[g] Parameters vary among the different sample types: quarterly and annual. The annual sample will be analyzed concurrently with the quarterly sample in the 2014 third quarter.

Table 2.–Meteoric Water Mobility procedure parameters for tailings geochemistry analyses.

Parameter	Method	Unit	Parameter	Method	Unit
pH	EPA 150.1	mg/L	Beryllium	ICP-MS	mg/L
Alkalinity	SM 2320	mg/L	Calcium	ICP-OES	mg/L
Bicarbonate	SM 2320	mg/L	Cadmium	ICP-MS	mg/L
Cyanide (WAD)	SM 4500-CN1	mg/L	Chromium	ICP-MS	mg/L
Chlorine[a]	EPA 300	mg/L	Copper	ICP-MS	mg/L
Fluorine[a]	EPA 300	mg/L	Iron	ICP-OES	mg/L
Nitrate as Nitrogen	EPA 300	mg/L	Potassium	ICP-OES	mg/L
Nitrite as Nitrogen	EPA 300	mg/L	Magnesium	ICP-OES	mg/L
Total Nitrates as Nitrogen	EPA 300	mg/L	Manganese	ICP-OES	mg/L
Sulfate	EPA 300	mg/L	Sodium	ICP-OES	mg/L
Mercury	CVAAS	mg/L	Nickel	ICP-OES	mg/L
Gold	ICP-OES	mg/L	Lead	ICP-MS	mg/L
Aluminum	ICP-OES	mg/L	Antimony	ICP-OES	mg/L
Arsenic	ICP-MS	mg/L	Selenium	ICP-MS	mg/L
Boron	ICP-MS	mg/L	Thallium	ICP-MS	mg/L
Barium	ICP-MS	mg/L	Zinc	ICP-OES	mg/L

[a] Chlorine and fluorine should be listed as chloride and fluoride in the plan, and will be corrected in the 2014 plan update.

Data Presentation

We present tables of sample results for the mill and TTF tailings samples. The laboratory report is included in Appendix B.

TAILINGS HABITABILITY

Plan Requirement – Section 2.3

The plan requires a pilot study to investigate benthic macroinvertebrate colonization of tailings and upland soil, substrates that will be present in the flooded TTF at mine closure. Benthic macroinvertebrate data obtained for each substrate type will be compared to results for the paired reference substrate, natural lakebed material collected from Upper Slate Lake. The study is designed to provide information on benthic macroinvertebrate colonization in the TTF after closure.

Sample Collection and Analysis

Sample trays measured 10 × 10 cm and had a total volume of 920 mL. We prepared 40 trays of tailings, 40 trays of upland soil, and 80 trays of Upper Slate Lake reference substrate and deployed the sample trays on the north and south ends of the lake at shallow (2–3 m) and deep (7–9 m) depths.

We collected about 50 L of tailings slurry (56% solids) from the mill standpipe in clean, unused buckets (Figure 2).[h] To mimic dilution during deposition in the TTF, we washed the tailings three times in clean, unused buckets by diluting the tailings with water from Upper Slate Lake 1:1. We stirred the mixture to suspend the tailings, waited 20–30 min until the tailings settled, decanted supernatant water, and washed the tailings two more times. In all washes, we observed that heavier particles settled at the bottom, and lighter particles remained in suspension (Figure 3).

We used stainless steel scoops to fill 40 sample trays with 875 mL of washed tailings and froze the trays to minimize sample loss during deployment. We observed heavier particles clumped in the trays, creating pockets of less dense, lighter particles that may present a study bias if the pockets do not occur naturally in the TTF or settle over time. We sent one sample of washed tailings to AECOM Environmental Toxicology for grain size analysis.

Figure 2.–Habitat biologist Ben Brewster collected tailings from the mill standpipe.

Figure 3.–Decanting supernatant water after tailings wash.

We collected 40 samples of upland soil from the west bank of the TTF near 213 m elevation (N 58.8103, W 135.0444), the expected flooded water level of the TTF after closure (Figure 4). We used a clam shovel to cut a 10 × 10 × 8 cm sample area and placed the rock, soil, and vegetative mat plug in each sample tray (Figure 5), about 875 mL of material, and froze the trays to minimize sample loss during deployment. We chose soil samples with moss vegetation because the larger vegetation types would not fit in the sample trays. We sent one sample of upland soil to AECOM Environmental Toxicology for grain size analysis.

[h] Collecting tailings samples from the TTF with a universal core sampler and retaining only the top 7 cm was not practical for the amount of tailings needed for the study.

Figure 4.–Terrestrial vegetation near 213 m el.

Figure 5.–Upland soil collection.

To provide reference data, we prepared 80 sample trays of Upper Slate Lake lakebed substrate to pair with the tailings and upland soil sample trays. To compare with the tailings and upland soil sample tray results, the reference substrate must also be devoid of benthic macroinvertebrate life at the inception of the study. We collected about 100 L of lakebed substrate from Upper Slate Lake at depths 3–8 m using a Ponar dredge (Figure 6). To eradicate insects and eggs (Wang et al. 2002, Gazit et al. 2004), we added water from Upper Slate Lake to homogenize batches in metal pots and used propane burners to raise the temperature of the substrate to about 96°C (Figure 7). After the batches cooled, we transferred the reference substrate to 10 µm filter bags to drain excess water (Figure 8). Once the batches had dehydrated to about the original consistency, we filled sample trays with about 875 mL of the prepared reference substrate and froze the trays to minimize sample loss during deployment. We sent one sample of defaunated lakebed reference substrate to AECOM Environmental Toxicology for grain size analysis.

Figure 6.–Habitat biologist Matt Kern using a Ponar dredge to collect lakebed substrate in Upper Slate Lake.

Figure 7.–Heating lakebed Upper Slate Lake substrate to eradicate insects.

Figure 8.–Habitat biologist Gordon Willson-Naranjo filtered lakebed substrate to remove excess water.

The plan also specifies including sediment traps with the sample trays to study sediment deposition over time. To make the sediment traps, we filled 16 sample trays with about 875 mL of concrete and allowed the material to harden overnight.

We constructed 16 circular arrays using PVC pipe, rebar, and 5 mm plastic mesh to deploy the 160 sample trays in Upper Slate Lake. The arrays measured 1.2 m diameter with space for 10 sample trays each, and one sediment trap in the center (Figures 9–10). The plastic mesh supported the sample trays to prevent sinking into the soft organic lakebed, and limited lateral movement of benthic macroinvertebrates from the surrounding native lakebed. Tray elevation encourages drift as the natural vector for benthic macroinvertebrate colonization in the sample trays, mimicking expected recolonization of tailings in the TTF at closure (Kline and Stekoll 2001, Snucins 2003). Immediately prior to deployment, we secured the sediment traps and paired frozen sample trays (one upland soil or tailings sample tray and one reference sample tray) to the array mesh using zipties.

Figure 9.–Assembled PVC array with rebar and mesh support, and the paired sample trays.

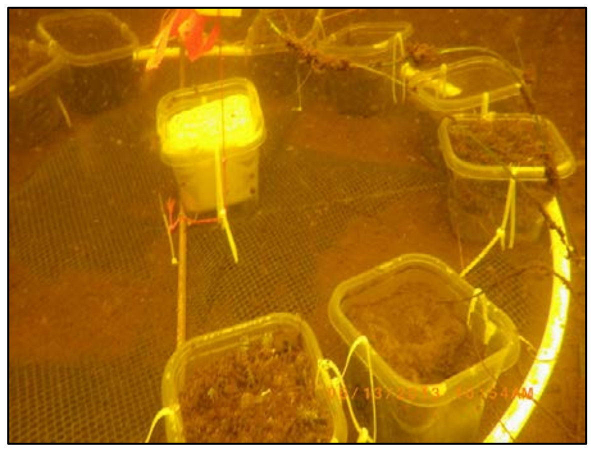

Figure 10.–Deployed array with upland soil and reference substrate trays and center sediment trap.

On June 12 and 13, 2013, we deployed 16 assembled arrays in Upper Slate Lake along four transects: two shallow (2–3 m depth) and two deep (7–9 m depth), one each on the north and south sides of the lake (Figure 11). We used a Garmin Fish Finder 100® to measure depth of each array, and a Garmin GPSmap 60CSx to record array locations[i] (Tables 3–4). We lowered the arrays one at a time from a boat using a harness and rope attached to a buoy (Figure 12), maintaining 3–6 m between arrays on each transect (Figure 13). We attached a nylon line connecting each array in a transect and tied one end to the shore as a navigation line for divers. After all four arrays were deployed on a transect, two SCUBA divers descended to adjust arrays and remove the deployment ropes, being careful to avoid disturbing the soft organic lakebed, sample trays, and sediment traps. We followed our approved dive safety plan for the dive work (Appendix C).

[i] World Geodetic System 84 datum.

Table 3.–GPS locations of arrays placed in shallow depths of Upper Slate Lake.

Shallow Arrays			
Array	Approx. Depth (m)	Lat/Lon	Date
Shallow South 1	2.1	N 58.81569 W 135.03955	6/12/2013
Shallow South 2	2.4	N 58.81569 W 135.03954	6/12/2013
Shallow South 3	2.9	N 58.81568 W 135.03941	6/12/2013
Shallow South 4	3.0	N 58.81566 W 135.03925	6/12/2013
Shallow North 1	2.9	N 58.81848 W 135.04025	6/12/2013
Shallow North 2	2.4	N 58.81843 W 135.04016	6/12/2013
Shallow North 3	2.7	N 58.81841 W 135.04012	6/12/2013
Shallow North 4	2.1	N 58.81836 W 135.04007	6/12/2013

Table 4.–GPS locations of arrays placed in deep depths of Upper Slate Lake

Deep Arrays			
Array	Approx. Depth (m)	Lat/Lon	Date
Deep South 1	7.6	N 58.81580 W 135.03934	6/13/2013
Deep South 2	7.9	N 58.81580 W 135.03934	6/13/2013
Deep South 3	8.2	N 58.81583 W 135.03934	6/13/2013
Deep South 4	8.2	N 58.81585 W 135.03928	6/13/2013
Deep North 1	7.9	N 58.81824 W 135.04041	6/13/2013
Deep North 2	8.2	N 58.81828 W 135.04045	6/13/2013
Deep North 3	8.5	N 58.81835 W 135.04051	6/13/2013
Deep North 4	8.2	N 58.81836 W 135.04053	6/13/2013

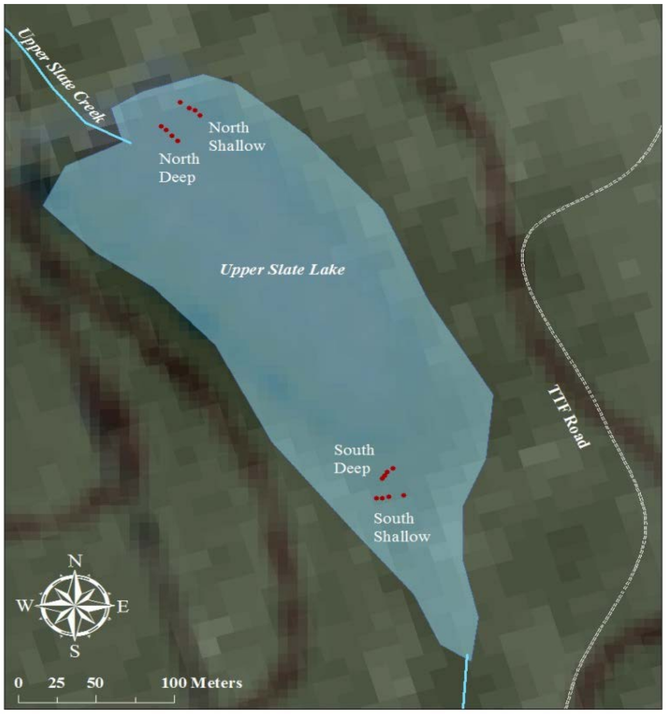

Figure 11.–Map illustrating locations of arrays in Upper Slate Lake.

Figure 12.–Habitat Biologist Greg Albrecht lowers an array into Upper Slate Lake.

Figure 13.–Arrays attached to buoys deployed on the north side of Upper Slate Lake on the deep transect.

SCUBA divers, following the approved dive safety plan, retrieved one array (10 sample trays and one sediment trap each) from each of the four transects. We selected the last array in each transect to minimize disturbance to the other arrays. Divers placed lids on each sample tray and the sediment trap, reconnected the harness and rope attached to a buoy, and cut the nylon line connecting the other arrays in the transect.

Using a boat and the rope and harness, we raised each array to the surface and towed them to shore one at a time.[j] We placed each sample tray into a prelabeled plastic bag, and stored the samples in a cooler on ice until processing.

Within three days of sample retrieval, we rinsed each sample through a 300 µm sieve and preserved the contents of each sieved sample in separate, prelabeled, 500 mL plastic bottles containing 70% denatured ethanol. We used dissecting microscopes to sort and identify benthic macroinvertebrates in each sample bottle. We identified freshwater worms to class Oligochaeta, non-biting midges to family Chrionomidae, and all other insects to genus using Merritt and Cummins (1996) and Stewart and Oswood (2006).[k,l]

We calculated the density of aquatic and terrestrial macroinvertebrates per square meter by dividing the number of insects per sample by 0.013 m^2, the sample tray area, and present mean density for each sample type as the number of benthic macroinvertebrates/m^2.

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[j] We did not lift the arrays into the boat to avoid damaging the arrays and sample trays.

[k] ADF&G recommended, and the plan specifies, identification of all benthic macroinvertebrates to the genus level to compare feeding types of benthic macroinvertebrates between substrate sample types. When the plan was finalized, we were unaware of the microscopic evaluation and expertise required to identify oligochaetes and chironomids to genus, and that oligochaetes are poorly understood taxonomically. The time and costs necessary to train Habitat biologists and procure equipment, or contract with a specialist for taxonomic identification, was not desirable for this pilot study, so we identified freshwater worms to class Oligochaeta and nonbiting midges to family Chironomidae as we do for other benthic macroinvertebrate samples we collect. We did not determine feeding types of benthic macroinvertebrates.

[l] We did not record the number of degraded insects among the 2013 samples because we could not differentiate insect death caused by heating the substrate four months prior or natural death that occurred during the study.

We calculated the percentage of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) insects, collectively known as EPT insects, by dividing the total number of EPT insects counted in all samples by the total number of all insects in all samples.

Lake benthos is generally dominated by two taxa; oligachaetes and chironomids (Kaster and Jacobi 1978, Seminara et al. 1990, Lencioni et al. 2006, Babler et al. 2008, Jyvasjarvi et al. 2012, Mousavi and Amundsen 2012). We calculated the oligachete/chironomid ratio for each sample as described in Wiederholm (1980),[m] an index developed to evaluate benthic macroinvertebrate colonization after disturbance.

Though not required, we also calculated Shannon Diversity and Evenness Indices (Magurran 1988) for the benthic macroinvertebrate data, commonly applied measures of diversity. We used the following equations:

$$H = -\sum_{i=1}^{S}(P_i \ \log_{10} P_i)$$

and,

$$E = \frac{H}{\log_{10} S}$$

where P_i is the number of benthic macroinvertebrates per genus divided by the total number of benthic macroinvertebrates in the sample, and S is the number of genera in the sample.[n] A single insect community has an H value of 0 that increases with the insect number (richness) and insect evenness (abundance equality).

To measure sediment deposition in sample trays during the study, we rinsed sediment captured in each sediment trap into individual beakers and removed benthic macroinvertebrates for identification. We dried the sediment in the beakers on a hotplate until condensation ceased on the rim of the beakers, and measured dry weight of the desiccated sediment using a Mettler Toledo AB54 analytical balance to the nearest 0.1 mg.

Data Presentation

We present tables summarizing grain size data, benthic macroinvertebrate data, and sediment trap data. We also present figures illustrating mean benthic macroinvertebrate density and community composition for each sample type. The substrate grain size laboratory report is included in Appendix D, and a table summarizing the benthic macroinvertebrate data is included in Appendix E.

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[m] Wiederholm (1980) suggests excluding predatory and freely moving chironomids in the calculation because they are not sediment-bound and are tolerant of pollution. Because we did not identify chironomids to genus, we were unable to determine feeding types and mobility of insects, therefore our index results are potentially biased.

[n] Assuming all species are represented in the sample.

DISSOLVED OXYGEN, TEMPERATURE, AND PH PROFILES

Plan Requirement – Section 2.4

The plan requires measuring dissolved oxygen, temperature, and pH throughout the water column in Upper Slate Lake biannually during late-summer and late-winter for three years.

Sample Collection and Analyses

Using an Oakton 300 series meter and an Oakton 10 series meter with 20 m cables, Coeur staff measured dissolved oxygen, temperature, and pH at 0.6 m intervals from the lake surface to the lakebed at 10 sample sites (Table 5).

Table 5.–Depth and location of dissolved oxygen, temperature, and pH sample sites.

Site	Depth (m)	Latitude / Longitude
1	8.5	N58.81600, W135.03908
2	9.1	N58.81622, W135.03886
3	9.8	N58.81635, W135.03958
4	3.0	N58.81659, W135.03897
5	10.4	N58.81665, W135.04036
6	11.6	N58.81699, W135.04074
7	12.2	N58.81761, W135.04051
8	11.6	N58.81793, W135.04149
9	6.1	N58.81841, W135.04031
10	6.7	N58.81789, W135.03993

Data Presentation

We present a figure of mean dissolved oxygen, temperature, and pH data among data collected >8 m depth. We include Coeur's field data sheets in Appendix F.

RESULTS

Tailings Geochemistry

Coeur staff collected quarterly tailings samples from the TTF on August 24, 2013 and October 30, 2013, and samples from the mill on August 25, 2013 and October 30, 2013. Coeur staff did not perform the annual sampling requirement in 2013.

Among the August tailings samples collected at the mill and the TTF, bicarbonate, manganese, magnesium, and sulfur were greatest in the TTF sample and values of the other analytes were greatest in the mill sample (Table 6). Among the October tailings samples, calcium, manganese, sulfate, and total inorganic carbon were greatest in the TTF samples and values of the other analytes were greatest in the mill sample (Table 7). Samples collected from the mill and TTF in both August and October indicate the tailings are nonacid generating, similar to Coeur's (2005) findings. Though it is interesting to compare tailings geochemistry results of the different sample types, we expect variation among the results since the tailings were generated from different rock sources.

Table 6.–August 2013 tailings geochemistry results.

Parameter[a]	Unit	Reporting Limit (RL)	Mill Tailings	TTF Tailings
Paste pH	pH	n/a	8.48	8.16
Total Sulfur	%	0.01	0.09	0.11
Sulfide	%	0.01	< RL	0.05
Sulfate	%	0.06	0.09	0.06
Total Inorganic Carbon	%	0.1	1.29	1.22
Carbonate	mg/L	10.0	< RL	< RL
Neutralization Potential	tCaCO3/kt	0.3	93.5	92.3
Acid Generating Potential	tCaCO3/kt	0.3	< RL	1.5
Net Neutralization Potential	tCaCO3/kt	n/a	93.2	90.8
Neutralization Potential Ratio	tCaCO3/kt	n/a	311.7	61.5
pH	pH	n/a	8.94	7.89
Alkalinity	mg/L	10	20.0	47.2
Bicarbonate	mg/L	10	14.9	47.2
Cyanide	mg/L	0.0100	< RL	< RL
Chloride[b]	mg/L	1.0	3.4	1.6
Flouride[b]	mg/L	0.5	< RL	< RL
Nitrate as Nitrogen	mg/L	0.25	2.00	0.32
Nitrite as Nitrogen	mg/L	0.250	0.809	< RL
Total Nitrates as Nitrogen	mg/L	0.25	2.81	0.34
Sulfate	mg/L	3.00	326	260
Mercury	mg/L	0.00020	0.00023	< RL
Gold	mg/L	0.0100	< RL	< RL
Aluminum	mg/L	0.080	0.168	< RL
Arsenic	mg/L	0.0030	< RL	< RL
Boron	mg/L	0.20	< RL	< RL
Barium	mg/L	0.00100	0.0647	0.0620
Beryllium	mg/L	0.000200	< RL	< RL
Calcium	mg/L	1.00	110	86.7
Cadmium	mg/L	0.000200	< RL	< RL
Chromium	mg/L	0.00150	< RL	< RL
Copper	mg/L	0.00100	0.00166	< RL
Iron	mg/L	0.060	< RL	< RL
Potassium	mg/L	0.50	34.2	12.9
Magnesium	mg/L	0.30	1.48	10.7
Manganese	mg/L	0.0040	< RL	0.0552
Sodium	mg/L	5.00	25.1	10.3
Nickel	mg/L	0.010	< RL	< RL
Lead	mg/L	0.00300	< RL	< RL
Antimony	mg/L	0.020	< RL	< RL
Selenium	mg/L	0.00300	< RL	< RL
Thallium	mg/L	0.00100	< RL	< RL
Zinc	mg/L	0.06	< RL	< RL

[a] Coeur staff submitted Table 2 and Table 3 of the plan to the lab in their work order request. Silver (Ag) and ammonium (NH_4) do not appear in either table, only in the narrative, and therefore were not requested in their work order.

[b] Chloride and fluoride were incorrectly listed as chlorine and fluorine in Table 3 of the plan, and will be corrected in the 2014 plan update.

Table 7.–October 2013 tailings geochemistry results.

Parameter[a]	Unit	Reporting Limit (RL)	Mill Tailings	TTF Tailings
Paste pH	pH	n/a	8.03	7.58
Total Sulfur	%	0.01	0.29	0.1
Sulfide	%	0.01	0.18	< RL
Sulfate	%	0.01	0.11	0.1
Total Inorganic Carbon	%	0.10	0.95	1.68
Carbonate	mg/L	10.0	< RL	< RL
Neutralization Potential	tCaCO3/kt	0.3	85.7	142
Acid Generating Potential	tCaCO3/kt	0.3	5.5	< RL
Net Neutralization Potential	tCaCO3/kt	n/a	80.2	141.7
Neutralization Potential Ratio	tCaCO3/kt	n/a	15.6	473.3
pH	pH	n/a	7.82	7.68
Alkalinity	mg/L	10.0	61.6	54.1
Bicarbonate	mg/L	10.0	61.6	54.1
Cyanide	mg/L	0.0100	< RL	< RL
Chloride[b]	mg/L	1.0[c]	3.4	< RL
Fluoride[b]	mg/L	0.5	< RL	< RL
Nitrate as Nitrogen	mg/L	0.25[c]	0.58	< RL
Nitrite as Nitrogen	mg/L	0.250	3.68	< RL
Total Nitrates as Nitrogen	mg/L	0.25[c]	4.26	< RL
Sulfate	mg/L	3.00[c]	341	1080
Mercury	mg/L	0.00020	< RL	< RL
Gold	mg/L	0.0100	< RL	< RL
Aluminum	mg/L	0.080	< RL	< RL
Arsenic	mg/L	0.0030	< RL	< RL
Boron	mg/L	0.20	< RL	< RL
Barium	mg/L	0.00100	0.0821	0.0606
Beryllium	mg/L	0.000200	<RL	< RL
Calcium	mg/L	1.00	79.9	365
Cadmium	mg/L	0.00020	< RL	< RL
Chromium	mg/L	0.00150	< RL	< RL
Copper	mg/L	0.00100	< RL	< RL
Iron	mg/L	0.060	< RL	< RL
Potassium	mg/L	0.50	34.9	15.3
Magnesium	mg/L	0.30	14.1	13.5
Manganese	mg/L	0.00400	0.0531	0.461
Sodium	mg/L	5.00	28.2	9.95
Nickel	mg/L	0.010	< RL	< RL
Lead	mg/L	0.00300	< RL	< RL
Antimony	mg/L	0.020	< RL	< RL
Selenium	mg/L	0.00300	< RL	< RL
Thallium	mg/L	0.00100	< RL	< RL
Zinc	mg/L	0.06	< RL	< RL

[a] Coeur staff submitted Table 2 and Table 3 of the plan to the lab in their work order request. Silver (Ag) and ammonium (NH_4) do not appear in either table, only in the narrative, and therefore were not requested in their work order.

[b] Chloride and fluoride were incorrectly listed as chlorine and fluorine in Table 3 of the plan, and will be corrected in the 2014 plan update.

[c] The RL for the TTF tailings sample was five times greater because the sample required dilution (Christine Meyer, Projects Manager, SVL Analytical, Kellogg, ID, personal communication).

Tailings Habitability

Substrate Grain Size Analysis

Sand was the dominant fine material (< 2 mm) present in all three sample types (Table 8). Silt was most abundant in the tailings, and clay was most abundant in the upland soil. The overall composition of fine material was most similar among the upland soil and tailings substrates.

Table 8.–Substrate grain size analysis results.

		Sample Type		
Particle Size[a] (%)	Grain Size (mm)	Tailings	Upland Soil	Reference
Coarse Material	> 2.0	<0.05	49.4	16.8
Sand	0.05–2.0	68.0	66.0	86.0
Silt	0.002–0.05	20.0	14.0	2.0
Clay	<0.002	12.0	20.0	12.0

[a] Particle size was determined using ASTM Method D422 and Modified ASA 15-5.

Benthic Macroinvertebrate Sample Trays

On October 28, 2013, we retrieved four arrays, one from each transect. We observed more benthic macroinvertebrates among the upland soil sample trays compared to the paired reference sample trays, and fewer benthic macroinvertebrates among the tailings sample trays compared to the paired reference sample trays (Tables 9–10, Figures 14–15). We observed the most number of taxa among the north shallow sample trays, and more EPT and chironomid insects among the north sample trays.

Table 9.–October 2013 macroinvertebrate data for the shallow (2–3 m depth) sample trays set on the north and south ends of Upper Slate Lake.

	Shallow Sample Trays			
Metric	North		South	
	Upland Soil	Reference	Upland Soil	Reference
Mean Macroinvertebrate Density (insects/m^2)	21,892	14,481	14,169	7,662
Total Number of Taxa Observed	11	10	7	8
% EPT	0.1%	0.3%	0.0%	0.0%
% Chironomidae	89%	76%	43%	73%
Oligochaete/Chironomid Ratio	0.02	0.01	0.02	0.01

Table 10.–October 2013 macroinvertebrate data for the deep (7–9 m depth) sample trays set on the north and south ends of Upper Slate Lake.

	Deep Sample Trays			
Metric	North		South	
	Tailings	Reference	Tailings	Reference
Mean Macroinvertebrate Density (insects/m^2)	1,108	2,938	692	3,092
Total Number of Taxa Observed	8	8	6	9
% EPT	5.6%	0.5%	0.0%	0.5%
% Chironomidae	64%	78%	36%	73%
Oligochaete/Chironomid Ratio	0.10	0.00	0.11	0.01

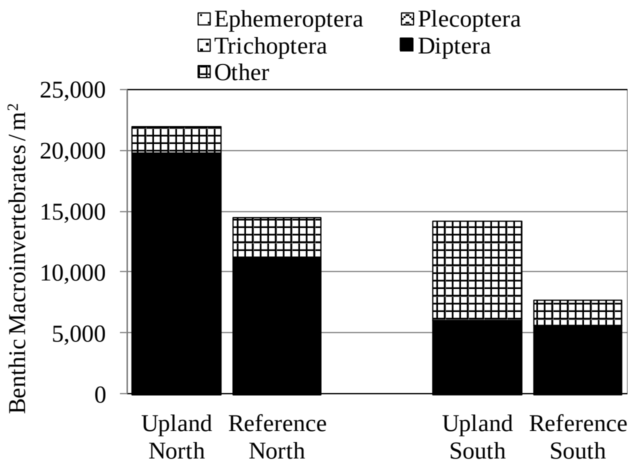

Figure 14.–October 2013 mean benthic macroinvertebrate densities for the shallow sample trays.

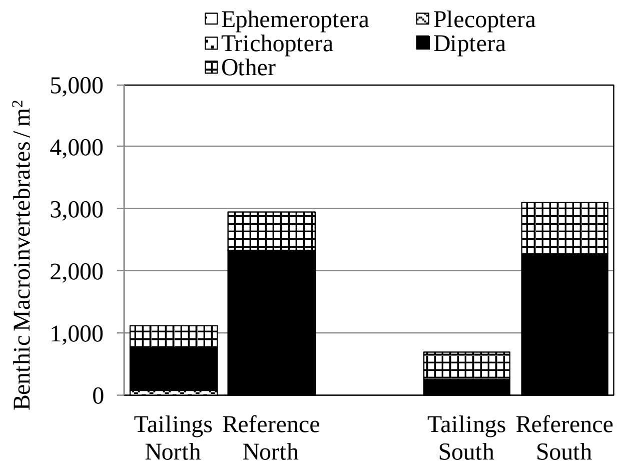

Figure 15.–October 2013 mean benthic macroinvertebrate densities for the deep sample trays.

While sieving the tailings sample trays, we noticed tailings had completely compacted in a few sample trays, and in other trays the tailings were compact below a 1–2 cm soft tailings layer. In 2014, we will investigate ways to evaluate tailings compaction in sample trays and consider the information during benthic macroinvertebrate data interpretation.

Sediment Trap Trays

More sediment deposited in the north sediment trap trays near the lake inlet than the south trays near the lake outlet, and more sediment deposited in the shallow trays than in the deep trays (Table 11). We observed swarms of hundreds of ostracods (seed shrimp) in the shallow sediment trap trays, behavior documented by Rossi et al. (2011) and others.

Table 11.–2013 dry weights of sediment in sediment traps.

Sediment Trap Location	Dry Weight of Sediment (g)
North Shallow	2.8102
North Deep	2.0057
South Shallow	1.6580
South Deep	0.5244

Dissolved Oxygen, Temperature, and pH Profiles

Coeur staff measured dissolved oxygen, temperature, and pH in Upper Slate Lake on August 8, 2013. Figure 16 presents the parameter means for data collected at sample sites > 8.5 m depth, illustrating a decrease in dissolved oxygen below 7 m and a zone of anoxic water near the lakebed, a thermocline between 3 and 6 m depth, and consistent pH throughout the water column. These findings are similar to Kline's (2005) data for Lower Slate Lake.

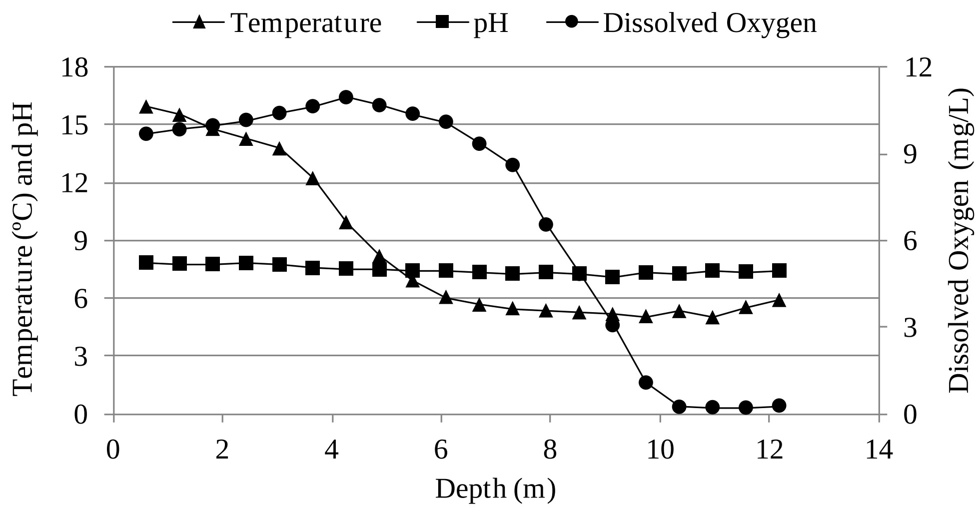

Figure 16.–August 2013 mean dissolved oxygen, temperature, and pH among data collected > 8.5 m depth in Upper Slate Lake.

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APPENDIX A:

ENVIRONMENTAL MONITORING PLAN AND AGENCY APPROVALS

TAILINGS TREATMENT FACILITY ENVIRONMENTAL MONITORING PLAN FOR KENSINGTON GOLD MINE

Developed for

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Project Number
1427-02

December 2013

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1.0 INTRODUCTION

The Kensington Gold Project is an underground gold mine located approximately 45-miles north-northwest of Juneau, Alaska, in the Tongass National Forest. Coeur Alaska, Inc. is the owner and operator of the Kensington Gold Mine and is committed to environmental stewardship and monitoring environmental impacts as a result of this project.

This Environmental Monitoring Plan (EMP) was developed to meet the requirements of the U.S. Forest Service (USFS), the Alaska Department of Fish and Game (ADF&G), and the Environmental Protection Agency (EPA) for environmental monitoring of mining operations. After completing the Final Supplemental Environmental Impact Statement (FSEIS), the USFS and the EPA each issued a Record of Decision (ROD) and identified specific requirements for environmental monitoring and the need for a coordinated, agency-approved EMP. In the event of conflicting direction or requirements, the USFS ROD takes precedent. Appendix A contains the USFS and EPA RODs.

The USFS ROD states that the "Monitoring will determine compliance of the project with the Plan of Operations, validate projected environmental effects of the project and determine effectiveness of mitigation measures." The ROD document also stated that the environmental monitoring measures required under the decision were those outlined in Chapter 2 (Management, Mitigation, and Monitoring) of the FSEIS. The monitoring actions described within this EMP will be based on those outlined in Chapter 2 of the FSEIS and the aforementioned discussions among USFS, ADF&G, and Coeur Alaska officials. Appendix B contains the tables from Chapter 2 of the FSEIS that list all monitoring activities required throughout the course of the project.

Coeur Alaska, USFS and ADF&G will review the plan every five years in conjunction with review of the Closure Plan. This review will occur to address any changes that may be required during the environmental monitoring including the addition, deletion, or alteration of specific programs. Every five years, the USFS and Coeur Alaska must conduct an environmental audit of all operations. A review of this EMP will be included as part of the audit to ensure that monitoring is conducted as required under the RODs and Operation Permits.

This EMP only addresses environmental monitoring during mining operations. The EMP does not cover environmental monitoring or final environmental assessments that are to occur during reclamation actions. A separate Reclamation Monitoring Plan has been developed to address environmental monitoring following the cessation of mine operations. A brief listing of the major monitoring requirements that will be included in the Reclamation Monitoring Plan is noted at the end of this EMP.

This EMP addresses several specific areas of environmental monitoring, most associated with water quality within the Lower Slate Lake Tailings Treatment Facility. The breadth of monitoring requirements has been reduced, and redundancy of specific programs eliminated from the previous EMP. The monitoring programs discussed in this EMP are those deemed by the USFS, ADF&G, EPA, and Coeur Alaska to be the most efficient and effective means of obtaining the information required under the ROD. Each specific monitoring program will be discussed in detail and will include monitoring methods to ensure safety, documentation, and proper information exchange between Coeur Alaska and the regulatory agencies.

2.0 MONITORING PARAMETERS

2.1 WATER QUALITY

During mining operations, water quality will be monitored in accordance with the Alaska Pollutant Discharge Elimination System (APDES) at the identified outfall located at the Lower Slate Lake TTF. During the final two years of mining operations prior to reclamation, the TTF water quality will be monitored to assess progress toward achieving the reclamation goals. These goals and the outfall locations on the TTF are outlined in Chapter 2 (Management, Mitigation, and Monitoring) of the FSEIS.

