United States
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Tongass
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R10-MB-500b

Kensington Gold Project

Final
Supplemental Environmental Impact Statement

Volume 2: Appendices A–L

Lead Agency

USDA Forest Service, Tongass National Forest

Cooperating Agencies

US Environmental Protection Agency, Region 10
US Army Corps of Engineers, Alaska District
Alaska Department of Natural Resources

United States
Environmental Protection
Agency

US Army Corps
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Alaska District

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Appendix A

Water Quality Analysis

Appendix A: Water Quality Analysis

Attachments A-1 through A-3 provide the basis for the predicted National Pollutant Discharge Elimination System (NPDES) permit limits and compliance evaluation that have been included in the Final Supplemental Environmental Impact Statement (SEIS) for Alternatives B and D. Attachment A-1 summarizes the rationale for the permit limits applicable to outfalls 001 (treated mine water) and 002 (tailings storage facility [TSF] discharge). Attachment A-2 provides additional details on the determination of water quality-based effluent limits (WQBELs). Attachment A-3 summarizes the water quality modeling that was performed to determine the TSF discharge quality. The approach of using expected NPDES permit limits as a tool to assess potential downstream water quality impacts is consistent with the 1997 Final SEIS. That document also showed that the dry tailings facility (DTF) discharge, outfall 002 under Alternative A, would meet NPDES permit limits. Outfall 001, the discharge of treated mine water, is the same under all alternatives.

The results of this analysis, along with the Ecological Risk Assessment provided in Appendix C, form the basis for the evaluation of the predicted impacts on surface water quality and freshwater aquatic resources included in the Final SEIS.

Attachment A-1 – Basis for NPDES Permit Effluent Limitations

A. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the basis for effluent limitations and other conditions in the draft permit. USEPA evaluates the discharges with respect to these sections of the CWA and the relevant NPDES regulations to determine which conditions to include in an NPDES permit.

USEPA first determines which technology-based limits must be incorporated into the permit. USEPA then evaluates the effluent quality expected to result from these controls to see whether water quality standards for the receiving waters might still be exceeded. If exceedances would occur, USEPA must include Water Quality-based Effluent Limitations (WQBELs) in the permit. The permit limits reflect whichever requirements (technology-based or water quality-based) limits are more stringent.

B. Technology-Based Evaluation

Section 301(b) of the CWA requires industrial dischargers to meet technology-based effluent guidelines established by USEPA, which are enforceable through their incorporation into an NPDES permit. For dischargers in industrial categories for which USEPA has not yet issued effluent guidelines, and for types of discharges not covered by an applicable effluent guideline, best professional judgment (BPJ) is used to establish technology-based permit limitations. The 1972 amendments to the CWA established a two-step approach for imposing technology-based controls. In the first phase, industrial dischargers were required to meet a level of pollutant control based on the best practicable control technology currently available (BPT). The second level of pollutant control was based on the best available technology economically achievable (BAT). And in 1977, enactment of section 301(b)(2)(E) of the CWA allowed the application of best conventional pollutant control technology (BCT) to supplement BPT standards for conventional pollutants with cost-effectiveness constraints on incremental technology requirements that exceed BPT. The BPT/BAT/BCT system of standards does not apply to a new source, which is defined by USEPA as a source, the construction of which is commenced after the publication of proposed regulations prescribing a standard of performance, which will be applicable to the source. Direct dischargers that are new sources must meet new source performance standards (NSPS), which are based on the best available demonstrated control technology.

At 40 CFR 440, USEPA has established technology-based effluent guidelines for the Ore Mining and Dressing Point Source Category. Subpart J of these guidelines, which became effective on December 3, 1982, is applicable to mines that produce gold-bearing ores from open-pit or underground operations and to mills that use the froth-flotation process, alone or in conjunction with other processes, for the beneficiation of gold.

At the Kensington Mine, discharge of mine drainage through outfall 001 to Sherman Creek was previously permitted based on the NSPS. In addition, discharges to East Fork Slate Creek through outfall 002 will also be subject to the NSPS of 40 CFR 440. Technology-based NSPS of 40 CFR 440 applicable to mine drainage are presented in Table 1.

Table 1. NSPS for Mine Drainage

Pollutant	Daily Maximum Concentration (mg/L)	Average Monthly Concentration (mg/L)
Copper	0.30	0.15
Zinc	1.5	0.75
Lead	0.6	0.3
Mercury	0.002	0.001
Cadmium	0.10	0.05
pH	6.0 to 9.0 (s.u.)	
TSS	30	20

NSPS at 40 CFR 440.104(b) also prohibit the discharge of process wastewaters from mills that use the froth-flotation process for the beneficiation of gold, except in two circumstances.

- If precipitation falling on the treatment facility and on the drainage area contributing surface runoff to the treatment facility exceeds evaporation, an amount equal to the difference between annual precipitation falling on the treatment facility and on the drainage area contributing surface runoff to the treatment facility and evaporation may be discharged, subject to the limitations in Table 1, above, or
- If contaminants build up in water recycled through the mill to a degree that causes interference with the ore recovery process, and the interference cannot be eliminated through appropriate treatment of the recycled water, a discharge of process water may be allowed by USEPA in an amount necessary to correct the interference problem, after installation of appropriate treatment. Such a discharge would also be subject to the limitations of Table 1 above.

With the recycle stream, diversions (under Alternatives C and D) and other "losses" such as infiltration, evaporation, and water retained in the tailings, discharges through outfall 002 at the Kensington Mine are equivalent to the natural flow into the TSF and are subject to the NSPS of Table 1, meeting the first exception, above.

C. Water Quality-based Evaluation

Section 301(b)(1)(C) of the CWA and its implementing regulations at 40 CFR 122.44(d) require permits to include limits for all pollutants or parameters which are or may be discharged at a level which will cause, or contribute to, an excursion above any state water quality standard, including state narrative criteria for water quality. If WQBELs are necessary, they must be stringent enough to ensure that AWQS are met, and they must be consistent with any available wasteload allocation. For pollutants with technology-based limits, USEPA must also determine whether the technology-based limits will be protective of the corresponding water quality criteria.

USEPA must also consider the state's Antidegradation Policy, described at 18 AAC 70.015, which is designed to ensure that:

- Existing water uses and the level of water quality necessary to protect existing uses are maintained and protected;
- If the quality of a water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and protected,

unless a short-term variance (18 AAC 70.200), a zone of deposit (18 AAC 70.210), a mixing zone (18 AAC 70.240), or such reduction in water quality is authorized by the state; and

- If a high-quality water constitutes an outstanding national resource, such as a water of a national or state park or wildlife refuge or a water of exceptional recreational or ecological significance, the quality of that water must be maintained and protected.

To determine appropriate WQBELs, USEPA uses the following general approach:

- Determine the appropriate water quality criteria
- Develop the wasteload allocations (WLA)
- Establish effluent limitations.

The following sections provide a detailed discussion of each step. Attachment A-2 shows the derivation of specific WQBELs for outfalls 001 and 002.

1. Water Quality Criteria

The first step in developing WQBELs is to determine the applicable water quality criteria, which the state presents in the Alaska Administrative Code at 18 AAC 70. Applicable criteria are based on the beneficial uses of the receiving water; for East Fork Slate Creek and Sherman Creek those uses are the freshwater use classes (1) (A, B, and C) as established at 18 AAC 70.050—(A) water supply (drinking, culinary, and food processing; agriculture, including irrigation and stock watering; aquaculture; and industrial), (B) water recreation (contact and secondary), and (C) growth and propagation of fish, shellfish, other aquatic life, and wildlife. To protect all uses, permit limits are established based on the most stringent water quality criteria applicable to those uses.

2. Wasteload Allocation (WLA) Development

WLAs must be developed to establish the allowable loadings of each pollutant that may be discharged without causing or contributing to exceedances of AWQS in the receiving waters. WLAs are typically established in three ways:

- Based on a mixing zone, or
- Based on total maximum daily load (TMDL), or
- By determining the end-of-pipe WLA that will allow attainment of applicable water quality criteria.

The Permittee has not applied for a mixing zone, and no TMDLs have been developed for East Fork Slate Creek or Sherman Creek. Neither creek is included on the state's current 303(d) list of impaired waters. Therefore, the water quality criteria, applied at the end-of-pipe, will become the WLAs.

3. Permit Limit Derivation

Once the WLA has been developed, USEPA applies the statistical permit limit derivation approach described in Chapter 5 of the *Technical Support Document for Water Quality-Based Toxics Control* (the TSD, USEPA/505/2-90-001, 1991) to establish maximum daily and average monthly permit limitations (MDLs and AMLs, respectively). This approach takes into account effluent variability, sampling frequency, AWQS, and the difference in time frames between the monthly average and the daily maximum limits.

The daily maximum limit is based on the coefficient of variation (CV) of the data and the probability basis, while the monthly average limitation is dependent on these two variables and monitoring frequency. As recommended by the TSD, USEPA has used a probability basis of 95 percent for the monthly average limit calculation and 99 percent for the daily maximum limit calculation. USEPA has also assumed a CV of 0.6 as recommended by the TSD for both monthly average and daily maximum calculations. For outfall 001, there are no effluent data for full-scale mining operations to establish a discharge-specific CV. Since outfall 002 has not been constructed, no effluent data are available for outfall 002.

D. Reasonable Potential Analysis

WQBELs must be included for all pollutants addressed by effluent guidelines. In determining which other pollutants require WQBELs, USEPA typically determines the "reasonable potential" of the discharge to exceed or cause an exceedance of applicable water quality criteria.

For outfall 001, there are little or no water quality data representative of full-scale mining operations. USEPA has determined that the existing mine water treatment system will ensure compliance with applicable water quality criteria, except potentially for aluminum. An additional pH adjustment stage may be needed to reduce effluent pH to the range of 6 to 7 s.u. to achieve better aluminum removal and meet discharge limitations. Because of a lack of data, however, USEPA has further determined that it is important to retain WQBELs for all pollutants included in the previous permit. In addition, limits have been added for iron, sulfate, and arsenic, since these pollutants are expected at concentrations in the discharge approaching the applicable water quality criteria.

For outfall 002, the predicted water quality is based on a limited analysis of tailings slurry. USEPA, therefore, has determined that it is appropriate to establish limits for all the same pollutants addressed at outfall 001.

E. Effluent Limitations—Outfalls 001 and 002

Tables 2 and 3 provide a summary of the effluent limitations applicable to outfalls 001 and 002 that were included in the draft NPDES permit issued in June 2004. Table 2 includes the "non-metal" pollutants (except ammonia), while Table 3 includes limits for ammonia and metals. Following the table is a discussion of the basis for each technology-based or water quality-based effluent limitation in the draft permit.

TSS

At 40 CFR 440, USEPA established NSPS for TSS in mine drainage of 30 mg/L (MDL) and 20 mg/L (AML). These technology-based effluent limitations for TSS in mine drainage, when applied together with the numeric limitations for metals proposed in the draft permit, are protective of the state's narrative water quality criterion for residues presented at 18 AAC 70.020 (b). The TSS limitations for TSS of 40 CFR 440 will therefore be applied to outfalls 001 and 002. TSS limitations for outfall 001 are unchanged from the previous NPDES permit.

Table 2. Effluent Limitations (Non-Metals Except Ammonia)

Parameter	Units	AML	MDL
PH	s.u.	6.5–8.5	
TSS	mg/L	20	30
TDS (outfall 001)	mg/L	1,000	1,000
TDS (outfall 002)	mg/L	500	500
Turbidity	NTUs	See note [a]	
Sulfate[b] (outfall 001)	mg/L	200	200
Sulfate (outfall 002)	mg/L	250	250
Chronic toxicity	TUc	1.1	1.6

[a] The turbidity must not be more than 5 NTUs greater than the background levels in samples taken from Sherman Creek (outfall 001) and the TSF diversion pipeline (outfall 002) within a reasonable time of effluent sampling.

[b] The sulfate limit for Sherman Creek applies only to sulfates associated with magnesium and sodium.

Table 3. Water Quality-based Limitations for Metals and Ammonia

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limitations (WQBELs)	
			MDL	AML
Aluminum	—	µg/L	143	71
Total ammonia (outfall 001)	—	mg/L as N	4.0	2.0
Total ammonia (outfall 002)	—	mg/L as N	1.8	1.3
Arsenic	—	µg/L	100	50
Cadmium	25	µg/L	0.2	0.1
	50	µg/L	0.3	0.2
	100	µg/L	0.5	0.3
	200	µg/L	0.7	0.4
Chromium VI	—	µg/L	16	8.0
Copper	25	µg/L	3.7	1.9
	50	µg/L	7.2	3.6
	100	µg/L	14	7.0
	200	µg/L	27	13
Iron	—	mg/L	1.7	0.8
Lead	25	µg/L	0.9	0.5
	50	µg/L	2.2	1.0
	100	µg/L	5.3	2.6
	200	µg/L	13	6.4
Mercury	—	µg/L	0.02	0.01
Nickel	25	µg/L	26	13
	50	µg/L	48	24
	100	µg/L	85	43
	200	µg/L	154	77
Selenium	—	µg/L	8.2	4.1
Silver	25	µg/L	0.4	0.2
	50	µg/L	1.2	0.6
	100	µg/L	4.1	2.1

Table 3. (continued)

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	Water Quality-based Effluent Limitations (WQBELs)	
			MDL	AML
	200	µg/L	13	6.7
Zinc	25	µg/L	37	18
	50	µg/L	67	33
	100	µg/L	120	60
	200	µg/L	216	108

TDS and Sulfate

The Alaska Water Quality Standards at 18 AAC 70 contain water quality criteria for TDS not to exceed 500 mg/L and sulfate not to exceed 250 mg/L. At 18 AAC 70.235, ADEC has established site-specific criteria for Sherman Creek of TDS not to exceed 1,000 mg/L and sulfates not to exceed 200 mg/L. The site-specific sulfate criteria apply only to sulfate associated with sodium and magnesium. Consistent with the state's draft 401 certification, the draft NPDES permit contains identical limitations for the average monthly limit and the maximum daily limits based on the "not to exceed" provision of the standards.

Turbidity

The Alaska Water Quality Standards prohibit an increase of greater than 5 NTUs in receiving waters above natural conditions, when the natural turbidity is 50 NTUs or less. Because natural turbidity levels in both the Sherman Creek and East Fork Slate Creek drainages are well below 50 NTUs, the draft permit requires that turbidity in the discharges be no greater than 5 NTUs above background.

Ammonia

The Alaska Water Quality Standards contain acute and chronic water quality standards for the protection of aquatic life. The criteria upon which the standards are based are contained in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2003). These criteria are dependent on the pH and temperature of the receiving waters, and whether the receiving waters support salmonids and early life stages of fish. Based on water quality monitoring performed by the Permittee, USEPA has used a pH range of 6.0 to 8.0 for lower Sherman Creek, a pH range of 7.1 to 8.1 for East Fork Slate Creek, and temperature ranges not to exceed 14 °C for both Sherman Creek and East Fork Slate Creek. Both creeks support early life stages of fish, salmonids in particular. Although 14 °C may be a higher temperature than what actually occurs in the creeks, water quality criteria are not temperature sensitive until temperatures exceed 14 °C.

Based on the applicable water quality standard for ammonia and using the statistical methodology presented in the TSD, USEPA is proposing the limitations in Table 3 for discharges to Sherman Creek and East Fork Slate Creek through outfalls 001 and 002.

pH

At 40 CFR 440, NSPS require pH of discharges from outfalls 001 and 002 to be within the range of 6.0 and 9.0 s.u. The Alaska Water Quality Standards limit receiving waters to the pH range of

6.5 to 8.5 s.u. USEPA is required to use the more stringent of the two criteria so the Alaska Water Quality Standards are used as the end-of-pipe pH limitations (see Table 2).

Aluminum

The draft NPDES permit includes WQBELs for aluminum, derived using the statistical methodology presented in the TSD and based on the Alaska Water Quality Standards. The draft permit proposed limitations are 143 µg/L (MDL) and 71 µg/L (AML) for aluminum, applied to outfalls 001 and 002, to ensure protection of applicable water quality criteria for Sherman Creek and East Fork Slate Creek.

Arsenic

For outfalls 001 and 002, the draft permit includes WQBELs that are based on currently applicable Alaska Water Quality Standards and derived using the statistical methodology presented in the TSD. The applicable AWQS is the human health standard for arsenic. The proposed limitations are 100.5 µg/L (MDL) and 50 µg/L (AML).

On January 21, 2001, USEPA adopted a new maximum contaminant level (MCL) for arsenic of 10 µg/L, which will become effective on January 23, 2006. If the MCL is further adopted by the State of Alaska as a water quality standard, it would apply to the Kensington mine discharges and the permit could be reopened to include more stringout arsenic limits (projected to be 20 µg/L [MDL] and 10 µg/L [AML]).

Cadmium

40 CFR 440 Subpart J contains NSPS for cadmium in mine drainage and mill discharges of 100 µg/L (MDL) and 50 µg/L (AML). Based on Alaska Water Quality Standards, which are hardness dependent, and using the statistical methodology presented in the TSD, the WQBELs found in Table 3 are also applicable to discharges from outfalls 001 and 002. Because the WQBELs for cadmium are more stringent than the NSPS, they are included in the draft NPDES permit, to ensure protection of water quality criteria for East Fork Slate Creek and Sherman Creek.