Water samples will be collected from the outfall at the Lower Slate Lake TTF, identified as "Outfall 002", twice annually, during late August and late winter (February 1st-March 31st) in the final two years of mining operations (Figure 1, Appendix D). This outfall is regularly sampled under other monitoring programs currently in place. This sampling can be conducted concurrently.

Water samples will also be collected from the Lower Slate Lake TTF (Figure 1, Appendix D). Samples will be collected from several locations throughout the TTF. These samples will be collected during late August and late winter in the final two years of mining operations at two locations within the water column, at mid-depth and near the tailings surface (motive lake bottom). Two years prior to mine closure, three monitoring locations will be utilized. These locations will be selected utilizing known TTF bathymetry and in areas which will fully characterize the facility. Sampling will not occur in areas where tailings are actively being deposited. One year prior to mine closure, six to eight monitoring locations will be utilized. The selection of additional monitoring locations will be done to complement those previously selected locations.

The personnel conducting the initial sampling are responsible for the selection of the monitoring locations. Upon initial selection of the monitoring locations, Global Positional Satellite (GPS) points will be logged of each monitoring site and those same locations will be utilized in every monitoring period thereafter.

Samples will be collected using an Alpha-type "at depth" water sampler. This device allows for collection of a representative water sample at a specified depth (Figure 1, Appendix C). The numbers and volumes of each sample will be dependent on the volume of water required for laboratory analysis.

Water samples collected from the TTF and the outfalls will be analyzed for Ag, Al, As, Cd, Cr, Cu, Fe, Hg, Mn, NH_4, Ni, NO_3, Pb, pH, Se, Total Phosphorous, Total Recoverable Potassium, Total Sulfur, Turbidity, SO_4, Total Dissolved Solids, and Zn. Sample methodology and laboratory analysis methods will follow Alaska Department of Environmental Conservation (ADEC) and EPA protocols and requirements.

No specific water quality parameter limits have been established for the TTF within the APDES permit. The most relevant comparison of water quality values will be to those limits set for Outfall 002. Water sample results collected from Outfall 002 will be assessed for compliance to the effluent limits for Outfall 002 set out in the Kensington Gold Project APDES Permit, Permit Number AK0050571 and listed in the Table 1 below.

Table 1. Outfall 002 Effluent Limits.

Parameter	Units	Hardness (mg/L)	Effluent Limits	
			Maximum Daily	Average Monthly
Aluminum	µg/L		143	71
Ammonia, Total	mg/L as N		3.5	1.7
Arsenic	µg/L		-	-
Cadmium	µg/L	H<30	0.2	0.1
	µg/L	H>30	0.2	0.1
Copper	µg/L	H<30	3.8	1.9
	µg/L	H>30	4.5	2.2
Chromium, Total	µg/L		-	-
Chromium VI	µg/L		16	8
Iron	µg/L		1,700	800
Lead	µg/L	H<30	0.9	0.5
	µg/L	H>30	1.1	0.6
Manganese	µg/L		98	50
Mercury	µg/L		0.02	0.01
Nickel	µg/L	H<30	26	13
	µg/L	H>30	31	15
Selenium	µg/L		8.2	4.1
Silver	µg/L	H<30	0.4	0.2
	µg/L	H>30	0.5	0.25
Zinc	µg/L	H<30	37	18
	µg/L	H>30	43	22
TDS	mg/L		500	500
TDS anions/cations	mg/L		-	-
Nitrates	mg/L		-	-
Sulfates	mg/L		250	250
Turbidity, effluent	NTU		-	-
Turbidity, natural condition	NTU		-	-
pH	s.u.		-	-
TSS	mg/L		30	20

Limited baseline water quality data exists for Lower Slate Lake prior to the development of the TTF. Water quality monitoring of a nearby, hydraulically connected Upper Slate Lake will be conducted so that TTF water quality data may be compared to that of a natural system. The natural conditions of Upper Slate Lake closely resemble those of Lower Slate Lake prior to TTF development, which allows for an accurate simulation of Lower Slate Lake baseline conditions.

These samples will be collected during late August and late winter in the final two years of mine operations at mid-depth within the water column. A total of five monitoring locations within Upper Slate Lake shall be selected utilizing known bathymetry of the lake and selecting monitoring locations that will allow for a composite understanding of each portion of the lake (Figure 1, Appendix D). The personnel conducting the initial sampling are responsible for the selection of the monitoring locations. Upon initial selection of the monitoring locations, Global Positional Satellite (GPS) points will be logged of each monitoring site and those same locations will be utilized in every monitoring period thereafter. Water quality monitoring within Upper Slate Lake will occur in the final two years of mine operations.

Water samples collected from Upper Slate Lake will be analyzed for Ag, Al, As, Cd, Cr, Cu, Fe, Hg, Mn, NH_4, Ni, NO_3, Pb, pH, Se, Total Phosphorus, Total Recoverable Potassium, Total Sulfur, Turbidity, SO_4, TDS, and Zn. Sample methodology and laboratory analysis methods will follow ADEC and EPA protocols and requirements.

Water quality analysis results from the TTF and Outfall 002 will be compared to baseline sampling results from Upper Slate Lake. This comparison will document the changes associated with active use of the TTF and will allow for future modeling of the TTF during and following the reclamation process.

2.2 TAILINGS GEOCHEMISTRY

Mine tailings samples will be collected from two locations at the mill facility and the Lower Slate Lake TTF. The purpose of these samples is to gain an understanding of the chemical properties and dissolution of tailings geochemistry into the TTF water body.

The first sampling location will be located at the mill facility. This sample will be collected immediately prior to the tailing slurry entering the stand pipe drain to the TTF (Figure 1, Appendix D). Only one sample will be collected at the mill location per sampling period. Coeur utilizes this sampling location for the collection of quarterly tailing samples for monitoring programs and mill operations procedures. This sampling can be conducted concurrently with other monitoring requirements, although all parameters required for this study must be incorporated into sample analysis.

The remaining tailings sampling location will be located within the Lower Slate Lake TTF. This sample will be collected from the motive lake bed (Figure 1, Appendix D). This sample will be collected within the TTF in an area where no tailings had been deposited in the prior month. The sampling site will be greater than 100 meters horizontal distance from the current location (at the time of sampling) of the discharge pipe. Tailings collected for this sample should have been settled on the motive lake bed for longer than one month but no longer than three months. This sampling period is to ensure that samples represent active, settled tailings rather than non-tailings related sediment deposition. The purpose of this sample is to collect tailings that most similarly represent the TTF facility immediately after cessation of mining operations. This sampling location will be mobile and changes in accordance with the position of the discharge pipe. Each sample location must be documented with GPS coordinates during sample collection.

Tailing samples will be collected using one of two different methods depending on the compaction of the TTF lake bed surface. Methods that may work in non-compacted substrates may not be ideal for sample collection in areas where tailings have settled for extended periods of time. In locations where the motive lake bed tailing compaction is low and tailings are easily extracted, samples will be collected using a Ponar-type benthic dredge (Figure 2, Appendix C).

In sample locations where motive lake bed tailing compaction is high, Ponar dredges will not function properly. In these areas it will be necessary to employ a hand-held aquatic substrate core sampler (Figure 3, Appendix C). These devices vary greatly in make and model and operate similarly to soil core samplers designed for terrestrial use. The personnel responsible for sample collection will select the specific make and model per their needs.

When using a core sampling device, it will be important that only the top two to three inches of the motive lake bed surface are collected at any one time. This two to three inch tailings layer is the active pore-water interface in which chemical diffusion and dissolution occurs (McDonald et.al, 2010). Collection of tailings samples below this layer will not accurately portray current bed surface conditions and should be avoided. In using either method, Ponar dredge or core sampler, efforts should be made to collect a representative sample of motive lake bottom tailings. Approximately 1.5 Kg dry equivalent of bed material will be required for laboratory analysis at each sampling location. The specific volume of material required is dependent on the water content of the tailings and may vary based on time and location.

Samples from the mill facility will be collected quarterly each year, and samples from the lake bed of the TTF will be collected quarterly for a period of one year during the five-year plan cycle. Samples from both locations will be analyzed using modified Acid Base Accounting (Lawrence, 1989) and Meteoric Water Mobility Procedure (MWMP) (Nevada Department of Environmental Protection). These two analysis suites are comprised of a large array of parameters listed in the Tables 2 and 3 below. Various analytical methods are utilized under each test suite. Those parameters of particular concern are Ag, Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Zinc, NH_4, NO_3, SO_4, Total Recoverable Potassium, and Total Sulfur. Sample methodology and laboratory analysis methods will follow ADEC and EPA protocols and requirements.

Table 2. Acid Base Accounting (Lawrence 1989) Parameters.

Parameter	Method	Units
Paste pH	EPA 150.1	Standard Units
Sulfur-Total (S)	Modified ABA test (Lawrence, 1989 and Canadian MEND report.)	wt. %
Sulfide (S_{-2})		wt. %
Sulfate (SO_4)		wt. % SO_4
Total Inorganic Carbon (TIC)		wt. %
Carbonate (CO_3)		wt. %
Neutralization Potential (NP)		T $CaCO_3$/1000 t
Acid Generating Potential (AP)		T $CaCO_3$/1000 t
Net Neutralizing Potential (NNP)		T $CaCO_3$/1000 t
Net Potential Ratio (NPR)		T $CaCO_3$/1000 t

Table 3. Meteoric Water Mobility Procedure (Nevada Department of Environmental Protection) Parameters.

Parameter	Method	Units
pH	EPA 150.1	Standard Units
Alkalinity	SM 2320	mg/L
Bicarbonate	SM 2320	mg/L
Cyanide (WAD)	SM4500-CN1	mg/L
Chlorine	EPA 300	mg/L
Fluorine	EPA300	mg/L
Nitrate as Nitrogen	EPA 300	mg/L
Nitrite as Nitrogen	EPA 300	mg/L
Total Nitrates as Nitrogen	EPA 300	mg/L
Sulfate	EPA 300	mg/L
Mercury	CVAAS	mg/L
Gold	ICP-OES	mg/L
Aluminum	ICP-OES	mg/L
Arsenic	ICP-MS	mg/L
Boron	ICP-MS	mg/L
Barium	ICP-MS	mg/L
Beryllium	ICP-MS	mg/L
Calcium	ICP-OES	mg/L
Cadmium	ICP-MS	mg/L
Chromium	ICP-MS	mg/L
Copper	ICP-MS	mg/L
Iron	ICP-OES	mg/L
Potassium	ICP-OES	mg/L
Magnesium	ICP-OES	mg/L
Manganese	ICP-OES	mg/L
Sodium	ICP-OES	mg/L
Nickel	ICP-OES	mg/L
Lead	ICP-MS	mg/L
Antimony	ICP-OES	mg/L
Selenium	ICP-MS	mg/L
Thallium	ICP-MS	mg/L
Zn	ICP-OES	mg/L

In addition to the year of quarterly monitoring (One year in five-year plan cycle), a separate parameter suite is to be analyzed once during the year (hereafter referred to as "annual monitoring"). This additional testing should be conducted concurrently to the quarterly monitoring, but must be conducted during the third quarter (late summer) of monitoring. Annual monitoring will include analysis of all quarterly parameters listed above and will also include an additional suite of parameters under separate analysis methods.

The annual monitoring tailing samples will be analyzed for Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn. The samples will be digested with nitric acid (EPA Method 3050) and then analyzed using ICP-MS (EPA Method 200.8) for both total and dissolved constituents. Annual monitoring parameters are listed in Table 4 below. Sample methodology and laboratory analysis methods will follow ADEC and EPA protocols and requirements.

Table 4. Annual Tailings Geochemistry Monitoring Parameters.

Parameter (Total and Dissolved)	Method	Units
Gold	EPA 200.8	µg/L
Aluminum	EPA 200.8	µg/L
Arsenic	EPA 200.8	µg/L
Barium	EPA 200.8	µg/L
Beryllium	EPA 200.8	µg/L
Calcium	EPA 200.8	µg/L
Cadmium	EPA 200.8	µg/L
Cobalt	EPA 200.8	µg/L
Chromium, Total	EPA 200.8	µg/L
Copper	EPA 200.8	µg/L
Iron	EPA 200.8	µg/L
Mercury	EPA 1631A	ng/L
Potassium	EPA 200.8	µg/L
Magnesium	EPA 200.8	µg/L
Manganese	EPA 200.8	µg/L
Sodium	EPA 200.8	µg/L
Nickel	EPA 200.8	µg/L
Lead	EPA 200.8	µg/L
Antimony	EPA 200.8	µg/L
Selenium	EPA 200.8	µg/L
Thallium	EPA 200.8	µg/L
Vanadium	EPA 200.8	µg/L
Zinc	EPA 200.8	µg/L

2.3 TAILINGS HABITABILITY

The future habitability of the Lower Slate Lake Tailings Treatment Facility is important for the final reclamation of the Kensington operation. Analyzing the recolonization rate of benthic macro-invertebrates is a practiced method for determining the habitability of the lake bottom substrates. These organisms have a high sensitivity to local environmental contaminants and maintain a limited range within the habitat. Therefore, invertebrate populations are a suitable indicator of habitat quality.

An *in situ*, tiered approach will be used to assess tailings habitability. The study will assess recolonization rates for different substrate types, locations, and depth. A multi-faceted study will allow for seasonal colonization rates to be established based on the anticipated conditions present in the TTF after cessation of mining operations.

A total of 80 samples will be placed in Upper Slate Lake during Year Three of mining operations. Additional studies will be dependent on the results of the Year Three study. Each study sample will be placed in a separate, polyethylene tray (4"x4" with a 946mL volume), and will be submerged and placed on top of the lake bed surface in the littoral zone of Upper Slate Lake (Figure 1, Appendix D). Prior to being submerged, each polyethylene tray and study sample soils will be frozen at a temperature below -4°C. The placement of a solidified sample in the lake ensures that no soils or tailings are lost in the placement process. The sample trays are to be deployed in Year Three. All tray locations are to be marked with underwater flagging, floating buoys, or other means of identification.

To calculate a colonization rate within the samples, 20 trays will be removed at specified intervals of time throughout the study period. The first set of trays will be removed after approximately four months. Each subsequent removal will follow the same, seasonal (spring, fall) removal schedule maintaining the interval as close as possible to a six month period. These monitoring periods will show summer seasonal abundance and colonization rates during times of lake productivity as well as annual colonization and/or survival after the winter dormancy and full yearly growth periods (Snuccins, 2003).

Annual monitoring (periods greater than 120 days in length) are set at the end of the growing season to best represent annual population increases rather than winter dormancy populations commonly found in spring months (Snuccins, 2003). Long term monitoring allows for analysis of colonization rate which will include consideration of immigration, emigration, pupation, seasonal taxa use, and death, and the number of "degraded organisms. Long-term re-colonization is dependent on multi-species benthic communities. Presence/absence assessments over the short-term will not be indicators of a successful re-colonization (Snuccins, 2003).

Two substrate types will be used in the habitability study. Half of the sample trays will be filled with tailings collected from the motive lake bed surface of the TTF. Mine tailings will likely be an active bed surface within the TTF immediately following the cessation of mining activities. Collection of TTF tailings samples will be conducted using the same processes utilized in the Tailings Geochemistry study. Both Ponar dredges and core sampling devices may be used for tailings collection. When using core sampling devices, it will be important to collect only the uppermost two to three inches of the bed surface for use in sample trays. In the event that tailings are too heavily compacted to collect the required volume, an alternative source of tailings will be necessary. If needed, tailings will be collected directly from the mill facility for use in the sample trays. Prior to placement in the sample trays, these mill facility tailings would be thoroughly washed in water collected from Upper Slate Lake. The water content of any mill facility tailings would have to be reduced from the slurry form prior to placement in sample trays.

The second type of substrate in the study will be terrestrial soil. The remaining half of the sample trays will contain this soil. This substrate is intended to imitate those soils recently submerged in the former upland areas of the TTF. Much of the TTF littoral zone will be comprised of flooded upland areas with a bed surface made of upland soils. As the littoral zone is the most productive for benthic invertebrates, the habitability of these soils will play a role in the recolonization of the TTF. Terrestrial substrate will be collected from the area surrounding the TTF, specifically, the areas on the western shore. These soils are thought to be most representative of those soils to be submerged within the TTF. All substrate will be collected above the current high water mark of the TTF. No sieving or alteration to the terrestrial substrate will occur beyond the freezing of the soils in sample trays for placement. This ensures that sample substrates accurately represent recently flooded terrestrial soils.

Samples trays of each soil type will be evenly divided among the two ends of Upper Slate Lake. The bathymetry of Upper Slate Lake varies significantly between the north and south ends. Additionally, the north end of the lake has active inflow of water from the Upper Slate Creek and the south end contains the outflow. To represent all possible lake conditions, the samples will be divided between these two locations. Samples placed in the north end of Upper Slate Lake will be placed outside of the zone of deposition for Upper Slate Creek.

The samples placed in Upper Slate Lake will also be divided evenly among two separate depths, a "shallow" depth within the littoral zone and a "deep" depth within the profudal zone. Productivity within the lake varies at given depths due to water temperature, dissolved oxygen, and light penetration. Frequently different benthic invertebrate species are present at different water depths. Invertebrate density and diversity generally decrease at deeper depths within lakes. All sample trays containing tailing substrates will be placed at a "deep" depth of approximately 25 feet below water surface and sample trays containing terrestrial soil substrates will be placed at a "shallow" depth of approximately five feet below water surface. Both five-foot and 25-foot depths are at low water elevation. The use of SCUBA gear and divers will likely be required for the placement of trays at depth.

Water depth within Upper Slate Lake has been known to vary seasonal as much as four to five feet. The prescribed depths are thought to be the most advantageous for effective monitoring under any conditions. A minimum water depth of two feet must be maintained to prevent the sample trays from being locked in the ice over winter periods. Annual low water periods in Upper Slate Lake occur during late spring and early summer. Selection of tray placement location will not occur during this time period. Extreme care should be taken in tray placement lest risk of the trays become exposed above the water surface.

The distribution of sample trays with varying substrate types, sample tray locations, and sample tray depths is shown in Table 5 below. This distribution of trays corresponds to the number of samples for each time period, four, twelve, eighteen, and twenty-four months.

Table 5. Habitability Study Sample Distribution.

Sampling Time Period (4, 12, 18, and 24 Months)	
TTF Tailing Substrate **10 Samples**	
North Upper Slate Lake	**South Upper Slate Lake**
5 Samples	5 Samples
"Deep" Depth	**"Deep" Depth**
5 Samples	5 Samples
Terrestrial Soil Substrate **10 Samples**	
North Upper Slate Lake	**South Upper Slate Lake**
5 Samples	5 Samples
"Shallow" Depth	**"Shallow" Depth**
5 Samples	5 Samples
Total 20 Samples	

The use of SCUBA gear and divers will likely be required for the recovery of trays at depth. During tray recovery after each specified time interval, trays are to be capped prior to disturbance. Trays are to be placed in polyethylene bags immediately after being capped and brought to the surface in these sealed bags. This will prevent the loss of any invertebrates or other material in the samples.

Upon retrieval, all materials in each sample tray are to be placed into separate, sealed sample jars and the contents preserved with 70% ethyl alcohol for future analysis. Each sample is to be individually sieved using wet sieve procedures with a minimum 300 micron mesh sieve and sorted. Grain size analysis will be conducted on all tailings and native soils. All macro-invertebrates present will be counted and identified. Identification for this monitoring will be conducted to the Genus level.

In Littoral zone samples, an emphasis will be on the identification of the Orders Ephemotptera (mayflies), Plectoptera (stoneflies), and Trichoptera (caddisflies), frequently known as EPT. EPT taxa are known to be pollution-sensitive taxa and a major indicator of taxa richness (Butkas et al., 2011). Therefore, their presence in a sustainable population would indicate conditions on terrestrial substrate acceptable for habitation and a recovering benthic ecosystem. An EPT index, or the proportion of EPT taxa to the total benthic invertebrate community, will be calculated for each sample tray located at shallow dephts.

EPT indices will be used to evaluate biotic integrity of the sample tray colonies and will also provide data for the determination of habitat preferences for individual invertebrate types. The data will also identify the quantity and rates at which invertebrates are colonizing the samples.

At the closure of the TTF, the mine tailings will be submerged at a depth of approximately 28 feet. At this depth, EPT taxa are not prevalent and other metrics for determining habitability are required. These metrics include total invertebrate numbers, densities, feeding types, the number of taxa, percent Chironomidae, and the Oligochaete:Chironomid ratio.

Additionally, taxonomic identification will include an assessment of invertebrate conditions and the reporting of any "degraded" invertebrates to estimate the number in a deceased condition prior to sampling and sample preservation.

Reporting metrics for each sample type, sample event are as follows:

- Total aquatic invertebrates counted;
- Total terrestrial invertebrates counted;
- Estimated mean aquatic invertebrate density (#invetebrates/m^3);
- Estimated mean terrestrial invertebrate density (#invetebrates/m^3);
- Total number of taxa observed among samples;
- Mean number of taxa per sample;
- Feeding types of collected invertebrates;
- Percent EPT;
- Percent Chironomidae;
- Percent Dominant Taxon; and
- Oligochaete:Chironomid ratio (as presented in Wiederholm [1980]).

The data from the tailings samples will be compared separately to the data of the reference soils of Upper Slate Lake using appropriate data transformations and statistical tools.

Due to the complexity of this study and the large array of variables, the design of any future study will be based on the results of previous studies with errors, failures, and study aspect requiring improvement in tray placement, sample retrieval, and data interpretation. Additionally, the use of the sample trays will likely restrict interstitial invertebrate movement. As a result the study represents a sample bias.

As limited baseline benthic invertebrate data are available for Upper Slate Lake, it is necessary to conduct a reference study for invertebrate sampling concurrently with habitability study monitoring. Sample trays containing native lake bed substrates from Upper Slate Lake will be deployed at both ends of Upper Slate Lake (north and south) at each depth ("deep" and "shallow" as previously specified). The methods of deployment are to be the same as those used within the Tailings Habitability Study. Native lake bed substrates will be boiled, being careful to avoid burning, to remove invertebrates prior to the freezing of the soils for placement. During each monitoring period, four, twelve, eighteen, and twenty-four months, a total of five samples will be collected from each of the respective locations within the lake (north, south, "deep", and "shallow").

Upon collection, each sample is to be individually sieved and sorted and all macro-invertebrates present will be counted and identified. Soil grain size analysis will also be conducted. For the purpose of this baseline study, invertebrates will be indentified to the genus level. Reference study invertebrate populations within Upper Slate Lake may be compared to habitability study colonization rates.

Organic substrate deposition within Upper Slate Lake may have an impact on the study trays and invertebrate mobility. To investigation organic substrate deposition rates, "sediment traps" will be installed at each of the four sampling locations in conjunction with the sample trays. Each sediment trap shall consist of a 4"x4" with a 946mL volume, identical to the sample trays, filled with concrete. A total of 16 sediment traps will be deployed. One trap will be retrieved from each sampling location at each sampling event. Data reporting will include a measured substrate deposition depth on the concrete surface prior to removal, if possible, and a dry weight of the captured substrate on the removed trap.

2.4 DISSOLVED OXYGEN

The final morphology of the Lower Slate Lake Tailings Treatment Facility will be determined in part by the chemical properties of the water body, in particular, the oxygen levels within the lake. The health and recovery of Dolly Varden and other fish species is dependent on sufficient oxygen levels to support life throughout the year. Therefore, winterkill is a major concern within the TTF.

Winterkill refers to fish mortality due to low levels of dissolved oxygen during the winter season. During winter conditions in lakes located in northern climates, bacterial decomposition of organic matter consumes oxygen at a time when oxygen input through primary production is limited and surface aeration is restricted due to the presence of surface ice and snow cover. Winterkill is a function of many variables, including the duration of ice cover, the depth of snow cover, the minimum oxygen tolerance threshold of resident fish, and the rate of oxygen depletion.

Attempts to predict winterkill susceptibility of a particular species can be made by examining lake characteristics such as mean water depth, seasonal stratification, total phosphorous, and chlorophyll *a*. Due to the number of variables and the complexity of the systems, broad generalized models cannot be made for all water bodies and it is often necessary to study regionally isolated and similar lakes to accurate determine the potential winterkill for the water body of concern. No existing studies had been previously conducted on the Slate Lake system and no model exists that can be applied to the TTF.

The measurement and analysis of oxygen profiles and related aquatic variables in the lakes surrounding the TTF will allow for a determination of the site-specific relationships between variables that influence the potential for winterkill. While the reclamation plan emphasizes establishment of a broad littoral zone in the TTF, there may be a point where oxygen consumption resulting from decomposition of organic matter produced in the littoral zone would result in winterkill. Based on these studies, the final reclamation plan will identify a balance of shallow and deep water that will be appropriate for the design of the TTF.

Upper Slate Lake is the nearby water body most similar to the Lower Slate Lake TTF and is hydraulically connected via Slate Creek and local hydrogeology. Upper Slate Lake will be monitored to gain an understanding of the site specific factors that that will affect the chemical makeup of the TTF and could result in winterkill conditions. Dissolved oxygen (DO), pH, and temperature profiles will be measured in Upper Slate Lake twice annually, in late August and in late winter between February 1st and March 31st of each year. DO, pH, and temperature monitoring for each profile should be conducted with sampling intervals every two feet from water surface to lake bottom.

During winter monitoring periods, ice thickness and snow depth at each monitoring location should be recorded as these are likely contributing factors to oxygen loss.

Monitoring for this study will occur during Year Two through Year Four of mining operations. The objective of this monitoring is to develop a complete database and will allow for comparison to natural conditions.

A total of 10 monitoring locations within Upper Slate Lake shall be selected utilizing known bathymetry of the lake and selecting monitoring locations that will allow for a composite understanding of each portion of the lake (Figure 1, Appendix D). The personnel conducting the initial sampling are responsible for the selection of the monitoring locations. Upon initial selection of the monitoring locations, Global Positional Satellite (GPS) points will be logged of each monitoring site and those same locations will be utilized in every monitoring period thereafter.

3.0 REPORTING AND DATA REVIEW

Annual reports will be prepared by Coeur Alaska that summarize environmental monitoring results and will be submitted to USFS and ADF&G by March 1st of the following year for review and comment. The results and agency comments will then be used to adapt the monitoring plan and schedules, as appropriate.

4.0 LITERATURE CITED

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APPENDIX A:

USFS AND EPA RODs

RECORD OF DECISION

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
KENSINGTON GOLD PROJECT

USDA Forest Service
Tongass National Forest - Chatham Area
Juneau Ranger District

DECISION TO BE MADE

This Record of Decision documents my selection of the alternative that will be used to revise the 1992 Plan of Operations for the Kensington Gold Project. This decision is based upon the analysis and evaluations in the Final Supplemental Environmental Impact Statement as well as information incorporated by reference from the 1992 FEIS and ROD.

ALTERNATIVES CONSIDERED IN DETAIL

Four alternatives were evaluated, including the No Action Alternative. This range of alternatives addressed the major issues associated with this project. The three action alternatives differed from each other in the type and location of various project components.

The alternatives are summarized as follows:

Alternative A - No Action - As a result of this alternative, the Forest Service would not approve the proposed 1996 revisions to the 1992 Plan of Operations. The No Action Alternative consists of Alternative F as identified in the 1992 FEIS and selected by the Forest Supervisor in the 1992 ROD and modified to address requirements identified by the Environmental Protection Agency during their 1994 review of the NPDES permit application.

Ore processing	Underground crushing, surface grinding, flotation, and cyanidation with the final product being gold bars.
Waste Rock	Stored in a 15-acre stockpile at the mill site, about 50 percent used in tailings embankment, road, and foundation construction.
Tailings Management	Disposal in an impoundment in Sherman Creek, no backfill.
Diversions	Diversions of Ophir and Sherman Creeks designed for 100-year, 24-hour storm event.
Mine Drainage and Mill Effluent	Discharge to tailings impoundment, then piped to marine discharge point 1/2 mile off shore in Lynn Canal north of Point Sherman, treatment by enhanced settling in impoundment.

Employee Transportation	Helicopter from Juneau Airport.
Supply Transportation	Barge to Comet Beach facility.
Power Supply	2 LPG generators at the mill site, one LPG generator at Comet Beach.
Employee Housing	Onsite personnel camp south of Sherman Creek.
Borrow Area	Sand and gravel quarries near the process area (130 acres) within impoundment drainage.
Reclamation	Restore to previous use, wildlife habitat and recreation, remove structures, regrade and revegetate, route streams over tailings impoundment.

<u>Alternative B - Proposed Action</u> - This alternative consists of the operator's proposal to modify the 1992 Plan of Operations and differs from Alternative A in the following:

Ore processing	Underground crushing, surface grinding and flotation, offsite transport of flotation concentrate for further processing.
Waste rock	Temporary 15-acre pile at mine portal, all waste rock used in DTF construction and backfill.
Tailings Management	Placement of dry tailings in the dry tailings facility (DTF), engineered drainage system, paste backfill minimum of 25 percent of all tailings, tailings trucked to DTF. 60-foot wide haul road from mill to DTF.
Diversions	Diversion above the DTF, Ophir Creek diversion around the mill site, both designed for 100-year, 24-hour storm event.
Mine Drainage and Mill Effluent	Mill effluent recycled; mine drainage discharged to Sherman Creek after treatment by enhanced settling in ponds, and precipitation/filtration; runoff/leachate from DTF discharged to Camp Creek.
Stream Crossings	Bottomless arch conduits for crossing Upper Sherman Creek and Ivanhoe Creek.
Power Supply	4 diesel generators at the mill site, one diesel generator at Comet Beach, diesel fuel trucked to the process area from the beach storage facility.
Employee Housing	Onsite personnel camp north of Sherman Creek.

Borrow Area	Sand and gravel quarries near the process area (16 acres total), till borrow area (27 acres) west of the sand and gravel quarry.
Reclamation	Restore to previous use, wildlife habitat and recreation, remove structures, regrade and revegetate, maintain diversion above the DTF - increase to 500-year, 24-hour event capacity.

Alternative C - This alternative is the same as Alternative B with the following exceptions:

Mine Drainage and Mill Effluent	Marine discharge of mine drainage and DTF effluent to Lynn Canal. Discharge of process area runoff to upper Sherman Creek, enhanced settling in ponds.
Power Supply	4 diesel generators at the mill site, one diesel generator at Comet Beach, diesel fuel piped to the process area from the beach storage area.

Alternative D - This alternative is the same as Alternative B with the following exceptions:

Tailings Management	Placement of dry tailings in the DTF, engineered structural berm around three sides of the tailings pile, backfill 25 percent of tailings. Tailings slurry piped from mill to DTF.
Stream Crossings	Bridges for crossing Sherman Creek, Upper Sherman Creek, and Ophir Creek.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative D is the environmentally preferred alternative. The environmentally preferred alternative is the one which causes the least damage to the biological and physical environment, and which best protects, preserves, and enhances historic, cultural and natural resources.

DESCRIPTION OF THE FOREST SERVICE SELECTED ALTERNATIVE

The selected alternative will be used to revise the 1992 Plan of Operations for the Kensington Gold Project.

Based on the analysis and evaluation in the Final Supplemental Environmental Impact Statement for the Kensington Gold Project, and portions of the 1992 FEIS incorporated by reference, it is my decision to select Alternative D.

Approval of the wastewater discharge site is outside the authority of the Forest Service. If EPA, through their permitting authority, were to approve marine discharge of wastewater, rather than freshwater discharge of wastewater as described in Alternative D, the Forest Service will approve the surface facilities required for marine discharge as outlined in Alternative C.

RATIONALE FOR THE DECISION

Alternative D differs from the other action alternatives in that it requires an engineered structural berm around three sides of the DTF, the tailings slurry is piped to the DTF from the mill rather than trucked, and bridges rather than bottomless arch conduits are used for crossing Upper Sherman Creek and Ivanhoe Creek.

I selected Alternative D because it best addresses issues identified during scoping and comments received concerning the DSEIS. While some alternatives better address individual issues, the Selected Alternative provides the best mix for addressing all the issues at an acceptable level.

Under Alternative D, as well as Alternatives B and C, the flotation concentrate would be shipped off-site for processing. This will provide several secondary benefits in terms of reducing potential environmental impacts. Off-site processing will eliminate the need for onsite use of cyanide and the risk of accidental cyanide release. It will also eliminate concerns regarding disposal of CIL tailings. With no CIL tailings production and new paste backfill techniques, the operator will be able to backfill a minimum of 25 percent of the tailings and reduce the volume of tailings disposed on the surface. Since cyanide destruction will no longer be required, the use of chlorine will be reduced to only what is required for domestic water treatment.

Dry tailings disposal, as described in Alternative D, will result in more visual impacts during the life of the mine than wet tailings disposal since the wet tailings impoundment would screen many of the facilities and revegetation of the impoundment face could begin immediately. Dry tailings disposal does, however, have a greater potential for successful reclamation and will require much less long term maintenance. It will eliminate the need to disturb a large section of Sherman Creek and reroute streams over reclaimed tailings. The use of a dry tailings facility will address many concerns regarding long term stability.

The operator has proposed to utilize diesel fuel for power generation, rather than LPG as approved in the 1992 ROD. Based on the information presented in the 1992 FEIS and this SEIS, I do not see a compelling reason to require one type of fuel over the other and, therefore, am approving the use of diesel fuel as requested. Both diesel fuel and LPG can easily meet air quality permit requirements. While the use of LPG would result in slightly lower emissions and slightly lower risk of spills, it would also require a separate, more elaborate and more visible storage facility. Since substantial amounts of diesel fuel will still be required for other aspects of the project, the use of LPG would not eliminate the need for diesel fuel transfer, transportation and storage at the site. There would be a slight increase in the risk of spills from increased diesel use but the diesel would be transported, handled, and stored according to an SPCC plan and State spill response requirements. Any impacts from spills would be limited by transfer timing restrictions, equipment design, and prompt spill response capability.

The approval and permitting of wastewater discharge under the Clean Water Act rests with EPA. The analysis in the FSEIS indicates that wastewater discharge into freshwater, as described under Alternatives B and D, will meet all permit requirements of other agencies without the use of a mixing zone. Utilization of a freshwater discharge site will address substantial controversy concerning the effects of a marine discharge, and associated mixing zone, on local commercial fisheries.

Alternative D requires construction of a structural berm around three sides of the dry tailings facility to minimize the risk of pile failure. This type of berm is based on proven technology and has a high probability of being effective. The operator will monitor tailings saturation and performance, allowing for further fine tuning of the DTF without fear of failure. Implementation of Alternative D minimizes the risk of tailings pile failure and allows the operator the flexibility to manage tailings disposal under a variety of climatic conditions. If the operator can demonstrate through monitoring and evaluation that tailings can be placed to a level of stability acceptable to the Forest Service, I will consider modifications to the berm design in the future.

The use of bridges under Alternative D instead of bottomless arch conduits at several haul road stream crossings will reduce the potential for stream channelization, erosion of bed materials, and channel downcutting. This will reduce the potential for degradation of aquatic habitat at these road crossings during operations and improve the potential for stream rehabilitation during reclamation of the road and mill site.

Because of reduced truck traffic, the use of a slurry line in Alternative D will reduce fugitive dust emissions when compared to truck transport of tailings in Alternatives B and C. The potential for a slurry spill as a result of pipeline rupture is minimized because of the use of double-walled pipe with check valves and pressure sensors.

Considerable concern was expressed during the preparation of this document about potential cumulative effects of the the Kensington Gold Project in conjunction with several other proposed or potential projects in the Berners Bay area. The FSEIS includes an expanded discussion addressing this concern. The alternative which I have selected results in very little direct or indirect effect to Berners Bay and has no direct relationship to any other projects except the proposed Juneau Access Road. Although no relationship exists at this time, I recognize the possibility that it could exist at some unspecified future date if changes to the project, such as development of the Jualin Mine, use of hydropower from Lace River, or changes to employee housing and transportation were proposed. These changes would require additional environmental analysis prior to approval.

PUBLIC INVOLVEMENT

A Notice of Intent to prepare a supplemental environmental impact statement was printed in the Federal Register on July 22, 1996. Public scoping meetings were held in Juneau on August 7, and in Haines on August 8, 1996. The Draft SEIS was sent to the public in February 1997 with the Notice of Availability published in the Federal Register on February 21, 1997. On March 6, 1997 members of the Interdisciplinary Teams from the Forest Service and our third party contractor, SAIC, were available at the Juneau Ranger District to answer questions from the public. Public hearings on the Draft SEIS were held in

Juneau on March 25, and in Haines on March 26, 1997. More than 50 comment letters on the Draft SEIS were received from the public.

All meetings were announced on local radio stations and in local newspapers in both communities. In addition, newspapers in Juneau and Haines printed many articles on the proposed Kensington Gold Project.
The following significant issues were identified for consideration in the SEIS.

Assurances should be given that the discharges under a National Pollutant Discharge Elimination System (NPDES) permit must meet water quality standards. Concerns were raised that the wastewater discharges permitted through the NPDES process meet water quality standards.

The potential for and effects of failure of the DTF should be considered. The risks, liability, and contingencies, as well as environmental effects, of a DTF failure should be discussed.

The visual effects on tourism, especially cruise ships and ferries, of the proposed changes should be minimized. Concerns were expressed that the visual impacts of the DTF, road, borrow pits, temporary camp, fugitive dust, and diesel emissions from power generation could negatively affect tourism.

Use of diesel fuel instead of liquified petroleum gas (LPG) for power generation may result in increased air emissions. There is concern that burning diesel fuel, as well as other project modifications, would increase emissions of air pollutants, including carbon dioxide.

The impacts from spills caused by transporting, storing, and handling additional diesel fuel could affect water quality, fisheries, and other resources. The increase in transportation, handling, and use of diesel fuel for power generation could increase the potential for spills.

MITIGATION, MONITORING, AND RECLAMATION

The FSEIS, Chapter 2, Mitigation and Monitoring lists the mitigation measures required as part of Alternative D that are designed to ensure that all practicable means have been adopted and will be implemented to avoid or minimize potential environmental impacts from the selected alternative during construction, operation, and project reclamation. These mitigation measures have been used successfully in other projects with similar types of activities. As a result, they are considered effective and are made part of this decision. Mitigation and monitoring plans will be submitted by the mine operator as part of the revised Plan of Operations. Mine construction may not begin until the Plan of Operations is approved.

Environmental monitoring programs that meet the requirements of the Forest Service, EPA, ADEC and other agencies will be implemented. These programs will be designed to determine compliance of the project with the Plan of Operations, other Federal, State and local permits, and to validate the projected effects of the project's construction, operation, reclamation and post-closure conditions. Impacts that result in violations of regulatory stipulations will require alterations of project operations or additional mitigation actions.

A summary of monitoring activities, including the various authorities and the responsible parties, are identified in Table 2-3 of the FSEIS. For resources under the authority of the FS, details of the the monitoring programs will be approved as part of the Plan of Operations. For resources under the regulatoryauthority of other agencies, the details of monitoring will be provided as required in that agency's permits.

ALASKA COASTAL MANAGEMENT PLAN

The State of Alaska sets standards and criteria for consistency determinations with the Alaska Coastal Management Plan. While Federal lands are excluded from the coastal zone, Section 307(c)(2) of the Coastal Zone Management Act states,"Any Federal agency which shall undertake any development project in the coastal zone of the state shall insure that the project is, to the maximum extent practicable, consistent with the approved management program."

The ACMP regulations in 6 AAC 85.020 require that each district coastal program develop goals and policies related to coastal management. These policies must be consistent with ACMP standards at 6 AAC 80. For the CBJ, these policies are established in the Juneau Comprehensive Plan, Part Two, Coastal Management Program (JCMP), effective on November 20, 1986. The following sections describe how the selected alternative, Alternative D, for the Kensington Gold Project is consistent with the specific enforceable policies in the JCMP. Only the JCMP sections that apply to the Kensington Gold Project are discussed.

Coastal Development (JCMP, Section 2)

The Comet Beach dock facilities are identified as coastal development. The construction and use of these facilities have been determined to be necessary and consistent with JCMP standards because: (1) this is a water-dependant use, (2) it is the only feasible and prudent location, and (3) the facilities would be constructed in a manner that is consistent with 33 CFR Parts 320-322 and minimizes adverse impacts on physical shore features, visual resources, fish habitat and passage, and navigation.

Geophysical Hazards (JCMP, Section 3)

The north sand and gravel borrow area and the Ophir Creek diversion are located in an area with landslide and snow avalanche potential. There is not a significant risk to human health or physical property at these sites. The Ophir Creek diversion will be removed at closure and the natural drainage restored. As discussed in Section 4.4 of the FSEIS, BMPs will be used during construction and operation to minimize erosion and the site will be revegetated at closure. The DTF design is based on withstanding the maximum credible earthquake. With the engineered structural berm and ongoing monitoring program, the potential for failure that could affect surrounding resources or endanger human health is minimal. This is consistent with JCMP standards.

Transportation and Utilities (JCMP, Section 6)

The transportation system for the selected alternative, except in accessing dock facilities, has been sited inland from beaches. Mitigation measures have been included to minimize road visibility from the beach. There are no stream crossings in the anadromous fishery in Lower Sherman Creek. Two crossings in Upper Sherman Creek and one in Ivanhoe Creek will be constructed with bridges to ensure fish passage and avoid impacts on fish habitat. In-stream construction will be avoided during critical stages for aquatic life. The project is consistent with JCMP requirements for transportation.

Mining and Mineral Processing

The enforceable policies of this section generally require consistency with other sections of JCMP.

Subsistence (JCMP, Section 10)

The FSEIS and 1992 FEIS have shown that there is little or no subsistence use of the Point Sherman area. Under the selected alternative, there will be no impacts on subsistence fishing opportunities. This is consistent with the JCMP standards to recognize and assure subsistence opportunities.

Habitat (JCMP, Section 11)

The Comet Beach dock facility will require dredging of approximately 2.3 acres. This will result in a localized disturbance of cobble beach habitat. The potential for significant effects on the overall availability of marine habitat and sport, commercial, and subsistence fishing opportunities is negligible. Wetlands are found throughout the site. None of the wetlands are unique and all losses, except at the DTF, will be temporary. Loss of wetlands associated with the DTF will not impact important habitat. All discharges from the site will meet human health and aquatic life water quality standards at the discharge points. Under the selected alternative, effects on stream flows and habitat in Sherman Creek will be minimized. Minimum instream flows established by ADF&G will have to be met and natural drainages will be restored at closure. This is consistent with JCMP standards.

Air, Land, and Water Quality (Section 12)

Under the selected alternative, the air emissions and water discharges from the project would comply with all applicable State air and water quality standards. The project is also consistent with all applicable land use designations. The site would be completely reclaimed and revegetated at closure.

Conclusion

In this analysis, the Forest Service has determined that the selected Alternative meets the JCMP standards to the maximum extent practicable. In addition, all feasible and prudent steps to maximize conformance with the JCMP have been taken.

FINDINGS REQUIRED BY OTHER LAWS

Tongass Land and Resource Management Plan

This decision is consistent with the 1997 Tongass Land and Resource Management Plan. The site is located in an area designated as Modified Landscape with a Minerals Prescription. The emphasis for management in this area is encouragement of minerals development in an environmentally sensitive manner and limited to the area necessary for efficient, economic, and orderly development. The long-term goal is reclamation consistent with a Modified Landscape designation.

ANILCA Section 810, Subsistence Evaluation and Finding

The effects of this project have been evaluated to determine potential effects on subsistence opportunities and resources. There is no documented or reported subsistence use that would be restricted as a result of this decision. The potential competition caused by population increases in Juneau could be controlled by regulations pertaining to Federal lands, which would reduce the season and/or bag limit by non-rural residents.

Coastal Zone Management Act of 1972, as amended

The Coastal Zone Management Act requires the Forest Service, when conducting or authorizing activities or undertaking development directly affecting the coastal zone, to insure that the activities or development be consistent with the approved Alaska Coastal Management Program to the maximum extent practicable. I have determined that the proposed activities are consistent with the Alaska Coastal Management Program to the maximum extent practicable.

Endangered Species Act of 1973

A biological evaluation has been completed for this action which documents that no Federally listed threatened or endangered species will be affected by this decision.

National Historic Preservation Act of 1966

The Forest Service program for compliance with the National Historic Preservation Act includes locating, inventorying and nominating all cultural sites that may be directly or indirectly affected by scheduled activities. This activity has been reviewed by a qualified archeologist and a determination made that no known cultural resources will be impacted by this action.

Floodplain Management (E.O. 11988)

This activity is located within floodplains as defined by Executive Order 11988. This action has been designed to minimize potential harm to or within the floodplains.

Protection of Wetlands (E.O. 11990)

This activity is located within wetlands as defined in Executive Order 11990. I have determined that (1) that there is no practicable alternative to such construction, and (2) that the selected alternative includes all practicable measures to minimize harm to wetlands which may result from such use.

Recreational Fisheries (E.O. 12962)

Based on the analyses for water quality and fisheries and pursuant to Executive Order 12962, I have determined that there will be no significant effect to recreational fisheries.

Environmental Justice (E.O. 12898)

I have determined that in accordance with Executive Order 12898 this project does not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

IMPLEMENTATION DATE:

Implementation of decisions made by the Chatham Area Forest Supervisor, which are subject to appeal pursuant to 36 CFR part 215, may occur on, but not before, 5 business from the close of the appeal filing period. The appeal filing period closes 45 days after publication of legal notice of this decision in the Juneau Empire newspaper, published in Juneau, Alaska.

RIGHT TO APPEAL OR ADMINISTRATIVE REVIEW

This decision is subject to administrative review (appeal) pursuant to 36 CFR Part 215. A written notice of appeal must be filed with the Appeal Deciding Officer:

Phil Janik, Regional Forester
Regional Office
P.O. Box 21628
Juneau, Alaska 99802-1628

The Notice of Appeal must be filed within 45 days of publication of notice of this decision in the Juneau Empire.

In accordance with 36 CFR Section 215.14, it is the responsibility of those who appeal a decision to provide the Appeal Deciding Officer sufficient evidence and rationale to show why the Responsible Official's decision should be remanded or reversed. The written notice of appeal filed must meet the following requirements:

1. State that the document is a Notice of Appeal filed pursuant to 36 CFR part 215.
2. List the name, address, and telephone number of appellant;
3. Identify the decision document by title and subject, date of the decision, and name and title of the Responsible Official;
4. Identify the specific change(s) in the decision that the appellant seeks or portion of the decision to which the appellant objects;
5. State how the Responsible Official's decision fails to consider comments previously provided, either before or during the comment period specified in 36 CFR 215.6 and, if applicable, how the appellant believes the decision violates law, regulation, or policy and, if applicable, specifically how the decision violates the law, regulation, or policy.

CONTACT PERSON

Roger Birk
Juneau Ranger District
8465 Old Dairy Road
Juneau, Alaska 99801
907-586-8800

GARY A. MORRISON
Chatham Area Forest Supervisor

8/1/97
Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

RECORD OF DECISION

KENSINGTON GOLD PROJECT

DECISION TO BE MADE

This Record of Decision (ROD) documents the decision by the U.S. Environmental Protection Agency (EPA) Region 10 to issue a National Pollutant Discharge Elimination System (NPDES) permit for discharges from the Kensington portal to Sherman Creek, discharges of treated domestic wastewater to Lynn Canal, and discharges from the proposed tailings storage facility (TSF) to East Fork Slate Creek. This project is considered a new source discharge and, in accordance with Section 511(c)(1) of the Clean Water Act, is subject to the provisions of the National Environmental Policy Act (NEPA).

The ROD is issued pursuant to NEPA (42 U.S.C. §4321 et seq.), the Council of Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500-1508), and EPA's NEPA implementing regulations (40 CFR Part 6, Subpart F). EPA participated in the development of the Kensington Gold Project Final Supplemental Environmental Impact Statement (FSEIS) as a cooperating agency, with the U.S. Forest Service (USFS) as the lead agency. EPA's decision to issue an NPDES permit is based upon the analysis in the FSEIS as supplemented by the U.S. Army Corps of Engineers (USACE) Clean Water Act 404(b)(1) analysis, which identified alternative D as the least environmentally damaging practicable alternative. The Notice of Availability of the FSEIS was published in the Federal Register by the USFS on December 23, 2004. EPA issued the draft NPDES permit on June 21, 2004 for a 45-day comment period. Public hearings were held in Juneau, Alaska on July 26, 2004 and in Haines, Alaska on July 27, 2004. EPA's response to comments on the draft NPDES permit is included in Appendix A.

INTRODUCTION

The Kensington Gold Project is an underground gold mine located approximately 45 miles north-northwest of Juneau, Alaska, in the Tongass National Forest (Figure 1; FSEIS Figure 1-1). The Kensington project has undergone three iterations of environmental review and was previously permitted in 1998. In 1990, the Kensington Venture (a joint venture between Coeur Alaska, Inc. [Coeur] and Echo Bay Exploration) first submitted plans to develop the mine to the USFS. The USFS completed the Final Environmental Impact Statement (FEIS) in 1992. The 1990 plan included underground mining to recover the ore, processing the ore via flotation, cyanidation, gold refining, and disposal of the tailings in a tailings impoundment built in the Sherman Creek drainage. The impoundment would have been sized to accommodate 30 million tons of tailings. The proposal included discharging wastewater to Lynn Canal following treatment, and shuttling employees to the mine site using helicopters. The operation would have used liquefied petroleum gas to fuel on-site generators. A marine terminal developed at Comet Beach in Lynn Canal would have handled supply deliveries and gold shipments. The Kensington Venture never obtained all the permits necessary to build the mine, and in 1995 Coeur became the sole stakeholder in the property. Coeur then, in 1995, submitted an amended plan of operations to the USFS. In June 1996 Coeur revised the 1995 plan in response to issues raised during scoping.

The 1996 amended plan, included removal of the cyanide circuit and off-site processing of the flotation concentrate, backfilling a portion of the tailings in the mine, and disposal of the remaining tailings in a 20 million ton dry tailings facility (DTF) constructed between Sherman and Sweeny creeks. Coeur's proposal also included using diesel instead of liquefied petroleum gas to fuel generators, and discharging mine water to Sherman Creek and DTF effluent to Camp Creek. The 1996 plan was analyzed in the Final Supplemental EIS and approved by the USFS in a ROD signed in August 1997. Coeur obtained all permits necessary for construction from federal, state, and local authorities, including an NPDES permit from EPA, issued on May 14, 1998 (Permit No. AK-005057-1). The permit authorized discharge of drainage from the Kensington portal, which is treated and discharged to Sherman Creek. It also authorized the discharge from the permitted DTF to Camp Creek and domestic wastewater discharge to Lynn Canal.

In November 2001, Coeur submitted another amendment to the plan of operations to the USFS. This plan, which initiated a second supplemental environmental impact statement, proposed a number of changes to the approved plan, including changing the location of the processing facilities, tailings disposal, and site access and employing a different means of transportation. The operation would also mine a smaller portion of the ore body containing higher average gold concentrations. This amendment also proposes to use a dock to be built at Cascade Point on property held by Goldbelt Incorporated, an Alaska Native corporation. The 2001 amended plan formed the basis for Alternative B for the December 2004 FSEIS. The USFS selected Alternative D in a ROD signed on December 9, 2004. Coeur revised its plan of operations to conform to Alternative D in May 2005. The USFS approved the plan of operations in June 2005.

The purpose of the proposed action is to consider changes to the previously permitted project. The changes were intended to improve efficiency and reduce the area of surface disturbance associated with the 1997 mining plan and to provide more reliable transportation and access by improving worker safety during transit to the site and eliminating shipping delays related to weather and sea conditions at Comet Beach. The improved reliability of access would allow Coeur to reduce the amount of diesel storage, as well as inventories of materials and supplies. Tailings disposal would require a smaller area of surface disturbance under the proposed action compared to the 1997 plan by utilizing a 20-acre lake for tailings storage (Lower Slate Lake).

The U.S. Forest Service was the lead agency for preparation of the Kensington Gold Project Final Supplemental EIS. EPA, the U.S. Army Corps of Engineers, and the State of Alaska Department of Natural Resources (ADNR) were cooperating agencies because of the federal and state authorizations and approvals required for this project. EPA was a cooperating agency because of a decision regarding NPDES permit issuance. In accordance with NEPA, the

FSEIS was prepared to reduce duplication, excessive paperwork and delay, and to address federal and state regulatory requirements. Through EPA's participation as a cooperating agency, we have determined that the FSEIS adequately describes the potential direct, indirect, and cumulative effects associated with the Kensington Mine Project.

Sections 301 and 306 of the Clean Water Act (CWA) require that EPA develop wastewater effluent standards for specific industries, including gold mines. These standards are established for both existing sources and "new sources". Because this project would be a new source, the New Source Performance Standards (NSPS) for gold mines and mills are applicable to the project (40 CFR 440.104). NPDES permit limits and requirements are established to ensure compliance with the NSPS and state water quality standards. The NSPS include effluent limits applicable to discharges of mine drainage; they also prohibit the discharge of process water (including mine tailings). An exception is provided for excess flows associated with net precipitation and/or co-mingled mine water where discharge of such flow is subject to the comparable effluent limits for mine drainage. In states that have not been delegated NPDES permitting authority, such as Alaska, EPA is authorized to permit point source discharges of effluent, including process wastewater and stormwater. Where EPA is the permitting agency, the regulations provide that issuance of a new source NPDES is subject to the environmental review requirements of NEPA.

The 5-year NPDES permit issued by EPA for the 1998 project expired on May 14, 2003, but was administratively extended until a new permit is issued because Coeur submitted a timely application in October 2002. Couer submitted a revised application for an NPDES permit on March 16, 2004. The final NPDES application submittal, consistent with the proposed project revisions, was made on June 15, 2004. The application addresses the current discharge to Sherman Creek, treated domestic wastewater discharge during construction, and the proposed discharge from the tailings storage facility (TSF) in Lower Slate Lake.

PROPOSED MINING OPERATION

The Kensington ore body extends from the surface to a depth of approximately 3,000 feet and is irregular in both shape and distribution of gold. After a two-year construction period, mining would be accomplished over a projected period of 10 years using a long hole, open stoping method. Ore would be mined at a rate of 2,000 tons per day targeting high-grade gold ore. Ore would be hauled by truck to the mill site located near the Jualin mining area. After crushing, the ore would be transferred to a grinding circuit. Following grinding, oversized material would be returned to the head of the grinding operation, while undersized material would be separated into coarse and fine materials using centrifugal cyclones. From the cyclones, heavy material would go to a gravity concentrator and light material would go to a conditioning tank that feeds a flotation circuit. Concentrate from the gravity concentrator and the flotation circuit would be dewatered, and approximately 700 tons per week of concentrate would be transported from the site. From 2,000 tons of ore per day, mining and processing would produce approximately 400 tons of waste rock per day and approximately 7.5 million tons of tailings over the lifetime of the proposed project.

Waste rock would be disposed in two disposal areas near the Kensington portal and near the Jualin mine area. Tailings would be separated into coarse and fine fractions. The coarse tailings would be pumped to the mine areas that need backfill. At least 40% of the tailings would be backfilled. The fine fractions would be disposed in the tailings storage facility.

Mine drainage is currently combined with runoff from waste rock piles and other disturbed areas and discharged to Sherman Creek through Outfall 001, pursuant to the 1998 NPDES permit. Underground workings that produce mine drainage, as well as waste rock, were developed as part of exploration activities and will be expanded as active mining operations are initiated. Water from mine dewatering operations will continue to be collected, clarified, and filtered underground, if necessary, and then pumped to an above ground mine water treatment facility. Although the revised proposal includes access to the workings by tunnels from both the Kensington and Jualin sides of the property, all mine drainage would be collected and routed to Outfall 001.

Tailings slurry from the mill would flow through a 3.5 mile pipeline to the TSF, which would be formed by the natural lake basin of Lower Slate Lake and a dam constructed at the outlet of the lake. The dam would be a concrete-faced rockfill dam constructed in two phases. The TSF would be designed to hold 4.5 million tons of tailings. Mid-lake East Fork Slate Creek would be diverted around the TSF. Creek water would be removed from behind a constructed berm through a 20-inch diversion pipeline. The TSF will receive water from slurry transport of tailings as well as undiverted natural inflows from drainage areas immediately adjacent to the TSF and overflows from the berm. Water will be recycled from the TSF to the mill at a rate of approximately 100 gallons per minute (gpm). The discharge from the TSF (Outfall 002) will be treated via reverse osmosis then combined with the diverted natural flows and pumped into the East Fork Slate Creek drainage below the TSF.

DESCRIPTION OF PROJECT ALTERNATIVES

NEPA requires that agencies consider alternatives to the proposed action that address the significant issues identified during the scoping process. NEPA also requires that the alternatives analysis include a No Action Alternative. Because the FSEIS is a supplement to a NEPA analysis that resulted in a permitted project (the 1997 mining plan), the No Action Alternative in this case represents no changes to the approved project. The FSEIS also includes an alternative (Alternative A1) that reflects a mining scenario that could occur if the No Action Alternative was selected, i.e., the operator could choose to lower the production rate and pursue a smaller portion of “high-grade” gold ore similar to what is proposed in the proposed action. The following discussion and Table 1 provides a summary of the No Action Alternative (Alternative A), reduced mining rate of the No Action Alternative (A1), and three action alternatives (Alternatives B, C, and D). Section 2 of the 2004 FSEIS provides detailed descriptions of each of the following alternatives for the Kensington Gold Project.

Alternative A – No Action

The No Action Alternative functions as the baseline against which the effects of other alternatives are compared. As noted above, the No Action Alternative represents a previous action, which in this case is the 1997 mining plan that received agency approval and authorizations in 1998. Alternative A corresponds to the 1997 SEIS Alternative D. Alternative A includes mining the entire ore body and underground crushing of ore with aboveground grinding and flotation. Flotation concentrate would be shipped to a processing facility off-site. There would be no on-site cyanidation circuit. Employees would be housed on-site and transported by helicopter for weekly rotations. Supplies, including fuel, would be delivered to a marine terminal constructed on Comet Beach. Approximately 25% of the tailings would be backfilled. The rest of the tailings would be dewatered before being placed in the DTF. The DTF would have the design capacity to hold 20 million tons of tailings and would include an engineered berm around each cell of the facility. Wastewater from tailings dewatering would be treated and discharged to Sherman Creek. The production rate would be 4,000 tons of ore per day and 400 tons of waste rock per day. The waste rock would be used in the construction of the DTF. Road and DTF construction would require the development of sand and gravel and till borrow areas.

Alternative A1 – Reduced Mining Rate, DTF

Alternative A1 reflects a mining plan similar to that described for Alternative A but uses the same mining rate and tailings production levels consistent with Alternatives B, C, and D (2,000 tons per day and 7.5 million tons total, respectively).

Alternative A1 would result in 4.5 million tons of tailings being placed in the DTF, assuming that 40 percent of the tailings would be backfilled. The DTF would be approximately 65 percent smaller than it would be under Alternative A. The reduced mining rate presented under Alternative A1 would produce very limited amounts of waste rock. Because waste rock would not be available for use in DTF construction under this alternative, the impact analysis assumes the same number of acres of sand and gravel borrow areas would be required as under Alternative A, although the coarse and fine till borrow areas would be reduced in size. Other aspects of Alternative A1, including wastewater management and transportation of employees and materials, would be the same as those described under Alternative A.

Alternative B – Coeur's Proposed Action

Alternative B reflects a number of changes to the mine plan compared to the No Action Alternative. These changes include construction of a TSF in Lower Slate Lake for tailings disposal instead of the dry tailings facility, relocating milling operations to the Johnson Creek drainage, and eliminating the personnel camp. The operation would mine a smaller amount of ore with a higher average gold concentration compared with that proposed under Alternative A. The production rate would be approximately 2,000 tons of ore per day. Alternative B would include the development of a tunnel connecting the Kensington and Jualin areas of the mine. Access to the site would be from marine terminals built in Slate Creek Cove and at Cascade Point (Figure 2; FSEIS Figure 1-2). A daily shuttle boat service would transport employees to and from the project site. The TSF would be sized to accommodate the disposal of 4.5 million tons of tailings (Figure 3; FSEIS Figure 2-6), while approximately 3.0 million tons of tailings would be used as backfill in the mine. Borrow areas would be developed for construction of the TSF dam and roads. This alternative includes recycling water from the TSF to the mill circuit. Alternative B would require upgrading the 5-mile-long access road and constructing a 3.5-mile pipeline access road and a 1-mile cutoff road connecting the other two roads.

Alternative C – Dock Location and Design/Diversion

Alternative C is the same as Alternative B except it includes surface water diversions around the TSF and a marine terminal at Echo Cove instead of Cascade Point. The dock in Echo Cove would be located approximately 0.75 mile north of the existing Echo Cove boat ramp (Figure 2; FSEIS Figure 1-2). Mine workers would use this dock to reach the shuttle boat that would transport them to the dock at Slate Creek Cove. The landing craft ramp at the Slate Creek Cove marine terminal would be eliminated, minimizing the amount of fill placed in the intertidal zone. Alternative C would not include recycling water from the TSF and the mill circuit. This alternative would include diversion channels to direct the flow from Mid-Lake East Fork Slate Creek and overland runoff from undisturbed areas around the TSF (Figure 4; FSEIS Figure 2-9). The diversion would discharge to a spillway at the top of the TSF dam. The diversion would require a dam on Upper Slate Lake to maintain water levels sufficient to reach the spillway at the TSF dam. The purpose of the diversion would be to minimize the volume of fresh water in contact with the tailings.

Alternative D – Modified TSF Design and Water Treatment

Alternative D was developed to address concerns about the TSF effluent meeting NPDES permit limits for protection of downstream water quality in East Fork Slate Creek below the TSF. Alternative D is the same as Alternative B, except it also includes diversion of stormwater and surface water around the TSF, TSF outfall water treatment, and a tailings cap at closure. Alternative D includes a dam in Mid-Lake East Fork Slate Creek that would gravity-feed a pipeline diversion around the TSF (Figure 5; FSEIS Figure 2-12). Water would be treated prior to discharge from the TSF via a reverse osmosis treatment system, which would provide solids and metals removal to ensure compliance with permit limits. Effluent from the treatment system would discharge to the diversion pipeline. Alternative D also requires a cap over the tailings at closure unless the operator could demonstrate to the USFS, USACE, ADNR, and EPA that the tailings are not toxic.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The environmentally preferable alternative "ordinarily, means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (CEQ, 1981: Forty Most Asked Questions, no. 6a).

On December 1, 2004, at the request of the U.S. Forest Service, EPA submitted its designation of an environmentally preferable alternative for inclusion in the FSEIS. EPA's selection of an environmentally preferable alternative was based on the record at the time, which lacked two important elements. First, the record lacked a completed ESA analysis by the National Marine Fisheries Service (NMFS) addressing potential impacts to listed species and designated critical habitat in Berners Bay. Second, the record lacked a completed Clean Water Act (CWA) § 404(b)(1) analysis from the U.S. Army Corps of Engineers, which must determine the least environmentally damaging practicable alternative and address significant degradation.

Based on information available at the time and on EPA's comparative analysis of the alternatives, EPA concluded that Alternative A is the Environmentally Preferable Alternative.

Alternative A is the only alternative that avoids the habitat loss and the loss of natural ecological functions in Lower Slate Lake during mine operations. Alternative A also avoids impacts to critical habitat and resources in Berners Bay that would result from dock construction, operation, and vessel activities. The USFS and the ADNR identified both Alternatives A and D as environmentally preferable.

Since that time, NMFS has issued a Biological Opinion (BO) and the Corps of Engineers has issued CWA 404 permits for the project. In the BO, issued on March 18, 2005, NMFS stated that individual Stellar sea lions and humpback whales within the action are may be adversely impacted. However, the BO concluded that Alternative D, as proposed, is not likely to jeopardize the continued existence of listed species, or destroy or adversely modify designated critical habitat found in proximity to the action area. NMFS maintained its earlier recommendation to use an alternative dock location to Cascade Point, preferably outside Berners Bay, to facilitate transportation of crews to the mine. The BO also included a list of conservation recommendations to minimize adverse effects to the listed species.

The Corps of Engineers CWA 404(b)(1) analysis, issued with the Record of Decision and CWA 404 permit, on June 17, 2005, concluded that Alternative D is the least environmentally damaging alternative based on acreages of wetland impacts. The Corps also concluded that Alternative D is economically more attractive than the previously permitted project.

The USFS selected Alternative D and approved the modifications to the 1997 Approved Plan of Operations in its Record of Decision (December 2005). The State of Alaska has also issued its decisions, authorizations, and certifications for Alternative D.

However, for the reasons discussed in our December 1, 2004 letter, EPA continues to believe that Alternative A is environmentally preferable.

EPA DECISION

EPA's decision regarding the Kensington Gold Project involves the issuance of an NPDES permit based on Coeur's NPDES permit application, which reflects Alternative D. The permit sets conditions on the discharges of pollutants from the mine to Sherman Creek (Outfall 001), from the TSF to East Fork Slate Creek (Outfall 002), and domestic wastewater to Lynn Canal (Outfall 003).

Outfall 001 represents the discharge from settling facilities that collect treated (metals precipitation and filtration) mine drainage from mine dewatering operations and runoff from waste rock piles and other disturbed areas in the Sherman Creek drainage. Outfall 002 will discharge water from the TSF, which includes the natural lake basin of Lower Slate Lake and a constructed retention embankment at the outlet of the lake. Outfall 003 will discharge treated domestic wastewater for the Kensington Mine camp during construction. No permanent camp is proposed to remain at the site during the operation phase of the project. The NPDES permit includes effluent limitations specific to each outfall and other requirements to ensure water quality protection in each of the water bodies mentioned above, including compliance with the Alaska Water Quality Standards (AWQS) for aquatic life and human health.

EPA made the draft NPDES permit and Fact Sheet available for a 45-day public review period on June 21, 2004. The draft permit contained effluent and receiving water (ambient) monitoring requirements as well as requirements that the permittee develop a Best Management Practices program for the control of toxic and hazardous pollutants.

The final permit and response to comments are included in this ROD in Appendix A.

FACTORS CONSIDERED IN THE DECISION

Scope of EPA's Clean Water Act § 402 Authority

EPA's NPDES permitting authority is limited to issuing permits based on NPDES permit applications we receive, so long as it is feasible for the project, as described in the application, to meet water-quality based limits. Coeur applied for an NPDES permit to discharge wastewater based on Alternative D. Coeur has gained approval to begin construction and operation of the Kensington Mine Project from the USFS, the USACE, and the State of Alaska, whose consent or authorization is necessary. Coeur has demonstrated their ability to implement treatment options (such as reverse osmosis for outfall 002) that will enable them to meet permit limits.

Receiving Waters

The permit authorizes discharges through three outfalls. Outfall 001 discharges mine water to Sherman Creek, and is located at latitude 58° 52' 04" North and longitude 135° 06' 55" West. Outfall 002 will discharge from the TSF to East Fork Slate Creek at latitude 58° 49' 58" North and longitude 134° 57' 58" West. Outfall 003 will discharge treated domestic wastewater to Lynn Canal at latitude 58° 51' 58" North and longitude 135° 8' 28" West.

East Fork Slate Creek and Sherman Creek are designated by the State as protected for water supply (drinking, culinary, and food processing; agricultural irrigation and stock watering; aquaculture; and industrial); contact and secondary recreation; and growth and propagation of fish, shellfish, other aquatic life, and wildlife (18 ACC 70.020(2)). Lynn Canal is protected for marine water supply (aquaculture, seafood processing and industrial); water recreation (contact and secondary); growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

Description of Discharges

Outfall 001

Outfall 001 represents the discharge from settling facilities into Sherman Creek. Inflows to the sediment ponds include treated mine drainage from mine dewatering operations and runoff from waste rock piles and other disturbed areas in the Sherman Creek drainage. The sediment pond has two cells. Stormwater runoff from waste rock and disturbed areas is routed to Cell 1 via a riprap lined spillway, which is sized to handle runoff from a 100-year, 24-hour precipitation event. A spillway, notched in the center berm, allows flow from Cell 1 to Cell 2. Cell 2, which is designed to treat water from mine dewatering operations and high flows from Cell 1, has been conservatively designed to hold settled solids for the life of the mine. Discharge from Cell 2 to Outfall 001 occurs through a perforated decant pipe with a design capacity to handle the 10-year, 24-hour storm event. Discharge flows from Outfall 001 will initially increase due to increased mine development area and will vary over time due to stormwater runoff.

Coeur estimates the rate of mine dewatering to generally range from 1.33 and 2.45 cubic foot per second (cfs). All of the flow will be collected in sumps within the mine where initial settling will occur. Mine drainage will be pumped to the mine water treatment system for metals precipitation and filtration. Settled solids will be added to tailings that are backfilled into the mine. Filter backwash will be recycled to the underground mine water treatment system.

Outfall 002

Outfall 002 will discharge water from the TSF to East Fork Slate Creek. The natural lake basin of Lower Slate Lake and a constructed retention embankment at the outlet of the lake will form the TSF. TSF inflows include tailings slurry from mill operations, precipitation that falls onto the lake, storm water runoff from upland areas adjacent to the TSF, and flows from Mid-Lake East Fork Slate Creek (if the flows are too high for the diversion to accommodate). The upstream flow in East Fork Slate Creek will be collected and transferred to a 20-inch diversion pipeline.

Tailings slurry will flow by gravity from the mill to the TSF in a 3.5-mile pipeline. The pipeline will be double-walled high density polyethylene (HDPE) and/or steel. The tailings slurry will be discharged into the TSF through perforations in a submerged portion of the tailing delivery pipeline. The pipeline will be operated so that a portion of the perforated segment is always above the bottom of the TSF, allowing the tailings to flow freely from the pipe.