Chromium

WQBELs for hexavalent chromium (Cr VI) of 16 µg/L and 8 µg/L were derived using the statistical methodology presented in the TSD and based on Alaska Water Quality Standards.

Copper

USEPA has established applicable NSPS for copper in mine drainage and mill discharges of 300 µg/L (MDL) and 150 µg/L (AML). Based on Alaska Water Quality Standards, which are hardness dependent, and using the statistical methodology presented in the TSD, the WQBELs found in Table 3 are also applicable to discharges from outfalls 001 and 002. Because the WQBELs for copper are more stringent than the technology-based limitations, they are included in the draft NPDES permit to ensure protection of aquatic life in East Fork Slate Creek and Sherman Creek.

Iron

The draft NPDES permit includes WQBELs for iron based on Alaska Water Quality Standards and derived using the statistical methodology presented in the TSD. The proposed limitations of 1.7 mg/L (MDL) and 0.8 mg/L (AML), applied to outfalls 001 and 002, ensure protection of aquatic life in East Fork Slate Creek and Sherman Creek.

Lead

USEPA has established NSPS for lead in mine drainage of 600 µg/L (MDL) and 300 µg/L (AML). Based on Alaska Water Quality Standards for lead, which are hardness dependent, and using the statistical methodology presented in the TSD, the WQBELs found in Table 4 are also applicable to the outfalls. Because the WQBELs for lead are more stringent than the NSPS, they are included in the draft NPDES permit.

Mercury

At 40 CFR 440, USEPA has established NSPS for mercury in mine drainage and mill discharges of 2 µg/L (MDL) and 1 µg/L (AML). Based on Alaska Water Quality Standards for mercury, and using the statistical methodology presented in the TSD, the WQBELs found in Table 4 are proposed for mercury. Because the WQBELs for mercury are more stringent than the NSPS, they are included in the draft NPDES permit, applicable to outfalls 001 and 002.

Nickel

The draft NPDES permit includes the WQBELs for nickel found in Table 4. These limits are based on Alaska Water Quality Standards, which are hardness dependent, and derived using the statistical methodology presented in the TSD.

Selenium

The draft NPDES permit includes WQBELs for selenium (see Table 4) based on Alaska Water Quality Standards and are derived using the statistical methodology presented in the TSD. The proposed limitations of 8.2 µg/L (MDL) and 4.1 µg/L (AML), applied to outfalls 001 and 002, will ensure protection of water quality for East Fork Slate Creek and Sherman Creek.

Silver

The draft permit includes the WQBELs for this pollutant based on Alaska Water Quality Standards, which are hardness dependent, and using the statistical methodology presented in the TSD. The proposed limitations (see Table 4) are applicable to outfalls 001 and 002 and are derived to protect water quality in East Fork Slate Creek and Sherman Creek.

Zinc

USEPA has established NSPS for zinc (1.5 mg/L [MDL], and 0.75 mg/L [AML]), which are applicable to mine drainage and mill discharges. Based on Alaska Water Quality Standards, which are hardness dependent, and using the statistical methodology presented in the TSD, the WQBELs found in Table 4 are also applicable to the Kensington Mine. Because the water quality-based limitations for zinc are more stringent than the technology-based standards, they are included in the draft NPDES permit and are applicable to outfalls 001 and 002.

Attachment A-2 – Determination of Water Quality-based Effluent Limitation for Outfalls 001 and 002

Step 1. Determine the appropriate criteria

Uses of receiving waters are defined in 18 AAC 70. For East Fork Slate Creek and Sherman Creek, the state's designated uses include 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. The most stringent water quality criteria for toxic pollutants applicable to these uses are summarized in Tables 1 and 2, below.

Because effluent limitations for metals must be expressed as total recoverable concentrations [40 CFR 122.45(c)], metals criteria are expressed as total metal concentrations. Moreover, because the toxicity of certain metals increases with decreasing hardness levels, certain of the aquatic life criteria for metals from 18 AAC 70 (Cd, Cr III, Cu, Pb, Ni, Ag, and Zn) must also be adjusted to account for the hardness level of the receiving water. Here, hardness levels of 25, 50, 100, and 200 mg/L $CaCO_3$ for the receiving waters were used to determine the applicable criteria, where the criteria are hardness dependent. Formulas for deriving hardness-dependent criteria are presented in Table III of the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2003).

Table 1. Summary of Water Quality Criteria for Nontoxic Pollutants and Pollutant Characteristics Applicable to Discharges to East Fork Slate Creek and Sherman Creek[a]

Pollutant	Most Stringent Applicable Water Quality Criteria
TDS	TDS may not exceed 500 mg/L in East Fork Slate Creek and 1,000 mg/L in Sherman Creek below the discharge of the Kensington Mine adit drainage to tidewater.
Sulfate	Sulfates may not exceed 250 mg/L, although site-specific criteria for Sherman Creek at 18 AAC 70.236(b) limit sulfates associated with magnesium and sodium to 200 mg/L in Sherman Creek.
pH	pH may not be less than 6.5 or greater than 8.5 and may not vary more than 0.5 pH unit from natural conditions.
Residues	Residues may not, alone or in combination with other substances or wastes, make the water unfit or unsafe for use; cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.
Sediment	There may be no measurable increase in concentration of settleable solids above natural conditions, as measured by the volumetric Imhoff cone method.
Turbidity	Turbidity may not exceed 5 nephelometric turbidity units (NTUs) above natural conditions when the natural turbidity is 50 NTUs or less.
Whole effluent toxicity	An effluent may not impart chronic toxicity equal to or greater than 1.0 TUc at the point of discharge.

[a] From 18 AAC 70.020(b), except site-specific criteria for Sherman Creek established at 18 AAC 70.236(b) and whole effluent toxicity standards established at 18 AAC 70.030(a).

Table 2. Summary of Water Quality Criteria for Toxics in Discharges to East Fork Slate Creek and Sherman Creek[a]

Pollutant	Most Stringent Applicable Water Quality Criteria
Ammonia	For Sherman Creek, acute and chronic criteria for the protection of aquatic life are 5.62 mg/L and 2.43 mg/L as N, respectively. These criteria are based on a maximum water temperature of 14 °C and a maximum pH of 8.0 and the presence of early life stages of salmonids in Sherman Creek. For East Fork Slate Creek, acute and chronic criteria for the protection of aquatic life are 4.64 mg/L and 2.10 mg/L as N, respectively. These criteria are based on a maximum water temperature of 14 °C and a maximum pH of 8.1 and the presence of early life stages of salmonids in East Fork Slate Creek.
Nitrite	1 mg/L as N—primary MCL for drinking water
Nitrate	10 mg/L as N—primary MCL for drinking water
Total nitrite plus nitrate	10 mg/L as N—primary MCL for drinking water
Aluminum	750 µg/L and 87 µg/L—acute and chronic aquatic life criteria
Arsenic	50 µg/L—primary MCL for drinking water and the standard for agricultural use (stockwater), human health criteria
Cadmium	0.52 µg/L and 0.10 µg/L, 1.1 µg/L and 0.2 µg/L, 2.1 µg/L and 0.3 µg/L, 4.3 µg/L and 0.5 µg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Chromium III	0.58 mg/L and 0.028 mg/L, 1.0 mg/L and 0.05 mg/L, 1.8 mg/L and 0.09 mg/L, 3.2 mg/L and 0.2 mg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Chromium VI	16 µg/L and 11 µg/L—acute and chronic aquatic life criteria
Chromium (total)	100 µg/L—the primary MCL for drinking water and the standard for agricultural use (stockwater)
Copper	3.8 µg/L and 2.9 µg/L, 7.3 µg/L and 5.2 µg/L, 14 µg/L and 9.3 µg/L, 27 µg/L and 17 µg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Iron	1 mg/L—chronic aquatic life criterion
Lead	14 µg/L and 0.54 µg/L, 34 µg/L and 1.3 µg/L, 82 µg/L and 3.2 µg/L, 197 µg/L and 7.7 µg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Mercury	0.012 µg/L—chronic aquatic life criteria
Nickel	145 µg/L and 16 µg/L, 261 µg/L and 29 µg/L, 469 µg/L and 52 µg/L, 843 µg/L and 94 µg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Selenium	20 µg/L and 5 µg/L—acute and chronic aquatic life criteria
Silver	0.37 µg/L, 1.2 µg/L, 4.1 µg/L, and 13.4 µg/L—acute aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively
Zinc	37 µg/L, 67 µg/L, 120 µg/L, and 216 µg/L—acute and chronic aquatic life criteria with receiving water hardness of 25, 50, 100, and 200 mg/L $CaCO_3$, respectively

[a] From 18 AAC 70.020(b), which incorporates Tables I, II, III, and Columns A and B of Table V of the *Alaska Water Quality Criteria Manual* (2003).

Step 2. Calculate the wasteload allocations (WLAs)

A WLA addresses variability in effluent quality and is the single level of receiving water quality necessary to provide protection against long-term or chronic effects. WLAs are calculated using the following mass balance equation, where C is the applicable water quality criterion, B is the background or ambient concentration of the pollutant in the receiving water, and D is the available dilution.

$WLA = C + D [C - B]$

In the circumstances where no credit is allowed for dilution, as at the two outfalls from the Kensington Mine, D equals zero, and the WLA for each pollutant is set equal to the most stringent applicable water quality criteria, ensuring that the discharge will not contribute to an exceedance of that standard.

Step 3. Determine long-term average concentrations (LTAs)

For each WLA based on an aquatic life criterion, the acute and chronic LTAs are calculated using the following equations from the TSD. LTAs are presented in Table 3, below.

$$LTA_C = WLA_C \times e\,[0.5\,\sigma_4^2 - z\sigma_4]$$

where $\sigma_4^2 = \ln [CV^2 / 4 + 1]$

$z = 2.326$ for the 99th percentile occurrence probability

CV = coefficient of variation (here, because there are no data points representative of full-scale mining, the CV is estimated to equal 0.6)

and $LTA_a = WLA_a \times e\,[0.5\,\sigma^2 - z\sigma]$

where $\sigma^2 = \ln [CV^2 + 1]$

$z = 2.326$ for the 99th percentile occurrence probability

$CV = 0.6$

Table 3. Determination of LTAs

Pollutant	Receiving Water Hardness[a]	WLA		LTA	
		Acute	Chronic	Acute	Chronic
Aluminum	N/A	750 µg/L	87 µg/L	241	46
Cadmium	25 mg/L	0.52 µg/L	0.1 µg/L	0.17	0.05
	50 mg/L	1.1 µg/L	0.2 µg/L	0.35	0.11
	100 mg/L	2.1 µg/L	0.3 µg/L	0.67	0.16
	200 mg/L	4.3 µg/L	0.5 µg/L	1.4	0.24
Chromium VI	N/A	16 µg/L	11 µg/L	5.1	5.8
Copper	25 mg/L	3.8 µg/L	2.9 µg/L	1.2	1.5
	50 mg/L	7.3 µg/L	5.2 µg/L	2.3	2.7
	100 mg/L	14 µg/L	9.3 µg/L	4.5	4.9
	200 mg/L	27 µg/L	17 µg/L	8.6	8.9
Iron	N/A	-	1.0 mg/L	-	0.53
Lead	25 mg/L	14 µg/L	0.54 µg/L	4.5	0.29
	50 mg/L	34 µg/L	1.3 µg/L	10.9	0.69
	100 mg/L	82 µg/L	3.2 µg/L	26.3	1.7

Table 3. (continued)

Pollutant	Receiving Water Hardness[a]	WLA		LTA	
		Acute	Chronic	Acute	Chronic
	200 mg/L	197 µg/L	7.7 µg/L	63.3	4.1
Nickel	25 mg/L	145 µg/L	16 µg/L	46.6	8.44
	50 mg/L	261 µg/L	29 µg/L	83.8	15.3
	100 mg/L	469 µg/L	52 µg/L	150.6	27.4
	200 mg/L	843 µg/L	94 µg/L	271	49.5
Selenium	N/A	-	5 µg/L	-	2.6
Silver	25 mg/L	0.37 µg/L	-	0.12	-
	50 mg/L	1.2 µg/L	-	0.39	-
	100 mg/L	4.1 µg/L	-	1.32	-
	200 mg/L	13.4 µg/L	-	4.3	-
Zinc	25 mg/L	37 µg/L	37 µg/L	11.9	19.5
	50 mg/L	67 µg/L	67 µg/L	21.5	35.3
	100 mg/L	120 µg/L	120 µg/L	38.5	63.3
	200 mg/L	216 µg/L	216 µg/L	69.2	114
Ammonia	Sherman Creek	5.62	2.43	1.804	1.282
	East Fork Slate Creek	4.64	2.10	1.490	1.108

[a] N/A means the parameter is not hardness-dependent.

Acute and chronic LTAs are compared, and the most stringent is used to develop the daily maximum and monthly average permit limits.

Step 4. Derive the maximum daily (MDL) and average monthly (AML) permit limits

Using equations from the TSD, the MDL and the AML are calculated as follows:

$$MDL = LTA \times e\,[z\sigma - 0.5\,\sigma^2]$$

$$= LTA \times 3.115$$

where $\sigma^2 = \ln\,[CV^2 + 1]$

$z = 2.326$ for the 99th percentile probability basis

$CV = 0.6$

and $AML = LTA \times e\,[z\sigma_n - 0.5\sigma_n^{\ 2}]$

$$= LTA \times 1.553$$

where $\sigma_n^{\ 2} = \ln\,[CV^2 / n + 1]$

$z = 1.645$ for the 95th percentile probability basis

$CV = 0.6$

n = number of sampling events required per month (here, n is set equal to 4, as recommended by the TSD whenever 4 or fewer samples per month are collected)

When the most stringent water quality criterion is a human health criterion (i.e., arsenic), the AML is set equal to the WLA, and the MDL is calculated by multiplying the WLA times the ratio of the MDL multiplier to the AML multiplier (3.115 / 1.553 = 2.006). MDLs and AMLs are presented in Table 4.

Table 4. Determination of WQBELs

Parameter	Receiving Water Hardness (mg/L $CaCO_3$)	Units	MDL	AML
Aluminum		µg/L	143	71
Arsenic		µg/L	100	50
Cadmium	25	µg/L	0.2	0.1
	50	µg/L	0.3	0.2
	100	µg/L	0.5	0.3
	200	µg/L	0.7	0.4
TDS	Sherman Creek	mg/L	1,000	1,000
	East Fork Slate Creek	mg/L	500	500
Sulfate	Sherman Creek	mg/L	200	200
	East Fork Slate Creek	mg/L	250	250
Chromium VI		µg/L	16	8.0
Copper	25	µg/L	3.7	1.9
	50	µg/L	7.2	3.6
	100	µg/L	14	7.0
	200	µg/L	27	13
Iron		mg/L	1.7	0.8
Lead	25	µg/L	0.9	0.5
	50	µg/L	2.2	1.0
	100	µg/L	5.3	2.6
	200	µg/L	13	6.4
Mercury		µg/L	0.02	0.01
Nickel	25	µg/L	26	13
	50	µg/L	48	24
	100	µg/L	85	43
	200	µg/L	154	77
Selenium		µg/L	8.2	4.1
Silver	25	µg/L	0.4	0.2
	50	µg/L	1.2	0.6
	100	µg/L	4.1	2.1
	200	µg/L	13	6.7
Zinc	25	µg/L	37	18
	50	µg/L	67	33
	100	µg/L	120	60
	200	µg/L	216	108
Ammonia	Sherman Creek	mg/L N	4.00	2.00
	East Fork Slate Creek	mg/L N	3.45	1.72

Attachment A-3 – Results of TSF Discharge Water Modeling

A. General Structure of the Water Quality Model

Knight Piesold, Inc. developed a water quality model using Microsoft Excel and @Risk, a Monte Carlo simulation program, to predict the characteristics of tailings storage facility (TSF) water. Monte Carlo simulation is a stochastic technique used to make modeling calculations on a probability basis by randomly selecting input values across a defined probability distribution (e.g., normal distribution, lognormal). Inputs are randomly chosen for all stochastic inputs simultaneously. For example, worst-case scenarios might use a low precipitation value with a high tailings concentration and another might use an average precipitation value with a high tailings concentration. Values are randomly selected over and over to create multiple scenarios that represent a range of possible conditions. The model, therefore, generates a range of possible outcomes as a probabilistic distribution that illustrates the likelihood of particular outcomes.

The model relies on inputs related to hydrology, production factors, and geochemistry. Precipitation is entered into the model as a stochastic distribution, as described below. The hydrologic inputs to the model are derived from monthly precipitation values selected randomly using the Monte Carlo algorithm. All other inputs were fixed (i.e., deterministic) values. Data outputs are defined as probabilistic distributions, rather than one static value, to incorporate uncertainty into the decision-making process.