The average slurry throughput to the TSF is projected to be 354 gpm with an average solids content of 55 percent by weight (i.e., the water component of the slurry will be approximately 247 gpm). A portion of the slurry water will be entrained in the tailings and will be unavailable for recycle. Coeur will recycle an average of 100 gpm out of the TSF back to the mill.

Coeur initially proposed to discharge effluent via Outfall 002 without treatment other than best management practices (BMPs) to enhance settling. However, water quality modeling indicated that total suspended solids (TSS) limits may not be achieved without additional treatment. In addition, background levels of aluminum in East Fork Slate Creek and Lower Slate Lake occasionally exceed the permit limits. As a result, Coeur amended its NPDES permit application to incorporate a reverse osmosis (RO) treatment system into the TSF design. The RO system will reduce levels of both aluminum and TSS to below permit limits and provide additional removal of other pollutants. A maximum total of 1,100 gpm is authorized to be discharged out of Outfall 002.

Outfall 003

The discharge of treated domestic wastewater for the Kensington Mine camp was previously permitted for use during exploration, construction and production. The current project anticipates the use of the camp through exploration and construction. No permanent camp is proposed for the site during the operation phase of the project. Domestic wastewater will be treated and discharged from Outfall 003 to Lynn Canal. The average flow for the plant during construction is estimated at 30,000 gallons per day (gpd), or 20.8 gpm, based on sizing to accommodate 300 people.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act (ESA) requires Federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), as appropriate, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under ESA, or destroy or adversely modify their critical habitat.

Through the NEPA process, EPA obtained a list of threatened and endangered species. On June 21, 2004, EPA sent a copy of the draft NPDES permit and Fact Sheet to NMFS and USFWS. In the Fact Sheet, EPA stated we do not expect the discharges from the facility, which comply with the requirements of the permit, to adversely affect endangered species. On November 17, 2004, the U.S. Forest Service and the U.S. Army Corps of Engineers sent a copy of the Biological Assessment/Biological Evaluation (BA/BE) to NMFS and requested initiation of formal consultation. NMFS issued a final Biological Opinion (BO) on March 18, 2005. The BO did not include any specific conservation recommendation applicable to the NPDES permit issuance.

Essential Fish Habitat (EFH)

Section 305(b) of the Magnuson Stevens Fishery Conservation and Management Act of 1996 requires Federal agencies to consult with NMFS when any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated Essential Fish Habitat (EFH). As stated in the Fact Sheet, EPA has determined that the issuance of the permit is not likely to have an adverse effect on EFH in the vicinity of the discharge. Effluent limitations have been incorporated in the permit based on criteria considered to be protective of overall water quality in East Fork Slate Creek, Sherman Creek, and Lynn Canal.

National Historic Preservation Act (NHPA)

The USFS completed a cultural resource survey of the area of potential effect (APE) for the Kensington Gold Project in 2003, in compliance with the requirements of Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq). The USFS sent determinations of eligibility of 43 historic sites within the APE to the State Historic Preservation Office for concurrence. Additionally, Coeur, the Alaska State Historic Preservation Office, and the Tongass National Forest entered into a Memorandum of Agreement (MOA) on November 29, 2004 to ensure compliance with Section 106 of the NHPA during mine construction, operation, and closure.

Coastal Zone Management Act (CZMA)

The State of Alaska, Office of Project Management and Permitting (OPMP), completed its review of the Kensington Gold Project for consistency with the Alaska Coastal Management Program (ACMP) on April 25, 2005. OPMP found the project, including the discharge of pollutants such as treated domestic wastewater and treated non-domestic wastewater from the Kensington Mine, to be consistent with the ACMP.

Wetlands (Executive Order 11990)

Wetlands throughout the project area would be affected by construction and operations. Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to issue permits for activities that would result in the placement of dredge or fill material in waters of the U.S., including wetlands. Before a permit can be issued, Section 404(b)(1) Guidelines require that projects avoid impacts to the extent possible, minimize impacts that cannot be avoided, and provide compensatory mitigation for impacts that occur. Alternative D is estimated to impact a total of 61.7 acres of U.S. waters, including 41.5 acres of wetlands filled, 20 acres of open water filled, and 0.2 acres of marine waters filled (USACE ROD, June 17, 2005). The Corps, in their CWA 404 permit and Record of Decision, determined Alternative D was least environmentally damaging based on total wetland acreages of impact.

Floodplains (Executive Order 11988)

The Kensington Gold Project is not located within floodplains.

Environmental Justice (Executive Order 12898)

EPA's issuance of the NPDES permit will not result in disproportionate adverse human health or environmental effects to minority or low-income communities.

Tribal Consultation and Coordination (Executive Order 13175)

On January 23, 2004, EPA sent letters to Chilkat (Klukwan) Village, Chilkoot Indian Association, Douglas Indian Association, and Tlingit and Haida Central Council informing the Tribes that the preliminary permit will be sent for tribal review. EPA also invited the Tribes to initiate formal government-to-government consultation with EPA in developing the final draft permit prior to public release. EPA transmitted the preliminary draft permit and draft Fact Sheet to the Tribes on April 8, 2004. EPA received no comments in response. Each Tribe also received a copy of the draft permit and Fact Sheet at the start of the public comment period on June 21, 2004. EPA did not receive any comments from these Tribes.

MITIGATION MEASURES

Section 2.5 and Tables 2-6 and 2-7 of the FSEIS identifies potential mitigation and monitoring measures required as part of Alternative D during construction, operation, and reclamation. Additional mitigation measures have been developed as part of stipulations, special conditions, monitoring requirements of other Federal and State permits and authorizations to ensure that environmental protection is being achieved.

Alternative D also includes the construction of a reverse osmosis treatment system to treat the TSF effluent water. The RO system would ensure compliance with permit limits for total suspended solids and metals. The treatment plant effluent would discharge into the diversion pipeline, which would flow to East Fork Slate Creek below the TSF dam.

Once tailings disposal is complete, the tailings would be capped to isolate any toxic contaminants unless Coeur could demonstrate to the satisfaction of EPA that tailings are not toxic. Although the FSEIS refers to a cover of approximately 4 inches of native material, the cap design (e.g., horizontal and vertical dimensions, types of materials, placement methods, etc.) will depend on the evaluation of the test results and the site characterization at closure.

The U.S. Army Corps of Engineers, in its CWA 404 permit, requires a special condition for Coeur to use nontoxic chemical flocculent to enhance the deposition of suspended particles and reduce turbidity levels in the Lower Slate Lake disposal site.

MONITORING

Under Section 308 of the Clean Water Act and 40 CFR 122.44(i), EPA must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations and assist in the development of effluent limitations. The permit contains both effluent and receiving water (ambient) monitoring requirements. The data from ambient monitoring is important for determining whether effluent limits in the proposed permit are adequate, and may be necessary for the development of water quality-based effluent limitations when the permit is reissued. The permit also requires that Coeur prepare a Quality Assurance Plan for all monitoring.

Outfall Monitoring

To ensure compliance with the effluent limitations, Coeur is required to monitor the discharges from Outfalls 001, 002, and 003 for metals, toxicity, and other parameters on a routine basis (See Permit Tables 1-4). The permit also requires that the percent removal for BOD and TSS be calculated on a quarterly basis for Outfall 003. This would entail measuring the influent as well as the effluent for these parameters.

Receiving Water (Ambient) Monitoring

The permit requires Coeur to conduct ambient monitoring in Sherman Creek, Slate Creek, and Johnson Creek.

Water Column Monitoring

The permit requires monthly water column monitoring for metals and other parameters at locations in Sherman Creek, Slate Creek, and Johnson Creek. The Sherman Creek and Slate Creek monitoring will provide data to assess the characteristics of the receiving stream below the discharges. Monitoring in Johnson Creek will be used to determine whether the process areas are affecting conditions in the creek.

Sediment Monitoring

The permit requires annual sediment monitoring for metals and other parameters and annual toxicity testing to assess the effect of mine effluent on sediments within the receiving streams. The permit requires sampling in Sherman Creek at a location immediately downstream of Outfall 001 and at another location below the fish barrier. Additional sampling is required at a location below Outfall 002 in East Fork Slate Creek and in lower Slate Creek below the fish barrier. Sediment sampling is also required at a location in upper Johnson Creek immediately below the process area.

Biological Testing and Monitoring of Aquatic Resources

Benthic Invertebrates – The permit requires benthic invertebrates monitoring using methods and locations established in baseline surveys in Sherman and Sweeny creeks. In Slate and Johnson Creeks, Coeur will define reaches to be sampled that are representative of potential impacts from Outfall 002 and the process area, respectively. Each reach will be delineated for all possible sampling sites. Every third or fourth sampling site will be sampled until a total of 6 samples are collected. Sampling will be conducted once during the construction period and annually thereafter.

Resident Fish – Abundance and condition of Dolly Varden char in Sherman, Slate, and Johnson creeks will be monitored using annual snorkel observations or electrofishing techniques comparable to those employed in previous baseline studies. Surveys will be conducted in: upper, middle, and lower Sherman Creek; East Fork Slate Creek and Lower Slate Creek; and Johnson Creek. These surveys will focus on fish greater than 25 mm. Data to be derived from the surveys include: 1) population estimates by species, habitat type, and stratum, and 2) condition factor by stratum.

Anadromous Fish – Annual surveys of spawning salmon in Sherman, Slate and Johnson creeks will be conducted to assess the size of the escapement. Surveys will consist of weekly stream counts throughout the spawning season documenting the distribution of salmon within the surveyed areas. Outmigrating juvenile pink salmon from the Sherman, Slate, and Johnson creek drainages will be sampled during the spring following each year of adult counts. Quantitative methods, such as screw trap or inclined plane trap will be used to estimate the relationship between adult escapement and fry protection.

The quality of spawning substrate used by pink salmon will be monitored to detect possible changes caused by potential introduction of fine sediments into lower Sherman, Slate, and Johnson creeks. Sediment samples will be collected in July prior to spawning activity.

Aquatic Vegetation – Annual visual surveys of visual impacts of aquatic vegetation in Sherman, Slate, and Johnson creeks will be conducted during the summer months.

RECLAMATION

Section 2.3.19 of the FSEIS discusses the general reclamation procedures for all the alternatives and summarizes how major mine components would be reclaimed. A more detailed closure and reclamation plan specific to Alternative D is presented in Appendix 1 of the Final Plan of Operations.

BEST MANAGEMENT PRACTICES (BMP) PLAN

Section 402 of the Clean Water Act and federal regulations at 40 CFR 122.44(k)(2) and (3) authorize EPA to require Best Management Practices (BMP) Plan in NPDES permits. The BMP Plan will be used to control the discharge of toxics or hazardous pollutants by way of spillage or leaks, sludge or waste disposal, and drainage from raw material storage. The BMP Plan must be maintained at the mine facility and amended whenever there is a change in the facility or in the operation of the mine which materially increases the potential for an increased discharge of pollutants. Annually, the BMP Plan must be reviewed and certified.

PUBLIC INVOLVEMENT

The public involvement process is presented in Section 1.5 of the FSEIS. The following is a chronology of the public involvement process for the FSEIS and NPDES permitting process:

September 13, 2002	The *Notice of Intent (NOI)* was published in the Federal Register and announced the USFS' intention to develop an SEIS under NEPA for the Kensington Gold Project. The NOI initiated the 30-day public scoping period.
Sept. 19 & 21, 2002	Scoping open houses held in Juneau and Haines, respectively.
January 23, 2004	Draft SEIS released to the public for review and comment.
Feb. 24 & 26, 2004	Public meetings on the Draft SEIS were held in Juneau and Haines, respectively.
June 21, 2004	EPA, U.S. Army Corps of Engineers, and the State of Alaska issued draft permits and draft decisions/authorizations (draft NPDES permit, CWA 404 public notices, draft State CWA 401 certifications, draft State decisions and authorizations) for public comment.

July 26 & 27, 2004 Public hearings on draft Federal and State permits and decisions/authorizations were held in Juneau and Haines, respectively.

CONCLUSIONS

Based on the NPDES permit application received by EPA, Coeur's demonstration that the project can meet permit limits, and the findings of the FSEIS, EPA is issuing an NPDES permit, with discharge limits, for Alternative D. The permit authorizes treated mine water discharges from Outfall 001 to Sherman Creek, treated TSF discharges from Outfall 002 to East Fork Slate Creek, and treated domestic wastewater discharge during construction from Outfall 003 to Lynn Canal. The final NPDES permit is included in Appendix A.

Further information regarding this Record of Decision (ROD) may be obtained by contacting:

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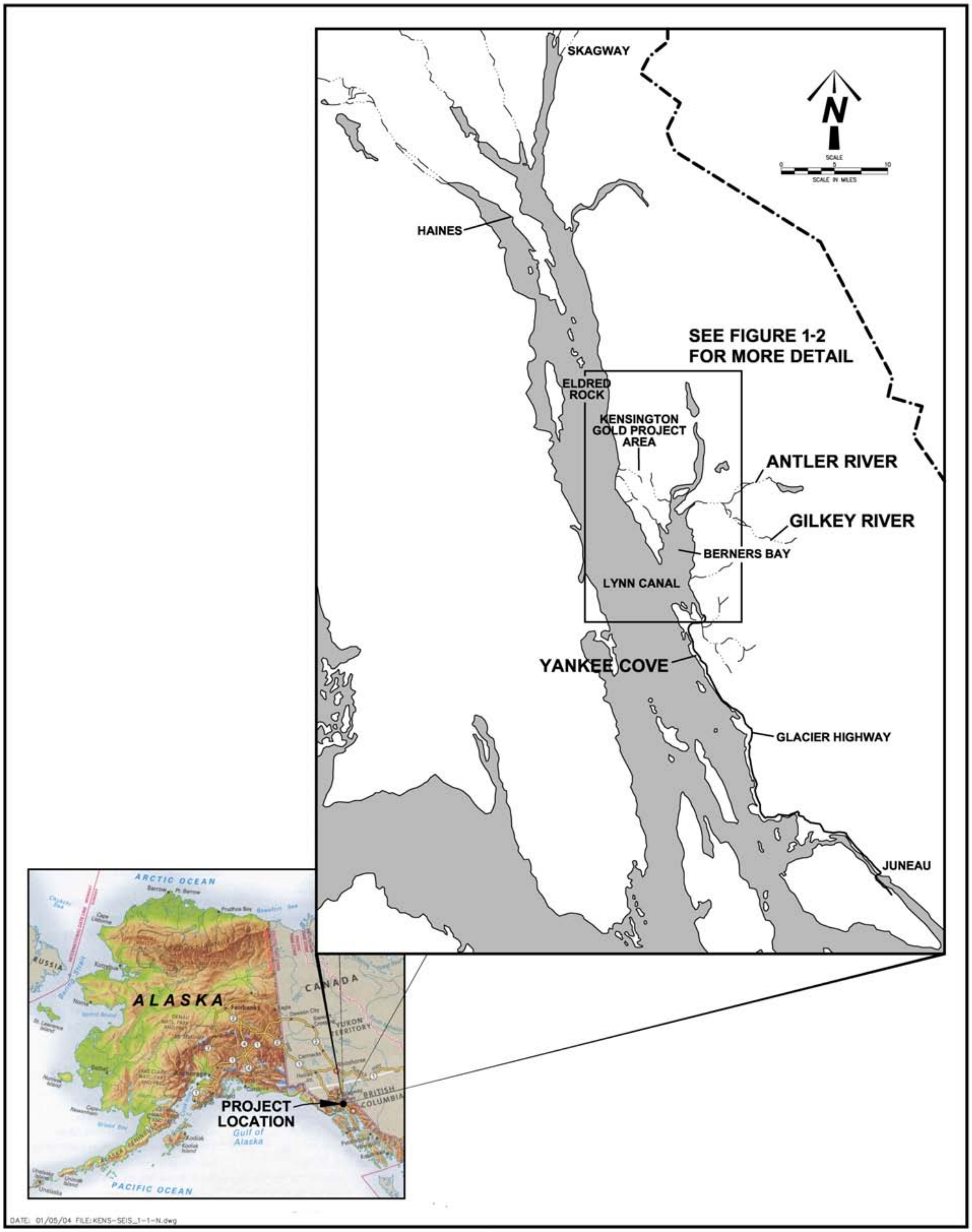
Approving Official:

_/S/ Michael F. Gearheard_______ _6/28/2005_______________
Michael F. Gearheard, Director Date
Office of Water and Watersheds

Alternative	**A**	**A1**	**B** (Coeur's Proposed Action)	**C**	**D**
Alternative Description	1998 permitted project	Same as A w/ reduced mining rate	Recycle process water; no treatment of TSF effluent	Same as B except with no recycle	Same as B except with treatment of TSF effluent by reverse osmosis and capping of the sediment post-operation
Tailings Disposal	DTF 20 million tons; 25% backfilled	DTF 4.5 million tons; 40% backfilled	Lower Slate Lake TSF 4.5 million tons; 40% backfilled	Lower Slate Lake TSF 4.5 million tons; 40% backfilled	Lower Slate Lake TSF 4.5 million tons; 40% backfilled
Diversion	Stormwater diversion around DTF	Stormwater diversion around DTF	No diversion	Ditch diversion around TSF- would require damming of Upper Slate Lake and raising water level 20 ft. to allow gravity flow	Pipeline diversion around TSF - would require dam in Mid-lake East Fork Slate Creek
Access/Marine Facilities	On-site housing; workers transported by helicopter (12 RT per week); marine terminal at Comet Beach	Same as A	No on-site housing; daily crew shuttle between marine terminals at Cascade Point and Slate Creek Cove (4 RT per day)	Same as B except daily crew shuttle service between Echo Cove and Slate Creek Cove; no landing craft ramp at Slate Creek Cove	Same as B

DTF - drystack tailings facility
TSF - tailings storage facility
RT - round trip

FIGURES



Source: Forest Service, 1997a

FIGURE 1. GENERAL PROJECT AREA (APPROXIMATELY 45 MILES NORTHWEST OF JUNEAU)

Source: U.S. Geological Survey, 1985

FIGURE 2. SPECIFIC PROJECT AREA

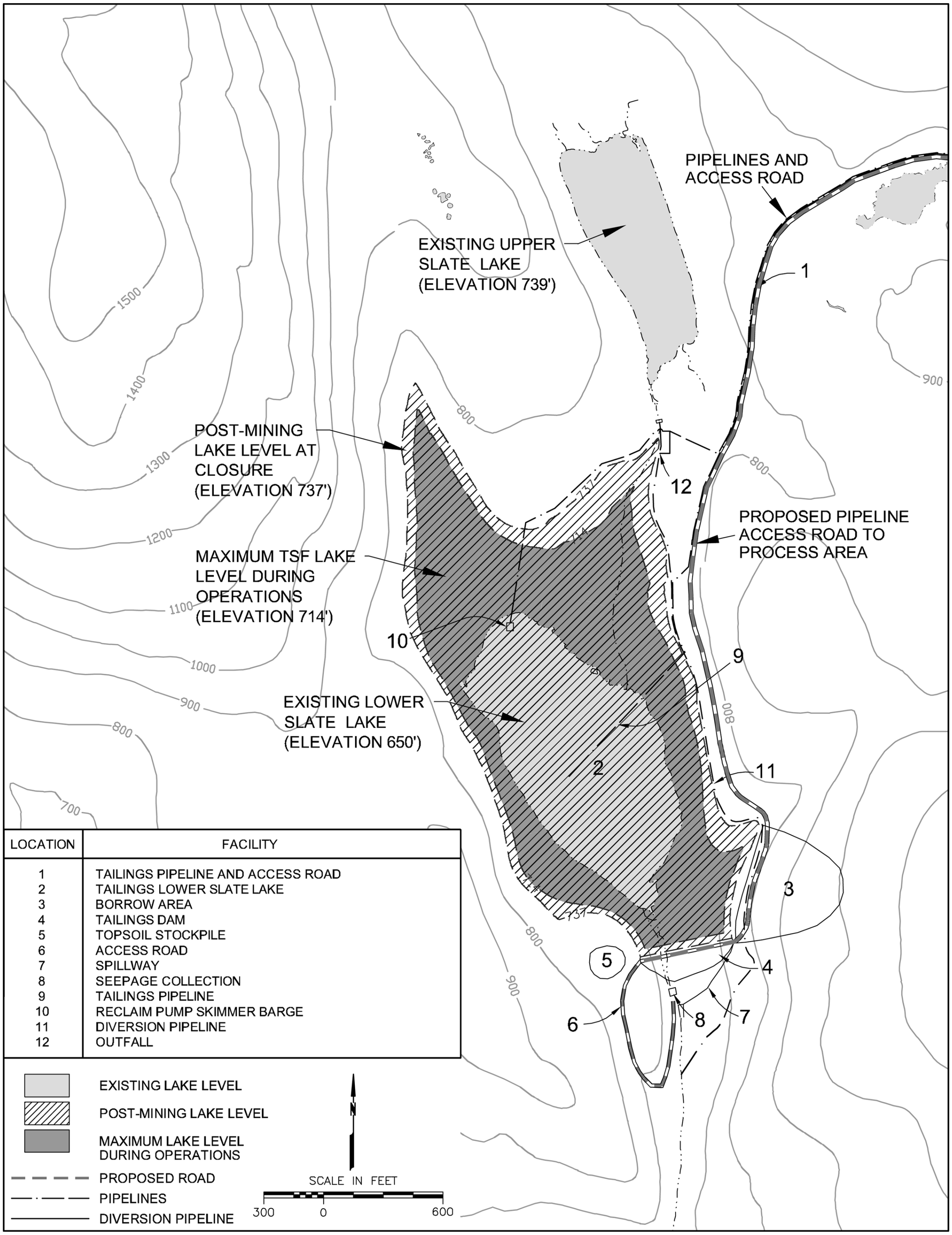


FIGURE 3. ALTERNATIVE B, TSF

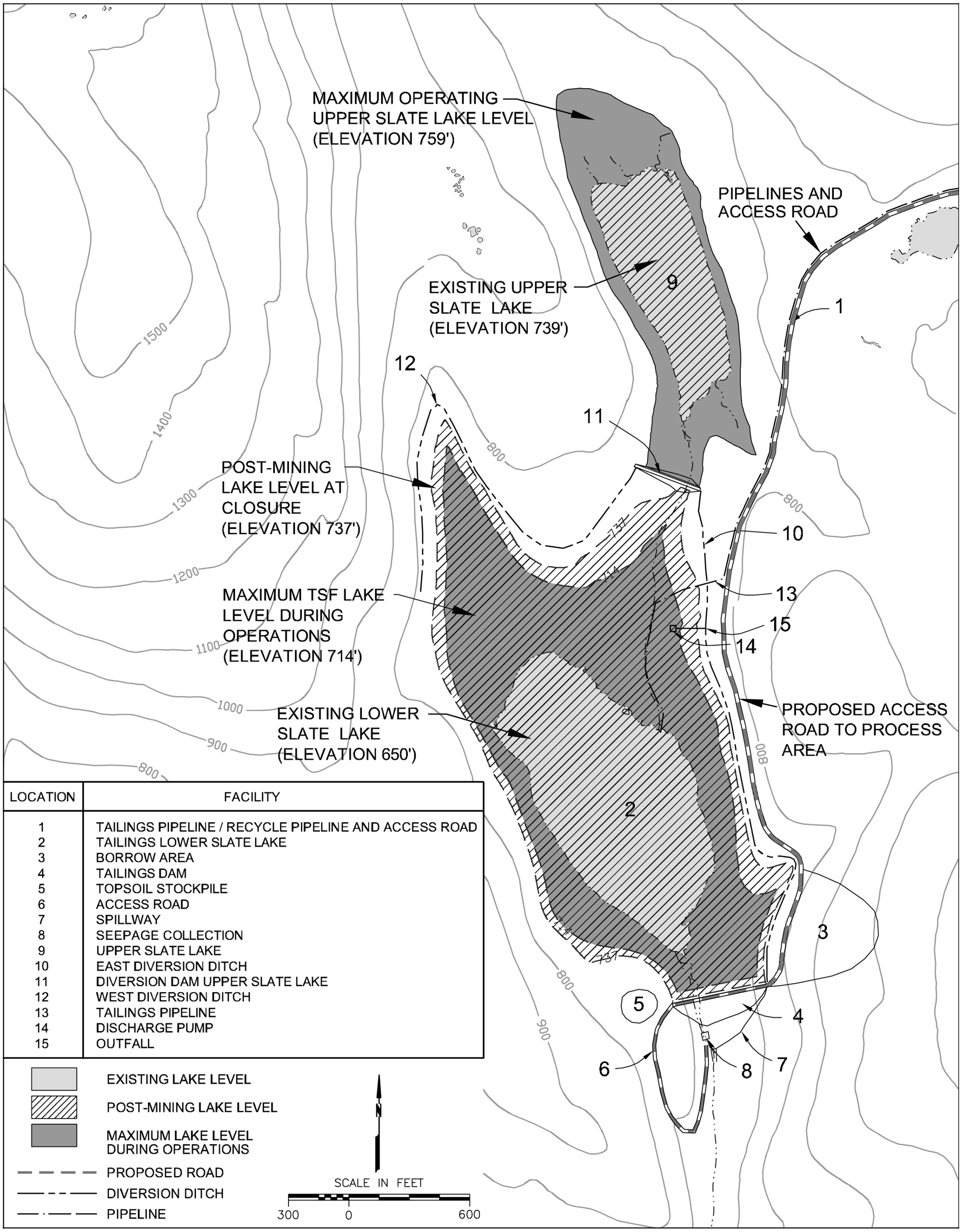


FIGURE 4. ALTERNATIVE C, TSF AND DIVERSIONS

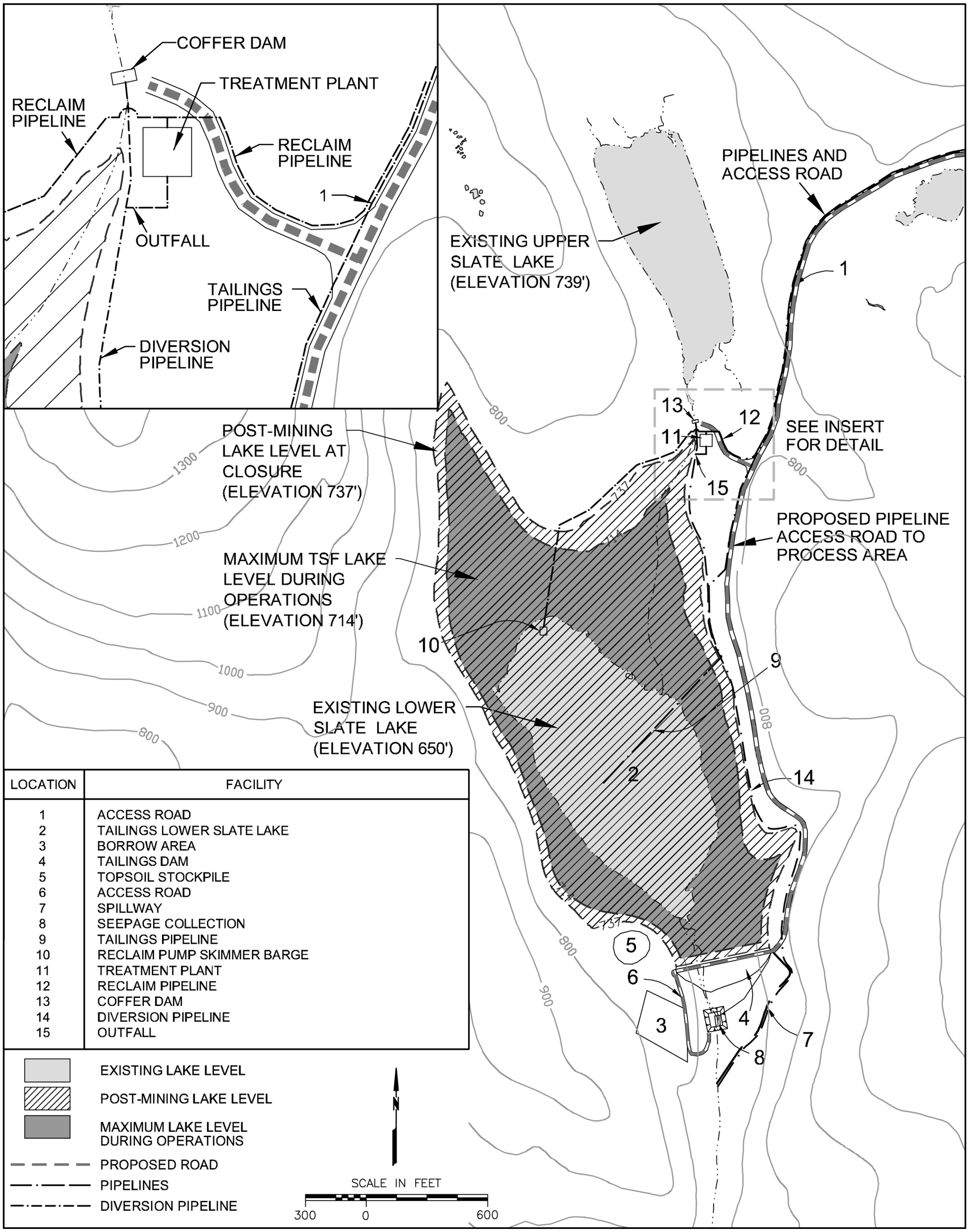


FIGURE 5. ALTERNATIVE D, TSF

APPENDIX B:

FSEIS REQUIRED MONITORING

ACTIVITIES TABLES

Table 2-7
Monitoring Requirements by Resource Area

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Construction, Operation, and Reclamation Specifications						
Construction, operation, and reclamation according to Plan of Operations and permit requirements	Document, report, and inspect	Ongoing	Nonconformance with approved design specifications	To be determined by individual agencies	Forest Service ROD, Final Plan of Operations, NPDES permit, Section 404 permit, ADNR Title 41 permit	Forest Service, USEPA, USACE, and ADNR
Air Quality						
Air emissions and compliance with air quality permit	Implement methods according to air quality permit	Frequency indicated in air quality permit	Threshold at air quality permit limits	Notify as required by air quality permit, implement measures to correct noncompliance	Air quality permit	The operator with ADEC review
Water Quality and Hydrology						
Effluent treatment measures	Inspect implementation of design and mitigation measures outlined in Final Plan of Operations and Final SEIS	Ongoing	Operability of measures at all times	May not discharge effluent to receiving waters until measures are implemented	Forest Service ROD, NPDES permit	The operator with Forest Service, ADEC, and USEPA review
Implementation of BMPs to control pollution from sediment, petroleum products, and hazardous or toxic waste (including metals) during construction and operation	Review site-specific BMP plans and inspect implementation of plans	During construction – ongoing During operation – monthly	Evidence that BMPs are not designed and implemented correctly	Require additional or improved pollution control measures	Forest Service ROD, Final Plan of Operations, SPCC Plan, NPDES permit	Forest Service, ADEC, USEPA, and Coeur Alaska
Effluent compliance with NPDES permit	Implement methods according to NPDES permit	Frequency indicated in NPDES permit	Thresholds at NPDES permit limits	Notify as required by NPDES permit and final Plan of Operations; implement additional measures to correct the noncompliance	NPDES permit	The operator with USEPA review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Surface water quality	Implement methods according to NPDES permit and monitoring program in Final Plan of Operations	Frequency indicated in NPDES permit and Final Plan of Operations	Trend showing effects on water quality	Per NPDES permit and Final Plan of Operations	NPDES permit and Final Plan of Operations	The operator with USEPA and Forest Service review
Effectiveness of BMPs in controlling nonpoint source pollution during construction and operation	Collect and evaluate data on relevant water quality constituents from sites above and below mine activity	During construction and operation; varies from weekly to quarterly	Evidence that nonpoint source pollution control measures are not installed correctly, maintained operationally, or effective; noncom-pliance with water quality criteria or changes in water quality trends	Require additional or improved pollution control measures	Forest Service ROD, Final Plan of Operations	The operator with Forest Service review
Groundwater quality effects of DTF (Alternative A)	Sample groundwater upgradient and downgradient of DTF	According to solid waste permit	Per solid waste permit	Per solid waste permit	Solid waste permit	The operator with ADEC review
Maintenance of instream flows in Sherman Creek, Johnson Creek, and East Fork State Creek	Monitor (by gauging) stream flows immediately below intake (all alternatives) and below TSF (Alternatives B, C, and D)	As established by ADNR water rights	Instream flow levels set by ADNR water rights	Limit water withdrawal; adjust TSF discharge flows	Forest Service ROD, ADNR water rights	The operator with Forest Service and ADNR review
Compliance with stormwater regulations	Sample and inspect according to general NPDES permit	According to general NPDES permit	Exceedance of benchmark values	Reevaluate BMPs and add additional BMPs as necessary	General NPDES permit	The operator with USEPA and ADEC review
Effectiveness of reclamation measures in maintaining water quality at the mine site	Monitor process area and DTF site (Alternative A) and process area and TSF sites (Alternatives B, C, and D)	Varies with time after reclamation	Background levels and trends, including seasonal influences	Implement additional reclamation efforts	Forest Service ROD, Final Plan of Operations	The operator with Forest Service review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Effectiveness of reclamation in maintaining stable, self-maintaining stream channels	Monitor reclaimed channels for stability	Varies with time after reclamation	Self-maintaining, productive channels	Implement additional reclamation efforts	Forest Service ROD, Final Plan of Operations	The operator with Forest Service and ADNR review
Impacts of spills and effects of response measures	See SPCC Plan	Post-spill as required in SPCC Plan	Spill occurs	Clean up, report, and monitor as necessary	SPCC Plan	The operator with ADEC and USEPA review
Aquatic Resources: Freshwater						
Discharge effect on aquatic organisms below discharges/facility operations	Perform bioassays of discharges to surface water; fish surveys above and below Sherman Creek discharges (all alternatives); and above and below TSF in East Fork State Creek and process area in Johnson Creek(Alternatives B, C, and D)	Per NPDES permit	Per NPDES permit	Per NPDES permit	NPDES permit and Final Plan of Operations	The operator with ADEC/ADNR and USEPA review
Aquatic life in TSF during operations and after closure	Perform invertebrate, fish, and aquatic plant sampling/surveys in TSF during operations and closure (Alternatives B, C, and D)	During operations: Yearly until sufficient for characterization After closure: Twice yearly until productive, sustainable community established	During operations: No specific threshold After closure: Benthic organism reestablishment does not meet density or diversity of reclamation objectives	Amendments to reclamation plan	Final Plan of Operations	The operator with Forest Service and ADNR review
Dolly Varden char spawning surveys in Upper Slate Lake	Survey for redds and distribution of mature Dolly Varden char to determine preferred spawning habitat	Yearly during spawning period to determine preferred spawning areas	No specific threshold; data collected to better define system and impacts and refine reclamation plan	Meet with Forest Service and state to refine long-term TSF reclamation approach, as appropriate	Final Plan of Operations and Title 41 permit with ADNR review	The operator, Forest Service, and ADNR

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Spawning salmon escapement survey	Conduct pink, chum, and coho spawning counts as appropriate, in intertidal zone and 90-foot sections of Sherman Creek (all alternatives), Slate Creek (Alternatives B, C, and D), and Johnson Creek (Alternatives B, C, and D) from mouth to fish barrier with same methods used by Konopacky in 1995	Yearly survey; weekly counts during spawning period	When results of this monitoring, in addition to other information, indicate habitat capabilities are changing as a result of mine activities	Meet with Forest Service to discuss potential problem; could result in change in construction or operating practices and mitigation in nearby streams	Final Plan of Operations	The operator with Forest Service and ADNR and NMFS review
Benthic macroinvertebrate community composition	Sample from sites above and below disturbances in Sherman Creek (all alternatives), Johnson Creek (Alternatives B, C, and D), and Slate Creek (Alternatives B, C, and D)	Yearly	Trend showing effects on benthic community composition (changes in density/species diversity)	Submit results in Annual Report; discuss follow-up actions with USEPA, ADNR, and Forest Service	NPDES permit Final Plan of Operations	The operator with USEPA, ADNR, and Forest Service review
Spawning gravel composition and embryo survival in Lower Sherman, Johnson, and Slate creeks	Sample using established procedures in Sherman Creek (all alternatives), Johnson Creek (Alternatives B, C, and D), and Slate Creek (Alternatives B, C, and D)	Yearly	Trend showing effects on gravel composition and embryo survival	Submit results in Annual Report; discuss follow-up actions with USEPA, state, and Forest Service	NPDES permit Final Plan of Operations	The operator with USEPA, ADNR, and Forest Service review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Sediment quality (metals toxicity and other characteristics)	Sample using established procedures at background locations, below discharges, and at mouths of Sherman Creek (all alternatives) and Slate Creek (Alternatives B, C, and D), and above and below process area in Johnson Creek (Alternatives B, C, and D)	Yearly	Trend showing increased toxicity or metals levels	Submit results in Annual Report; discuss follow-up actions with USEPA, state, and Forest Service	NPDES permit Final Plan of Operations	The operator with USEPA, state, and Forest Service review
Aquatic habitat characteristics	Observe and photograph habitat type (e.g., riffle, pool), substrate size, and vegetation/woody debris in Sherman Creek (all alternatives), Johnson Creek (Alternatives B, C, and D), and Slate Creek (Alternatives B, C, and D)	Yearly in Sherman Creek, Slate Creek, and Johnson Creek	Trend showing habitat change from baseline	Meet with Forest Service to discuss potential sources of impacts; could result in change in construction or operation practices and mitigation in nearby streams	Final Plan of Operations	The operator with Forest Service and ADNR review
Aquatic Resources: Marine						
Marine water quality – Polycyclic aromatic hydrocarbon (PAH) concentrations around Berners Bay (Alternatives B, C, and D)	Use polyethylene membrane devices (PEMDs)	Twice annually, once in April and once in July	Changes in baseline conditions	Per Tidelands lease	Tidelands lease	The operator with ADNR and NMFS review
Marine water quality	Take grab sample (extract)	Once annually coinciding with May recovery of PEMD noted above	Changes in baseline conditions	Per Tidelands lease	Tidelands lease	The operator with ADNR and NMFS review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Sediment quality	Conduct sediment sampling	Once annually coinciding with May recovery of PEMD noted above	Changes in baseline conditions	Per Tidelands lease	Tidelands lease	The operator with ADNR and NMFS review
Mussel tissue PAH concentrations	Conduct tissue sampling	Once annually coinciding with May recovery of PEMD noted above	Changes in baseline conditions	Per Tidelands lease	Tidelands lease	The operator with ADNR and NMFS review
Steller seal lions, marine mammals (seals)	Observe known haulout sites	Annually while activities are occurring; during times when haulouts are occupied	Evidence of harassment of marine mammals as direct result of mining-related activities	Enforce Marine Mammal Protection Act and Endangered Species Act. Avoid or modify activities causing impacts.	Marine Mammal Protection Act, Endangered Species Act	NMFS
Marine mammal and seabird (sea duck) observations	Observe species activities from vessels. Log presence or absence and direction of movement.	Daylight hours (may be done during certain periods based on results)	Evidence of changes from baseline	Meet with agencies to discuss impacts and potential changes to transportation plan	Tidelands Lease	The operator with Forest Service and U.S. Fish and Wildlife Service (USFWS) and NMFS review
Wildlife						
Eagle and goshawk nest management	Observe nest sites	During years 1 and 2 of project development, every month May–August; after second year, annually	A change (e.g., a change in the occupancy status of a nest) due to mining-related activity	Consult with USFWS for eagles, and Forest Service to modify if activity is deemed to be influencing the observed change (e.g., nest abandonment)	Bald and Golden Eagle Protection Act, Final Plan of Operations	Forest Service and USFWS
Wildlife use of Slate and Spectacle lakes	Document occurrence of waterfowl and other wildlife and associated habitat in Upper Slate and Spectacle lakes during operations and at TSF after closure	During operations: Continual in association with other studies until sufficient for characterization After closure: Twice yearly until productive, sustainable community is established	During operations: No specific threshold After closure: Failure to meet anticipated reclamation schedule	During operations; Incorporate findings into reclamation plan After closure; amend reclamation plan	Final Plan of Operations	The operator with Forest Service, USFWS, and ADNR/ADF&G review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Heron rookery and raptor nest protection	Pre-development surveys	Annually if active rookery/nests discovered during initial survey	Presence of nest/rookery within 600-foot buffer of project activity	Eliminate disturbances during nesting season (March 1–July 31)	Final Plan of Operations	Forest Service
Mountain goat monitoring	Conduct population surveys, track radio-collared goats	Several flights per year	Evidence of extreme adverse reaction to mining-related activities causing abandonment of habitat	Consult to minimize disturbance; if disturbance cannot be minimized, causing loss of mountain goat population, mitigation could involve reintroduction	Agreement with the operator	ADF&G and Forest Service
Vegetation						
Compliance with timber sale contract provisions (sale administration)	Conduct onsite inspections	Before, during, and after harvest activities	Compliance with contract clauses	Return to compliance	36 CFR Part 223	Forest Service
Visual Resources						
Operations monitoring; compliance with visual quality objectives	Conduct field observation and document with photos taken from established viewpoints	After construction, during operations, and after project completion	Determine whether visual impacts exceed anticipated impacts	Consider additional mitigation	Forest Service Handbook (FSH) 2309.22	Forest Service
Reclamation monitoring; compliance with visual quality objectives	Conduct field observation and document with photos taken from established viewpoints	Once every 5 years for 15 years after reclamation	Determine whether visual impacts exceed anticipated impacts	Use photos as reference in determining impacts and achieving visual quality objectives in future planning; implement additional planting or treatments as appropriate	Forest Service Handbook 2309.22	Forest Service
Geotechnical Stability						
Tailings structures: construction materials	Conduct visual inspection and gradation testing of materials	Continuous during construction	Per design documents	Remove non-conforming materials	Final Plan of Operations and Dam Safety Permit	The operator with Forest Service and ADNR review

Table 2-7
Monitoring Requirements by Resource Area (continued)

Resource/Item to Measure	Method of Measurement	Frequency of Measurement	Threshold of Variability	Action To Be Taken	Authority	Responsible Party
Tailings structures: construction methods	Perform compaction and moisture tests along with other standard engineering practices	As dictated by selected design needs during construction	Per design documents	Remove non-conforming materials or apply additional effort to installation	Final Plan of Operations and Dam Safety Permit	The operator with Forest Service and ADNR review
Tailing structures: ongoing performance	Perform visual inspections, measure saturation	At minimum monthly, more frequent as dictated by selected design; after large earthquakes and other natural events	Per design documents	Per analysis of variance	Final Plan of Operations and Dam Safety Permit	The operator with Forest Service and ADNR review
Waste rock pile stability	Perform visual inspection	Annually	Visible movement	As dictated by findings	Final Plan of Operations	The operator with Forest Service review
Cultural Resources						
Ground disturbance	Monitor for discovery of cultural resources by qualified archaeologist according to MOA approved by Forest Service and SHPO	During initial ground disturbance	Per MOA	Per MOA	Per MOA	The operator with Forest Service and SHPO review

APPENDIX C:

FIGURES

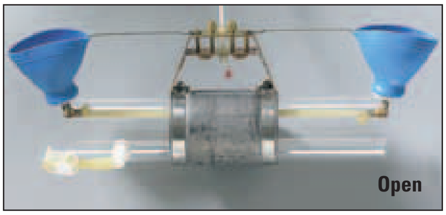
Figure 1.

Water Samplers

Samplers to handle your depth and water source requirements

- Quality materials help minimize contamination

Low-Cost Water Sampler



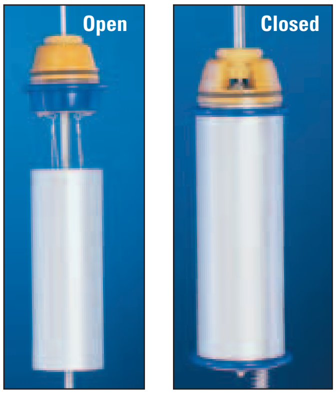
Low-cost water sampler 05488-20

Sampler is attached to 20-m calibrated line for depth measurement. Fitted plungers provide a positive seal preventing your sample from mixing with intermediate layers of water. Sampler includes a brass messenger for activation and a lead collar for rapid descent and minimal drift due to water currents. Sampler features a side drain outlet for removing small test samples.

Catalog number	Bottle type	Volume (liters)	Price
R-05488-20	Acrylic	1.0	

Kemmerer Water Samplers

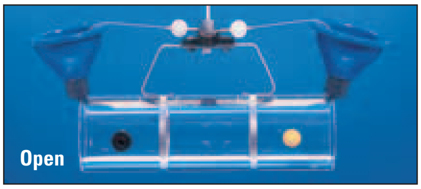
Sample at specific depths between 3 and 600 feet. The messenger activates the unique trip heads that ensure closure in fast flowing streams or turbulent waters, regardless of line angle. The 304 SS models have urethane end seals (do not use when mercury concentrations exceed 1 ppm). Acrylic models have silicone end seals. All models include a plastic carrying case; order messenger and line separately at right.



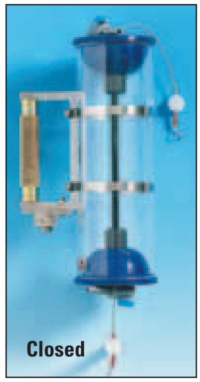
Kemmerer water sampler 05485-00

Catalog number	Bottle type	Volume (liters)	Price
R-05485-00 R-05485-10	304 SS	0.4 1.2	
R-05486-00 R-05486-10	Acrylic	1.2 2.2	

Alpha Water Samplers



Horizontal alpha water sampler 05488-10



Vertical alpha water sampler 05487-10

Alpha samplers are suitable for use in oceans, deep lakes, and corrosive waters (do not use when mercury concentrations exceed 1 ppm). Vertical samplers retrieve large water samples at any depth and collect plankton or floating sediments. Choose horizontal samplers for sampling at the surface, thermocline, or just above the bottom. Urethane end seals snap shut with minimum surface disturbance on messenger contact. Drain valve provides easy sample removal. Samplers include a carrying case; order messenger and line separately below. Silicone end seals are available by special order; call our Application Specialists for details.

Catalog number	Bottle type	Volume (liters)	Price
Vertical alpha water samplers			
R-05487-00 R-05487-10	PVC Acrylic	2.2	
Horizontal alpha water samplers			
R-05488-00 R-05488-10	PVC Acrylic	2.2	

Accessories for Kemmerer and Alpha Water Samplers

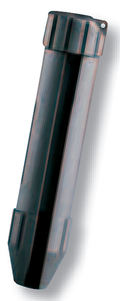
Solid 3/16" Braided Polyester Line is for use with sampling equipment that weighs less than 75 lb (34 kg). Maximum load is 110 lb (50 kg).

R-05499-33 Braided polyester line, 338 ft (100 m) ....

Tapered Nose Messengers activate closing mechanisms on sampling equipment. Fit up to 1/4" line.

R-05499-10 Messenger; 11-oz split-barrel, stainless steel; 4"L x 1" dia. Enclosed spring mechanism..

R-05499-15 Messenger; 8-oz solid-barrel, stainless steel; 2 1/2"L x 1" dia ....


05499-10

Gravity-Type, Messenger-Activated Core Sampler Kit

Collect moist to slightly liquid sediment samples

- Messenger weight allows sample obtainment at deeper depths than hand-operated samplers

Complete core sampler kit includes one stainless steel core tube (liner type) measuring 20"L x 2" ID, two plastic liner tubes with caps, three eggshell core catchers, two Lexan® nose pieces, one messenger, 100 feet of steel aircraft cable, and plastic carrying case. Drop the messenger weight to activate the closing mechanism when a solid sample is obtained. Order stabilizer-fin attachment, core tube weight, and replacement parts separately at right.

Catalog number	Description	Price
R-05460-00	Core sampler kit	

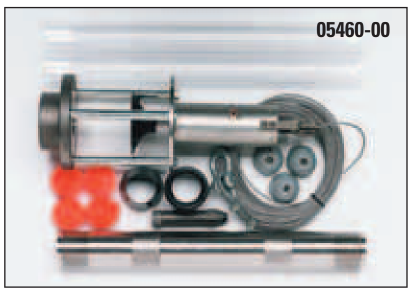
R-05460-05 Stabilizer-fin attachment..

R-05460-06 Core tube weight. For greater penetration into sediment, clamps onto core tube..

R-05465-05 Repl. Lexan nose pieces. Pack of 6 .... /pk

R-05465-12 Repl. liner tubes. Pack of 12 .... /pk

R-05465-10 Repl. eggshell core catcher. Pack of 10........................ /pk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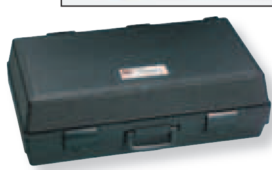
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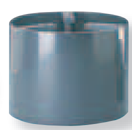

05460-06

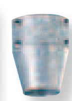

05460-05

Figure 2.

	Description	Sample Volume	Penetration Depth	Approx. Sample Weight (lbs.)	Shipping Weight
602-001	6" x 6" x 6" Standard Ekman Sampler	3.5 L	6"	15-25	15 lbs.
602-002	6" x 6" x 9" Tall Ekman Sampler	5.3 L	9"	20-35	18 lbs.
602-003	9" x 9" x 9" Large Ekman Sampler	11.9 L	12"	45-70	33 lbs.
602-004	5 ft. Extension Handle				5 lbs.
602-005	10 ft. Extension Handle				8 lbs.
602-006	Standard Ekman Sample Kit				15 lbs.

TOP

Ponar Type Grab Sampler

The Ponar Type Grab sampler is a commonly used sampler that is very versatile for all types of hard bottoms such as sand, gravel and clay. It can be used in streams, lakes reservoirs and the ocean. This modified Van Veen type self-tripping sampler features center hinged jaws and a spring loaded pin that releases when the sampler makes impact with the bottom. It also includes an underlip attachment that cleans gravel from the jaws that would normally prevent lateral loss of sample. The top is covered with a stainless steel screen with neoprene rubber flaps which allows water to flow through for a controlled descent and less interference with the sample. It is constructed of stainless steel with zinc plated steel arms and weights. A simple pin prevents premature closing.

The Ponar style sampler comes in several sizes with the lightweight model (1/8" stainless plate) easily used from a small boat with nylon cable. The heavyweight models (1/4" stainless plate) should be used with a sounding reel.

	Description	Sample Volume	Penetration Depth	Approx. Sample Weight	Shipping weight
602-012	6" x 6" Lightweight Grab Sampler	2.4 L	2.75"	15-20 lbs.	16 lbs.
602-013	6" x 6" Heavyweight Grab Sampler	2.4 L	2.75"	15-20 lbs.	26 lbs.
602-014	9" x 9" Heavyweight Grab Sampler	8.2 L	3.5"	50-70 lbs.	45 lbs.
602-015	Extra Bolt on Weights (2)				15 lbs.

TOP

Van Veen Grab Sampler

Figure 3.

Click on any picture to enlarge

Core Samplers

[Hand Corer Sampler] [Ballchek Core Sampler] [KB Core Sampler]
[Hand, Ballchek & KB Core Sampler Accessories] [Ogeechee Sand Corer]
[AMS Soft Sediment Core Sampler] [Russian Peat Corer] [Universal Core Sampler]

Universal Core Sampler

The Universal Core Sampler takes high quality cores of water-sediment interface. The core head drives clear, polycarbonate barrels into sediments, resulting in long cores with minimal effort and sample compression. The one-way check valve permits the barrel to free flush during deployment and also retains the core sample without using core catchers and nosepieces. To obtain a sample, attach a polycarbonate core barrel to the core head and push or lower the sampler into the sediment. If sampling in compact deposits, use the optional slide hammer. To adjust sampler weight, use the optional bronze gravity weights for even easier penetration. In shallow water (less than 20 ft.), the sampler is manually-driven using the "T" handle and the optional aluminum extension rods. In deeper water, the corer is gravity/slide hammer-driven.

603-111 Universal Core Sampler 14 lbs.

603-112 24" Polycarbonate Core Barrels with End Caps 3 lbs.

603-113 48" Polycarbonate Core Barrels with End Caps 5 lbs.

603-114 Slide Hammer Assembly 16 lbs.

603-115 Gravity Weight 12 lbs.

603-116 Core Extruding Rod with Extruding Plug 5 lbs.

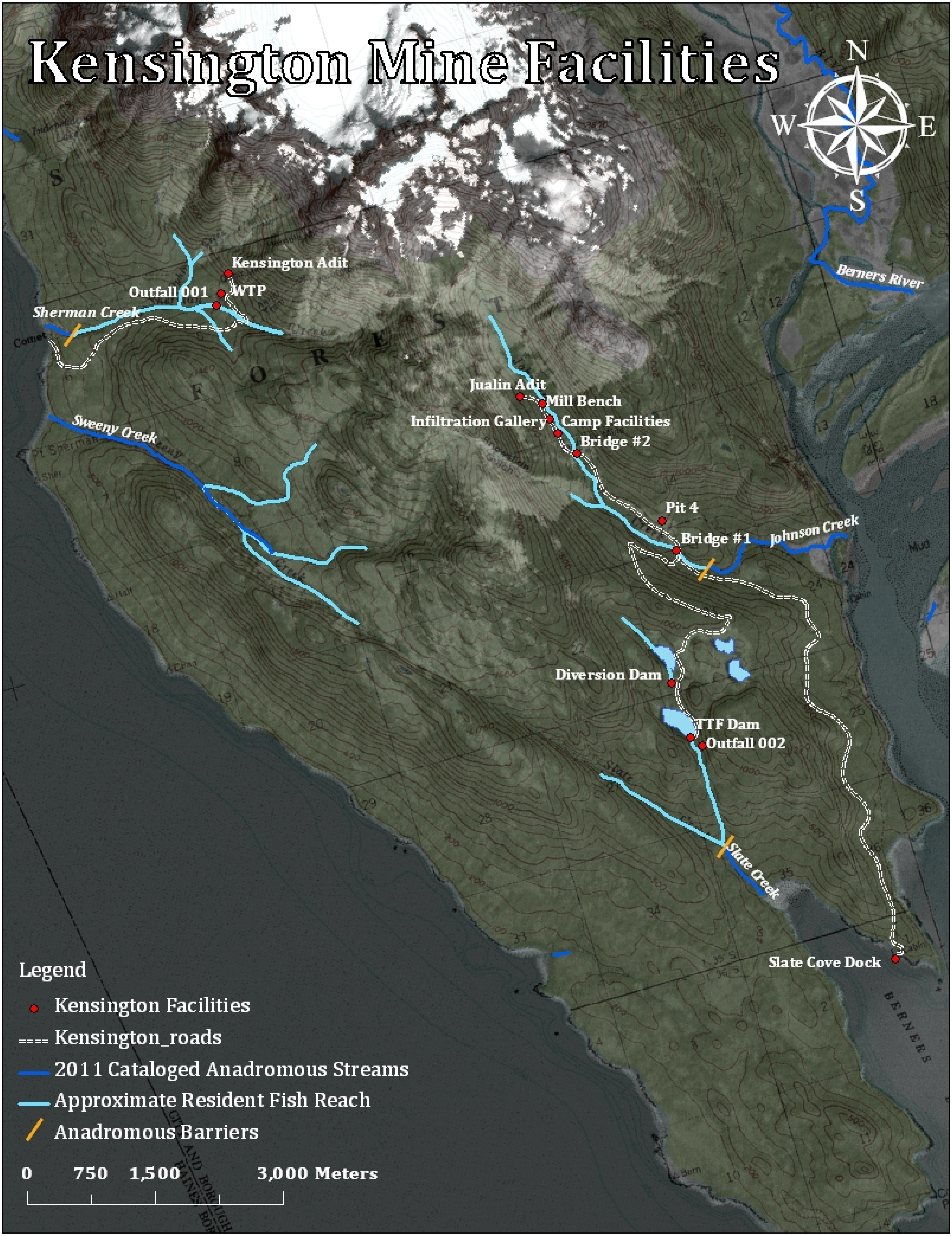
603-119 4 ft. Extension Rods 3 lbs.

603-120 8 ft. Extension Rods 5 lbs.

RICKLY HYDROLOGICAL COMPANY
1700 JOYCE AVENUE COLUMBUS, OH 43219 U.S. Only: 1-800-561-9677 PHONE: 1-614-297-9877 FAX: 1-614-297-9878 sales@rickly.com

APPENDIX D:

LOCATION MAPS



Kensington Mine Facilities
N
W
E
S
Berners River
Kensington Adit
Outfall 001
WTP
Sherman Creek
Jualin Adit
Mill Bench
Infiltration Gallery
Camp Facilities
Bridge #2
Sweeny Creek
Pit 4
Bridge #1
Johnson Creek
Diversion Dam
TTF Dam
Outfall 002
Slate Creek
Slate Cove Dock
Legend
Kensington Facilities
Kensington_roads
2011 Cataloged Anadromous Streams
Approximate Resident Fish Reach
Anadromous Barriers
0
750
1,500
3,000 Meters

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game
DIVISION OF HABITAT
Southeast Region Office
802 3rd Street
Douglas, AK 99824-5412
P.O. Box 110024
Juneau, Alaska 99811-0024
Main: 907.465.4105
Fax: 907.465.4759

FISH HABITAT PERMIT FH05-I-0050
Amendment C

ISSUED: June 10, 2013
Replaces FH05-I-0050 and Amendments A and B
EXPIRES: Upon Satisfactory Completion of Restoration

Coeur Alaska, Inc.
ATTN: Luke Russell
3031 Clinton Dr, Ste 202
Juneau, AK 99801

RE: Tailings Impoundment Dam in Lower Slate Lake and Temporary Dam in Mid-Lake Slate Creek
Slate Creek (Stream No. 115-20-10030)
Sec 26, T 35 S, R 62E, CRM (Juneau D-4)
Location: 58.8081 N, 135.0383 (NAD83)

Dear Mr. Russell:

Pursuant to AS 16.05.841 and AS 16.05.871(b), the Alaska Department of Fish and Game Division of Habitat reviewed Coeur Alaska, Inc.'s Tailing Treatment Facility Ecological Monitoring Plan, required in their original permit FH05-I-0050 and subsequent amendments. The plan includes a study to investigate tailings habitability among others, to inform the closure design for the tailing treatment facility (TTF), and achieve the reclamation goal of restoring and improving aquatic productivity in Lower Slate Lake. This permit approves the plan, updates the permit for the project, and replaces the original permit and amendments A and B.

Project Description

Coeur has constructed two of three phases of an earthen dam for the TTF, which will raise the water level in Lower Slate Lake by about 85 feet, increase the size of the lake from about 20 to 56 acres, and flood the majority of Mid-Lake Slate Creek, the main inflow to Lower Slate Lake. Mine tailings will be permanently stored in the lake. During operations, Mid-Lake Slate Creek will be diverted around the TTF and safe downstream fish passage between Upper Slate Lake and East Fork Slate Creek will be provided by the diversion pipeline. Tailings will be deposited in the TTF for approximately 12 years, then reclaimed and improved to provide fish habitat. At reclamation, downstream fish migration will be provided via a constructed spillway.

Anadromous Fish Act and Fishway Act
Slate Creek has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). Stream No. 115-20-10030 provides habitat for chum, coho, and pink salmon, and eulachon. We have also documented cutthroat trout and Dolly Varden char. Upstream of the barriers to anadromous fish migration, Dolly Varden char and threespine stickleback are present in East Fork Slate Creek and Upper Slate Lake.

In accordance with AS 16.05.841 and AS 16.05.871(d) project approval is hereby given subject to project description above, the terms of this permit, and following stipulations:

1. Coeur will submit plans and specifications for the final impoundment spillway with their proposed Reclamation and Closure Plan prior to closure. The Division of Habitat will approve the final plans in a future permit amendment; and

2. You will maintain the concrete diversion dam in Mid-Lake Slate Creek until conditions in the reclaimed TTF are suitable for Dolly Varden char, at which time the dam will be removed to allow free fish passage.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. For any activity that significantly deviates from the approved plan, you shall notify the Division of Habitat and obtain written approval in the form of a permit amendment before beginning the activity. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any stipulation contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the Division of Habitat. Therefore, it is recommended you consult the Division of Habitat immediately when a deviation from the approved plan is being considered.

For the purpose of inspecting or monitoring compliance with any condition of this permit, you shall give an authorized representative of the state free and unobstructed access, at safe and reasonable times, to the permit site. You shall furnish whatever assistance and information as the authorized representative reasonably requires for monitoring and inspection purposes.

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to activities regulated by the Division of Habitat; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other permits; state, federal, or local. You are still required to comply with all other applicable laws.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. The department reserves the right to require mitigation measures to correct disruption to fish and game created by the project and which was a direct result of the failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

The AS 16.05.871 permit decision may be appealed in accordance with the provisions of AS 44.62.330-630.

If you have any questions regarding this permit, please contact Kate Kanouse at (907) 465-4290 or by email at kate.kanouse@alaska.gov.

Sincerely,
Cora Campbell
Commissioner

By Jackie Timothy
Southeast Regional Supervisor

Email cc:
Al Ott, ADF&G Habitat, Fairbanks
Dan Teske, ADF&G Sport Fish, Douglas
Rich Chapell, ADF&G Sport Fish, Haines
Dave Harris, ADF&G Comm Fish, Douglas
Randy Bachman, ADF&G Comm Fish, Haines
Ryan Scott, ADF&G Wildlife Conservation, Douglas
Kyle Moselle, ADNR OPMP, Anchorage
Dave Kelley, ADNR DMLW, Juneau
Kenwyn George, ADEC, Juneau
Sgt. Matt Dobson, DPS/AWT, Juneau
Randy Vigil, USACE, Juneau
Sarah Samuelson, USFS, Juneau
Steve Brockmann, USFWS, Juneau
Kevin Eppers, Coeur, Juneau

USDA United States Department of Agriculture | Forest Service | Alaska Region, Tongass National Forest, Juneau Ranger District | 8510 Mendenhall Loop, Juneau, AK 99801, Phone: (907) 586-8800, Fax: (907) 586-8808

File Code: 2810
Date: June 10, 2013

Kevin Eppers
Environmental Manager
Coeur Alaska - Kensington Gold Mine
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Dear Mr. Eppers:

The 2005 Kensington Gold Project EIS requires a tailings habitability study of the Kensington Gold Mine tailings treatment facility. Members of the Forest Service staff from this office have worked closely with you and Alaska Department of Fish and Game (ADFG) habitat biologists for the past two years to develop a study plan.

The study plan is now complete and the June 2013 version of the plan is acceptable to the Forest Service. This letter constitutes my approval of the Tailings Treatment Facility Ecological Monitoring Plan, attached.

The tailings habitability results will be used to help inform us of the closure design best suited to achieving the reclamation goal of restoring and improving aquatic productivity in Lower Slate Lake. We will continue to work closely with you to refine your reclamation and closure plan for aquatic habitats.

Thank you for the opportunity to work with you on this project. If you have any questions, please contact me at 907.789.6244 or Jessica Lopez Pearce at 907.789.6273.

Sincerely,

Marti M Marshall

MARTI M. MARSHALL
District Ranger

cc: Jessica Lopez Pearce, David L Schmerge, Pete Schneider, Richard T Edwards, Kate Kanouse, Kyle Moselle

APPENDIX B:
TAILINGS GEOCHEMISTRY LABORATORY REPORTS

One Government Gulch - PO Box 929 | Kellogg ID 83837-0929 | (208) 784-1258 | Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
CAK-TTF SED. TAILS-20130824	W3H0720-01	Soil	24-Aug-13 12:00	PS	28-Aug-2013
CAK-MILL TAILS SLURRY-20130825	W3H0720-02	Soil	25-Aug-13 10:00	PS	28-Aug-2013

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested. Non-Detects are reported at the MDL.
Sample preparation is defined by the client as per their Data Quality Objectives.
This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.
The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted.

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Client Sample ID: **CAK-TTF SED. TAILS-20130824**
SVL Sample ID: **W3H0720-01 (Soil)**

Sample Report Page 1 of 2

Sampled: 24-Aug-13 12:00
Received: 28-Aug-13
Sampled By: PS

Acid/Base Accounting & Sulfur Forms

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Modified Sobek	**ABA**	90.8	TCaCO3/kT	0.3			N/A		09/09/13 12:34	
Modified Sobek	**AGP**	1.5	TCaCO3/kT	0.3			N/A		09/09/13 12:34	
Modified Sobek	**ANP**	92.3	TCaCO3/kT	0.3	0.1		W336227	AGF	09/09/13 12:00	A2
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01	0.006		W336227	MCE	09/09/13 12:34	
Modified Sobek	**Non-Sulfate Sulfur**	0.05	%	0.01	0.006		W336227	MCE	09/09/13 12:03	
Modified Sobek	**Pyritic Sulfur**	0.05	%	0.01			N/A		09/09/13 12:34	
Modified Sobek	**Sulfate Sulfur**	0.06	%	0.01			N/A		09/09/13 12:03	
Modified Sobek	**Total Sulfur**	0.11	%	0.01	0.006		W336227	MCE	09/06/13 11:56	

Classical Chemistry Parameters

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
LECO	**Total Inorganic Carbon**	1.22	%	0.10	0.007		W337270	MCE	09/12/13 15:23	
USDA HB60(21a)	**Paste pH @21.7°C**	8.16	pH Units				W337025	MCE	09/12/13 13:10	

Meteoric Water Mobility Extraction Parameters

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
ASTM E2242-07	**Extraction Fluid pH**	5.67	pH Units				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Extraction Time**	8.0	Hrs				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	Extraction Type	Rotation					W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Feed Moisture**	18.5	%				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Final Fluid pH**	8.38	pH Units				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Sample Weight**	2500	g				W336154	ESB	09/11/13 09:50	

Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 09/06/13 12:30

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
EPA 200.7	Aluminum	< 0.080	mg/L Extract	0.080	0.031		W337224	TJK	09/12/13 15:47	
EPA 200.7	Antimony	< 0.020	mg/L Extract	0.020	0.008		W337224	TJK	09/12/13 15:47	
EPA 200.7	Boron	< 0.20	mg/L Extract	0.20	0.01		W337224	TJK	09/12/13 15:47	
EPA 200.7	**Calcium**	86.7	mg/L Extract	1.00	0.02		W337224	TJK	09/12/13 15:47	
EPA 200.7	Iron	< 0.060	mg/L Extract	0.060	0.019		W337224	TJK	09/12/13 15:47	
EPA 200.7	**Magnesium**	10.7	mg/L Extract	0.30	0.04		W337224	TJK	09/12/13 15:47	
EPA 200.7	**Manganese**	0.0552	mg/L Extract	0.0040	0.0012		W337224	TJK	09/12/13 15:47	
EPA 200.7	Nickel	< 0.010	mg/L Extract	0.010	0.003		W337224	TJK	09/12/13 15:47	
EPA 200.7	**Potassium**	12.9	mg/L Extract	0.50	0.11		W337224	TJK	09/12/13 15:47	
EPA 200.7	**Sodium**	10.3	mg/L Extract	5.00	0.11		W337224	TJK	09/12/13 15:47	
EPA 200.7	Zinc	< 0.06	mg/L Extract	0.06	0.002		W337224	TJK	09/12/13 15:47	
EPA 200.8	Arsenic	< 0.0030	mg/L Extract	0.0030	0.0003		W337216	DT	09/12/13 11:40	
EPA 200.8	**Barium**	0.0620	mg/L Extract	0.00100	0.000100		W337216	DT	09/12/13 11:40	
EPA 200.8	Beryllium	< 0.000200	mg/L Extract	0.000200	0.000074		W337216	DT	09/12/13 11:40	
EPA 200.8	Cadmium	< 0.00020	mg/L Extract	0.00020	0.00003		W337216	DT	09/12/13 11:40	
EPA 200.8	Chromium	< 0.00150	mg/L Extract	0.00150	0.00018		W337216	DT	09/12/13 11:40	
EPA 200.8	Copper	< 0.00100	mg/L Extract	0.00100	0.000061		W337216	DT	09/12/13 11:40	
EPA 200.8	Lead	< 0.00300	mg/L Extract	0.00300	0.000048		W337216	DT	09/12/13 11:40	
EPA 200.8	Selenium	< 0.00300	mg/L Extract	0.00300	0.00026		W337216	DT	09/12/13 11:40	
EPA 200.8	Thallium	< 0.00100	mg/L Extract	0.00100	0.00001		W337216	DT	09/12/13 11:40	
EPA 231.2	Gold	< 0.0100	mg/L Extract	0.0100	0.0004		W337211	KWH	09/19/13 07:32	D10
EPA 245.1	Mercury	< 0.00020	mg/L Extract	0.00020	0.000045		W337233	STA	09/16/13 13:44	

Meteoric Water Mobility Leachates (Classical) Extracted: 09/06/13 12:30

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
SM 2320B/2310B	**Bicarbonate**	47.2	mg/L Extract	10.0			W337200	DKS	09/11/13 11:51	
SM 2320B/2310B	Carbonate	< 10.0	mg/L Extract	10.0			W337200	DKS	09/11/13 11:51	
SM 2320B/2310B	**Total Alkalinity**	47.2	mg/L Extract	10.0			W337200	DKS	09/11/13 11:51	
SM 2540C	**Total Diss. Solids**	381	mg/L Extract	20			W337251	RS	09/12/13 08:05	
SM 4500 H B	**pH @22.0°C**	7.89	pH Units				W337200	DKS	09/11/13 11:51	
SM 4500-CN-I	Cyanide (WAD)	< 0.0100	mg/L Extract	0.0100	0.0017		W337213	IIT	09/11/13 15:00	

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Client Sample ID: **CAK-TTF SED. TAILS-20130824**
SVL Sample ID: **W3H0720-01 (Soil)**