A general description of the model can be found in the Knight Piesold report *Slate Creek Lakes Tailings Storage Facility Report on Water Quality Modeling and Conceptual Closure Plan* (2002).

B. Model Outputs

The @Risk model generates a variety of outputs that are useful to the decision-making process. Each of these outputs is presented on a monthly basis as the expected value from the distribution points selected for modeling under the Monte Carlo process. The greater the number of model iterations, the more likely the expected value will equal the mean of the resulting distribution. More important, the user can evaluate the probability (or likelihood) of each calculated result. For example, the user can go into the model output and determine the maximum 95th percentile precipitation event across 10 years. The phrase “maximum 95th percentile” is used because each month within each year has its own Monte Carlo distribution. The maximum 95th percentile event would be the largest precipitation event over the modeling period.

The output categories of interest include the following:

Pond Size. The model estimates the size of the tailings pond (acre-feet) needed to retain process water, surface water, and precipitation. Pond size can vary significantly depending on precipitation.

Parameter Concentrations. The model estimates TSF concentrations for chemical constituents with WQBELs in the draft NPDES permit (except aluminum). Nitrate is considered separately. As discussed in Section 4.6 of the Final SEIS, nitrate levels have been predicted to be low based on continued implementation of blasting best management practices (BMPs). Discharge concentrations are a function of geochemistry, hydrologic scenario, and operating parameters. The user is able to see both the expected value after *x* iterations and detailed probability data for each parameter.

C. *Production Inputs*

Table 1 presents the expected parameters for tailings and tailings slurry generated at the mill. These values, while consistent with the available Kensington documents, would exceed the capacity of the TSF. The TSF is designed to hold no more than 60 percent of the tailings generated by the mining operation, assuming 2,042 tons per day over 10 years (Table 1). Thus, 40 percent or more of the tailings will be used to backfill the mine to meet the currently designed capacity of the TSF. The Table 1 tailings parameters, adjusted for 40 percent backfill, are presented in Table 2.

Table 1. Kensington Production Inputs to TSF under the "No Backfill" Scenario

S.G. of solids:	2.79	
S.G. of fluid:	1	
Percent solids:	55.0	by weight
Peak slurry throughput:	440	U.S. gpm
Average slurry throughput:	400	U.S. gpm
Mine life:	10	years
S.G. of slurry:	1.55	
Average solids throughput:	2,042	U.S. ton/day
Average solids throughput:	745,504	U.S. ton/year
Average fluid throughput:	279	U.S. gpm
Avg. dry density yr. 1:	65	pcf
Avg. dry density yr. 6+:	70	pcf
Total tailings volume:	213,000,000	ft^3
Total tailings tonnage:	7,455,000	tons

Table 2. Kensington Production Inputs to TSF under the "40 Percent Backfill" Scenario

S.G. of solids:	2.79	
S.G. of fluid:	1	
Percent solids:	55.0	by weight
Peak slurry throughput:	266	U.S. gpm
Average slurry throughput:	242	U.S. gpm
Mine life:	10	years
S.G. of slurry:	1.55	
Average solids throughput:	1,236	U.S. ton/day
Average solids throughput:	451,030	U.S. ton/year
Average fluid throughput:	169	U.S. gpm
Avg. dry density yr. 1:	65	pcf
Avg. dry density yr. 6+:	70	pcf
Total tailings volume:	128,857,000	ft^3
Total tailings tonnage:	4,510,000	tons

Consistent with 40 CFR Part 440 Subpart J, EPA Region 10 initially determined that TSF water recycling is required as part of the NPDES approval process. Coeur modified aspects of its plan of operations, as described below, to incorporate TSF water recycling.

Tailings from the flotation circuit would be pumped to the tailings thickener tank, where process water will be recovered and recycled back into the milling circuit. These thickened tailings would be sent from the thickener tank to an agitator tank, and then flow by gravity through a 3.5-mile pipeline to the TSF. Tailings will be placed into the TSF, where settling would occur. Process water associated with the tailings slurry will either remain entrained in the tailings, slowly releasing as consolidation occurs, or mix with pond water.

The @Risk model is set up to allow alternative TSF operating scenarios including process water recycling and/or backfilling the mine with tailings; both affect the size of the TSF.

The volume of process water recycled can be varied within the model. For example, if average slurry throughput is 354 gallons per minute (gpm) with an average solids content of 55 percent by weight, the water component of the slurry is 247 gpm. If the percent solids decreases to 35 percent, the volume of water in the slurry increases to 297 gpm. A portion of this water is entrained in the tailings and is unavailable for immediate recycle, although some of this water is "squeezed" from the tailings over time under the weight of subsequent tailings and supernatant. The volume of water available for recycle is estimated to range between 67 and 160 gpm, at 55 percent solids. In its NPDES permit application, Coeur indicated a recycle rate of 100 gpm, which has been incorporated into the model.

Under Alternatives B, C, and D, the TSF will discharge to East Fork Slate Creek through outfall 002. Alternative D includes a TSF treatment system with a capacity of 1,200 gpm. For this alternative, the model assumes that this is the maximum TSF discharge volume.

D. Hydrologic Inputs

1. Precipitation

Mean annual precipitation for the study area is 58.3 inches, based on historical records for Eldred Rock (the closest regional station with historic precipitation data). The project site is located at an elevation of approximately 700 feet, so an orographic factor of 1.25 was applied to the Eldred Rock data to obtain the estimated mean annual precipitation value (58.3 inches). The annual total was further divided into mean monthly values, also based on Eldred Rock monthly mean precipitation values. Mean monthly values range from a high of 11.02 inches in October to a low of 2.20 inches in June (Table 3). Variations from year to year are represented by coefficients of variation ranging from 0.5 to 1.0, which are reflected in monthly standard deviations. The 5th and 95th percentile precipitation values (Table 3) were calculated from @Risk Monte Carlo sampling, after 100 iterations. The Probable Maximum Precipitation (PMP) event of about 17 inches in 24 hours is not included in the model; however, this large event would be handled with the dam freeboard.

For the @RISK model, Knight Piesold defined monthly precipitation distributions according to the mean monthly precipitation and standard deviation. The monthly distributions used in the model are truncated normal distribution type, with the lower bound set at zero. According to Knight Piesold (2002), this approach provided a reasonable fit to the historical monthly Eldred Rock precipitation values.

Table 3. Precipitation, Surface Runoff Data, and @Risk Model Inputs

Description	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Precipitation[a]	Inches (mean)	11.02	6.80	5.36	4.05	4.83	3.33	2.61	3.02	2.20	3.07	4.54	7.47	58.3
	% Annual	18.9	11.7	9.2	6.9	8.3	5.7	4.5	5.2	3.8	5.3	7.8	12.8	100
	5th % (inches)	5.8	3.5	2.6	1.9	2.4	1.6	1.4	1.5	1.2	1.6	2.4	3.9	
	95th % (inches)	16.6	10.2	7.8	6.0	7.2	5.0	3.9	4.4	3.4	4.6	6.8	11.1	
Runoff[b]	Inches	7.86	5.34	2.34	2.24	2.01	2.00	3.75	8.49	6.81	4.29	5.54	7.64	58.3
	% Annual	13.5	9.2	4.0	3.8	3.4	3.4	6.4	14.6	11.7	7.4	9.5	13.1	100.0
	% Precip	71.4	78.5	43.6	55.2	41.6	60.1	143.6	281.1	309.7	139.6	121.9	102.3	100.0
Model inputs														
Precipitation – mean	Inches	11.02	6.80	5.36	4.05	4.83	3.33	2.61	3.02	2.20	3.07	4.54	7.47	
Precipitation – st dev	Inches	3.306	2.046	1.608	1.206	1.452	0.996	0.786	0.909	0.666	0.927	1.365	2.238	
Rainfall runoff	% Precip	75	75	45	45	45	60	100	100	100	100	100	100	
Snow pack	% Precip	25	25	55	55	55	40							
Snow pack runoff	% Snowpack							10.0	40.0	35.0	10.0	5.0		

[a] Precipitation distribution derived from Knight Piesold (2002). It is based on historical records for Eldred Rock.
[b] Runoff distribution based on historical records for Auke Creek at Auke Bay. This is a regional station with similar elevation and annual runoff.

Monthly precipitation is the only stochastic hydrologic parameter. The remaining hydrologic inputs are deterministic values.

For each of the model iterations, @Risk selects 120 monthly precipitation values (one for each month over the 10-year project period) from the user-defined monthly precipitation distributions. At the conclusion of each model run, @Risk generates an expected value for each month's total precipitation, in inches. The expected value is approximately the mean of the values selected from the distribution during the Monte Carlo simulations. As the number of iterations increases, the average solution (the mean of the described distribution[s]) provides an approximate solution to the problem. The advantage of Monte Carlo simulation lies in the fact that the user can review all selected values and the probability of occurrence for each of these values. Thus, the user can review the behavior of the TSF under high, low, and average precipitation events and, if desired, can evaluate the influence of changes in multiple variables simultaneously.

2. Evaporation

Mean annual evaporation for the project area is estimated to be 17.1 inches (Knight Piesold, 1990). Approximately 80 percent of the total annual evaporation occurs in May, June, July, and August; 20 percent in each month. The remaining 20 percent annual evaporation is divided between April and September. Evaporation does not occur from October through March. Evaporation is used in the water balance model only for the TSF surface. Therefore, the model calculates an evaporative water loss from the TSF for April through September.

3. Snowpack

Mean annual snowpack accumulation is estimated to be 13.62 inches water equivalent, which is included in the annual precipitation rate of 58.3 inches (Knight Piesold, 2002). Snow accumulates in the project area from October through March. Percent snowpack for total precipitation values by month ranges from 25 percent in October and November, to 55 percent in December, January, and February (Table 3).

4. Runoff

Knight Piesold (2002) used regional precipitation and runoff records to estimate the quantity of local precipitation-related runoff. Data from Auke Creek/Bay (30 miles south of the project area) were determined to be the most suitable for runoff estimates. The Auke Creek/Bay data suggest that annual precipitation at the basin's outlet can provide a reasonable approximation of unit runoff from the basin. Increases in higher elevation precipitation would likely be offset by evapotranspiration losses and deep ground water recharge. Therefore, for the proposed TSF, mean annual runoff would approximately equal the mean annual precipitation of 58.3 inches at the outlet of Lower Slate Creek Lake.

Monthly runoff patterns differ from monthly precipitation patterns because snow accumulates during the winter months and melts in the spring and summer months. Rainfall runoff percentages range from 45 percent in December, January, and February, to 100 percent in April through September (Table 3). Snow pack runoff occurs from April through August, ranging from 5 percent in August to 40 percent in May. As a result, total runoff exceeds 100 percent of monthly precipitation in the period of April through August when snowmelt occurs. Runoff still accounts for about 40 to 70 percent of total monthly precipitation during winter months.

For Alternative B, the model assumes no diversions around the TSF. For Alternative C, the model assumes that all runoff from the 378-acre Upper Slate Lake catchment area and 95 acres around the TSF will be diverted in open channels. For Alternative D, the model assumes that all runoff from the 378-acre Upper Slate Lake catchment area will generally be diverted around the TSF by pipeline. Undiverted runoff from 95 acres around the TSF will commingle with tailings water.

5. Stream Flow

Mean monthly flow values were used in the water balance model for both East Slate Creek and West Slate Creek. These flow rates were estimated using monthly unit runoff rates (rainfall and snow pack) for the given catchment areas. This was the only flow estimation method possible because of the lack of historical flow measurement records for the creeks. Mean monthly stream flow for East Slate Creek, below the TSF outfall, ranges from about 530 to 3,470 gpm, or 1.2 to 7.7 cubic feet per second (cfs) (Knight Piesold, 2002).

Because of the distribution of precipitation values used for each month in the @RISK model, stream flow values will vary across the range of precipitation values used to calculate runoff per unit area. As such, both high and low stream flow values are incorporated into the model results, not just mean monthly values.

6. Conclusion

By incorporating a probabilistic approach whereby monthly distributions of probable precipitation values were used for the @RISK model, model results allow a water balance to be calculated based on all probable combinations of monthly precipitation conditions (i.e., low and high values). The many combinations of precipitation values in the distributions are then used in the model to calculate runoff conditions into and out of the TSF.

E. Geochemistry Inputs

Tailings placed into the TSF during operation of the Kensington mine will interact with inflowing runoff and the standing column of water. Predictions of water quality for the TSF must therefore address the potential for sulfide oxidation (with associated acid formation) and trace element release through dissolution and desorption of constituents from the tailing. All the geochemical characterization data available for Kensington tailings have been reviewed to facilitate identification of appropriate inputs for Slate Creek TSF water quality model development. Documents reviewed include the following:

- Geochemica/Kensington Venture (1994), Geochemical Characterization Report.
- Kensington Venture (1994), Ore Characterization Report.
- Coeur Alaska (1996), Geochemical Character of the Kensington Gold Deposit.
- Montgomery Watson (1996), Coeur Alaska, Inc. Kensington Mine Project: Rougher Tailings Characterization report.
- SRK (1996), Review of Development Rock, Ore, and Tailings Characterization Testing, Kensington Gold Project.
- SAIC (1997), Technical Resource Document for Water Resources.
- Montgomery Watson (1998), Kensington Pilot Testing Result memo to E. Klepfer (Coeur) from Ed Cryter (MW), 12/23/98.
- Colorado Mineral Research Institute (1998), Kensington Mine Flotation and Leaching Studies.
- Rescan (2000), Tailings Reactivity Study.

- Maxim Technologies (2000), Comparison of Particle Size Distributions, Mineral Compositions, and Chemical Compositions between Kensington Mine Tailings and Lynn Canal Sediment.
- Knight Piesold (2001), Coeur Alaska Inc. Kensington Project: Slate Creek Lakes Tailings Storage Facility Conceptual Design and Water Balance (Ref. No. 31328/12-2).
- Knight Piesold (2002), Coeur Alaska Inc. Kensington Project: Slate Creek Lakes Tailings Storage Facility Report on Water Quality Modeling and Conceptual Closure Plan (Ref. No. VA101-00020/1-1).

Efforts to compare and integrate data from the various testing programs raised the question of whether the ore used to generate the tailings for each set of analyses was comparable between tests. The Forest Service also reviewed whether the ore samples were representative of the overall ore body and if the chemistry of tailings generated in different metallurgical studies was consistent between tests.

1. Review of Ore Sampling and Metallurgical Studies

Three bulk ore samples have been collected for metallurgical testing over the life of the Kensington project. Four sets of analyses of these samples have been completed, designated M1 through M4 in Figures 1 through 7. The first bulk sample was collected in 1994 and tested by Degerstrom (results shown as M1) to evaluate cyanidation processing. As cyanidation is no longer proposed, those data are not presented here. The second bulk ore sample was a 3.8-ton composite collected by Lakefield Research, known as Composite B. The composite B sample was composed of quartz-carbonate veins and pyritic mineralization excavated from Crosscut II, on the 1,150 elevation, in zones 10, 20, and 41. This composite generated tailings and process water samples that were analyzed first by Degerstrom in 1995 (M2) and later by Montgomery Watson and SRK (M3) in 1996 (Montgomery Watson, 1996; SRK, 1996). The specific whole rock digestion used in the M2 analysis is not known but is obviously a more complete (i.e., four-acid) digestion than the USEPA method 3051 digestion used for the M3 analyses. The gold assay, whole rock metal and sulfur geochemistry of the ore composites, and the tailings are described in Tables 4 and 7 based on the 1996 M3 analyses. The five batches of tailings that were analyzed were generated in separate batches, and process water was not recycled.

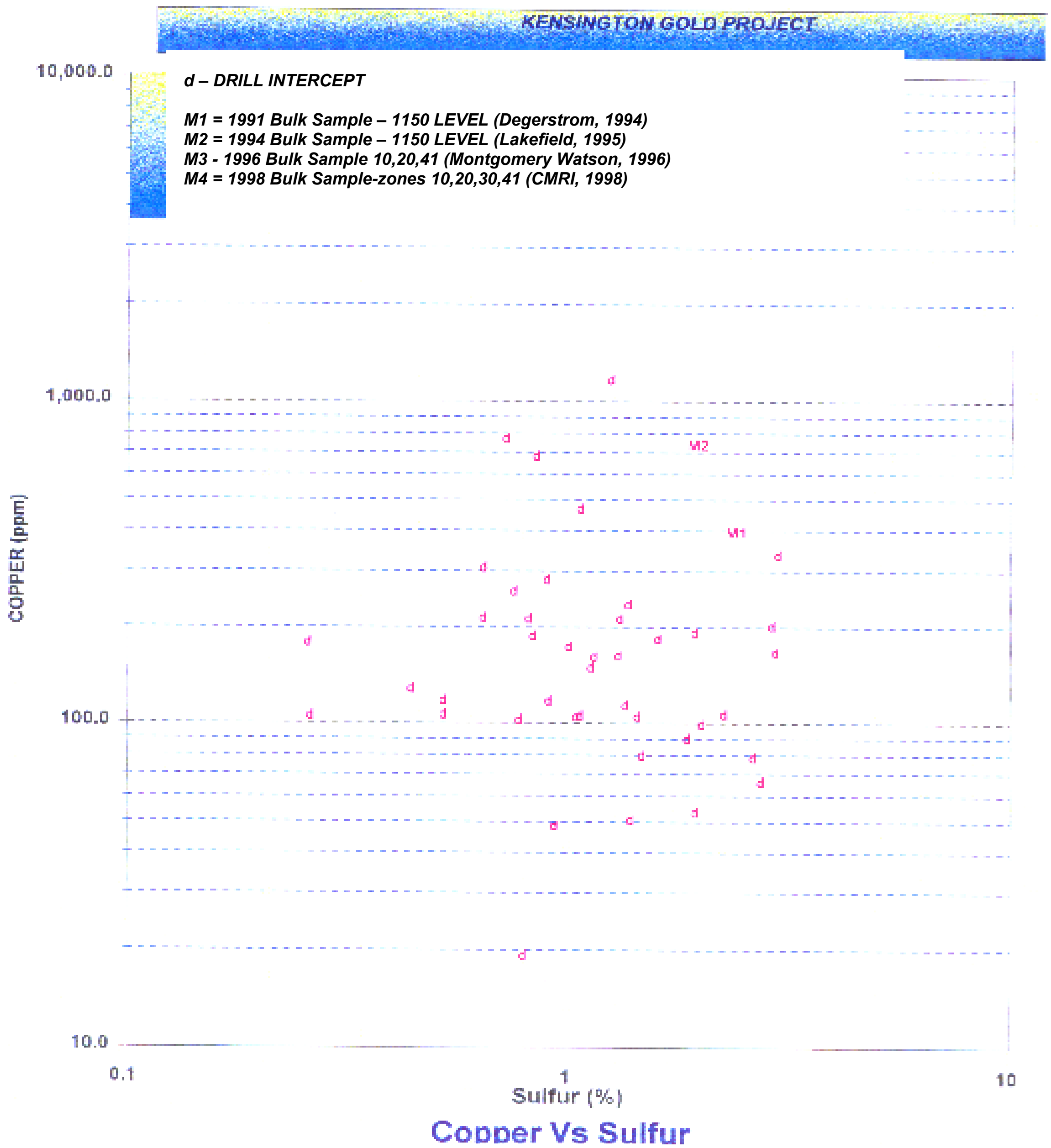


Figure 1

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

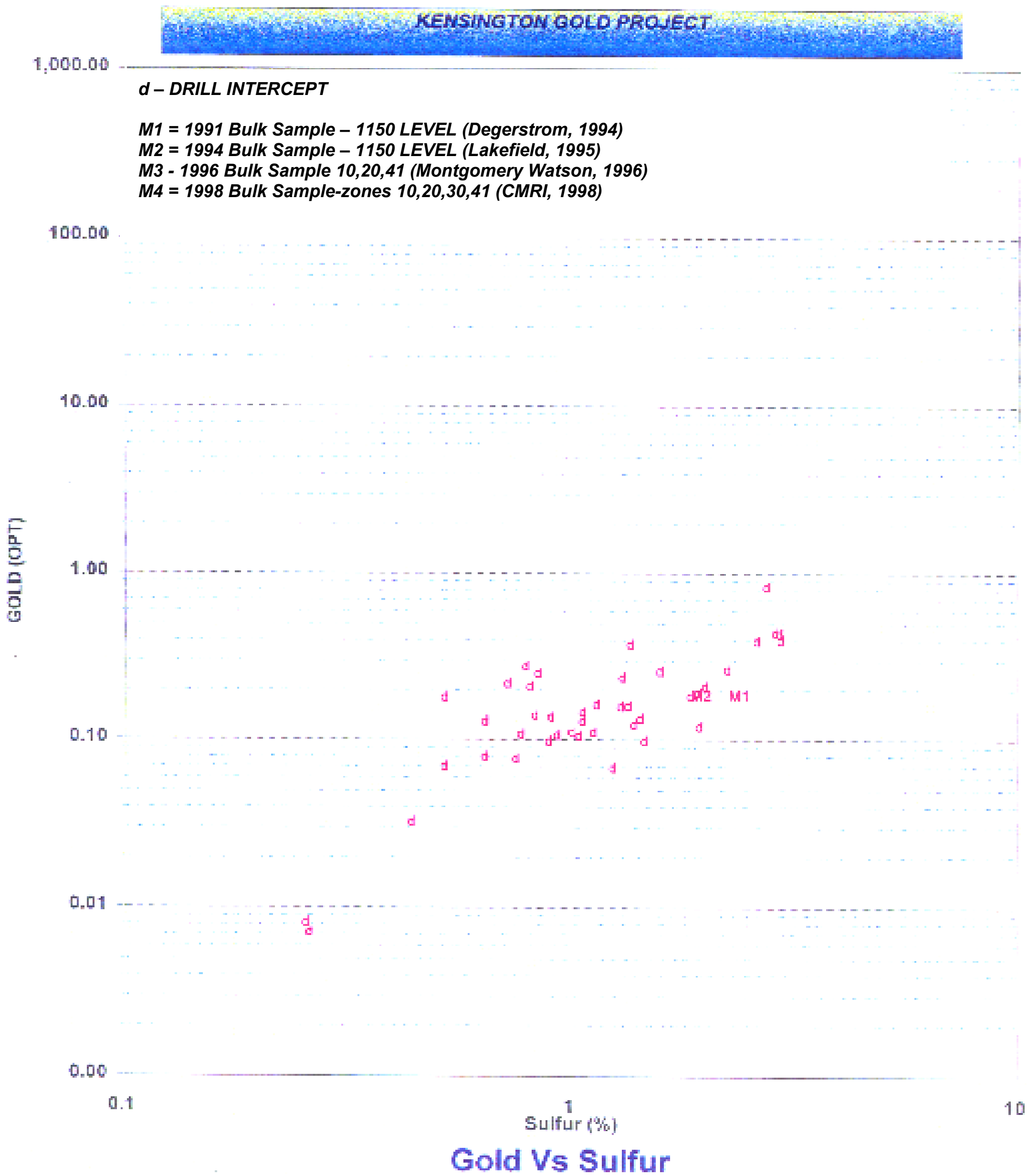


Figure 2

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

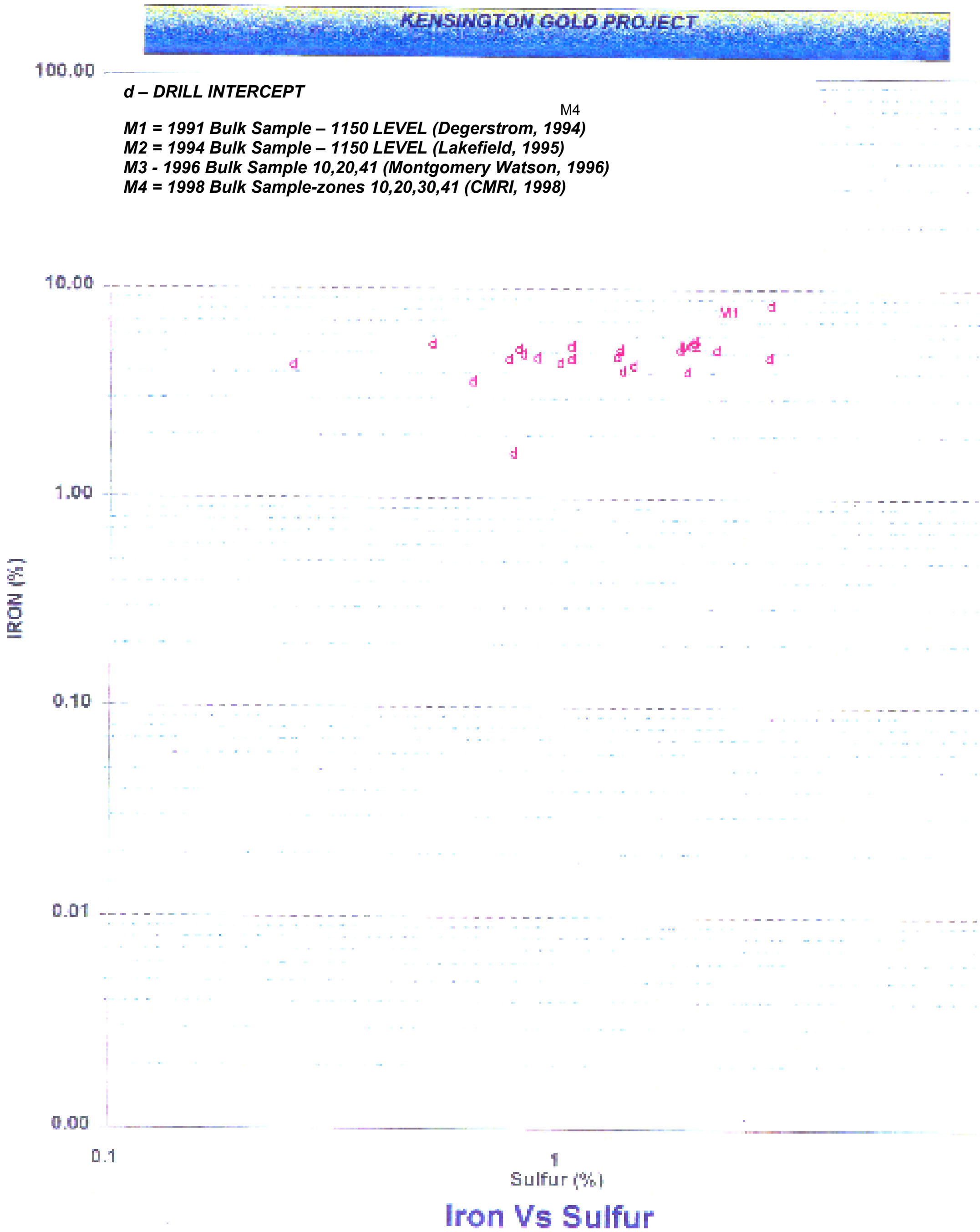


Figure 3

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

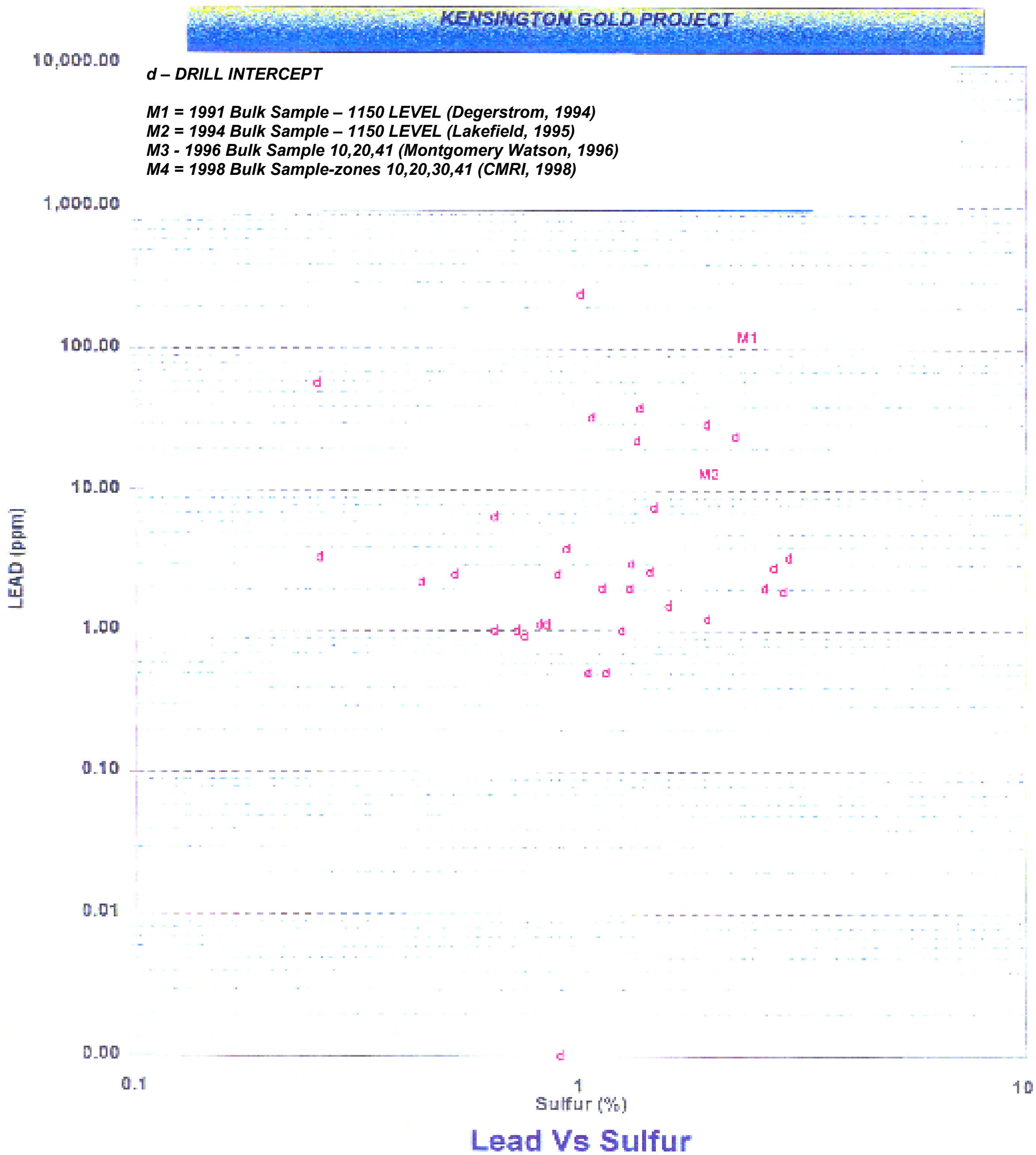


Figure 4

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

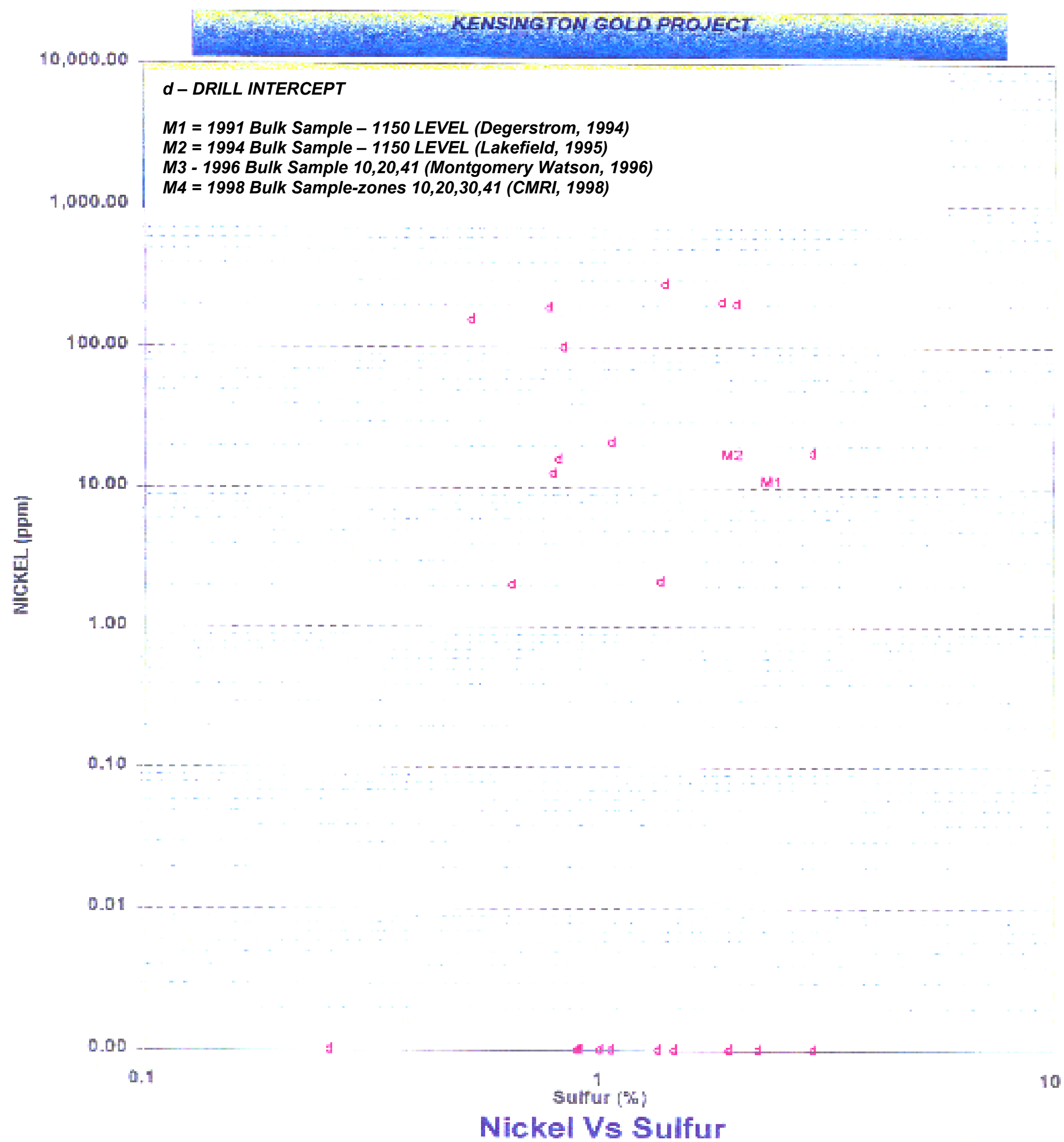


Figure 5

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

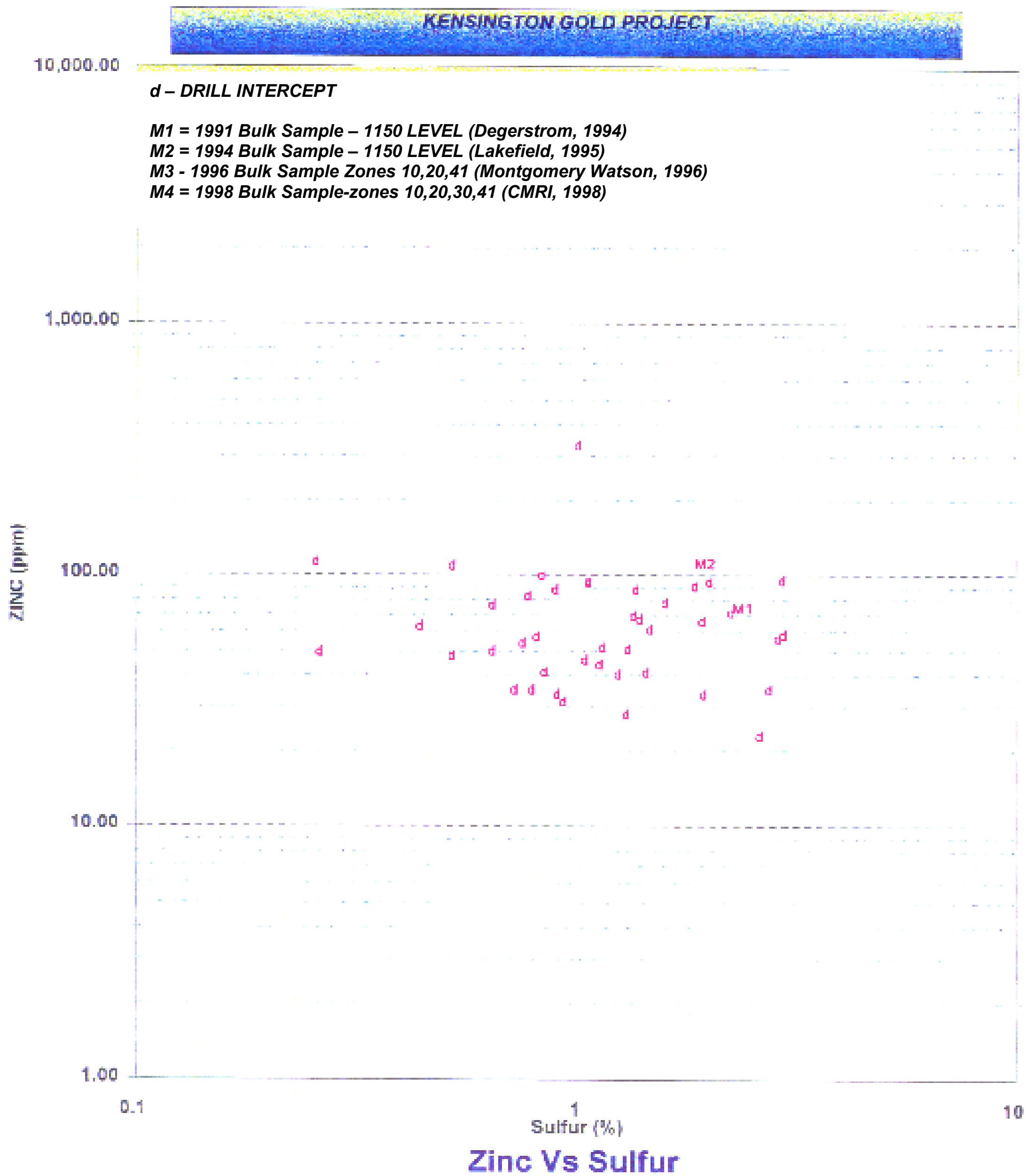


Figure 6

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

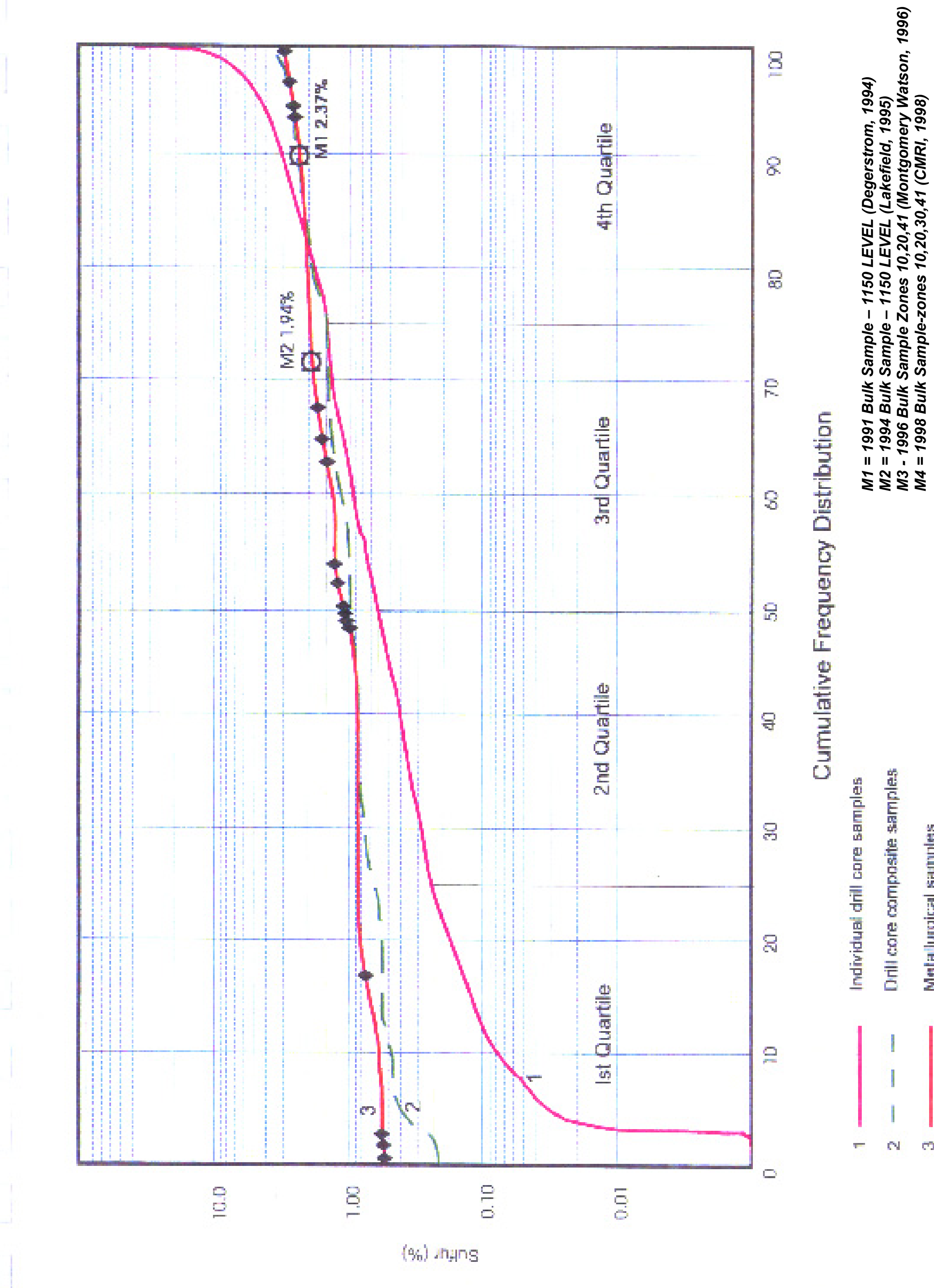


Figure 7

After Coeur, 1996,
Geologic Character of the Kensington Gold Deposit

A third bulk sample made up of 3.7 tons of rock collected from zones 10, 20, 30, and 41 underwent flotation at the Colorado Mineral Research Institute (CMRI) in 1998. Roughly 1 ton of the sample underwent flotation in five 400-pound batches, between which process water was recycled. Whole rock analyses conducted by CMRI are shown as M4 in Figures 1 through 7. The digestion method for these whole rock analyses reported by CMRI is also not known. The whole rock metal and sulfur geochemistry of the ore composite and the tailings from the CMRI analysis (M4) are described in Tables 5 and 8. The gold grade was measured for each batch independently. A subsample collected from a single process cycle was analyzed by Rescan. Knight Piesold used results of this analysis for mass load modeling purposes, as described in Table 6.

Additional whole rock analyses for tailings samples are reported by Maxim (2000) based on digestions using methods 3050 and 3052. No ore analyses were reported, however, and so these results have not been summarized here.

The 1997 Final Kensington Mine Project SEIS relied on the 1996 M3 whole rock data reported by Montgomery Watson and SRK. These have been updated with the 1998 CMRI results (M4). The Forest Service's review of these two sets of data leads to the conclusion that the ore composites were representative of the ore to be mined, based on three key findings.

- Both samples were collected in a spatially and lithologically representative fashion from the main ore zones 10, 20, and 41. The primary difference is that the M3 sample, collected on the 1,150 level, would not have contained ore from zone 30 that is included in M4, because that zone occurs above the 2,050 elevation and so would not have been accessible from the 1,150 level workings during the 1995 sampling event.
- The whole rock geochemistry of the bulk ore samples used in the 1996 and 1998 samples is generally comparable, as summarized in Figures 1 to 6. The specific digestion method used by CMRI to digest the ore sample for whole rock analysis is not known, but is inferred to be the more complete four-acid digestion, as this is a more common method for metallurgical analysis. The 1998 whole rock data for tailings presented in Table 1 are from a four-acid digestion; an aqua-regia digestion is also reported by Rescan, but not included in this summary. The 1998 M4 bulk ore sample had very similar gold and lead concentrations, higher iron content, and slightly lower copper, zinc, and nickel content than the 1996 M3 sample. The gold values reported for both samples are very close to the reported deposit-wide average of 0.16 opt.
- Total sulfur content was also somewhat lower in M4, but like the M3 sample plotted in the third quartile of the sulfur distribution for individual and composite drill samples as shown in Figure 7. *Samples M3 and M4 both plot in the upper third of the sulfur and metal distributions and conservatively represent the range of trace element geochemistry in the Kensington deposit.*

Table 4. Dissolved Whole Rock Metal and Sulfur Geochemistry, M3 Sample

	M3	MONTGOMERY WATSON - LAKEFIELD 1994–1996				
Parameter	**MW 96 (detection limit)**	**MW96 C1 24 hr**	**MW96 C2 24 hr**	**MW96 C3 24 hr**	**MW96 C4 24 hr**	**MW96 C5 24 hr**
Met. lab name		**Lakefield**	**Lakefield**	**Lakefield**	**Lakefield**	**Lakefield**
Anal. lab name		**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**
Process		**Batch**	**Batch**	**Batch**	**Batch**	**Batch**
Date test	**1996**	**1996**	**1996**	**1996**	**1996**	**1996**
No. samples		**1**	**1**	**1**	**1**	**1**
Composite		**3.8 ton**	**3.8 ton**	**3.8 ton**	**3.8 ton**	**3.8 ton**