Sampled: 24-Aug-13 12:00
Received: 28-Aug-13
Sampled By: PS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions) Extracted: 09/06/13 12:30										
EPA 300.0	**Chloride**	1.6	mg/L Extract	1.0	0.06		W337203	AEW	09/11/13 22:41	
EPA 300.0	Fluoride	< 0.5	mg/L Extract	0.5	0.02		W337203	AEW	09/11/13 22:41	
EPA 300.0	**Nitrate as N**	0.32	mg/L Extract	0.25	0.02		W337203	AEW	09/11/13 22:41	H11
EPA 300.0	**Nitrate/Nitrite as N**	0.34	mg/L Extract	0.25	0.02		W337203	AEW	09/11/13 22:41	H11
EPA 300.0	Nitrite as N	< 0.250	mg/L Extract	0.250	0.010		W337203	AEW	09/11/13 22:41	H11
EPA 300.0	**Sulfate as SO4**	260	mg/L Extract	3.00	0.66	10	W337203	AEW	09/11/13 22:53	D2,M3

Cation/Anion Balance and TDS Ratios

Cation Sum: 5.99 meq/L Anion Sum: 6.43 meq/L C/A Balance: -3.50 % Calculated TDS: 412 TDS/cTDS: 0.92

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Client Sample ID: **CAK-MILL TAILS SLURRY-20130825**
SVL Sample ID: **W3H0720-02 (Soil)**

Sample Report Page 1 of 2

Sampled: 25-Aug-13 10:00
Received: 28-Aug-13
Sampled By: PS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	93.5	TCaCO3/kT	0.3			N/A		09/09/13 12:37	
Modified Sobek	AGP	< 0.3	TCaCO3/kT	0.3			N/A		09/09/13 12:37	
Modified Sobek	**ANP**	93.5	TCaCO3/kT	0.3	0.1		W336227	AGF	09/09/13 12:00	A2
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01	0.006		W336227	MCE	09/09/13 12:37	
Modified Sobek	Non-Sulfate Sulfur	< 0.01	%	0.01	0.006		W336227	MCE	09/09/13 12:06	
Modified Sobek	Pyritic Sulfur	< 0.01	%	0.01			N/A		09/09/13 12:37	
Modified Sobek	**Sulfate Sulfur**	0.09	%	0.01			N/A		09/09/13 12:06	
Modified Sobek	**Total Sulfur**	0.09	%	0.01	0.006		W336227	MCE	09/06/13 12:00	
Classical Chemistry Parameters										
LECO	**Total Inorganic Carbon**	1.29	%	0.10	0.007		W337270	MCE	09/12/13 15:26	
USDA HB60(21a)	**Paste pH @21.5°C**	8.48	pH Units				W337025	MCE	09/12/13 13:10	
Meteoric Water Mobility Extraction Parameters										
ASTM E2242-07	**Extraction Fluid pH**	5.67	pH Units				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Extraction Time**	8.0	Hrs				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	Extraction Type	Rotation					W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Feed Moisture**	17.5	%				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Final Fluid pH**	8.91	pH Units				W336154	ESB	09/11/13 09:50	
ASTM E2242-07	**Sample Weight**	3080	g				W336154	ESB	09/11/13 09:50	
Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 09/06/13 12:30										
EPA 200.7	**Aluminum**	0.168	mg/L Extract	0.080	0.031		W337224	TJK	09/12/13 15:54	
EPA 200.7	Antimony	< 0.020	mg/L Extract	0.020	0.008		W337224	TJK	09/12/13 15:54	
EPA 200.7	Boron	< 0.20	mg/L Extract	0.20	0.01		W337224	TJK	09/12/13 15:54	
EPA 200.7	**Calcium**	110	mg/L Extract	1.00	0.02		W337224	TJK	09/12/13 15:54	
EPA 200.7	Iron	< 0.060	mg/L Extract	0.060	0.019		W337224	TJK	09/12/13 15:54	
EPA 200.7	**Magnesium**	1.48	mg/L Extract	0.30	0.04		W337224	TJK	09/12/13 15:54	
EPA 200.7	Manganese	< 0.0040	mg/L Extract	0.0040	0.0012		W337224	TJK	09/12/13 15:54	
EPA 200.7	Nickel	< 0.010	mg/L Extract	0.010	0.003		W337224	TJK	09/12/13 15:54	
EPA 200.7	**Potassium**	34.2	mg/L Extract	0.50	0.11		W337224	TJK	09/12/13 15:54	
EPA 200.7	**Sodium**	25.1	mg/L Extract	5.00	0.11		W337224	TJK	09/12/13 15:54	
EPA 200.7	Zinc	< 0.06	mg/L Extract	0.06	0.002		W337224	TJK	09/12/13 15:54	
EPA 200.8	Arsenic	< 0.0030	mg/L Extract	0.0030	0.0003		W337216	DT	09/12/13 11:54	
EPA 200.8	**Barium**	0.0647	mg/L Extract	0.00100	0.000100		W337216	DT	09/12/13 11:54	
EPA 200.8	Beryllium	< 0.000200	mg/L Extract	0.000200	0.000074		W337216	DT	09/12/13 11:54	
EPA 200.8	Cadmium	< 0.00020	mg/L Extract	0.00020	0.00003		W337216	DT	09/12/13 11:54	
EPA 200.8	Chromium	< 0.00150	mg/L Extract	0.00150	0.00018		W337216	DT	09/12/13 11:54	
EPA 200.8	**Copper**	0.00166	mg/L Extract	0.00100	0.000061		W337216	DT	09/12/13 11:54	
EPA 200.8	Lead	< 0.00300	mg/L Extract	0.00300	0.000048		W337216	DT	09/12/13 11:54	
EPA 200.8	Selenium	< 0.00300	mg/L Extract	0.00300	0.00026		W337216	DT	09/12/13 11:54	
EPA 200.8	Thallium	< 0.00100	mg/L Extract	0.00100	0.00001		W337216	DT	09/12/13 11:54	
EPA 231.2	Gold	< 0.0100	mg/L Extract	0.0100	0.0004		W337211	KWH	09/19/13 07:32	D10
EPA 245.1	**Mercury**	0.00023	mg/L Extract	0.00020	0.000045		W337233	STA	09/16/13 13:46	
Meteoric Water Mobility Leachates (Classical) Extracted: 09/06/13 12:30										
SM 2320B/2310B	**Bicarbonate**	14.9	mg/L Extract	10.0			W337200	DKS	09/11/13 11:55	
SM 2320B/2310B	Carbonate	< 10.0	mg/L Extract	10.0			W337200	DKS	09/11/13 11:55	
SM 2320B/2310B	**Total Alkalinity**	20.0	mg/L Extract	10.0			W337200	DKS	09/11/13 11:55	
SM 2540C	**Total Diss. Solids**	532	mg/L Extract	20			W337251	RS	09/12/13 08:05	
SM 4500 H B	**pH @22.0°C**	8.94	pH Units				W337200	DKS	09/11/13 11:55	
SM 4500-CN-I	Cyanide (WAD)	< 0.0100	mg/L Extract	0.0100	0.0017		W337213	IIT	09/11/13 15:02	

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Client Sample ID: **CAK-MILL TAILS SLURRY-20130825**
SVL Sample ID: **W3H0720-02 (Soil)**

Sampled: 25-Aug-13 10:00
Received: 28-Aug-13
Sampled By: PS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions) Extracted: 09/06/13 12:30										
EPA 300.0	**Chloride**	3.4	mg/L Extract	1.0	0.06		W337203	AEW	09/11/13 23:53	
EPA 300.0	Fluoride	< 0.5	mg/L Extract	0.5	0.02		W337203	AEW	09/11/13 23:53	
EPA 300.0	**Nitrate as N**	2.00	mg/L Extract	0.25	0.02		W337203	AEW	09/11/13 23:53	H11
EPA 300.0	**Nitrate/Nitrite as N**	2.81	mg/L Extract	0.25	0.02		W337203	AEW	09/11/13 23:53	H11
EPA 300.0	**Nitrite as N**	0.809	mg/L Extract	0.250	0.010		W337203	AEW	09/11/13 23:53	H11
EPA 300.0	**Sulfate as SO4**	326	mg/L Extract	3.00	0.66	10	W337203	AEW	09/12/13 00:05	D2

Cation/Anion Balance and TDS Ratios

Cation Sum: 7.60 meq/L Anion Sum: 7.48 meq/L C/A Balance: 0.75 % Calculated TDS: 525 TDS/cTDS: 1.01

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms								
Modified Sobek	ANP	TCaCO3/kT	<0.3	0.1	0.3	W336227	09-Sep-13	
Modified Sobek	Non-Sulfate Sulfur	%	<0.01	0.006	0.01	W336227	09-Sep-13	
Modified Sobek	Total Sulfur	%	<0.01	0.006	0.01	W336227	06-Sep-13	
Modified Sobek	Non-extractable Sulfur	%	<0.01	0.006	0.01	W336227	09-Sep-13	
Classical Chemistry Parameters								
LECO	Total Inorganic Carbon	%	<0.10	0.007	0.10	W337270	12-Sep-13	

Quality Control - EXTRACTION BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 09/06/13 12:30 Batch: W336154								
EPA 200.7	Aluminum	mg/L Extract	<0.080	0.031	0.080	W337224	12-Sep-13	
EPA 200.7	Antimony	mg/L Extract	<0.020	0.008	0.020	W337224	12-Sep-13	
EPA 200.7	Boron	mg/L Extract	<0.20	0.01	0.20	W337224	12-Sep-13	
EPA 200.7	Calcium	mg/L Extract	<1.00	0.02	1.00	W337224	12-Sep-13	
EPA 200.7	Iron	mg/L Extract	<0.060	0.019	0.060	W337224	12-Sep-13	
EPA 200.7	Magnesium	mg/L Extract	<0.30	0.04	0.30	W337224	12-Sep-13	
EPA 200.7	Manganese	mg/L Extract	<0.0040	0.0012	0.0040	W337224	12-Sep-13	
EPA 200.7	Nickel	mg/L Extract	<0.010	0.003	0.010	W337224	12-Sep-13	
EPA 200.7	Potassium	mg/L Extract	<0.50	0.11	0.50	W337224	12-Sep-13	
EPA 200.7	Sodium	mg/L Extract	<5.00	0.11	5.00	W337224	12-Sep-13	
EPA 200.7	Zinc	mg/L Extract	<0.06	0.002	0.06	W337224	12-Sep-13	
EPA 231.2	Gold	mg/L Extract	<0.0100	0.0004	0.0100	W337211	19-Sep-13	D10
EPA 245.1	Mercury	mg/L Extract	<0.00020	0.000045	0.00020	W337233	16-Sep-13	
Meteoric Water Mobility Leachates (Classical) Extracted: 09/06/13 12:30 Batch: W336154								
SM 2320B/2310B	Total Alkalinity	mg/L Extract	<10.0		10.0	W337200	11-Sep-13	
SM 2320B/2310B	Bicarbonate	mg/L Extract	<10.0		10.0	W337200	11-Sep-13	
SM 2320B/2310B	Carbonate	mg/L Extract	<10.0		10.0	W337200	11-Sep-13	
SM 2540C	Total Diss. Solids	mg/L Extract	<20		20	W337251	12-Sep-13	
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	<0.0100	0.0017	0.0100	W337213	11-Sep-13	
Meteoric Water Mobility Leachates (Anions) Extracted: 09/06/13 12:30 Batch: W336154								
EPA 300.0	Fluoride	mg/L Extract	<0.5	0.02	0.5	W337203	11-Sep-13	
EPA 300.0	Chloride	mg/L Extract	<1.0	0.06	1.0	W337203	11-Sep-13	
EPA 300.0	Nitrate as N	mg/L Extract	<0.25	0.02	0.25	W337203	11-Sep-13	
EPA 300.0	Nitrite as N	mg/L Extract	<0.250	0.010	0.250	W337203	11-Sep-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	<1.50	0.07	1.50	W337203	11-Sep-13	
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	<0.25	0.02	0.25	W337203	11-Sep-13	

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	197	216	91.1	80 - 120	W336227	09-Sep-13	
Modified Sobek	Total Sulfur	%	1.00	0.942	106	80 - 120	W336227	06-Sep-13	
Classical Chemistry Parameters									
LECO	Total Inorganic Carbon	%	1.05	1.00	105	80 - 120	W337270	12-Sep-13	
USDA HB60(21a)	Paste pH	pH Units	7.32	7.40	98.9	93.7 - 106.3	W337025	12-Sep-13	
Meteoric Water Mobility Leachates (Metals by 200 Series)									
EPA 200.7	Aluminum	mg/L Extract	0.990	1.00	99.0	85 - 115	W337224	12-Sep-13	
EPA 200.7	Antimony	mg/L Extract	0.982	1.00	98.2	85 - 115	W337224	12-Sep-13	
EPA 200.7	Boron	mg/L Extract	0.97	1.00	96.5	85 - 115	W337224	12-Sep-13	
EPA 200.7	Calcium	mg/L Extract	19.6	20.0	98.0	85 - 115	W337224	12-Sep-13	
EPA 200.7	Iron	mg/L Extract	9.17	10.0	91.7	85 - 115	W337224	12-Sep-13	
EPA 200.7	Magnesium	mg/L Extract	19.1	20.0	95.7	85 - 115	W337224	12-Sep-13	
EPA 200.7	Manganese	mg/L Extract	0.956	1.00	95.6	85 - 115	W337224	12-Sep-13	
EPA 200.7	Nickel	mg/L Extract	0.969	1.00	96.9	85 - 115	W337224	12-Sep-13	
EPA 200.7	Potassium	mg/L Extract	19.3	20.0	96.7	85 - 115	W337224	12-Sep-13	
EPA 200.7	Sodium	mg/L Extract	18.0	19.0	95.0	85 - 115	W337224	12-Sep-13	
EPA 200.7	Zinc	mg/L Extract	1.00	1.00	100	85 - 115	W337224	12-Sep-13	
EPA 200.8	Arsenic	mg/L Extract	0.0237	0.0250	94.9	85 - 115	W337216	12-Sep-13	
EPA 200.8	Barium	mg/L Extract	0.0248	0.0250	99.4	85 - 115	W337216	12-Sep-13	
EPA 200.8	Beryllium	mg/L Extract	0.0239	0.0250	95.4	85 - 115	W337216	12-Sep-13	
EPA 200.8	Cadmium	mg/L Extract	0.0238	0.0250	95.3	85 - 115	W337216	12-Sep-13	
EPA 200.8	Chromium	mg/L Extract	0.0245	0.0250	98.2	85 - 115	W337216	12-Sep-13	
EPA 200.8	Copper	mg/L Extract	0.0245	0.0250	98.1	85 - 115	W337216	12-Sep-13	
EPA 200.8	Lead	mg/L Extract	0.0242	0.0250	96.9	85 - 115	W337216	12-Sep-13	
EPA 200.8	Selenium	mg/L Extract	0.0229	0.0250	91.7	85 - 115	W337216	12-Sep-13	
EPA 200.8	Thallium	mg/L Extract	0.0249	0.0250	99.7	85 - 115	W337216	12-Sep-13	
EPA 231.2	Gold	mg/L Extract	0.0534	0.0500	107	85 - 115	W337211	19-Sep-13	D10
EPA 245.1	Mercury	mg/L Extract	0.00496	0.00500	99.2	85 - 115	W337233	16-Sep-13	
Meteoric Water Mobility Leachates (Classical)									
SM 2320B/2310B	Total Alkalinity	mg/L Extract	96.0	97.2	98.8	85 - 115	W337200	11-Sep-13	
SM 2320B/2310B	Bicarbonate	mg/L Extract	94.9	97.2	97.6	85 - 115	W337200	11-Sep-13	
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.157	0.150	105	80 - 120	W337213	11-Sep-13	
Meteoric Water Mobility Leachates (Anions)									
EPA 300.0	Fluoride	mg/L Extract	2.0	2.00	98.4	90 - 110	W337203	12-Sep-13	
EPA 300.0	Chloride	mg/L Extract	3.0	3.00	102	90 - 110	W337203	12-Sep-13	
EPA 300.0	Nitrate as N	mg/L Extract	2.03	2.00	101	90 - 110	W337203	12-Sep-13	
EPA 300.0	Nitrite as N	mg/L Extract	2.60	2.50	104	90 - 110	W337203	12-Sep-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	10.3	10.0	103	90 - 110	W337203	12-Sep-13	
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	4.63	4.50	103	0 - 200	W337203	12-Sep-13	

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Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	40.4	38.9	3.7	20	W336227	09-Sep-13	
Modified Sobek	Non-Sulfate Sulfur	%	2.63	2.67	1.5	20	W336227	09-Sep-13	D2
Modified Sobek	Total Sulfur	%	4.71	4.80	2.0	20	W336227	06-Sep-13	D2
Modified Sobek	Non-extractable Sulfur	%	0.06	0.07	16.9	20	W336227	09-Sep-13	
Classical Chemistry Parameters									
LECO	Total Inorganic Carbon	%	1.22	1.22	0.0	20	W337270	12-Sep-13	
USDA HB60(21a)	Paste pH	pH Units	8.13	8.16	0.4	20	W337025	12-Sep-13	
Meteoric Water Mobility Leachates (Classical)									
SM 2320B/2310B	Total Alkalinity	mg/L Extract	160	158	0.9	20	W337200	11-Sep-13	
SM 2320B/2310B	Bicarbonate	mg/L Extract	159	157	0.9	20	W337200	11-Sep-13	
SM 2320B/2310B	Carbonate	mg/L Extract	<10.0	<10.0	<RL	20	W337200	11-Sep-13	
SM 2540C	Total Diss. Solids	mg/L Extract	645	655	1.5	10	W337251	12-Sep-13	
SM 4500 H B	pH	pH Units	8.31	8.31	0.0	20	W337200	11-Sep-13	

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series)										
EPA 200.7	Aluminum	mg/L Extract	1.14	0.128	1.00	101	70 - 130	W337224	12-Sep-13	
EPA 200.7	Antimony	mg/L Extract	0.985	<0.020	1.00	98.5	70 - 130	W337224	12-Sep-13	
EPA 200.7	Boron	mg/L Extract	1.21	0.22	1.00	98.9	70 - 130	W337224	12-Sep-13	
EPA 200.7	Calcium	mg/L Extract	54.5	34.3	20.0	101	70 - 130	W337224	12-Sep-13	
EPA 200.7	Iron	mg/L Extract	9.24	<0.060	10.0	92.0	70 - 130	W337224	12-Sep-13	
EPA 200.7	Magnesium	mg/L Extract	28.6	9.32	20.0	96.6	70 - 130	W337224	12-Sep-13	
EPA 200.7	Manganese	mg/L Extract	0.959	<0.0040	1.00	95.9	70 - 130	W337224	12-Sep-13	
EPA 200.7	Nickel	mg/L Extract	0.971	<0.010	1.00	97.1	70 - 130	W337224	12-Sep-13	
EPA 200.7	Potassium	mg/L Extract	30.0	10.1	20.0	99.5	70 - 130	W337224	12-Sep-13	
EPA 200.7	Sodium	mg/L Extract	61.5	42.5	19.0	99.8	70 - 130	W337224	12-Sep-13	
EPA 200.7	Zinc	mg/L Extract	0.97	<0.06	1.00	96.7	70 - 130	W337224	12-Sep-13	
EPA 200.8	Arsenic	mg/L Extract	0.0243	<0.0030	0.0250	97.0	70 - 130	W337216	12-Sep-13	
EPA 200.8	Barium	mg/L Extract	0.0886	0.0620	0.0250	106	70 - 130	W337216	12-Sep-13	
EPA 200.8	Beryllium	mg/L Extract	0.0226	<0.000200	0.0250	90.4	70 - 130	W337216	12-Sep-13	
EPA 200.8	Cadmium	mg/L Extract	0.0241	<0.00020	0.0250	96.2	70 - 130	W337216	12-Sep-13	
EPA 200.8	Chromium	mg/L Extract	0.0241	<0.00150	0.0250	96.4	70 - 130	W337216	12-Sep-13	
EPA 200.8	Copper	mg/L Extract	0.0235	<0.00100	0.0250	92.7	70 - 130	W337216	12-Sep-13	
EPA 200.8	Lead	mg/L Extract	0.0239	<0.00300	0.0250	95.5	70 - 130	W337216	12-Sep-13	
EPA 200.8	Selenium	mg/L Extract	0.0240	<0.00300	0.0250	94.9	70 - 130	W337216	12-Sep-13	
EPA 200.8	Thallium	mg/L Extract	0.0245	<0.00100	0.0250	98.1	70 - 130	W337216	12-Sep-13	
EPA 231.2	Gold	mg/L Extract	0.0537	<0.0100	0.0500	107	70 - 130	W337211	19-Sep-13	D10
EPA 245.1	Mercury	mg/L Extract	0.00102	<0.00020	0.00100	102	70 - 130	W337233	16-Sep-13	
Meteoric Water Mobility Leachates (Classical)										
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.100	<0.0100	0.100	100	75 - 125	W337213	11-Sep-13	
Meteoric Water Mobility Leachates (Anions)										
EPA 300.0	Fluoride	mg/L Extract	2.2	<0.5	2.00	95.5	90 - 110	W337203	11-Sep-13	
EPA 300.0	Chloride	mg/L Extract	4.8	1.6	3.00	107	90 - 110	W337203	11-Sep-13	
EPA 300.0	Nitrate as N	mg/L Extract	2.44	0.32	2.00	106	90 - 110	W337203	11-Sep-13	
EPA 300.0	Nitrite as N	mg/L Extract	2.16	<0.250	2.00	107	90 - 110	W337203	11-Sep-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	272	260	10.0	R > 4S	90 - 110	W337203	11-Sep-13	D2,M3

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

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Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Quality Control - MATRIX SPIKE Data (Continued)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions) (Continued)										
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	4.60	0.34	4.00	106	90 - 110	W337203	11-Sep-13	

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series)										
EPA 200.7	Aluminum	mg/L Extract	1.13	1.14	1.00	0.7	20	W337224	12-Sep-13	
EPA 200.7	Antimony	mg/L Extract	0.989	0.985	1.00	0.4	20	W337224	12-Sep-13	
EPA 200.7	Boron	mg/L Extract	1.22	1.21	1.00	0.5	20	W337224	12-Sep-13	
EPA 200.7	Calcium	mg/L Extract	54.4	54.5	20.0	0.2	20	W337224	12-Sep-13	
EPA 200.7	Iron	mg/L Extract	9.25	9.24	10.0	0.1	20	W337224	12-Sep-13	
EPA 200.7	Magnesium	mg/L Extract	28.8	28.6	20.0	0.5	20	W337224	12-Sep-13	
EPA 200.7	Manganese	mg/L Extract	0.964	0.959	1.00	0.5	20	W337224	12-Sep-13	
EPA 200.7	Nickel	mg/L Extract	0.968	0.971	1.00	0.3	20	W337224	12-Sep-13	
EPA 200.7	Potassium	mg/L Extract	29.6	30.0	20.0	1.3	20	W337224	12-Sep-13	
EPA 200.7	Sodium	mg/L Extract	61.1	61.5	19.0	0.5	20	W337224	12-Sep-13	
EPA 200.7	Zinc	mg/L Extract	0.98	0.97	1.00	0.9	20	W337224	12-Sep-13	
EPA 200.8	Arsenic	mg/L Extract	0.0254	0.0243	0.0250	4.5	20	W337216	12-Sep-13	
EPA 200.8	Barium	mg/L Extract	0.0881	0.0886	0.0250	0.6	20	W337216	12-Sep-13	
EPA 200.8	Beryllium	mg/L Extract	0.0224	0.0226	0.0250	0.7	20	W337216	12-Sep-13	
EPA 200.8	Cadmium	mg/L Extract	0.0242	0.0241	0.0250	0.7	20	W337216	12-Sep-13	
EPA 200.8	Chromium	mg/L Extract	0.0249	0.0241	0.0250	3.3	20	W337216	12-Sep-13	
EPA 200.8	Copper	mg/L Extract	0.0241	0.0235	0.0250	2.5	20	W337216	12-Sep-13	
EPA 200.8	Lead	mg/L Extract	0.0241	0.0239	0.0250	1.1	20	W337216	12-Sep-13	
EPA 200.8	Selenium	mg/L Extract	0.0242	0.0240	0.0250	1.1	20	W337216	12-Sep-13	
EPA 200.8	Thallium	mg/L Extract	0.0250	0.0245	0.0250	2.0	20	W337216	12-Sep-13	
EPA 231.2	Gold	mg/L Extract	0.0558	0.0537	0.0500	3.9	20	W337211	19-Sep-13	D10
EPA 245.1	Mercury	mg/L Extract	0.00102	0.00102	0.00100	0.0	20	W337233	16-Sep-13	
Meteoric Water Mobility Leachates (Classical)										
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.0990	0.100	0.100	1.0	20	W337213	11-Sep-13	
Meteoric Water Mobility Leachates (Anions)										
EPA 300.0	Fluoride	mg/L Extract	2.2	2.2	2.00	0.6	20	W337203	11-Sep-13	
EPA 300.0	Chloride	mg/L Extract	4.8	4.8	3.00	0.5	20	W337203	11-Sep-13	
EPA 300.0	Nitrate as N	mg/L Extract	2.45	2.44	2.00	0.5	20	W337203	11-Sep-13	
EPA 300.0	Nitrite as N	mg/L Extract	2.15	2.16	2.00	0.7	20	W337203	11-Sep-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	273	272	10.0	0.2	20	W337203	11-Sep-13	D2,M3
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	4.60	4.60	4.00	0.0	20	W337203	11-Sep-13	

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Work Order: **W3H0720**
Reported: 19-Sep-13 13:11

Notes and Definitions

A2	2 g of sample used in ANP analysis
D10	Method of Standard Additions (MSA) was performed on prep batch QC and may not meet accreditation standards.
D2	Sample required dilution due to high concentration of target analyte.
H11	Extract was analyzed after laboratory assigned holding time.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

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Coeur Alaska	**Project Name: TTF Filter Cake 2013**
3031 Clinton Drive, Suite 202	Work Order: **W3K0038**
Juneau, AK 99801	Reported: 19-Nov-13 11:52

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
CAK-TTF SED. TAILS-20131030	W3K0038-01	Solid	30-Oct-13 13:00	RB	04-Nov-2013
CAK-MILL TAILS SLURRY-20131030	W3K0038-02	Solid	30-Oct-13 11:00	RB	04-Nov-2013

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.
Sample preparation is defined by the client as per their Data Quality Objectives.
This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.
The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted.

(Q6) SVL received the following containers outside of published EPA guidelines for preservation temperatures (0-6°C).
The guidelines do not pertain to nitric-preserved metals.

Default Cooler (Received Temperature: 9.9°C)

Labnumber	Container	Client ID	Labnumber	Container	Client ID
W3K0038-01 A	Jar, glass	CAK-TTF SED. TAILS-20131030	W3K0038-01 B	Jar, glass	CAK-TTF SED. TAILS-20131030
W3K0038-01 C	Jar, glass	CAK-TTF SED. TAILS-20131030	W3K0038-01 D	Jar, glass	CAK-TTF SED. TAILS-20131030
W3K0038-01 E	Manila Pulverize	CAK-TTF SED. TAILS-20131030	W3K0038-02 A	Misc.	CAK-MILL TAILS SLURRY-20131030
W3K0038-02 B	Misc.	CAK-MILL TAILS SLURRY-20131030	W3K0038-02 C	Misc.	CAK-MILL TAILS SLURRY-20131030
W3K0038-02 E	Manila Pulverize	CAK-MILL TAILS SLURRY-20131030			

Case Narrative

11/13/13 DG ASTM E2242 requires a minimum sample of 5000g

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

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Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Project Name: TTF Filter Cake 2013
Work Order: **W3K0038**
Reported: 19-Nov-13 11:52

Client Sample ID: **CAK-TTF SED. TAILS-20131030**
SVL Sample ID: **W3K0038-01 (Solid)**

Sampled: 30-Oct-13 13:00
Received: 04-Nov-13
Sampled By: RB

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes

Acid/Base Accounting & Sulfur Forms

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Modified Sobek	**ABA**	142	TCaCO3/kT	0.3			N/A		11/12/13 14:10	
Modified Sobek	AGP	< 0.3	TCaCO3/kT	0.3			N/A		11/12/13 13:20	
Modified Sobek	**ANP**	142	TCaCO3/kT	0.3	0.1		W346067	AGF	11/12/13 14:10	A2
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01	0.006		W346067	MCE	11/12/13 13:20	
Modified Sobek	Non-Sulfate Sulfur	< 0.01	%	0.01	0.006		W346067	MCE	11/12/13 12:05	
Modified Sobek	Pyritic Sulfur	< 0.01	%	0.01			N/A		11/12/13 13:20	
Modified Sobek	**Sulfate Sulfur**	0.10	%	0.01			N/A		11/12/13 12:05	
Modified Sobek	**Total Sulfur**	0.10	%	0.01	0.006		W346067	MCE	11/11/13 15:15	

Classical Chemistry Parameters

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
LECO	**Total Inorganic Carbon**	1.68	%	0.10	0.007		W346105	MCE	11/13/13 14:19	
USDA HB60(21a)	**Paste pH @20.8°C**	7.58	pH Units				W346132	AGF	11/13/13 08:15	

Meteoric Water Mobility Extraction Parameters

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
ASTM E2242-12	Extraction Type	Rotation					W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Dry Feed Moist. Weight**	144	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Wet Feed Moist. Weight**	174	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moist. Dry Temp.**	105	°C				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moist. Dry Time**	19.0	Hrs				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moisture**	17.3	%				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	5cm Retained Weight	0.00	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**5cm Passing Weight**	1760	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	5cm Retained Percent	0.00	%				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Sample Weight**	1580	g				W345164	ESB	11/12/13 09:45	N1,T6
ASTM E2242-12	**Dry Sample Weight**	1310	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Water Volume Used**	1310	mL				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Fluid pH**	5.74	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Temp.**	19.2	°C				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Time**	8.0	Hrs				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Effluent pH**	6.62	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Final Effluent Weight**	1400	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	Filter Type	Nitrocellulose					W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Filter Pore Size**	0.45	µm				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extract pH**	6.78	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extract Weight**	1350	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	Dry Res. Moist. Weight	0.00	g				W345164	ESB	11/12/13 09:45	

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Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Project Name: TTF Filter Cake 2013
Work Order: **W3K0038**
Reported: 19-Nov-13 11:52

Client Sample ID: **CAK-TTF SED. TAILS-20131030**
SVL Sample ID: **W3K0038-01 (Solid)**

Sampled: 30-Oct-13 13:00
Received: 04-Nov-13
Sampled By: RB

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 11/07/13 14:45										
EPA 200.7	Aluminum	< 0.080	mg/L Extract	0.080	0.031		W346110	AS	11/14/13 17:11	
EPA 200.7	Antimony	< 0.020	mg/L Extract	0.020	0.009		W346110	AS	11/14/13 17:11	
EPA 200.7	Boron	< 0.20	mg/L Extract	0.20	0.01		W346110	AS	11/14/13 17:11	
EPA 200.7	**Calcium**	365	mg/L Extract	1.00	0.02		W346110	AS	11/14/13 17:11	M3
EPA 200.7	Iron	< 0.060	mg/L Extract	0.060	0.023		W346110	AS	11/14/13 17:11	
EPA 200.7	**Magnesium**	13.5	mg/L Extract	0.30	0.04		W346110	AS	11/14/13 17:11	
EPA 200.7	**Manganese**	0.461	mg/L Extract	0.0040	0.0010		W346110	AS	11/14/13 17:11	
EPA 200.7	Nickel	< 0.010	mg/L Extract	0.010	0.003		W346110	AS	11/14/13 17:11	
EPA 200.7	**Potassium**	15.3	mg/L Extract	0.50	0.13		W346110	AS	11/14/13 17:11	
EPA 200.7	**Sodium**	9.95	mg/L Extract	5.00	0.08		W346110	AS	11/14/13 17:11	
EPA 200.7	Zinc	< 0.06	mg/L Extract	0.06	0.002		W346110	AS	11/14/13 17:11	
EPA 200.8	Arsenic	< 0.0030	mg/L Extract	0.0030	0.0003		W346115	KWH	11/19/13 06:50	
EPA 200.8	**Barium**	0.0606	mg/L Extract	0.00100	0.000100		W346115	KWH	11/19/13 06:50	
EPA 200.8	Beryllium	< 0.000200	mg/L Extract	0.000200	0.000074		W346115	KWH	11/19/13 06:50	
EPA 200.8	Cadmium	< 0.00020	mg/L Extract	0.00020	0.00003		W346115	KWH	11/19/13 06:50	
EPA 200.8	Chromium	< 0.00150	mg/L Extract	0.00150	0.00018		W346115	KWH	11/19/13 06:50	
EPA 200.8	Copper	< 0.00100	mg/L Extract	0.00100	0.000061		W346115	KWH	11/19/13 06:50	
EPA 200.8	Lead	< 0.00300	mg/L Extract	0.00300	0.000048		W346115	KWH	11/19/13 06:50	
EPA 200.8	Selenium	< 0.00300	mg/L Extract	0.00300	0.00026		W346115	KWH	11/19/13 06:50	
EPA 200.8	Thallium	< 0.00100	mg/L Extract	0.00100	0.00001		W346115	KWH	11/19/13 06:50	
EPA 231.2	Gold	< 0.0100	mg/L Extract	0.0100	0.0004		W346121	KWH	11/18/13 08:57	
EPA 245.1	Mercury	< 0.00020	mg/L Extract	0.00020	0.000045		W346215	STA	11/15/13 14:33	
Meteoric Water Mobility Leachates (Classical) Extracted: 11/07/13 14:45										
SM 2320B/2310B	**Total Alkalinity**	54.1	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:04	
SM 2320B/2310B	**Bicarbonate**	54.1	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:04	
SM 2320B/2310B	Carbonate	< 10.0	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:04	
SM 2540C	**Total Diss. Solids**	1580	mg/L Extract	20			W346147	RS	11/14/13 12:20	
SM 4500 H B	**pH @21.0°C**	7.68	pH Units				W346130	DKS	11/13/13 08:04	
SM 4500-CN-I	Cyanide (WAD)	< 0.0100	mg/L Extract	0.0100	0.0017		W346247	VRH	11/14/13 11:23	
Meteoric Water Mobility Leachates (Anions) Extracted: 11/07/13 14:45										
EPA 300.0	Chloride	< 5.0	mg/L Extract	5.0	0.2	5	W346206	AEW	11/14/13 00:42	D1,M2
EPA 300.0	Fluoride	< 0.5	mg/L Extract	0.5	0.1	5	W346206	AEW	11/14/13 00:42	D1,M2
EPA 300.0	Nitrate as N	< 1.25	mg/L Extract	1.25	0.03	5	W346206	AEW	11/14/13 00:42	D1,H3,M1
EPA 300.0	Nitrate/Nitrite as N	< 1.25	mg/L Extract	1.25	0.07	5	W346206	AEW	11/14/13 00:42	D1,H3,M1
EPA 300.0	Nitrite as N	< 0.250	mg/L Extract	0.250	0.036	5	W346206	AEW	11/14/13 00:42	D1,H3,M1
EPA 300.0	**Sulfate as SO4**	1080	mg/L Extract	15.0	1.05	50	W346206	AEW	11/14/13 00:53	D2,M3

Cation/Anion Balance and TDS Ratios

Cation Sum: 20.2 meq/L   Anion Sum: 23.6 meq/L   C/A Balance: -7.80 %   Calculated TDS: 1516   TDS/cTDS: 1.04