Aluminum (µg/L)	500	<500	<500	<500	<500	<500
Arsenic (µg/L)	0.5	0.491	0.601	0.943	0.899	0.778
Copper (µg/L)	**2**	**<2**	**<2**	**<2**	**<2**	**<2**
Iron (µg/L)	50	<50	<50	<50	<50	<50
Lead (µg/L)	2	<2	<2	<2	<2	<2
Mercury (µg/L)	0.00001	0.00818	0.00445	0.00301	0.00298	0.0033
Nickel (µg/L)	10	**<10**	**<10**	**<10**	**<10**	**<10**
Selenium (µg/L)	0.001	0.768	0.948	1.05	1.17	1.05
Silver (µg/L)	0.008	**<0.008**	**<0.008**	**<0.008**	**<0.008**	**<0.008**
Zinc (µg/L)	10	15	13	13	13	12
Ammonia (µg/L)	50	2,800	3,800	4,100	4,500	4,600
Nitrate (mg/L)	500	19,800	28,000	33,000	35,000	36,000
TDS (mg/L)		**470**	**650**	**710**	**730**	**810**
TSS, mg/L	4	<4	6	<4	<4	<4
NTU, lab		nd	nd	nd	nd	nd
SO_4, field	1	**198**	**280**	**310**	**330**	**330**
TOC		nd	nd	nd	nd	nd
pH, field		**nd**	**nd**	**nd**	**nd**	**nd**
pH, lab	**0.01**	**8.1**	**8**	**8.1**	**8.2**	**8.1**
Eh, field		nd	nd	nd	nd	nd
Hardness		**210**	**260**	**290**	**310**	**320**
Sample Zones		10, 20, 41	10, 20, 41	10, 20, 41	10, 20, 41	10, 20, 41
WHOLE ROCK ORE DATA		MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1
Ore digestion		3,051	3,051	3,051	3,051	3,051
Ore total S		**1.83**	**1.83**	**1.83**	**1.83**	**1.83**
Ore total sulfide		1.74	1.74	1.74	1.74	1.74
Ore total Au, opt		**0.155**	**0.155**	**0.155**	**0.155**	**0.155**
Ore Cu, ppm		**254**	**254**	**254**	**254**	**254**
Ore Fe, ppm		45,000	45,000	45,000	45,000	45,000
Ore Pb, ppm		26	26	26	26	26
Ore Hg, ppb		76	76	76	76	76
Ore Mn, ppm		1,351	1,351	1,351	1,351	1,351
Ore Ni, ppm		7	7	7	7	7
Ore Zn, ppm		64	64	64	64	64
WHOLE ROCK TAILS DATA		MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1
Tails digestion		3,051	3,051	3,051	3,051	3,051
Tails tot S, %		**0.04**	**0.04**	**0.04**	**0.04**	**0.04**
Tails Cu, ppm		**30**	**30**	**30**	**30**	**30**
Tails Fe, ppm		31,000	31,000	31,000	31,000	31,000
Tails Pb, ppm		25	25	25	25	25
Tails, Hg ppb		58	58	58	58	58
Tails Mn, ppm		1,286	1,286	1,286	1,286	1,286
Tails Ni, ppm		6	6	6	6	6
Tails Zn, ppm		55	55	55	55	55

Table 5. Dissolved Whole Rock Metal and Sulfur Geochemistry, M4 Sample

Parameter	CMRI 1998 (detection limit)	M4 CMRI D2 DUPLICATES C2	CMRI (1998) CMRI C2 Leach Decant Water	CMRI C3 Leach Decant Water	CMRI C4 Leach Decant Water	CMRI C5 Leach Decant Water	Kensington Mine Water 1998
Met. lab name		**CMRI**	**CMRI**	**CMRI**	**CMRI**	**CMRI**	**CMRI**
Anal. lab name		**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**
Process		**Recycle**	**Recycle**	**Recycle**	**Recycle**	**Recycle**	**Adit**
Date test		**1998**	**1998**	**1998**	**1998**	**1998**	**9/18/1998**
No. samples		**1**	**1**	**1**	**1**	**1**	**1**
Composite		**3.7 ton**	**3.7 ton**	**3.7 ton**	**3.7 ton**	**3.7 ton**	**grab**
Aluminum (µg/L)	250	3,200	3,100	2,200	3,200	660	3,200
Arsenic (µg/L)	0.02	<2	<2	<2	<2	<2	<2
Copper (µg/L)	2	**0.0795**	**0.0925**	**0.255**	**0.286**	**0.524**	**7.1**
Iron (µg/L)	50	<10	<10	<10	<10	<10	<10
Lead (µg/L)	2	0.676	1.16	<0.08	<0.08	<0.08	<0.5
Mercury (µg/L)	0.00005	**0.0196**	**0.0280**	**0.0129**	**0.0204**	**0.0309**	<0.2
Nickel (µg/L)	**10**	**5.96**	**6.7**	**3.82**	**4.15**	**3.55**	19
Selenium (µg/L)	0.05	2.49	2.79	<2	2.81	2.00	<5
Silver (µg/L)	**0.008**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.5**
Zinc (µg/L)	10	71.7	75.7	10.3	6.9	3.8	11
Ammonia (µg/L)	50	1,010	950	900	1,050	860	<0.05
Nitrate (mg/L)	0.1, 0.3, 0.5	4.1	4.1	4.8	5.6	4.0	0.31
TDS (mg/L)	**20**	**990**	**1,000**	**900**	**1,160**	**1,000**	**460**
TSS, mg/L	4	6	5	240	110	70	<4
NTU, lab	0.2	46	88	200	19	24	<0.1
SO_4, field	**2,6,10**	**710**	**710**	**680**	**770**	**550**	**280**
TOC		32.9	31.6	43.2	42.5	33.5	
pH, field	**0.001**	**10.3**	**10.5**	**10.2**	**10.25**	**10.3**	**7.45**
pH, lab		**10.7**	**10.7**	**10.5**	**11**	**11.1**	**7.8**
Eh, field		-43	-38	-62	-60	-43	211
Hardness	**10**	**707**	**658**	**583**	**654**	**524**	**349**
Sample zones		10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	
WHOLE ROCK ORE DATA		CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	
Ore digestion		Unknown	Unknown	Unknown	Unknown	Unknown	
Ore total S		**1.34**	**1.34**	**1.34**	**1.34**	**1.34**	
Ore total sulfide		nd	Nd	nd	nd	nd	
Ore total Au, opt		**0.176⁺**	**0.176⁺**	**0.171⁺**	**0.187⁺**	**0.160⁺**	
Ore Cu, ppm		**326**	**326**	**326**	**326**	**326**	
Ore Fe, ppm		48,100	48,100	48,100	48,100	48,100	
Ore Pb, ppm		10	10	10	10	10	
Ore Hg, ppb		nd	nd	nd	nd	nd	
Ore Mn, ppm		1,560	1,560	1,560	1,560	1,560	
Ore Ni, ppm		6	6	6	6	6	
Ore Zn, ppm		70.6	70.6	70.6	70.6	70.6	