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

SVL holds the following certifications:
AZ:0538, **CA**:2080, **FL**(**NELAC**):E87993, **ID**:ID00019 & ID00965 (Microbiology), **NV**:ID000192007A, **WA**:C573

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Coeur Alaska	**Project Name: TTF Filter Cake 2013**
3031 Clinton Drive, Suite 202	Work Order: **W3K0038**
Juneau, AK 99801	Reported: 19-Nov-13 11:52

Client Sample ID: **CAK-MILL TAILS SLURRY-20131030**
SVL Sample ID: **W3K0038-02 (Solid)**

Sampled: 30-Oct-13 11:00
Received: 04-Nov-13
Sampled By: RB

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms										
Modified Sobek	**ABA**	80.2	TCaCO3/kT	0.3			N/A		11/12/13 14:10	
Modified Sobek	**AGP**	5.5	TCaCO3/kT	0.3			N/A		11/12/13 13:28	
Modified Sobek	**ANP**	85.7	TCaCO3/kT	0.3	0.1		W346067	AGF	11/12/13 14:10	A2
Modified Sobek	Non-extractable Sulfur	< 0.01	%	0.01	0.006		W346067	MCE	11/12/13 13:28	
Modified Sobek	**Non-Sulfate Sulfur**	0.18	%	0.01	0.006		W346067	MCE	11/12/13 12:09	
Modified Sobek	**Pyritic Sulfur**	0.18	%	0.01			N/A		11/12/13 13:28	
Modified Sobek	**Sulfate Sulfur**	0.11	%	0.01			N/A		11/12/13 12:09	
Modified Sobek	**Total Sulfur**	0.29	%	0.01	0.006		W346067	MCE	11/11/13 15:18	
Classical Chemistry Parameters										
LECO	**Total Inorganic Carbon**	0.95	%	0.10	0.007		W346105	MCE	11/13/13 14:28	
USDA HB60(21a)	**Paste pH @20.5°C**	8.03	pH Units				W346132	AGF	11/13/13 08:15	
Meteoric Water Mobility Extraction Parameters										
ASTM E2242-12	Extraction Type	Rotation					W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Dry Feed Moist. Weight**	159	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Wet Feed Moist. Weight**	200	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moist. Dry Temp.**	105	°C				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moist. Dry Time**	19.0	Hrs				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Feed Moisture**	20.6	%				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	5cm Retained Weight	0.00	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**5cm Passing Weight**	2400	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	5cm Retained Percent	0.00	%				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Sample Weight**	2200	g				W345164	ESB	11/12/13 09:45	N1,T6
ASTM E2242-12	**Dry Sample Weight**	1750	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Water Volume Used**	1750	mL				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Fluid pH**	5.74	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Temp.**	19.2	°C				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extraction Time**	8.0	Hrs				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Effluent pH**	7.10	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Final Effluent Weight**	1380	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	Filter Type	Nitrocellulose					W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Filter Pore Size**	0.45	µm				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extract pH**	7.28	pH Units				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	**Extract Weight**	1380	g				W345164	ESB	11/12/13 09:45	
ASTM E2242-12	Dry Res. Moist. Weight	0.00	g				W345164	ESB	11/12/13 09:45	

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Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Project Name: TTF Filter Cake 2013
Work Order: **W3K0038**
Reported: 19-Nov-13 11:52

Client Sample ID: **CAK-MILL TAILS SLURRY-20131030**
SVL Sample ID: **W3K0038-02 (Solid)**

Sampled: 30-Oct-13 11:00
Received: 04-Nov-13
Sampled By: RB

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 11/07/13 14:45										
EPA 200.7	Aluminum	< 0.080	mg/L Extract	0.080	0.031		W346110	AS	11/14/13 17:36	
EPA 200.7	Antimony	< 0.020	mg/L Extract	0.020	0.009		W346110	AS	11/14/13 17:36	
EPA 200.7	Boron	< 0.20	mg/L Extract	0.20	0.01		W346110	AS	11/14/13 17:36	
EPA 200.7	**Calcium**	79.9	mg/L Extract	1.00	0.02		W346110	AS	11/14/13 17:36	
EPA 200.7	Iron	< 0.060	mg/L Extract	0.060	0.023		W346110	AS	11/14/13 17:36	
EPA 200.7	**Magnesium**	14.1	mg/L Extract	0.30	0.04		W346110	AS	11/14/13 17:36	
EPA 200.7	**Manganese**	0.0531	mg/L Extract	0.0040	0.0010		W346110	AS	11/14/13 17:36	
EPA 200.7	Nickel	< 0.010	mg/L Extract	0.010	0.003		W346110	AS	11/14/13 17:36	
EPA 200.7	**Potassium**	34.9	mg/L Extract	0.50	0.13		W346110	AS	11/14/13 17:36	
EPA 200.7	**Sodium**	28.2	mg/L Extract	5.00	0.08		W346110	AS	11/14/13 17:36	
EPA 200.7	Zinc	< 0.06	mg/L Extract	0.06	0.002		W346110	AS	11/14/13 17:36	
EPA 200.8	Arsenic	< 0.0030	mg/L Extract	0.0030	0.0003		W346115	KWH	11/19/13 06:56	
EPA 200.8	**Barium**	0.0821	mg/L Extract	0.00100	0.000100		W346115	KWH	11/19/13 06:56	
EPA 200.8	Beryllium	< 0.000200	mg/L Extract	0.000200	0.000074		W346115	KWH	11/19/13 06:56	
EPA 200.8	Cadmium	< 0.00020	mg/L Extract	0.00020	0.00003		W346115	KWH	11/19/13 06:56	
EPA 200.8	Chromium	< 0.00150	mg/L Extract	0.00150	0.00018		W346115	KWH	11/19/13 06:56	
EPA 200.8	Copper	< 0.00100	mg/L Extract	0.00100	0.000061		W346115	KWH	11/19/13 06:56	
EPA 200.8	Lead	< 0.00300	mg/L Extract	0.00300	0.000048		W346115	KWH	11/19/13 06:56	
EPA 200.8	Selenium	< 0.00300	mg/L Extract	0.00300	0.00026		W346115	KWH	11/19/13 06:56	
EPA 200.8	Thallium	< 0.00100	mg/L Extract	0.00100	0.00001		W346115	KWH	11/19/13 06:56	
EPA 231.2	Gold	< 0.0100	mg/L Extract	0.0100	0.0004		W346121	KWH	11/18/13 08:57	D10
EPA 245.1	Mercury	< 0.00020	mg/L Extract	0.00020	0.000045		W346215	STA	11/15/13 14:34	
Meteoric Water Mobility Leachates (Classical) Extracted: 11/07/13 14:45										
SM 2320B/2310B	**Total Alkalinity**	61.6	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:09	
SM 2320B/2310B	**Bicarbonate**	61.6	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:09	
SM 2320B/2310B	Carbonate	< 10.0	mg/L Ext. as CaCO	10.0			W346130	DKS	11/13/13 08:09	
SM 2540C	**Total Diss. Solids**	546	mg/L Extract	20			W346147	RS	11/14/13 12:20	
SM 4500 H B	**pH @21.0°C**	7.82	pH Units				W346130	DKS	11/13/13 08:09	
SM 4500-CN-I	Cyanide (WAD)	< 0.0100	mg/L Extract	0.0100	0.0017		W346247	VRH	11/14/13 11:25	
Meteoric Water Mobility Leachates (Anions) Extracted: 11/07/13 14:45										
EPA 300.0	**Chloride**	3.4	mg/L Extract	1.0	0.04		W346206	AEW	11/13/13 23:26	
EPA 300.0	Fluoride	< 0.5	mg/L Extract	0.5	0.02		W346206	AEW	11/13/13 23:26	
EPA 300.0	**Nitrate as N**	0.58	mg/L Extract	0.25	0.006		W346206	AEW	11/13/13 23:26	H3
EPA 300.0	**Nitrate/Nitrite as N**	4.26	mg/L Extract	0.25	0.01		W346206	AEW	11/13/13 23:26	H3
EPA 300.0	**Nitrite as N**	3.68	mg/L Extract	0.250	0.007		W346206	AEW	11/13/13 23:26	H3
EPA 300.0	**Sulfate as SO4**	341	mg/L Extract	3.00	0.21	10	W346206	AEW	11/13/13 23:37	D2

Cation/Anion Balance and TDS Ratios

Cation Sum: 7.27 meq/L Anion Sum: 8.73 meq/L C/A Balance: -9.11 % Calculated TDS: 557 TDS/cTDS: 0.98

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

Coeur Alaska
3031 Clinton Drive, Suite 202
Juneau, AK 99801

Project Name: TTF Filter Cake 2013
Work Order: **W3K0038**
Reported: 19-Nov-13 11:52

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms								
Modified Sobek	ANP	TCaCO3/kT	<0.3	0.1	0.3	W346067	12-Nov-13	
Modified Sobek	Non-extractable Sulfur	%	<0.01	0.006	0.01	W346067	12-Nov-13	
Modified Sobek	Non-Sulfate Sulfur	%	<0.01	0.006	0.01	W346067	12-Nov-13	
Modified Sobek	Non-Sulfate Sulfur	%	<0.01	0.006	0.01	W346067	12-Nov-13	
Modified Sobek	Total Sulfur	%	<0.01	0.006	0.01	W346067	11-Nov-13	
Classical Chemistry Parameters								
LECO	Total Inorganic Carbon	%	<0.10	0.007	0.10	W346105	13-Nov-13	

Quality Control - EXTRACTION BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series) Extracted: 11/07/13 14:45 Batch: W345164								
EPA 200.7	Aluminum	mg/L Extract	<0.080	0.031	0.080	W346110	14-Nov-13	
EPA 200.7	Antimony	mg/L Extract	<0.020	0.009	0.020	W346110	14-Nov-13	
EPA 200.7	Boron	mg/L Extract	<0.20	0.01	0.20	W346110	14-Nov-13	
EPA 200.7	Calcium	mg/L Extract	<1.00	0.02	1.00	W346110	14-Nov-13	
EPA 200.7	Iron	mg/L Extract	<0.060	0.023	0.060	W346110	14-Nov-13	
EPA 200.7	Magnesium	mg/L Extract	<0.30	0.04	0.30	W346110	14-Nov-13	
EPA 200.7	Manganese	mg/L Extract	<0.0040	0.0010	0.0040	W346110	14-Nov-13	
EPA 200.7	Nickel	mg/L Extract	<0.010	0.003	0.010	W346110	14-Nov-13	
EPA 200.7	Potassium	mg/L Extract	<0.50	0.13	0.50	W346110	14-Nov-13	
EPA 200.7	Sodium	mg/L Extract	<5.00	0.08	5.00	W346110	14-Nov-13	
EPA 200.7	Zinc	mg/L Extract	<0.06	0.002	0.06	W346110	14-Nov-13	
EPA 200.8	Arsenic	mg/L Extract	<0.0030	0.0003	0.0030	W346115	19-Nov-13	
EPA 200.8	Barium	mg/L Extract	<0.00100	0.000100	0.00100	W346115	19-Nov-13	
EPA 200.8	Beryllium	mg/L Extract	<0.000200	0.000074	0.000200	W346115	19-Nov-13	
EPA 200.8	Cadmium	mg/L Extract	<0.00020	0.00003	0.00020	W346115	19-Nov-13	
EPA 200.8	Chromium	mg/L Extract	<0.00150	0.00018	0.00150	W346115	19-Nov-13	
EPA 200.8	Copper	mg/L Extract	<0.00100	0.000061	0.00100	W346115	19-Nov-13	
EPA 200.8	Lead	mg/L Extract	<0.00300	0.000048	0.00300	W346115	19-Nov-13	
EPA 200.8	Selenium	mg/L Extract	<0.00300	0.00026	0.00300	W346115	19-Nov-13	
EPA 200.8	Thallium	mg/L Extract	<0.00100	0.00001	0.00100	W346115	19-Nov-13	
EPA 231.2	Gold	mg/L Extract	<0.0100	0.0004	0.0100	W346121	18-Nov-13	D10
EPA 245.1	Mercury	mg/L Extract	<0.00020	0.000045	0.00020	W346215	15-Nov-13	
Meteoric Water Mobility Leachates (Classical) Extracted: 11/07/13 14:45 Batch: W345164								
SM 2320B/2310B	Total Alkalinity	mg/L Ext. as CaCO	<10.0		10.0	W346130	13-Nov-13	
SM 2320B/2310B	Bicarbonate	mg/L Ext. as CaCO	<10.0		10.0	W346130	13-Nov-13	
SM 2320B/2310B	Carbonate	mg/L Ext. as CaCO	<10.0		10.0	W346130	13-Nov-13	
SM 2540C	Total Diss. Solids	mg/L Extract	<20		20	W346147	14-Nov-13	
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	<0.0100	0.0017	0.0100	W346247	14-Nov-13	

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Quality Control - EXTRACTION BLANK Data (Continued)

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions) Extracted: 11/07/13 14:45 Batch: W345164								
EPA 300.0	Chloride	mg/L Extract	<1.0	0.04	1.0	W346206	14-Nov-13	
EPA 300.0	Fluoride	mg/L Extract	<0.5	0.02	0.5	W346206	14-Nov-13	
EPA 300.0	Nitrate as N	mg/L Extract	<0.25	0.006	0.25	W346206	14-Nov-13	
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	<0.25	0.01	0.25	W346206	14-Nov-13	
EPA 300.0	Nitrite as N	mg/L Extract	<0.250	0.007	0.250	W346206	14-Nov-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	<1.50	0.02	1.50	W346206	14-Nov-13	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	0.0	216		80 - 120	W346067	12-Nov-13	
Modified Sobek	Total Sulfur	%	1.82	2.00	91.0	80 - 120	W346067	11-Nov-13	
Classical Chemistry Parameters									
LECO	Total Inorganic Carbon	%	0.94	1.00	94.4	80 - 120	W346105	13-Nov-13	
USDA HB60(21a)	Paste pH	pH Units	7.16	7.40	96.8	93.7 - 106.3	W346132	13-Nov-13	
Meteoric Water Mobility Leachates (Metals by 200 Series)									
EPA 200.7	Aluminum	mg/L Extract	0.974	1.00	97.4	85 - 115	W346110	14-Nov-13	
EPA 200.7	Antimony	mg/L Extract	0.985	1.00	98.5	85 - 115	W346110	14-Nov-13	
EPA 200.7	Boron	mg/L Extract	1.00	1.00	99.9	85 - 115	W346110	14-Nov-13	
EPA 200.7	Calcium	mg/L Extract	18.9	20.0	94.4	85 - 115	W346110	14-Nov-13	
EPA 200.7	Iron	mg/L Extract	9.44	10.0	94.4	85 - 115	W346110	14-Nov-13	
EPA 200.7	Magnesium	mg/L Extract	18.7	20.0	93.5	85 - 115	W346110	14-Nov-13	
EPA 200.7	Manganese	mg/L Extract	0.981	1.00	98.1	85 - 115	W346110	14-Nov-13	
EPA 200.7	Nickel	mg/L Extract	0.948	1.00	94.8	85 - 115	W346110	14-Nov-13	
EPA 200.7	Potassium	mg/L Extract	19.8	20.0	99.0	85 - 115	W346110	14-Nov-13	
EPA 200.7	Sodium	mg/L Extract	18.4	19.0	96.6	85 - 115	W346110	14-Nov-13	
EPA 200.7	Zinc	mg/L Extract	1.02	1.00	102	85 - 115	W346110	14-Nov-13	
EPA 200.8	Arsenic	mg/L Extract	0.0255	0.0250	102	85 - 115	W346115	19-Nov-13	
EPA 200.8	Barium	mg/L Extract	0.0257	0.0250	103	85 - 115	W346115	19-Nov-13	
EPA 200.8	Beryllium	mg/L Extract	0.0257	0.0250	103	85 - 115	W346115	19-Nov-13	
EPA 200.8	Cadmium	mg/L Extract	0.0253	0.0250	101	85 - 115	W346115	19-Nov-13	
EPA 200.8	Chromium	mg/L Extract	0.0255	0.0250	102	85 - 115	W346115	19-Nov-13	
EPA 200.8	Copper	mg/L Extract	0.0251	0.0250	101	85 - 115	W346115	19-Nov-13	
EPA 200.8	Lead	mg/L Extract	0.0246	0.0250	98.2	85 - 115	W346115	19-Nov-13	
EPA 200.8	Selenium	mg/L Extract	0.0254	0.0250	102	85 - 115	W346115	19-Nov-13	
EPA 200.8	Thallium	mg/L Extract	0.0246	0.0250	98.4	85 - 115	W346115	19-Nov-13	
EPA 231.2	Gold	mg/L Extract	0.0447	0.0500	89.5	85 - 115	W346121	18-Nov-13	D10
EPA 245.1	Mercury	mg/L Extract	0.00492	0.00500	98.4	85 - 115	W346215	15-Nov-13	
Meteoric Water Mobility Leachates (Classical)									
SM 2320B/2310B	Total Alkalinity	mg/L Ext. as CaCO	101	97.2	103	85 - 115	W346130	13-Nov-13	
SM 2320B/2310B	Bicarbonate	mg/L Ext. as CaCO	101	97.2	103	85 - 115	W346130	13-Nov-13	
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.137	0.150	91.3	80 - 120	W346247	14-Nov-13	

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Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions)									
EPA 300.0	Chloride	mg/L Extract	6.0	6.00	99.5	90 - 110	W346206	14-Nov-13	
EPA 300.0	Fluoride	mg/L Extract	4.0	4.00	99.8	90 - 110	W346206	14-Nov-13	
EPA 300.0	Nitrate as N	mg/L Extract	4.26	4.00	106	90 - 110	W346206	14-Nov-13	
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	9.23	9.00	103	0 - 200	W346206	14-Nov-13	
EPA 300.0	Nitrite as N	mg/L Extract	4.98	5.00	99.6	90 - 110	W346206	14-Nov-13	
EPA 300.0	Sulfate as SO4	mg/L Extract	21.3	20.0	106	90 - 110	W346206	14-Nov-13	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Acid/Base Accounting & Sulfur Forms									
Modified Sobek	ANP	TCaCO3/kT	71.5	72.5	1.4	20	W346067	12-Nov-13	
Modified Sobek	Non-extractable Sulfur	%	0.03	0.03	1.2	20	W346067	12-Nov-13	
Modified Sobek	Non-Sulfate Sulfur	%	2.68	2.88	7.2	20	W346067	12-Nov-13	D2
Modified Sobek	Non-Sulfate Sulfur	%	3.06	3.34	8.8	20	W346067	12-Nov-13	D2
Modified Sobek	Total Sulfur	%	3.70	3.74	1.1	20	W346067	11-Nov-13	D2
Classical Chemistry Parameters									
LECO	Total Inorganic Carbon	%	1.67	1.68	0.6	20	W346105	13-Nov-13	
USDA HB60(21a)	Paste pH	pH Units	7.55	7.50	0.7	20	W346132	13-Nov-13	
Meteoric Water Mobility Leachates (Classical)									
SM 2320B/2310B	Total Alkalinity	mg/L Ext. as CaCO	53.7	54.1	0.8	20	W346130	13-Nov-13	
SM 2320B/2310B	Bicarbonate	mg/L Ext. as CaCO	53.7	54.1	0.8	20	W346130	13-Nov-13	
SM 2320B/2310B	Carbonate	mg/L Ext. as CaCO	<10.0	<10.0	UDL	20	W346130	13-Nov-13	
SM 2540C	Total Diss. Solids	mg/L Extract	1190	1190	0.3	10	W346147	14-Nov-13	
SM 2540C	Total Diss. Solids	mg/L Extract	943	934	1.0	10	W346147	14-Nov-13	
SM 4500 H B	pH	pH Units	7.65	7.68	0.4	20	W346130	13-Nov-13	

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series)										
EPA 200.7	Aluminum	mg/L Extract	0.888	<0.080	1.00	85.0	70 - 130	W346110	14-Nov-13	
EPA 200.7	Antimony	mg/L Extract	0.826	<0.020	1.00	82.6	70 - 130	W346110	14-Nov-13	
EPA 200.7	Boron	mg/L Extract	0.91	<0.20	1.00	86.1	70 - 130	W346110	14-Nov-13	
EPA 200.7	Calcium	mg/L Extract	374	365	20.0	R > 4S	70 - 130	W346110	14-Nov-13	M3
EPA 200.7	Iron	mg/L Extract	8.29	<0.060	10.0	82.9	70 - 130	W346110	14-Nov-13	
EPA 200.7	Magnesium	mg/L Extract	29.6	13.5	20.0	80.4	70 - 130	W346110	14-Nov-13	
EPA 200.7	Manganese	mg/L Extract	1.30	0.461	1.00	83.9	70 - 130	W346110	14-Nov-13	
EPA 200.7	Nickel	mg/L Extract	0.777	<0.010	1.00	77.7	70 - 130	W346110	14-Nov-13	
EPA 200.7	Potassium	mg/L Extract	32.8	15.3	20.0	87.8	70 - 130	W346110	14-Nov-13	
EPA 200.7	Sodium	mg/L Extract	26.4	9.95	19.0	86.5	70 - 130	W346110	14-Nov-13	
EPA 200.7	Zinc	mg/L Extract	0.80	<0.06	1.00	79.6	70 - 130	W346110	14-Nov-13	
EPA 200.8	Arsenic	mg/L Extract	0.0302	<0.0030	0.0250	121	70 - 130	W346115	19-Nov-13	

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Quality Control - MATRIX SPIKE Data (Continued)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series) (Continued)										
EPA 200.8	Barium	mg/L Extract	0.0901	0.0606	0.0250	118	70 - 130	W346115	19-Nov-13	
EPA 200.8	Beryllium	mg/L Extract	0.0219	<0.000200	0.0250	87.6	70 - 130	W346115	19-Nov-13	
EPA 200.8	Cadmium	mg/L Extract	0.0256	<0.00020	0.0250	102	70 - 130	W346115	19-Nov-13	
EPA 200.8	Chromium	mg/L Extract	0.0261	<0.00150	0.0250	103	70 - 130	W346115	19-Nov-13	
EPA 200.8	Copper	mg/L Extract	0.0238	<0.00100	0.0250	93.6	70 - 130	W346115	19-Nov-13	
EPA 200.8	Lead	mg/L Extract	0.0238	<0.00300	0.0250	95.4	70 - 130	W346115	19-Nov-13	
EPA 200.8	Selenium	mg/L Extract	0.0329	<0.00300	0.0250	129	70 - 130	W346115	19-Nov-13	
EPA 200.8	Thallium	mg/L Extract	0.0247	<0.00100	0.0250	98.9	70 - 130	W346115	19-Nov-13	
EPA 231.2	Gold	mg/L Extract	0.0544	<0.0100	0.0500	109	70 - 130	W346121	18-Nov-13	
EPA 245.1	Mercury	mg/L Extract	0.00118	<0.00020	0.00100	104	70 - 130	W346215	15-Nov-13	
EPA 245.1	Mercury	mg/L Extract	0.00102	<0.00020	0.00100	102	70 - 130	W346215	15-Nov-13	
Meteoric Water Mobility Leachates (Classical)										
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.213	0.140	0.100	73.0	75 - 125	W346247	14-Nov-13	D2,M2
Meteoric Water Mobility Leachates (Anions)										
EPA 300.0	Chloride	mg/L Extract	5.5	<5.0	3.00	53.6	90 - 110	W346206	14-Nov-13	D1,M2
EPA 300.0	Fluoride	mg/L Extract	1.9	<0.5	2.00	83.4	90 - 110	W346206	14-Nov-13	D1,M2
EPA 300.0	Nitrate as N	mg/L Extract	2.48	<1.25	2.00	113	90 - 110	W346206	14-Nov-13	D1,M1
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	5.19	<1.25	4.00	121	90 - 110	W346206	14-Nov-13	D1,M1
EPA 300.0	Nitrite as N	mg/L Extract	2.71	<0.250	2.00	129	90 - 110	W346206	14-Nov-13	D1,M1
EPA 300.0	Sulfate as SO4	mg/L Extract	1040	1080	10.0	R > 4S	90 - 110	W346206	14-Nov-13	D2,M3

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Metals by 200 Series)										
EPA 200.7	Aluminum	mg/L Extract	0.905	0.888	1.00	1.9	20	W346110	14-Nov-13	
EPA 200.7	Antimony	mg/L Extract	0.835	0.826	1.00	1.1	20	W346110	14-Nov-13	
EPA 200.7	Boron	mg/L Extract	0.92	0.91	1.00	1.7	20	W346110	14-Nov-13	
EPA 200.7	Calcium	mg/L Extract	389	374	20.0	3.9	20	W346110	14-Nov-13	M3
EPA 200.7	Iron	mg/L Extract	8.36	8.29	10.0	0.8	20	W346110	14-Nov-13	
EPA 200.7	Magnesium	mg/L Extract	30.1	29.6	20.0	1.6	20	W346110	14-Nov-13	
EPA 200.7	Manganese	mg/L Extract	1.31	1.30	1.00	0.7	20	W346110	14-Nov-13	
EPA 200.7	Nickel	mg/L Extract	0.782	0.777	1.00	0.6	20	W346110	14-Nov-13	
EPA 200.7	Potassium	mg/L Extract	33.1	32.8	20.0	0.9	20	W346110	14-Nov-13	
EPA 200.7	Sodium	mg/L Extract	26.6	26.4	19.0	0.6	20	W346110	14-Nov-13	
EPA 200.7	Zinc	mg/L Extract	0.81	0.80	1.00	1.9	20	W346110	14-Nov-13	
EPA 200.8	Arsenic	mg/L Extract	0.0295	0.0302	0.0250	2.5	20	W346115	19-Nov-13	
EPA 200.8	Barium	mg/L Extract	0.0903	0.0901	0.0250	0.2	20	W346115	19-Nov-13	
EPA 200.8	Beryllium	mg/L Extract	0.0237	0.0219	0.0250	7.8	20	W346115	19-Nov-13	
EPA 200.8	Cadmium	mg/L Extract	0.0253	0.0256	0.0250	0.9	20	W346115	19-Nov-13	
EPA 200.8	Chromium	mg/L Extract	0.0259	0.0261	0.0250	0.9	20	W346115	19-Nov-13	
EPA 200.8	Copper	mg/L Extract	0.0236	0.0238	0.0250	0.7	20	W346115	19-Nov-13	
EPA 200.8	Lead	mg/L Extract	0.0243	0.0238	0.0250	1.7	20	W346115	19-Nov-13	
EPA 200.8	Selenium	mg/L Extract	0.0326	0.0329	0.0250	0.9	20	W346115	19-Nov-13	
EPA 200.8	Thallium	mg/L Extract	0.0252	0.0247	0.0250	1.9	20	W346115	19-Nov-13	
EPA 231.2	Gold	mg/L Extract	0.0535	0.0544	0.0500	1.7	20	W346121	18-Nov-13	
EPA 245.1	Mercury	mg/L Extract	0.00116	0.00118	0.00100	1.7	20	W346215	15-Nov-13	
Meteoric Water Mobility Leachates (Classical)										
SM 4500-CN-I	Cyanide (WAD)	mg/L Extract	0.235	0.213	0.100	9.8	20	W346247	14-Nov-13	D2

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Quality Control - MATRIX SPIKE DUPLICATE Data (Continued)

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Meteoric Water Mobility Leachates (Anions)										
EPA 300.0	Chloride	mg/L Extract	5.5	5.5	3.00	0.0	20	W346206	14-Nov-13	D1,M2
EPA 300.0	Fluoride	mg/L Extract	1.9	1.9	2.00	1.8	20	W346206	14-Nov-13	D1,M2
EPA 300.0	Nitrate as N	mg/L Extract	2.03	2.48	2.00	19.7	20	W346206	14-Nov-13	D1
EPA 300.0	Nitrate/Nitrite as N	mg/L Extract	4.44	5.19	4.00	15.5	20	W346206	14-Nov-13	D1
EPA 300.0	Nitrite as N	mg/L Extract	2.41	2.71	2.00	11.8	20	W346206	14-Nov-13	D1,M1
EPA 300.0	Sulfate as SO4	mg/L Extract	1040	1040	10.0	0.1	20	W346206	14-Nov-13	D2,M3

Notes and Definitions

A2	2 g of sample used in ANP analysis
D1	Sample required dilution due to matrix.
D10	Method of Standard Additions (MSA) was performed on prep batch QC and may not meet accreditation standards.
D2	Sample required dilution due to high concentration of target analyte.
H3	Sample was received and/or analysis requested past holding time.
M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M2	Matrix spike recovery was low, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
N1	See case narrative.
T6	The reported results cannot be used for compliance purposes.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

APPENDIX C:
ADF&G DIVISION OF HABITAT DIVE PLAN

Kensington Gold Mine: Habitability Study Dive Plan

January 2013

Division of Habitat

Alaska Department of Fish and Game

By:

Gordon Willson-Naranjo

and

Greg Albrecht

January 1, 2013

Gordon Willson-Naranjo

Alaska Department of Fish and Game

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Introduction

This is the dive plan for the tailings habitability study at the Kensington Gold Mine (KGM), located 45 air miles north of Juneau, submitted to comply with the Alaska Department of Fish and Game (ADF&G) Dive Safety Manual (Hebert 2012).

Habitability Study

The tailings habitability study is part of the Tailings Treatment Facility (TTF) Ecological Monitoring Plan (EMP) required by the U.S. Forest Service in Coeur Alaska's Plan of Operations, and ADF&G Fish Habitat Permit FH05-I-0050B. The TTF (Figure 1), formerly Lower Slate Lake, was engineered to be a sub-aqueous disposal facility for mine tailings. The goal of the study is to evaluate the habitability of multiple substrate types that will be encountered in the TTF after cessation of mining. We will be deploying sample trays in the neighboring Upper Slate Lake (USL) (Figures 1 through 5), and quantifying benthic macro-invertebrate abundance over a period of 24 months.

Location **(Chapter I, Section 2.21.4)**

The KGM is a remote mine site at the base of Lions Head Mountain in Berners Bay. The mine site is primarily accessed by boat from Yankee Cove, about 27 miles north of Juneau. It can also be accessed via helicopter (landing pad on site, figure 1), or float plane (landing in Slate Cove, figure 1) **(Chapter I, Section 2.21.2.4)**. We will access the southern end of USL (Lat. 58.816^{o}, Long. -135.040^{o}) using a 300 foot trail behind the TTF water treatment plant (figure 4) on site. There is an alternate trail from the north end, but is impractical due to the length and terrain. USL is located at approximately 700 feet above sea level. The lake is relatively shallow, with a maximum depth of 42 feet. There is an inlet creek on the north end and outlet creek on the south. Bottom slopes range from approximately 45 degrees by the inlet to nearly flat in the embayment near the outflow. Total calculated lake volume is 215 acre feet (Kline 2005). On the north end, there is a steep shelf at the edge of the alluvial fan created by the inlet creek.

USL is a sheltered water body, and wind conditions are not expected to create any wave action on the lake. The lake bottom substrate is dominated by a thick layer of organics encompassing the littoral, sub-littoral and profundal zones, which can easily be disturbed, creating increased turbidity. Poor visibility (three to six feet) is expected during dive operations due to the combination of substrate, and the presence of heavy tannins in the water. Secchi disc values taken on September 12 and 13 of 2012, were about 5 feet.

Upper Slate Lake Dive Operations **(Chapter I, Section 2.21.7)**

The TTF EMP requires the use of Self Contained Underwater Breathing Apparatus (SCUBA) in USL in order to deploy 160 sample trays containing substrate at depths of 5-10 feet, and 25-30 feet (80 at each depth). Eight sample trays, which are sealed 3.5x3.5x3.5 inch plastic containers, will be attached to a four foot diameter PVC hoop to form a sample array. There will be 10 sample arrays placed at a depth of 5-10 feet, five in a transect on the north side and five in a transect on the south side, and 10 sample arrays placed from 25-30 feet, five in a transect on the north side and five in a transect on the south side.

During the week of June 10, 2013, sample arrays will be preassembled on the south shore of USL, and lowered from a boat to the desired depths. Divers, using compressed breathing air (no NITROX or mixed gas will be used for this project) will enter the water from shore once all five arrays have been placed. Divers will descend to the first array, properly seat the trays on the bottom and remove all sample container lids. They will remain submerged, and move to the next array, by following a thin brightly colored poly line that will connect all arrays in the transect. Four dives will be required (1 per transect) and we expect sample deployment to take 1-2 days.

SCUBA will also be used to recover the trays four times during the following 24 months (dates to be determined). During recovery, divers will descend on a transect, remove two trays from each array (navigating by the poly line) and surface upon completion. Four dives will be necessary for recovery and will follow the same procedures within this deployment plan.

Details of Proposed Dive **(Chapter I, section 2.21)**

Divers:
Habitat Division's dive program is relatively new. Therefore the lead diver **(Chapter I, Section 1.26)** for this project will be Greg Albrecht (Habitat, ADF&G Certified Diver), working under the supervision of the Commercial Fisheries Dive program (specifically Jeff Meucci). Greg will be accompanied by Gordon Willson-Naranjo (Habitat, ADF&G Diver in Training) or as an alternate, Nicole Legere (Habitat, ADF&G Diver in Training). Greg is an American Academy of Underwater Sciences (AAUS) certified scientific diver, with a PADI open water certification, and was recently checked off for ADF&G Diver Certification. Gordon and Nicole will complete their 20 proficiency dives in accordance with section 4 of the Dive Safety Manual prior to project initiation. **(Chapter I, Section 2.1)**.

(Chapter I, Section 2.21.1)

Name	ADFG diver status	Dive Certification	Dive Physical	O_2 First Aid (expires)	First Aid/CPR (expires)	Total Number of Dives
Greg Albrecht	ADF&G Diver	Open Water 2004 AAUS 2010 ADF&G Cert. Pending	9/2012	9/2014	FA 2/2013 CPR 9/2013	53
Gordon Willson-Naranjo	Diver in Training	Open water 2005 Advanced 2006 Rescue 2008 Dive Master 2008	9/2012	9/2014	FA 5/2013 CPR 5/2013	220
Nicole Legere	Diver in Training	Open Water 2009 Advanced 2009 Deep Dive cert. 2009	10/2012	9/2014	FA 4/2013 CPR 4/2013	38

Number of Dives and Depths **(Chapter I, Sections 2.21.3 to 2.21.8)**:
Eight dives are anticipated for deployment and recovery in 2013. All dives will follow the recommended decompression stops **(Chapter I, Section 3.28)**, though none are anticipated due to the maximum depth planned. A combination of dive tables and the Aeris Atmos 2 wrist computer will be used for dive planning. The first two dives will be conducted on the south end of the lake with little to no surface interval. There will be a one hour surface interval before the 3rd and 4th dives, the anticipated amount of time it will take to move the whole operation to the north side of the lake (Figure 5). The location of the shallow transect on the North Side has not yet been determined, but will be mapped prior to project initiation.

Dive Location	Number of Dives	Max Depth (ft)	*Bottom Time (min)
USL South End	1	30	< 40 min.
USL South End	1	10	< 40 min.
1 Hour Surface interval			
USL North End	1	30	< 40 min.
USL North End	1	10	< 40 min.

*Bottom time depends on the amount of manipulation needed to place transects at desired depths. It is not anticipated that bottom time for each dive will be greater than 40 min.

Mine Safety and Health Administration (MSHA)

The Mine Safety and Health Administration produces all safety guidelines for work on a mine site. MSHA regulations state that all personnel will wear appropriate Personal Protective Equipment (PPE) when working on or around water; this includes a personal floatation device (PFD). The divers will be wearing a Buoyance Control Device (BCD) **(Chapter I, Section 3.26)**. This will satisfy the MSHA regulation (Jeannie Wailes, Coeur Alaska Safety Department, personal correspondence, phone message 9/14/2012).

Safety Information

Coeur Alaska operates a medical facility and has trained medics on site, including Tim Cooper, a master scuba diver, who has been trained in dive-related injuries. Coeur will provide a medic and emergency response vehicle **(Chapter I, Section 3.41)** dedicated to our operation for the duration of diving. We will have a medical-grade oxygen cylinder and respirator, in a ready to use configuration, on site during the dives. The divers, one dive tender and the medic will be trained and certified to administer oxygen **(Chapter I, Section 3.41)**. We will have two life rings on site during the dives, one on shore and one on the boat. A tender will be designated to watch and assist divers at all times while divers are in the water. Site conditions (temperature, surface visibility, time etc.) will be evaluated prior to each dive **(Chapter I, Section 2.22.** If it is deemed unsafe to dive under the conditions, diving will cease until conditions become conducive to diving. Due to the presence of lines underwater and poor visibility, divers will remain within arm's reach of one another and each carry a dive knife and light. If buddy contact is lost for more than one minute, divers will surface. A copy of this plan, along with emergency contact and first aid information will be on site, and will be delivered to Coeur Alaska safety personnel prior to the commencement of diving.

Dive Equipment **(Chapter I, Section 3.2)**

Habitat Division's dive program is new and most of our gear was transferred over from the Commercial Fisheries Dive program (courtesy of Jeff Meucci). Additional dive gear used for this project; tanks and Regulators, will be rented from The Scuba Tank, in Juneau Alaska. The Scuba Tank is a reputable, full service dive shop affiliated with the nationally recognized organization PADI, and is located at 8319-C Airport Boulevard. All equipment will be visually inspected prior to use **(Chapter I, Section 2.22)**, and cylinders will be checked to ensure their inspections are current. Dive equipment such as alternate air and pressure gauges will be worn in a streamline and secur manner to prevent entanglement.

Emergency Plan **(Chapter I, Section 2.21)**

A diving accident victim could be any person who has been breathing compressed air underwater, regardless of depth. It is imperative that emergency procedures are pre-planned and that medical treatment is initiated as soon as possible. It is the responsibility of each department diver to understand the procedures for diving emergencies including evacuation and medical treatment, prior to diving.

Depending on and according to the nature of the diving, stabilize the patient, administer 100% oxygen, contact local emergency medical services, in this case Coeur Alaska medics, for transport to a medical facility. Explain the circumstances for the dive incident to the evacuation team, medics and/or physicians. Do not assume that they understand why 100% oxygen may be required for the diving accident victim, or that recompression treatment may be necessary.

Following is **the emergency plan, with contact information, for diving operations at the Kensington Gold Mine**:

1. Make appropriate contact with victim.
2. Establish ABCs (Airway, Breathing, Circulation)
3. Contact local emergency medical system for transport to Bartlett Regional Hospital. Options in order of preference are:
    1) Call 911. Let the dispatcher coordinate the transportation. If embolism or decompression sickness is suspected, tell the dispatcher it's a **scuba diving emergency and request hyperbaric chamber arrangements** (in this case there are hyperbaric chambers at Virginia Mason Hospital in Seattle and American Hyperbarics Center, 3350 E. Bogard Rd., Wasilla, 907-357-5400 or 907-244-9982, both of which would require a medevac jet from Juneau International Airport).
    2) Call Coastal Helicopters (907)-789-5600, and request immediate evacuation to Bartlett Regional Hospital. If embolism or decompression sickness is suspected call Bartlett Regional Hospital's 24 hour line at (907)-586-2611 ext. 210. Tell the operator it's a scuba diving emergency and evacuation to a hyperbaric chamber may be necessary.

4. Tow the victim through the water (by boat or swimming) to the south end beach for primary care.
5. Administer 100% oxygen if appropriate (in cases of decompression illness, or near drowning)
6. Notify the diver's emergency contact

Diver's Name	Emergency Contact	Phone Number	Relationship
Greg Albrecht	Annie Albrecht	(907) 957-6554	Wife
Gordon Willson-Naranjo	Tess Quinn	(907) 723-3078	Girlfriend
Nicole Legere	Cheryl Legere	(508) 344-5908	Mother

7. Notify Douglas ADFG Habitat office at (907)-465-4105 or Southeast Regional Supervisor Jackie Timothy at (907) 465-4275.
8. Notify ADF&G Dive Safety Officer (DSO) Kyle Hebert at (907) 465-4228.
9. Complete and submit an Incident Report Form (Attached to this dive plan) to the ADF&G Dive Safety Board and the AAUS.

Hazardous Conditions **(Chapter I, Section 2.21.8)**

Mine Activities: Kensington Gold Mine is an active mine site. There is heavy traffic on all haul roads and other mine-related dangers. All personnel will be provided appropriate personal protective equipment for transport to and from USL. This includes steel toe boots, hard hat, safety glasses and reflective vests. Everyone involved in the deployment and recovery will have their 40 hour MSHA certification.

Hypothermia: The water temperature of USL is relatively cold, and there will be anticipated down time for divers, the combination of which could lead to hypothermia. Each diver will be aware of this and operate only within their individual limits. Dive tenders will also be aware of the possibility of hypothermia and will look for altered speech or action patterns in divers.

Entanglement: There will be lines in the water, while divers are present, used to lower the arrays to depth and serve as navigational aid between arrays. Divers and tenders will carry dive knives while the divers are in the water, to prevent entanglement.

Poor visibility: Visibility is expected to be less than five feet; therefore divers will carry dive lights, remain within arm's reach of one another, and surface after one minute if buddy contact is lost.

Mechanical: A boat will be used for transect placement. It will be the only boat on the lake, and is man powered with no motor; therefore no mechanical hazards are expected.

Photos and Figures

9/24/12 ADFG Habitat

Figure 1 Location Map

Figure 2 Upper Slate Lake looking north

Figure 3 South transect

Figure 4 Upper Slate Lake with foot trail (red) to staging beach area

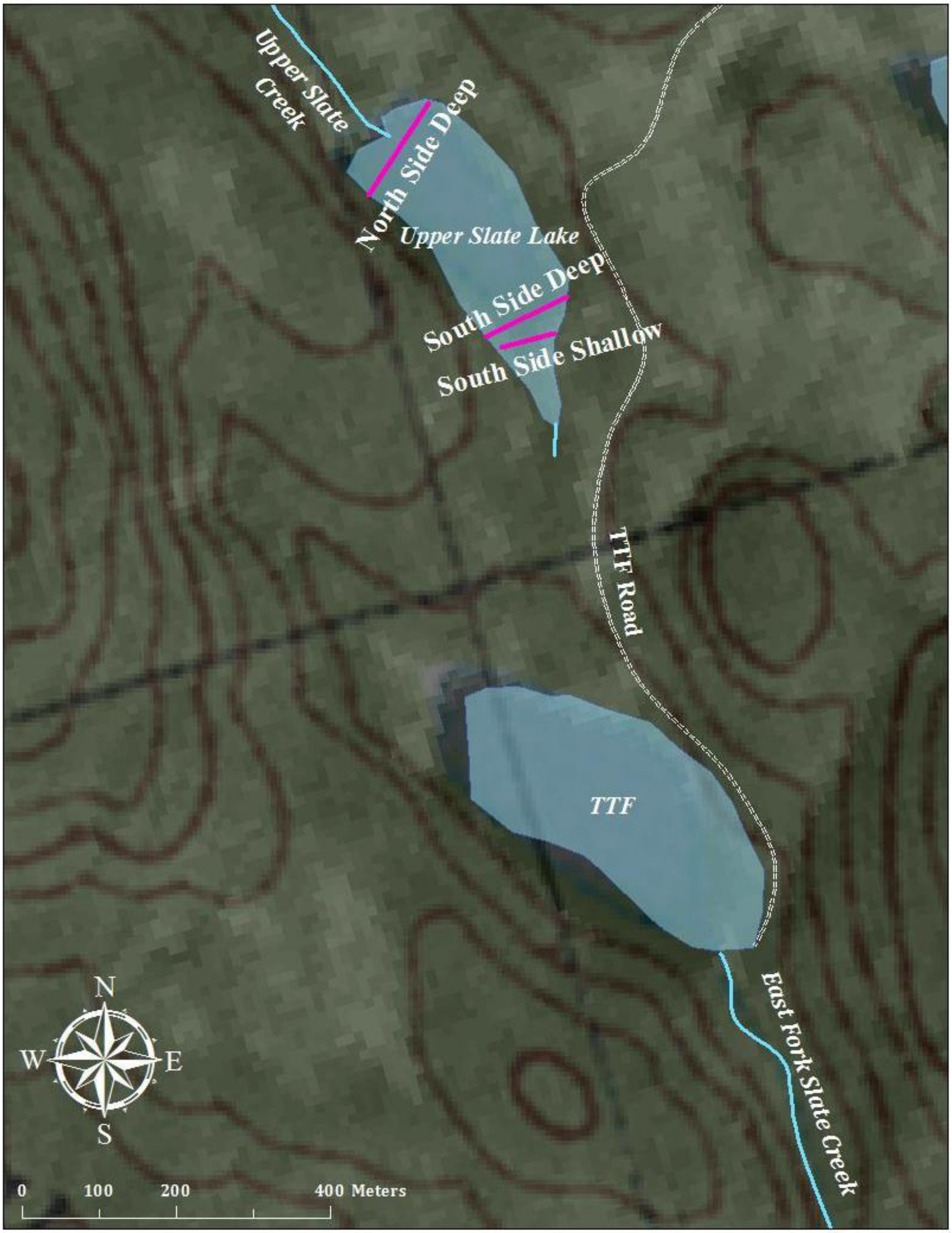

Figure 5 Arial map showing transect locations. North shallow transect, yet to be determined

Literature Cited

Hebert, K. 2006. Dive Safety Manual. Alaska Department of Fish and Game, Special Publication No. 0639, Anchorage

Kline Environmental Research, LLC. 2005. Data Report for aquatic studies conducted in the Slate Lakes Drainage during 2003-2004. Prepared for Coeur Alaska, Inc. Juneau, AK. 84p.

Appendix L.–Diving accident or incident form.

AMERICAN ACADEMY OF UNDERWATER SCIENCES

ACCIDENT OR INCIDENT REPORTING FORM

DATE & TIME OF ACCIDENT
MONTH/DAY/YEAR ☐☐☐ Time ________ AM PM

IS THIS A FATALITY REPORT?
☐ YES ☐ NO
If yes, complete Fatality Report Form.

1. PATIENT NAME LAST FIRST MI

2. OCCUPATION

3. ADDRESS STREET CITY ST ZIP

4. PATIENT PHONE (HOME)

5. PATIENT PHONE (WORK)

6. COUNTRY (IF NOT USA)

7. AGE YRS

8. SEX M or F

9. HEIGHT FT IN

10. WEIGHT LBS.

11. HOME INSTITUTION

12. CERTIFIED DEPTH

13. DAN MEMBER? Y - Yes N - No

14. YEARS DIVING YEARS MONTHS

15. NUMBER OF DIVES MADE Total; Previous 12 months

16. PREVIOUS DIVE ACCIDENTS
A - Possible DCS
B - DCS
C - AGE
D - Pul. barotrauma
E - None

17. CURRENT MEDICATIONS
Y or N
☐ Prescription
☐ Non-prescription
List ________

18. CIGARETTE USE
A - Presently
B - In past
C - Never
☐ Packs per day
☐ Years Smoking

19. PREVIOUS MAJOR ILLNESSES/ SURGERY
(Provide up to 3 responses)
A - Chest-lung
B - Asthma
C - Chest-heart
D - Gastrointestinal/Abdomen
E - Brain
F - Spine/Back
G - Limb or joint of DCS site
H - Circulation/Blood
I - Neurologic/Nervous system
J - Muscle/Skeleton system
K - Eye
L - Mental/Emotional
M - Other ________
N - None

Past
A - 2-6 months
B - 7-12 months
C - 1-3 years
D - 2-5 years
E - 5+ years

List and describe specific problems.

____

20. CURRENT HEALTH PROBLEMS WITHIN PREVIOUS 2 MONTH
(Provide up to 3 responses)
A - Chest-lung
B - Asthma
C - Chest-heart
D - Gastrointestinal/Abdomen
E - Brain
F - Spine/Back
G - Limb or joint of DCS site
H - Circulation/Blood
I - Neurologic/Nervous system
J - Muscle/Skeleton system
K - Eye
L - Mental/Emotional
M - Other ________
N - None

List and describe specific problems or additional current medications

____

ATTACH A WRITTEN REPORT DESCRIBING THE ACCIDENT OR INCIDENT

–continued–

APPENDIX D:
SUBSTRATE GRAIN SIZE ANALYSIS LABORATORY REPORT

AECOM
Environmental Toxicology
4303 West LaPorte Avenue, Fort Collins, Colorado 80521-2154
T 970.416.0916 F 970.490.2963 www.aecom.com

September 3, 2013

Kevin Eppers
Coeur Alaska Inc.
Kensington Gold Mine
3031 Clinton Drive
Suite 202
Juneau, AK 99801

Subject: Analytical results of sediment samples

Dear Mr. Eppers:

Below are the particle size analytical results for the sediment samples collected on June 18, 2013 by the Alaska Department of Fish and Game and shipped to AECOM.

Parameter	Sample Identification		
	Upland (#26858)	USL (#26857)	Tails (#26859)
Particle Size (%)[a]			
Clay	20.0	12.0	12.0
Sand	66.0	86.0	68.0
Silt	14.0	2.0	20.0
Texture	Sandy Clay Loam	Loamy Sand	Sandy Loam
Coarse Material (2 mm)	49.4	16.8	<0.05

[a] Particle size was determined using ASTM Method D422 and Modified ASA 15-5

We greatly appreciate the opportunity to complete this study for Coeur Alaska Inc. Please do not hesitate to contact us if you have any questions. We appreciate your business.

Sincerely,

Ashley Romero
Data Analyst
ashley.romero@aecom.com

Rami B. Naddy, Ph.D.
Study Director / Environmental Toxicologist
rami.naddy@aecom.com

60297514-100-100
Attachment

Friday, July 26, 2013

MSE Analytical Laboratory

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: FCETL

Work Order: 1307038

Dear Rami Naddy:

MSE Lab Services received 3 sample(s) on 7/3/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

7/26/13

MSE Lab Services

Date: *26-Jul-13*

CLIENT:	AECOM	**Client Sample ID:**	UPLAND SOIL(#26858)
Lab Order:	1307038	**Collection Date:**	6/18/2013 12:30:00 PM
Project:	FCETL		
Lab ID:	1307038-001	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: jr
1" Gradation	ND	0.05	0.10		%	1	7/8/2013 8:30:00 AM
2mm Gradation	49.4	0.05	0.10		%	1	7/8/2013 8:30:00 AM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: jr
% Clay	20.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Sand	66.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Silt	14.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
Soil Class	SANDY CLAY LOAM					1	7/8/2013 3:00:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	USL (#26857)
Lab Order:	1307038	**Collection Date:**	6/18/2013 12:00:00 PM
Project:	FCETL		
Lab ID:	1307038-002	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **jr**
1" Gradation	ND	0.05	0.10		%	1	7/8/2013 8:30:00 AM
2mm Gradation	16.8	0.05	0.10		%	1	7/8/2013 8:30:00 AM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **jr**
% Clay	12.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Sand	86.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
Soil Class	LOAMY SAND					1	7/8/2013 3:00:00 PM

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *26-Jul-13*

CLIENT:	AECOM	**Client Sample ID:**	TAILS (#26859)
Lab Order:	1307038	**Collection Date:**	6/18/2013 1:00:00 PM
Project:	FCETL		
Lab ID:	1307038-003	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: jr
1" Gradation	ND	0.05	0.10		%	1	7/8/2013 8:30:00 AM
2mm Gradation	ND	0.05	0.10		%	1	7/8/2013 8:30:00 AM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: jr
% Clay	12.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Sand	68.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
% Silt	20.0	0.1	0.1		%	1	7/8/2013 3:00:00 PM
Soil Class	SANDY LOAM					1	7/8/2013 3:00:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Analytical Laboratory

P.O. Box 4078
200 Technology Way
Butte, MT 59701

Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: 26-Jul-13
Report Date: 26-Jul-13

QA/QC SUMMARY REPORT

Client: AECOM
Project: FCETL

Work Order: 1307038
BatchID: R23789

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: 1307038-001A-D			*Method: ASTMD422*		*Batch ID: R23789*		*Analysis Date: 7/8/2013 8:30:00 AM*			
1" Gradation	ND	0.10	%					0	35	
2mm Gradation	48.9	0.10	%					1.19	35	

Qualifiers: NA Sample conc. is > 4*spike level R RPD outside accepted recovery limits

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: 26-Jul-13
Report Date:

QA/QC SUMMARY REPORT

Client: AECOM
Project: FCETL

Work Order: 1307038
BatchID: R23863

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **1307038-003A-D***			*Method: **MSA15-5***		*Batch ID: **R23863***		*Analysis Date: 7/8/2013 3:00:00 PM*			
% Clay	16.0	0.1	%					28.6	35	
% Sand	66.0	0.1	%					2.99	35	
% Silt	18.0	0.1	%					10.5	35	
Soil Class	SANDY LOAM									

Qualifiers: NA Sample conc. is > 4*spike level R RPD outside accepted recovery limits

AECOM

CHAIN OF CUSTODY RECORD 1307038

Page ___ of ___

Client/Project Name:

Project Location: FCETL

Project Number: 058

Field Logbook No.:

Sampler (Print Name)/(Affiliation): original sample: GWN/client Amber Potts/AECOM

Chain of Custody Tape Nos.: 43589

Signature: Amber Potts

Send Results/Report to: Rami Naddy

TAT: Std

Analysis Requested

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Grain Size	Lab I.D.	Remarks
Upland Soil (#26858)	6/18/13	1230		X	500ml plastic	S/SD	NA	NA	X		
USL (#26857)	6/18/13	1200		X	↓	↓	↓	↓	X		
Tails (#26859)	6/18/13	1300		X	↓	↓	↓	↓	X		

Container Type
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Relinquished by	Date/Time	Received by	Date/Time
Relinquished by: (Print Name)/(Affiliation) Amber Potts/AECOM Signature: Amber Potts	Date: Time:	Received by: (Print Name)/(Affiliation) Melissa Dinnings Signature: Melissa Dinnings	Date: 7/3/13 Time: 11:45 am
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination): 6.2 °C
~~AECOM Toxicology Lab~~ MSE
~~4303 W. Laporte Avenue~~
~~Fort Collins, CO 80521~~
~~(970) 416-0916~~
~~(970) 490-2963 (FAX)~~

Sample Shipped Via: UPS (FedEx) Courier Other

Temp blank: Yes (No)

Serial No. № 53500

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

MSE Lab Services

Sample Receipt Checklist

Client Name AECOM_INC

Date and Time Received: 7/3/2013 11:45:00 AM

Work Order Number 1307038 RcptNo: 1

Received by SW

COC_ID: 1307038 CoolerID:

Checklist completed by: Melissa Dinning 7/3/13 (Signature / Date)

Reviewed by: TL (Initials) 7/03/13 (Date)

Matrix:

Carrier name FedEx

Shipping container/cooler in good condition?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on shippping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☐	No ☑	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Blank ☑

Adjusted? ____________ Checked by NA/Soils

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted ____________ Date contacted: ____________ Person contacted ____________

Contacted by: ____________ Regarding: ____________

Comments: FED EX TEMP=6.2 DEGREE C

Corrective Action ____________

APPENDIX E:
BENTHIC MACROINVERTEBRATE DATA SUMMARIES

	Shallow Sample Trays				Deep Sample Trays			
	North		South		North		South	
	Upland Soil	Reference	Upland Soil	Reference	Tailings	Reference	Tailings	Reference
Total Aquatic Insect Taxa Counted	11	10	7	8	8	8	6	9
Mean No. of Insect Taxa / Sample	7	7	6	6	4	5	4	5
Total Aquatic Insects Counted	1,423	765	921	498	72	191	45	201
Total Terrestrial Insects Counted	0	0	0	1	0	0	0	0
Total Insects Counted	1,423	765	921	499	72	191	45	201
% Sample Aquatic	100%	100%	100%	99.8%	100%	100%	100%	100%
% Sample Terrestrial	0%	0%	0%	0.2%	0%	0%	0%	0%
Estimate No. of Aquatic Insects / m^2								
Ephemeroptera	0	0	0	0	31	0	0	0
Plecoptera	15	0	0	0	31	0	0	0
Trichoptera	0	38	0	0	0	15	0	15
Aquatic Diptera	19,708	11,212	6,046	5,600	708	2,308	246	2,262
Other	2,169	3,231	8,123	2,062	338	615	446	815
% Ephemeroptera	0%	0%	0%	0%	3%	0%	0%	0%
% Plecoptera	0.1%	0%	0%	0%	3%	0%	0%	0%
% Trichoptera	0%	0.3%	0%	0%	0%	0.5%	0%	0.5%
% Aq. Diptera	90%	77%	43%	73%	64%	79%	36%	73%
% Other	10%	22%	57%	27%	31%	21%	64%	26%
% EPT	0.1%	0.3%	0%	0%	5.6%	0.5%	0%	0.5%
% Chironomidae	89%	76%	43%	73%	64%	78%	36%	73%
% Dominant Taxon	89%	76%	74%	73%	64%	78%	38%	73%
Total Sample Area (m^2)	0.065	0.052	0.065	0.065	0.065	0.065	0.065	0.065
Estimated Mean No. of Aquatic Insects / m^2	21,892	14,481	14,169	7,662	1,108	2,938	692	3,092
1 Standard Deviation	6,532	2,337	13,667	1,506	521	813	344	1,151
Mean No. of Aquatic Insects / Sample	285	188	187	100	14	38	9	40
1 Standard Deviation	85	30	178	20	7	11	4	15
Oligochaete / Chironomid Ratio	0.02	0.01	0.02	0.01	0.11	0.00	0.13	0.01
Shannon Diversity Score	0.21	0.38	0.36	0.35	0.41	0.34	0.53	0.40
Evenness Score	0.24	0.46	0.5	0.46	0.70	0.51	0.93	0.54

APPENDIX F:

UPPER SLATE LAKE SURVEY
FIELD DATA SHEETS

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey, Zach Bicknell

Date - 8-8-2013

Meter # - 456 Oakton DO/Temp w/ 20m; 827 Oakton pH/Cond w/ 20m

Weather- Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
1	N 58.81600	10:00	2'	15.6	7.68	9.64 mg/L	134.9
	W 135.03908		4'	15.4	7.64	9.85 mg/L	133.5
			6'	15.0	7.55	10.04 mg/L	132.3
			8'	14.4	7.53	10.13 mg/L	124.8
			10'	13.9	7.60	10.32 mg/L	119.9
			12'	12.9	7.58	10.23 mg/L	129.2
			14'	10.1	7.48	10.71 mg/L	105.1
			16'	8.7	7.43	10.66 mg/L	99.5
			18'	7.4	7.65	10.30 mg/L	98.7
			20'	6.5	7.70	10.02 mg/L	97.9
			22'	6.1	7.41	9.16 mg/L	98.6
			24'	5.9	7.50	8.58 mg/L	100.4
			26'	6.0	7.80	5.00 mg/L	106.5
			28'	5.9	7.81	0.57 mg/L	197.9
			30'			mg/L	

notes:
Gps point #60

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
2	N 58.81622	10:45	2'	13.9	7.78	9.74 mg/L	135.8
	W 135.03886		4'	13.5	7.95	9.81 mg/L	136.6
			6'	13.0	7.65	9.82 mg/L	136.0
			8'	12.1	7.89	10.10 mg/L	132.6
			10'	11.6	7.99	10.28 mg/L	130.8
			12'	10.6	7.68	10.39 mg/L	127.5
			14'	7.2	7.87	10.92 mg/L	103.1
			16'	6.1	7.38	10.62 mg/L	98.6
			18'	6.1	7.53	10.32 mg/L	98.0
			20'	4.7	7.55	10.06 mg/L	98.2
			22'	4.7	7.44	9.18 mg/L	99.5
			24'	4.6	7.07	8.60 mg/L	101.8
			26'	4.7	7.98	7.30 mg/L	105.3
			28'	4.8	7.30	5.30 mg/L	110.7
			30'	5.2	7.02	3.39 mg/L	119.2
			32'	5.6	7.16	2.36	192.9

notes:
Gps point #61

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey
Zach Bicknell

Date - 8-8-2013

Meter # - 456 Oakton DO/Temp w/20m
827 Oakton pH/Cond w/20m

Weather- Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
3	58.81635	11:10	2'	15.8	7.90	9.85 mg/L	135.5
	W 135.03958		4'	15.3	7.75	10.01 mg/L	134.7
			6'	14.9	7.63	10.28 mg/L	130.9
			8'	14.5	7.80	10.46 mg/L	132.1
			10'	13.8	7.72	10.48 mg/L	129.4
			12'	12.5	7.53	11.00 mg/L	126.1
			14'	10.0	7.55	10.78 mg/L	102.4
			16'	8.6	7.62	10.57 mg/L	97.9
			18'	7.1	7.41	10.31 mg/L	98.0
			20'	6.3	7.42	9.95 mg/L	98.4
			22'	5.9	7.51	9.42 mg/L	98.6
			24'	5.7	7.51	8.93 mg/L	99.7
			26'	5.4	7.30	7.02 mg/L	104.0
			28'	5.3	7.39	5.65 mg/L	106.8
			30'	5.3	7.40	3.94 mg/L	110.9
			32'	5.2	7.78	0.38	198.0

notes:
Gps point #64

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
4	N 58.81659	11:40	2'	15.6	7.86	9.56 mg/L	149.0
	W 135.03897		4'	15.1	7.72	9.53 mg/L	146.7
			6'	14.9	7.75	9.38 mg/L	164.4
			8'	14.5	7.54	9.09 mg/L	161.9
			10'	14.0	7.42	7.41 mg/L	168.2
			12'	12.7	7.03	0.38 mg/L	188.5
			14'			mg/L	
			16'			mg/L	
			18'			mg/L	
			20'			mg/L	
			22'			mg/L	
			24'			mg/L	
			26'			mg/L	
			28'			mg/L	
			30'			mg/L	

notes:
Gps point # 65

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey, Zach Bicknell

Meter # - 456 Oakton DO/Temp. w/ 20m; 827 Oakton pH/Cond. w/ 20m

Date - 8-8-2013

Weather - Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
5	N 58.81665	12:10	2'	16.1	7.87	9.94 mg/L	134.6
	W 135.04036		4'	15.4	7.82	10.01 mg/L	128.0
			6'	14.9	7.82	10.10 mg/L	132.3
			8'	14.5	7.76	10.07 mg/L	129.4
			10'	14.2	7.74	10.37 mg/L	130.8
			12'	12.6	7.68	10.48 mg/L	125.7
			14'	10.8	7.63	11.00 mg/L	112.3
			16'	8.1	7.45	10.48 mg/L	98.6
			18'	7.0	7.20	10.23 mg/L	98.3
			20'	6.1	7.43	9.68 mg/L	100.3
			22'	5.7	7.25	8.38 mg/L	103.4
			24'	5.5	7.21	7.21 mg/L	108.1
			26'	5.3	7.20	5.50 mg/L	111.1
			28'	5.2	7.15	4.80 mg/L	114.3
			30'	5.2	7.20	3.71 mg/L	119.3
			32'	5.1	7.57	2.46 mg/L	120.4
			34'	6.4	7.90	0.41 mg/L	196.3
			36'			mg/L	
			38'			mg/L	
			40'			mg/L	
			42'			mg/L	
			44'			mg/L	
			46'			mg/L	
			48'			mg/L	
			50'			mg/L	

notes:

Gps point #66

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey, Zach Bicknell

Meter # - 456 Oakton DO/Temp. w/ 20m; 827 Oakton pH/Cond. w/ 20m

Date - 8-8-2013

Weather- Sunny 60-65° F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
6	N 58.81699	12:40	2'	16.4	7.91	9.27 mg/L	134.7
	W 135.04074		4'	16.0	7.75	9.87 mg/L	135.0
			6'	15.2	7.84	9.91 mg/L	132.4
			8'	14.8	7.77	10.18 mg/L	131.3
			10'	14.6	7.81	10.28 mg/L	132.3
			12'	12.4	7.39	11.02 mg/L	124.8
			14'	10.3	7.49	10.90 mg/L	104.6
			16'	8.7	7.46	10.94 mg/L	99.9
			18'	6.7	7.31	10.46 mg/L	97.6
			20'	6.1	7.29	10.10 mg/L	98.2
			22'	5.6	7.27	9.00 mg/L	99.9
			24'	5.4	7.20	8.24 mg/L	102.5
			26'	5.2	7.20	4.80 mg/L	108.0
			28'	5.1	7.01	3.86 mg/L	114.8
			30'	5.0	6.92	1.88 mg/L	128.4
			32'	5.0	7.02	0.33 mg/L	128.4
			34'	5.0	6.99	0.35 mg/L	129.3
			36'	5.0	7.81	0.37 mg/L	199.0
			38'	5.7	7.58	0.31 mg/L	219.0
			40'			mg/L	
			42'			mg/L	
			44'			mg/L	
			46'			mg/L	
			48'			mg/L	
			50'			mg/L	

notes:

GPS point # 67

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey
Zach Bicknell

Meter # - 456 Oakton DO/Temp. w/ 20m
827 Oakton pH/Cond. w/ 20m

Date - 8-8-2013

Weather- Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
7	N 58.81761	13:20	2'	16.8	7.95	9.43 mg/L	132.8
	W 135.04051		4'	16.2	7.80	9.32 mg/L	134.5
			6'	15.3	7.92	9.58 mg/L	136.2
			8'	14.8	7.79	9.84 mg/L	134.1
			10'	14.0	7.70	10.33 mg/L	132.1
			12'	12.1	7.60	10.47 mg/L	145.7
			14'	10.3	7.22	11.13 mg/L	112.3
			16'	8.2	7.46	10.71 mg/L	104.8
			18'	7.0	7.41	10.47 mg/L	111.7
			20'	6.3	7.30	10.35 mg/L	116.0
			22'	5.7	7.41	9.98 mg/L	131.5
			24'	5.5	7.28	9.14 mg/L	133.3
			26'	5.4	7.23	7.81 mg/L	136.5
			28'	5.2	7.16	6.71 mg/L	143.0
			30'	5.1	7.06	4.31 mg/L	151.2
			32'	5.0	7.05	2.12 mg/L	158.5
			34'	4.9	7.03	0.17 mg/L	173.2
			36'	5.0	7.01	0.28 mg/L	196.0
			38'	5.8	7.17	0.30 mg/L	249.8
			40'	5.9	7.42	0.28 mg/L	309.0
			42'	5.5	7.59	0.70 mg/L	310.0
			44'			mg/L	
			46'			mg/L	
			48'			mg/L	
			50'			mg/L	

notes:

Gps point # 68

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey
Zach Bicknell

Date - 8-8-2013

Meter # - 456 Oakton DO/Temp. w/ 20m
827 Oakton pH/Cond. w/ 20m

Weather- Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
8	N 58.81793	14:00	2'	16.9	7.81	9.86 mg/L	135.5
	W 135.04149		4'	16.7	7.80	9.94 mg/L	135.6
			6'	15.1	7.82	10.04 mg/L	133.4
			8'	14.7	7.80	10.30 mg/L	132.8
			10'	14.2	7.65	10.70 mg/L	132.4
			12'	12.4	7.40	10.81 mg/L	123.5
			14'	10.8	7.49	11.14 mg/L	111.6
			16'	8.8	7.52	10.67 mg/L	98.8
			18'	7.1	7.36	10.50 mg/L	98.1
			20'	6.4	7.32	10.48 mg/L	98.2
			22'	5.9	7.20	10.20 mg/L	98.5
			24'	5.7	7.10	9.48 mg/L	100.5
			26'	5.5	7.26	8.34 mg/L	102.7
			28'	5.3	7.04	7.44 mg/L	105.7
			30'	5.2	6.97	4.18 mg/L	116.8
			32'	5.0	7.15	0.87 mg/L	128.2
			34'	5.0	7.15	0.20 mg/L	167.0
			36'	5.0	7.10	0.20 mg/L	190.2
			38'	5.1	7.09	0.21 mg/L	192.0
			40'			mg/L	
			42'			mg/L	
			44'			mg/L	
			46'			mg/L	
			48'			mg/L	
			50'			mg/L	

notes:

Gps point # 69

Upper Slate Lake - Water Quality Monitoring Field Data Form

Coeur Alaska - Kensington Gold Mine

Personnel - Ryan Bailey, Zach Bicknell

Date - 8-8-2013

Meter # - 456 Oakton DO/Temp w/20m; 827 Oakton pH/Cond w/20m

Weather- Sunny 60-65°F

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
9	N 58.81841	14:30	2'	16.9	7.87	9.87 mg/L	135.5
	W 135.04031		4'	16.3	7.90	10.03 mg/L	134.8
			6'	15.5	7.82	10.16 mg/L	133.0
			8'	14.6	7.84	10.39 mg/L	134.4
			10'	14.1	7.65	10.51 mg/L	127.8
			12'	12.5	7.57	11.01 mg/L	119.5
			14'	10.3	7.40	10.35 mg/L	106.2
			16'	8.1	7.48	9.85 mg/L	99.0
			18'	7.2	7.49	9.42 mg/L	98.6
			20'	6.85	7.80	8.44 mg/L	100.1
			22'	6.50	7.59	0.43 mg/L	191.0
			24'			mg/L	
			26'			mg/L	
			28'			mg/L	
			30'			mg/L	

notes:

Gps point #73

Location #	GPS Coordinates	Time	Depth	Temp.	pH	D.O.	Cond.
10	N 58.81789	15:00	2'	16.9	7.90	9.72 mg/L	135.2
	W 135.03993		4'	16.2	7.85	9.94 mg/L	134.3
			6'	15.0	7.75	10.01 mg/L	133.6
			8'	14.7	7.80	10.28 mg/L	131.9
			10'	13.9	7.70	10.30 mg/L	129.9
			12'	13.2	7.62	10.80 mg/L	127.7
			14'	10.0	7.45	10.55 mg/L	103.3
			16'	7.8	7.37	9.89 mg/L	97.9
			18'	7.0	7.35	9.28 mg/L	98.0
			20'	6.4	7.46	8.17 mg/L	99.6
			22'	6.4	7.06	10.43 mg/L	185.6
			24'			mg/L	
			26'			mg/L	
			28'			mg/L	
			30'			mg/L	

notes:

Gps point #74