Table 5. Dissolved Whole Rock Metal and Sulfur Geochemistry, M4 Sample (continued)

Parameter	CMRI 1998 (detection limit)	M4 CMRI D2 DUPLICATES C2	CMRI (1998) CMRI C2 Leach Decant Water	Parameter	CMRI 1998 (detection limit)	M4 CMRI D2 DUPLICATES C2	CMRI (1998) CMRI C2 Leach Decant Water
WHOLE ROCK TAILS DATA		Rescan, 2000	Rescan, 2000	Rescan, 2000	Rescan, 2000	Rescan, 2000	
Tails digestion		4 acid	4 acid	4 acid	4 acid	4 acid	
Tails tot S, %		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	
Tails Cu, ppm		**27**	**27**	**27**	**27**	**27**	
Tails Fe, ppm		31,600	31,600	31,600	31,600	31,600	
Tails Pb, ppm		6	6	6	6	6	
Tails, Hg ppb		10	10	10	10	10	
Tails Mn, ppm		14,000	14,000	14,00	14,000	14,000	
Tails Ni, ppm		32	32	32	32	32	
Tails Zn, ppm		54	54	54	54	54	

Table 6. Dissolved Whole Rock Metal and Sulfur Geochemistry, Rescan and Knight Piesold Sample

	Rescan	**KP DATA**	**2000–2002**
Parameter	**Rescan (detection limit)**	**CMRI 98 Rescan Process Water**	**KP 2002**
Met. lab name		CMRI	
Anal. lab name		ASL	
Process		1998	
Date test		CYCLE 3 ONLY	
No. samples		1	
Composite		3.7 ton	
Aluminum (µg/L)	10	600	600
Arsenic (µg/L)	0.1	0.2	0.2
Copper (µg/L)	1	30	30
Iron (µg/L)	30	<30	<30
Lead (µg/L)	10	<10	<10
Mercury (µg/L)	0.05	<0.05	<0.05
Nickel (µg/L)	1	<1	<1
Selenium (µg/L)	0.5	1.6	1.6
Silver (µg/L)	0.1	0.2	0.2
Zinc (µg/L)	5	<5	<5
Ammonia (µg/L)		NA	NA
Nitrate (mg/L)	0.005	4.83	4.83
TDS (mg/L)			1000
TSS, mg/L			240
NTU, lab			
SO_4, field	1	730	730
TOC			
pH, field	0.01	9.68	7.5
pH, lab	0.01		
Eh, field			
Hardness			473?
Sample zones		10, 20, 30, 41	10, 20, 30, 41
WHOLE ROCK ORE DATA		CMRI 1998, Tab 5	CMRI 1998, Tab 5
Ore digestion		Unknown	Unknown
Ore total S		1.34	1.34
Ore total sulfide		nd	nd
Ore total Au, opt		0.169	0.169
Ore Cu, ppm		326	326
Ore Fe, ppm		48,100	48,100
Ore Pb, ppm		10	10
Ore Hg, ppb			
Ore Mn, ppm		1,560	1,560
Ore Ni, ppm		6	6
Ore Zn, ppm		70.6	70.6

Table 6. Dissolved Whole Rock Metal and Sulfur Geochemistry, Rescan and Knight Piesold Sample (continued)

	Rescan	**KP DATA**	**2000–2002**
Parameter	**Rescan (detection limit)**	**CMRI 98 Rescan Process Water**	**KP 2002**
WHOLE ROCK TAILS DATA		Rescan, 2000	Rescan, 2000
Tails digestion		4 acid	4 acid
Tails tot S, %		0.06	0.06
Tails Cu, ppm		27	27
Tails Fe, ppm		31,600	31,600
Tails Pb, ppm		6	6
Tails, Hg ppb			
Tails Mn, ppm			
Tails Ni, ppm		32	32
Tails Zn, ppm		54	54

Table 7. Total Whole Rock Metal and Sulfur Geochemistry, M3 Sample

		avg	**TSS**	**pH**	**SO_4**		
		16-hr settling time	**7.8**	**8–8.2**	**289.6**		
		24-hr settling time	**2.8**	**8–8.2**	**289.6**		
	M3	***MONTGOMERY WATSON - LAKEFIELD M2 1994–1996***					
Parameter	**MW 96 (detection limit)**	**MW96 C1 24 hr**	**MW96 C2 24 hr**	**MW96 C3 24 hr**	**MW96 C4 24 hr**	**MW96 C5 24 hr**	**1996 NPDES Inputs Decant Water**
Met. lab name		**Lakefield**	**Lakefield**	**Lakefield**	**Lakefield**	**Lakefield**	**Lakefield**
Anal. lab name		**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**
Process		**Batch**	**Batch**	**Batch**	**Batch**	**Batch**	
Date test	**1996**	**1996**	**1996**	**1996**	**1996**	**1996**	**1996**
No. samples		**1**	**1**	**1**	**1**	**1**	**Max of 5 samples**
Composite		**3.8 ton**	**3.8 ton**	**3.8 ton**	**3.8 ton**	**3.8 ton**	**5 composites**
Aluminum (µg/L)	500	<500	<500	<500	<500	<500	<500
Arsenic (µg/L)	0.5	0.573	0.665	0.553	0.626	0.619	0.76
Copper (µg/L)	**2**	**<2**	**<2**	**<2**	**<2**	**<2**	**< 2**
Iron (µg/L)	50	130	150	62	99	76	50
Lead (µg/L)	2	<2	<2	<2	<2	<2	< 2
Mercury (µg/L)	**0.00001**	**0.0009**	**0.00495**	**0.00483**	**0.00324**	**0.00339**	**0.0109**
Nickel (µg/L)	**10**	**<10**	**<10**	**<10**	**<10**	**<10**	**< 10**
Selenium (µg/L)	0.001	0.871	1.03	0.787	1.13	1.23	1.23
Silver (µg/L)	**0.008**	**<0.008**	**<0.008**	**0.0158**	**0.00804**	**<0.008**	**< 0.008**
Zinc (µg/L)	10	<10	<10	<10	<10	<10	< 10
Ammonia (µg/L)	50	2,800	3,800	4,100	4,500	4,600	4,600
Nitrate (mg/L)	500	19,800	28,000	33,000	35,000	36,000	36
TDS (mg/L)		470	650	710	730	810	810
TSS, mg/L	**4**	**<4**	**6**	**<4**	**<4**	**<4**	**28**
NTU, lab		**nd**	**nd**	**nd**	**nd**	**nd**	**nd**
SO_4	**1**	**198**	**280**	**310**	**330**	**330**	**330**
TOC		nd	nd	nd	nd	nd	nd
pH, field		**nd**	**nd**	**nd**	**nd**	**nd**	**nd**
pH, lab	**0.01**	**8.1**	**8**	**8.1**	**8.2**	**8.1**	**8.1**
Eh, field		nd	nd	nd	nd	nd	nd
Hardness	**10**	**210**	**260**	**290**	**310**	**320**	**nd**
Sample zones		10, 20, 41	10, 20, 41	10, 20, 41	10, 20, 41	10, 20, 41	10, 20, 41
WHOLE ROCK ORE DATA		MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1
Ore digestion		3,051	3,051	3,051	3,051	3,051	3,051
Ore total S		**1.83**	**1.83**	**1.83**	**1.83**	**1.83**	**1.83**
Ore total sulfide		1.74	1.74	1.74	1.74	1.74	1.74
Ore total Au, opt		**0.155**	**0.155**	**0.155**	**0.155**	**0.155**	**0.155**
Ore Cu, ppm		**254**	**254**	**254**	**254**	**254**	**254**
Ore Fe, ppm		45,000	45,000	45,000	45,000	45,000	45,000
Ore Pb, ppm		26	26	26	26	26	26
Ore Hg, ppb		76	76	76	76	76	76
Ore Mn, ppm		1,351	1,351	1,351	1,351	1,351	1,351
Ore Ni, ppm		7	7	7	7	7	7
Ore Zn, ppm		64	64	64	64	64	64

Table 7. Total Whole Rock Metal and Sulfur Geochemistry, M3 Sample (continued)

		avg	**TSS**	**pH**	**SO4**		
		16-hr settling time	**7.8**	**8–8.2**	**289.6**		
		24-hr settling time	**2.8**	**8–8.2**	**289.6**		
	M3	***MONTGOMERY WATSON - LAKEFIELD M2 1994–1996***					
Parameter	**MW 96 (detection limit)**	**MW96 C1 24 hr**	**MW96 C2 24 hr**	**MW96 C3 24 hr**	**MW96 C4 24 hr**	**MW96 C5 24 hr**	**1996 NPDES Inputs Decant Water**
WHOLE ROCK TAILS DATA		MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1	MW, 1996, Tab 1-1
Tails digestion		3051	3051	3051	3051	3051	3051
Tails tot S, %		**0.04%**	**0.04%**	**0.04%**	**0.04%**	**0.04%**	**0.04%**
Tails Cu, ppm		**30**	**30**	**30**	**30**	**30**	**30**
Tails Fe, ppm		31,000	31,000	31,000	31,000	31,000	31,000
Tails Pb, ppm		25	25	25	25	25	25
Tails, Hg ppb		58	58	58	58	58	58
Tails Mn, ppm		1,286	1,286	1,286	1,286	1,286	1,286
Tails Ni, ppm		6	6	6	6	6	6
Tails Zn, ppm		55	55	55	55	55	55

Grade measured for each batch by CMRI; whole rock geochemistry for bulk composite low level metal analyses are not available for adit water.

Table 8. Total Whole Rock Metal and Sulfur Geochemistry, M4 Sample

			Settling time estimated 30 minutes				
	M4	***CMRI (1998)***					
Parameter	**CMRI 1998 (detection limit)**	**CMRI D2 DUPLICATES C2**	**CMRI C2 Leach Decant Water**	**CMRI C3 Leach Decant Water**	**CMRI C4 Leach Decant Water**	**CMRI C5 Leach Decant Water**	**Kensington Mine Water 1998**
Met. lab name		**CMRI**	**CMRI**	**CMRI**	**CMRI**	**CMRI**	**CMRI**
Anal. lab name	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**	**MW/BNL**
Process		**recycle**	**recycle**	**recycle**	**recycle**	**recycle**	
Date test		**1998**	**1998**	**1998**	**1998**	**1998**	**9/18/1998**
No. samples		**1**	**1**	**1**	**1**	**1**	**1**
Composite		**3.7 ton**	**3.7 ton**	**3.7 ton**	**3.7 ton**	**3.7 ton**	**grab**
Aluminum (µg/L)	500	2,700	2,800	3,900	250	1,100	3,200
Arsenic (µg/L)	0.02	<2.0	<2.0	2.1	1.8	2.9	<2
Copper (µg/L)	**2**	**6.95**	**9.97**	**10.2**	**10.7**	**9.05**	**7.1**
Iron (µg/L)	50	3,300	4,000.0	140	1,900	1,500	<10
Lead (µg/L)	2	0.976	1.10	3.81	4.43	2.52	<0.5
Mercury (µg/L)	**0.00005**	**0.0264**	**0.0581**	**0.0506**	**0.0725**	**0.0332**	**<0.2**
Nickel (µg/L)	**10**	**5.88**	**8.12**	**9.18**	**11.8**	**5.81**	**19**
Selenium (µg/L)	0.05	2.96	4.7	2.91	2.56	3.18	<5
Silver (µg/L)	**0.008**	**0.05**	**0.050**	**0.050**	**0.050**	**0.050**	**<0.5**
Zinc (µg/L)	10	75.8	83.5	20.0	23.4	12.7	11
Ammonia (µg/L)	50	1,010	950	900	1,050	860	<0.05
Nitrate (mg/L)	0.1, 0.3, 0.5	4.1	4.1	4.8	5.6	4.0	0.31
TDS (mg/L)	20	**990**	**1,000**	**900**	**1,160**	**1,000**	**460**
TSS, mg/L	**4**	**6**	**5**	**240**	**110**	**70**	**<4**
NTU, lab	**0.2**	**46**	**88**	**200**	**19**	**24**	**<0.1**
SO_4	**2,6,10**	**710**	**710**	**680**	**770**	**550**	**280**
TOC		32.9	31.6	43.2	42.5	33.5	nd
pH, field	**0.001**	**10.3**	**10.5**	**10.2**	**10.25**	**10.3**	**7.45**
pH, lab	**0.001**	**10.7**	**10.7**	**10.5**	**11**	**11.1**	**7.8**
Eh, field		-43	-38	-62	-60	-43	211
Hardness	**10**	**707**	**658**	**583**	**654**	**524**	**349**
Sample zones		10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	10, 20, 30, 41	adit
WHOLE ROCK ORE DATA		CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	CMRI 1998, Tab 5	
Ore digestion		Unknown	Unknown	Unknown	Unknown	Unknown	
Ore total S		**1.34**	**1.34**	**1.34**	**1.34**	**1.34**	
Ore total sulfide		nd	nd	nd	nd	nd	
Ore total Au, opt		**0.176**[+]	**0.176**[+]	**0.171**[+]	**0.187**[+]	**0.160**[+]	
Ore Cu, ppm		**326**	**326**	**326**	**326**	**326**	
Ore Fe, ppm		48,100	48,100	48,100	48,100	48,100	
Ore Pb, ppm		10	10	10	10	10	
Ore Hg, ppb		nd	nd	nd	nd	nd	
Ore Mn, ppm		1,560	1,560	1,560	1,560	1,560	
Ore Ni, ppm		6	6	6	6	6	
Ore Zn, ppm		70.6	70.6	70.6	70.6	70.6	

Table 8. Total Whole Rock Metal and Sulfur Geochemistry, M4 Sample (continued)

			Settling time estimated 30 minutes				
	M4	***CMRI (1998)***					
Parameter	**CMRI 1998 (detection limit)**	**CMRI D2 DUPLICATES C2**	**CMRI C2 Leach Decant Water**	**CMRI C3 Leach Decant Water**	**CMRI C4 Leach Decant Water**	**CMRI C5 Leach Decant Water**	**Kensington Mine Water 1998**
WHOLE ROCK TAILS DATA		Rescan, 2000	Rescan, 2000	Rescan, 2000	Rescan, 2000	Rescan, 2000	
Tails digestion		4 acid	4 acid	4 acid	4 acid	4 acid	
Tails tot S, %		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	
Tails Cu, ppm		**27**	**27**	**27**	**27**	**27**	
Tails Fe, ppm		31,600	31,600	31,600	31,600	31,600	
Tails Pb, ppm		6	6	6	6	6	
Tails, Hg ppb		10	10	10	10	10	
Tails Mn, ppm		14,000	14,000	14,000	14,000	14,000	
Tails Ni, ppm		32	32	32	32	32	
Tails Zn, ppm		54	54	54	54	54	

Grade measured for each batch by CMRI; whole rock geochemistry for bulk composite low-level metal analyses are not available for adit water.

2. Tailings Flotation and Process/Decant Water Sampling

Both sets of flotation tests were conducted using the same metallurgical process, with differences in the recycling of process water and pH adjustment through lime addition. In the 1996 Montgomery Watson tests, two process water chemistry measurements were made for each batch, after 16 hours and 24 hours of settling time. The five analyses of process decant water collected after 24 hours (MW96 C1–C5 24 hr) are summarized in Table 4 for dissolved concentrations and Table 7 for total concentrations.

In the 1998 CMRI/Montgomery Watson work, the process (or decant) water was analyzed for the last four of the five cycles (CMRI C2–C5), for both dissolved and total concentrations (Tables 5 and 8). Unlike the results of the initial 1996 process water testing, concentration of solutes increased with each cycle due to the use of recycling in 1998. Water collected from the Kensington Mine workings for use in the flotation process was also analyzed, as shown in Tables 5, 6, and 8. The 1998 test process was somewhat modified by the use of additional lime to achieve higher pH, as a basis for improving recovery. This resulted in higher hardness concentrations. As pH will be adjusted to optimize recovery and maintain minimum ore grades in concentrates shipped to smelter during mine life, hardness should be expected to vary between 200 and 600 mg/L. For this reason, data generated through analysis of M2 and M3 tailings are both relevant for the TSF evaluation.

Process or decant water samples were collected after tailings were allowed to settle. Unlike the 1996 Montgomery Watson data, which specifically collected decant water following 16 and 24 hours of settling time, no information on the time allowed for precipitation of solids prior to sampling was provided for the 1998 CMRI samples. Decant water was removed by pumping down to 1 inch above the tailings solid after 30 minutes of settling, but it is unclear when decant water samples were actually collected from this initial split. Comparison of the total suspended solids data, which are higher for the majority of the 1998 samples, suggests that decant water samples were collected by CMRI before full settling occurred. If samples were collected in less than 100 minutes, CMRI data indicate that settling would be incomplete. Total analyses of 1998 samples are therefore somewhat conservative, in that they reflect high concentrations of suspended solids that will not be permitted to occur in discharge. As with the predicted variance in hardness, the range of TSS and associated differences in chemistry that are observed between the 1996 and 1998 samples address a range of operational conditions.

Both sets of decant water samples appear to have been collected, filtered, and preserved using the same procedure, and ultraclean technique was used to obtain samples for low-level analysis by Battelle National Laboratories for both data sets (Table 9). Limited quality assurance/quality control (QA/QC) data are available, and some errors in transcription were identified and corrected during data review.

Table 9. Low-Level Copper Data from 1998 CMRI Decant Analyses

Sample Source	Low Level Copper Total (µg/L)	Low Level Copper Dissolved (µg/L)
C2- 9/16/1998	9.97	0.0925
C3- 9/17/1998	10.2	0.255
C4- 9/17/1998	10.7	0.286
C5- 9/18/1998	9.05	0.524

3. Acid Generation Potential

Acid generation is not expected to result from weathering or leaching of tailings from the Kensington Gold Project (Forest Service, 1997 EIS). Current plans involve mining a select, higher-grade portion of the deposit, and so the potential for acid generation was revisited as part of this data review. The relative concentrations of sulfide and acid-neutralizing minerals determine the potential for acid generation. As the majority of metals at Kensington occur in association with sulfide in the vein systems, or as telluride complexes associated with the sulfide minerals, total sulfur is a useful indicator element for metal concentrations as well.

Total sulfur, whole rock geochemistry, and acid base accounting data are available to characterize ore geochemistry across the deposit. The range and average total sulfur content are summarized in Table 10 for the 583 samples reported by Geochemica (1994), as well as for the subset of this population with gold contents higher than 0.09 ounce per ton (opt) and the currently proposed cutoff grade of 0.14 opt. The average total sulfur content of samples tested in the Montgomery Watson tailings flotation and the SRK column study (1.85 weight percent) is higher than the average for all samples (0.40 opt), suggesting that previous test results may be conservative in characterizing the ore body as a whole, but that ore may have been somewhat lower in total sulfur content prior to flotation, relative to the average total sulfur values of 2.7 percent and 3.1 percent under the two cutoff grade scenarios. Despite the higher averages, however, the quantity of sulfide estimated to remain in tailings is very small, as shown in Table 10.

Table 10. Summary of Total Sulfur Content for Kensington Ore Samples, by Grade Cutoff

	All Ore Samples n = 583	Samples Au > 0.09 opt n = 193	Samples Au >0.14 opt n = 144
Mean Au, opt	0.16	0.47	0.59
Min total sulfur, wt. %	0.01	0.03	0.03
Max total sulfur, wt. %	22	22	22
Mean total sulfur, wt. %	0.397	2.687	3.075
Tailings 90% efficiency	0.04	0.27	0.31
Tailings 98% efficiency	0.008	0.05	0.06

Figure 8 shows a general trend of increasing total sulfur with increasing gold concentration for the baseline samples reported by Geochemica (1994), which is somewhat better developed below a gold grade of 0.5 opt. The use of a higher cutoff grade is therefore expected to increase the average total sulfur content of the mined ore. This increase is expected to have a minimal effect on tailings chemistry as 90 to 98 percent of sulfide will be removed during flotation, leaving less than 0.31 percent sulfur, as shown in Table 10. Material with a total sulfur concentration of 0.3 weight percent (or below) will not produce acid rock drainage (Jambor et al., 2000). Reference to Figure 9 shows that the total sulfur distribution is lognormal, so that sulfur concentrations above the mean values are very rare and unlikely to dominate water quality in the impoundment. The proposed shift in grade, therefore, does not alter the previous conclusion that acid mine water will not be produced by the Kensington tailings.

4. Trace Element Release Potential

There are several geochemical analyses that estimate metal-release potential for tailings generated by the proposed Kensington operation. These include historic pre-1996 humidity cell and MWMP analyses of combined flotation and cyanidation tailing, as well as more recent column leach tests and studies of decanted process water from rough tailings generated in flotation tests by Montgomery Watson (1996) and CMRI (1998). The Forest Service agrees with the SRK conclusion (SRK, 1996) that none of the combined (rough with CIL) tailings data are applicable to the currently proposed metallurgical process. These data are therefore not presented in this review. Column tests conducted by SRK (1996) to evaluate weathering within the dry TSF facilities as a result of unsaturated flow conditions are also not pertinent to evaluation of the subaqueous tailings management plan, so that the results of the 1996 SRK column work are also not presented. Removing the column test and mixed tailings data leaves the 1996 Montgomery Watson decant water analyses used in the 1997 NPDES evaluation and the 1998 CMRI/Montgomery Watson process water data. Also, Rescan analyzed a sample from a single cycle of flotation processing in the 1998 CMRI study; this analysis was originally used by Knight Piesold for input into the Slate Creek TSF.

Figure 8. Comparison of gold and total sulfur content, Kensington ore samples.

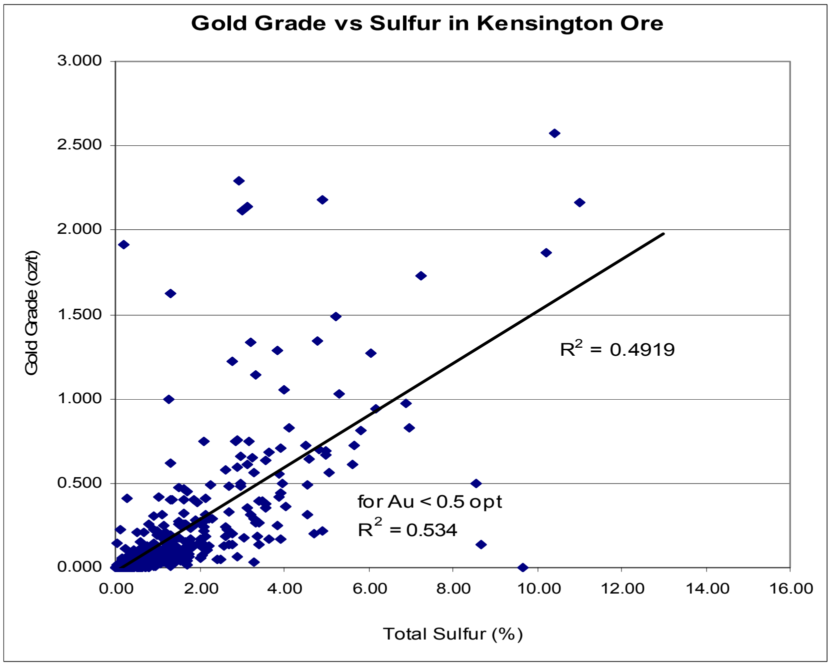
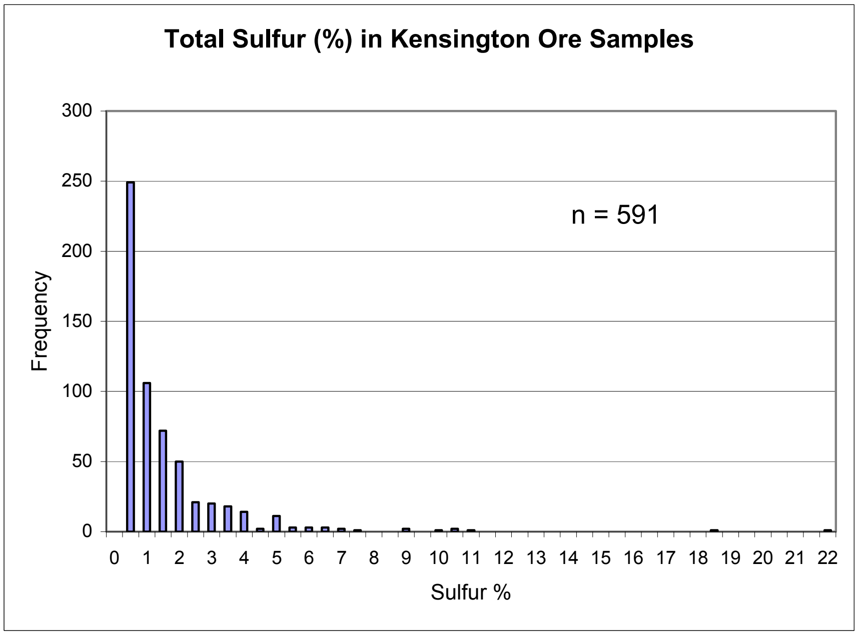


Figure 9. Distribution of total sulfur concentrations (weight percent) from Kensington ore samples.

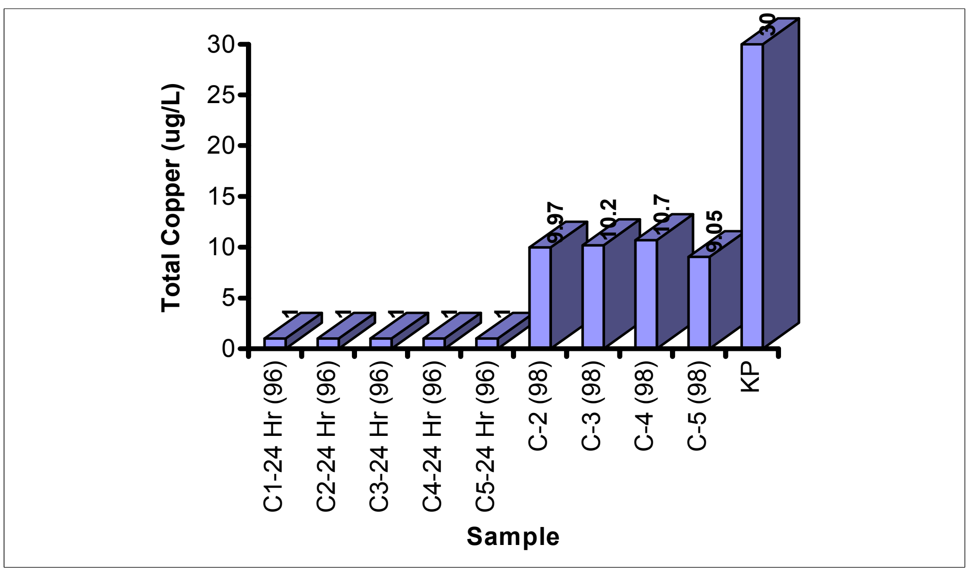


5. *Process Water Analyses*

The Montgomery Watson (MW96 C1–C5 24 hr, 1996) and CMRI (CMRI C2–C5, 1998) process water data for rough tailings are summarized in Tables 7 and 8, for dissolved and total concentrations respectively. Also presented in Table 6 are the dissolved concentrations reported by Rescan (2000) and used by Knight Piesold (2002) in the Slate Creek TSF water quality model; no total concentration data are available for this sample. Tables 5 and 8 also provide total concentrations measured in a sample from the Kensington mine; no dissolved concentration data are available for the mine water. These results are summarized for total copper in Figure 10 and dissolved copper in Figure 11. The 30 µg/L (Knight Piesold, 2002) was not identified as total or dissolved. Data for sulfate are shown as Figure 12.

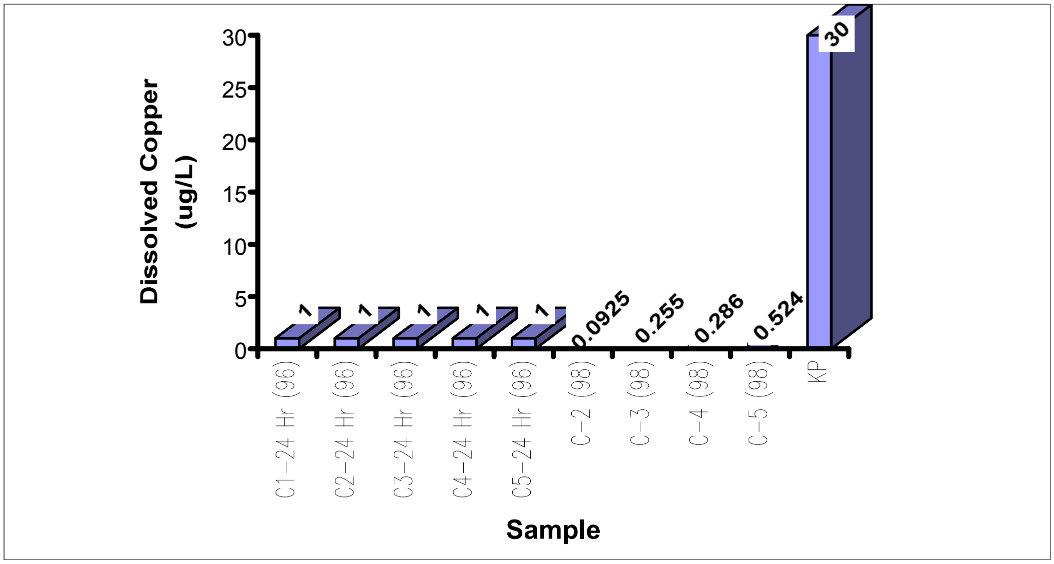
Comparison of the total values indicates that the higher concentrations of suspended solids result in higher (more conservative) metal concentrations in the 1998 process water than were measured in the 1996 samples. Hardness is also considerably higher in the 1998 samples, due to the use of additional lime in the flotation process.

Figure 10. Total copper values from Montgomery Watson 1996, CMRI (1998), and Knight Piesold (2002).



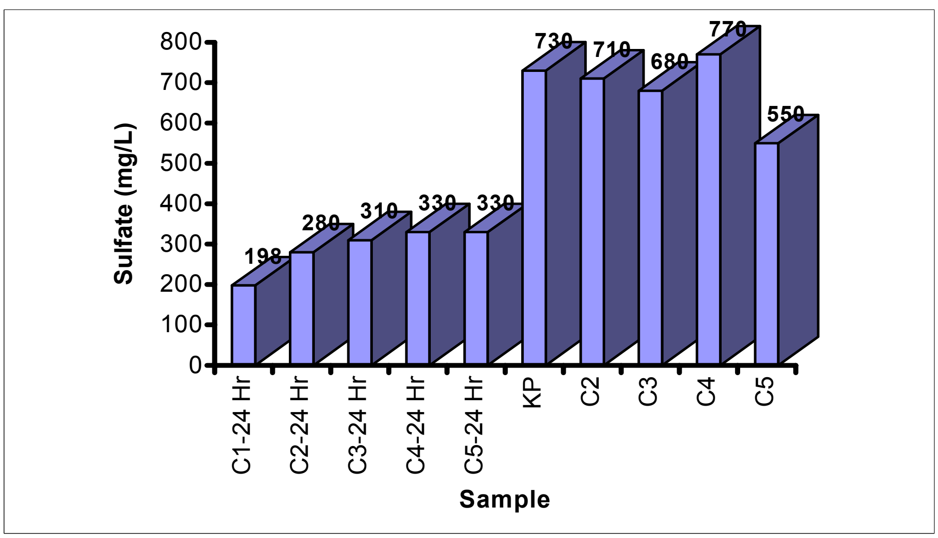
Montgomery Watson (1996) detection limit = 2 µg/L.

Figure 11. Dissolved copper values from Montgomery Watson 1996, CMRI (1998), and Knight Piesold (2002).



Montgomery Watson (1996) detection limit = 2 µg/L.

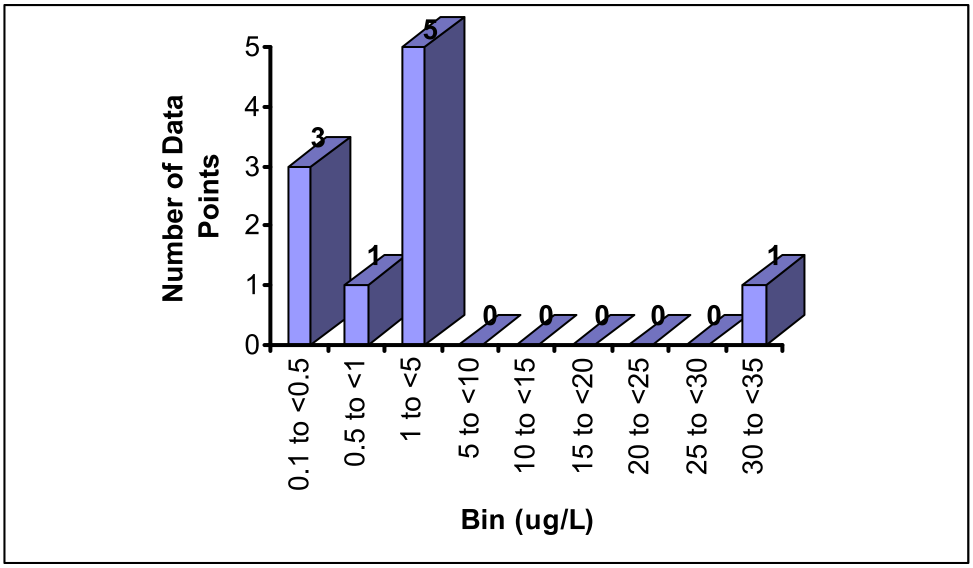
Figure 12. Sulfate data from Montgomery Watson 1996, CMRI (1998), and Knight Piesold (2002).



Comparison of the dissolved (sub-0.45–µm filtration) concentrations indicates that results are consistent between testing programs, although different detection limits were used. It is important to recall that process water samples from the 1996 program are from independent flotation batch tests, while the 1998 samples are from a system that recycled water between cycles. Also, the higher pH of the 1998 samples is reflected in the elevated aluminum, selenium, mercury, and zinc concentrations. Significant differences were observed in detections of copper using standard ICP-MS and ultralow level methods. Dissolved concentrations measured by ICP ranged from 2.7 to 8.6 µg/L, while concentrations detected in ultralow analyses ranged from 0.08 to 0.52 µg/L. The ICP-MS measurements indicate concentrations close to the detection limit of 2 µg/L that are almost certainly within the practical quantitation limit of the instrument. Dissolved concentrations were also greater than total concentrations in the sample from cycle 2 and in the mine water measurements made by ICP-MS. These results indicate a potential bias in ICP-MS analytical data. Review of the QA/QC data for a field blank (sample B2, not shown in the table) indicates no contamination due to lab method. Comparison of the duplicate sample D2 indicates significant differences between the total concentrations reported, however, for copper, mercury, selenium, and TSS. These differences in the metal concentrations may be a result of the differences in TSS or may be due to variance below the practical quantitation limit for the method. There may also have been problems with equipment decontamination between samples; review of the Montgomery Watson procedure indicates that equipment may not have been acid-rinsed between samples, in contrast to the ultra-clean technique used in collecting samples for low-level analysis. For these reasons, the low-level data have been reported in Tables 4 and 5.

In addition, a filtered water sample from cycle 3 was analyzed independently by ASL laboratories on behalf of Rescan Environmental (2000). Knight Piesold originally used the Rescan data (dissolved concentrations only, see Table 6) in their 2002 mass-loading model for the Slate Creek TSF. Comparison of the ASL data with the more comprehensive Montgomery Watson ICAP-MS and the low-level Battelle National Laboratories data indicates that the single ASL sample fails to characterize the range of chemistry observed in the other analyses. Comparison of this analysis with dissolved concentrations reported by Montgomery Watson and Battelle National Laboratories for CMRI C3 (also of cycle 3 process water) shows general agreement for all constituents except for copper, although the detection limits used were considerably higher for some elements. Unfortunately, there are no available quality assurance data for this analysis. With the exception of the copper value, it is thus tempting to retain the ASL analysis in the data set, although it duplicates the CMRI C3 analysis. However, the dissolved copper concentration reported by ASL, and used by Rescan and Knight Piesold, is two orders of magnitude higher than the corresponding low-level value reported by Battelle National Laboratories. Comparison of the dissolved data in Figure 11 shows the 30-µg/L copper concentration reported by ASL to be a statistical outlier, a value more in line with the total concentration data reported in Tables 7 and 8, which would significantly alter the population average. For these reasons, the analysis reported by ALS, and used by Rescan/Knight Piesold, was replaced with the data reported by Montgomery Watson and Battelle National Laboratories.

Figure 13. Dissolved copper histogram, based on Montgomery Watson 1996, CMRI (1998), and Knight Piesold (2002).



Montgomery Watson (1996) detection limit = 2 µg/L.

6. TSF Water Quality Model Inputs

The total concentration values used to calculate the 1997 NPDES permit limits, which incorporated either the 1996 Montgomery Watson process water analyses or the average of column effluent concentrations (SRK, 1996), whichever was greater, are also shown in Table 4. Where a pollutant was not detected in any samples, the value in the 1997 model was assumed to be zero. Zinc was not detected in the fourth pore volume of the column test, which appeared to be an error because zinc was detected in all other pore volumes. The fourth pore volume result was, therefore, replaced by the average of the five pore volumes. In addition, the Forest Service found an apparent error in determining the appropriate mercury value from the Montgomery Watson data.

Comparison of these various analyses shows that no one analysis is conservative for all parameters. The available data and supporting information, therefore, do not provide compelling support for the use of any one set of analyses as a basis for the NPDES permit. The data vary considerably for some constituents, in some cases over orders of magnitude, increasing the difficulty identifying a single analysis or source of data that is considered representative of the conditions that will exist during and after operations in the Slate Creek tailings facility. Use of the Rescan values by Knight Piesold was conservative for the elements aluminum, cadmium, chromium, copper, lead, selenium, silver, TDS, and sulfate, but fails to represent the range of chemistry observed in the various analyses reported for the individual metallurgical cycles. The observed variability and fairly small number of samples also make it more difficult to justify the use of a measure of central tendency (mean or median) as a basis for modeling.

The Forest Service believes that the tailings decant water, obtained by allowing tailings solids to settle following flotation, is most representative of geochemical conditions that will exist within the pond during operations. Because the material will be stored in a subaqueous setting, sulfide oxidation and associated acid production will not occur. The process of metal-release will more likely result from dissolution and desorption, rather than oxidation or significant changes in pH. As model inputs, the Forest Service therefore used the maximum total constituent concentrations from the five analyses of decant water from 1996 (MW 1996 C1–C5) and the four analyses of decant water from 1998 (CMRI C2–C5) to represent the range of major ion and trace element chemistry that will occur in the process water.

F. Background Water Quality

Coeur collected background water quality for Slate and Johnson creeks during 2000 and 2001 (Earthworks, 2002) and spring 2004. As model inputs for "natural" flows into the TSF, the Forest Service used the maximum total constituent concentrations as shown in Table 11 for the monitoring stations immediately upstream and downstream of Lower Slate Lake. Where a constituent was not detected in any samples, the background concentration was set as zero in the model.

Table 11. East Slate Creek Background Water Quality

Parameter	Units	Background Concentration
Aluminum	µg/L	360
Ammonia	µg/L	130
Arsenic	µg/L	0.52
Cadmium	µg/L	0
Chromium	µg/L	0.63
Copper	µg/L	0.39
Iron	µg/L	370
Lead	µg/L	0
Mercury	µg/L	0
Nickel	µg/L	0.799
Selenium	µg/L	0
Silver	µg/L	0.983
Sulfate	mg/L	2.68
TDS	mg/L	84
Zinc	µg/L	9.24

G. Model Results

Tables 12, 13, and 14 summarize the results of the @Risk modeling to characterize the water in the TSF under Alternatives B, C, and D. As discussed throughout this appendix, these results reflect minimum, average, and maximum projected constituent concentrations for 1,000 "life of mine" precipitation distributions. For all alternatives, the pond volume never approaches the TSF capacity. For Alternative D, it is important to recognize that the predicted values in Table 13 represent the "untreated" TSF water that is influent to the reverse osmosis treatment system. In the Final SEIS, Table 4-15 shows the predicted treated discharge quality.

Table 12. Projected TSF Water Quality for Alternative B

Parameter	Units	Projected TSF Water Quality		
		Minimum	Mean	Maximum
Aluminum	µg/L	403	567	742
Ammonia	mg/L	0.184	0.391	0.613
Arsenic	µg/L	0.003	0.041	0.608
Cadmium	µg/L	0.002	0.012	0.022
Chromium	µg/L	0.77	1.29	1.85
Copper	µg/L	0.51	0.99	1.50
Iron	µg/L	414	582	762
Lead	µg/L	0.05	0.26	0.48
Mercury	µg/L	0.0008	0.0042	0.0078
Nickel	µg/L	0.93	1.44	1.99
Selenium	µg/L	0.06	0.27	0.51
Silver	µg/L	0.894	0.935	0.973
Sulfate	mg/L	12	48	86
TDS	mg/L	97	147	200
Zinc	µg/L	10	13.6	17.3

Table 13. Projected TSF Water Quality for Alternative C

Parameter	Units	Projected TSF Water Quality		
		Minimum	Mean	Maximum
Aluminum	µg/L	442	935	1,209
Ammonia	mg/L	0.233	0.856	1.202
Arsenic	µg/L	0.06	0.14	0.62
Cadmium	µg/L	0.005	0.033	0.049
Chromium	µg/L	0.89	2.46	3.33
Copper	µg/L	0.63	2.11	2.86
Iron	µg/L	454	960	1,241
Lead	µg/L	0.10	0.72	1.06
Mercury	µg/L	0.0017	0.012	0.017
Nickel	µg/L	1.1	2.6	3.4
Selenium	µg/L	0.11	0.76	1.13
Silver	µg/L	0.785	0.849	0.964
Sulfate	µg/L	21	127	187
TDS	mg/L	109	259	342
Zinc	µg/L	11	21	27

Table 14. Projected "Untreated" TSF Water Quality under Alternative D

Parameter	Units	Projected TSF Water Quality		
		Minimum	Mean	Maximum
Aluminum	µg/L	432	780	1,057
Ammonia	mg/L	0.221	0.660	1.010
Arsenic	µg/L	0.05	0.15	0.62
Cadmium	µg/L	0.004	0.024	0.040
Chromium	µg/L	0.86	1.97	2.85
Copper	µg/L	0.60	1.61	2.42
Iron	µg/L	443	800	1,085
Lead	µg/L	0.09	0.53	0.87
Mercury	µg/L	0.0015	0.0086	0.014
Nickel	µg/L	1.0	2.1	3.0
Selenium	µg/L	0.10	0.56	0.93
Silver	µg/L	0.821	0.885	0.966
Sulfate	mg/L	18	94	154
TDS	mg/L	106	212	296
Zinc	µg/L	11	18	24

References

Catalan, L.J., E.K. Yanful, J.F. Boucher, and M.L. Shelp. 2000. *A Field Investigation of Tailings Resuspension in a Shallow Water Cover*. Noranda Inc., Technology Centre, Pointe Claire, Quebec, Canada.

CMRI (Colorado Minerals Research Institute). 1998. Kensington Mine Flotation and Leach Studies. CMRI Project No. 982016.

Coeur (Coeur Alaska, Inc.). 1996. *Geochemical Character of the Kensington Gold Deposit.*

Earthworks (Earthworks Technology). 2002, November. *Kensington Gold Project Water Quality Data, Slate Creek Tributaries and Johnson Creek.*

Forest Service. 1997. Kensington Gold Project, Final Supplemental Environmental Impact Statement. R10-MB-343. USDA Forest Service, Tongass National Forest, Juneau, AK.

Geochemica, Inc., and Kensington Venture. 1994. Analysis of Acid-Base Accounting Data, Kensington Mine Project.

Jambor, J.L., D.W. Blowes, and C.J. Ptacek. 2000. Mineralogy of mine wastes and strategies for remediation. In *European Mineralogical Union Notes in Mineralogy,* vol. 2, *Environmental Mineralogy,* ed. D.J. Vaughan and R.A. Wogelius. Eötvös University Press, Budapest.

Kensington Venture, Inc. 1994. Geochemical Characterization of the Kensington Gold Deposit, December 1994.

Knight Piesold Ltd. 1990. Kensington Venture, Tailings Storage Facility, Volume VI–Hydrogeologic Report. August 1990.

Knight Piesold Ltd. 2002. *Slate Creek Lakes Tailings Storage Facility, Report on Water Quality Modeling and Conceptual Closure Plan.* Coeur Alaska, Inc., Kensington Project. Ref. No. VA101-00020/1-1. April 5, 2002.

Knight Piesold Ltd. 2003. *Slate Creek Lakes Tailings Storage Facility, Report on Water Quality Modeling.* Coeur Alaska, Inc., Kensington Project. Ref. No. VA101-00020/3-1. February 7, 2003.

Maxim Technologies, Inc. 2000. *Comparison of Particle Size Distributions, Mineral Compositions, and Chemical Compositions between Kensington Mine Tailings and Lynn Canal Sediment.* Prepared for Coeur Alaska, Inc. March 2000.

Montgomery Watson. 1996. *Kensington Mine Project, Rougher Tailings Evaluation Report*. June 1996.

Province of British Columbia, Ministry of Environment. 1980. *Guidelines for the Design and Operation of Settling Ponds Used for Sediment Control in Mining Operations*.

Rescan (Rescan Environmental Services, Ltd.). 2000. *Tailings Reactivity Study*. Prepared for Coeur Alaska, Inc.

SAIC (Science Applications International Corporation). 1997. *Technical Resources Document for Water Resources, Kensington Gold Project*.

Stahre, P., and B. Urbonas. 1990. *Stormwater Detention for Drainage, Water Quality, and CSO Management*. Prentice-Hall, Inc., Englewood Cliffs, NJ.

SRK (Steffen Robertson & Kirsten). 1996. Review of Development Rock, Ore, and Tailings Characterization Testing, Kensington Gold Project.

Appendix B

Essential Fish Habitat Assessment

Appendix B: Essential Fish Habitat Assessment

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), establishes the procedures designated to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a federal fishery management plan (FMP). The act requires federal agencies to consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agencies that might adversely affect EFH. EFH has been broadly defined in the act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This appendix provides details suitable for an EFH assessment of the proposed Forest Service actions related to the Kensington Gold Project in the Berners Bay region of Alaska.

The MSFCMA requires that an EFH assessment include (1) a description of the proposed action, (2) an analysis of the effects, (3) the federal agency's (in this case, the Forest Service's) view of the effects of the action, and (4) mitigation, if necessary. To satisfy these requirements, the Forest Service includes the following sections:

- A description of the proposed actions, including on-land activities and crew shuttle boat terminal facilities and environmental conditions (summarized only and referenced to the main text of the Final SEIS).
- A list of EFH of species and life history stages that might be affected by the project.
- The Forest Service's assessment of the effects of the action.
- The mitigation actions being proposed.
- The Forest Service's EFH effects determination.

Impacts on herring are specifically addressed in detail in the BA/BE (see Appendix J).

Description of Proposed Action

The proposed action is the development of ore extraction from the region between Comet Beach and Berners Bay, ore processing, ore shipment from Slate Creek Cove, the development of crew shuttle boat terminals at Slate Creek Cove and on the east shore of Berners Bay at either Cascade Point or Echo Cove, and operation of crew shuttle boat transport from the terminals. The details of the proposed project actions are provided in the Supplementary Environmental Impact Statement (SEIS), Section 2.0, Description of Proposed Action and Other Alternatives.

Summary of NMFS Consultation to Date

The National Marine Fisheries Service (NMFS) responded to a draft of this Essential Fish Habitat Assessment on February 20, 2004. The response noted that they disagreed with the initial finding that hazardous spills would not produce an adverse effect on essential fish habitat (EFH) in Berners Bay. This finding has been revised to indicate that a large enough spill could produce adverse effects to EFH in Berners Bay although the likelihood of such a spill is negligible.

The following four points summarize the EFH Conservation Recommendations provided by NMFS, which are followed by the Forest Service response to those recommendations:

1. Select Alternative C for the Slate Creek Cove facility and for the Echo Cove terminal for originating employee transport.

2. If Alternative B (Cascade Point) is selected, adopt a mitigation and monitoring program. The program should be implemented by Goldbelt in a memorandum of agreement between Goldbelt, Coeur Alaska, the Forest Service, Alaska Department of Fish and Game (ADF&G) and NMFS.

3. No in-water work including dredging should be conducted from March 1 to June 30 at the marine terminals.

4. Wood structures associated with any of the marine dock facilities should not include creosote of ammonical copper zinc arsenate treated compounds.

The Forest Supervisor's decision is documented in the Record of Decision at the front of the Final SEIS. The Record of Decision defers the selection on the location of the marine terminals to the authority of the U.S. Army Corps of Engineers (USACE) (Clean Water Act Section 404 permit) and the Alaska Department of Natural Resources (ADNR) (State Tidelands Leases).

The Forest Service acknowledges NMFS' authority regarding EFH assessments, the concerns identified by NMFS and the significance of the conservation recommendations. None of the proposed marine terminals would be located on National Forest System lands. Therefore, Forest Service has no authority to establish monitoring and mitigation requirements, windows for in-water work, or limits on the types of materials used in construction of facilities on these lands outside the National Forest. The U.S. Army Corps of Engineers and Alaska Department of Natural Resources have served as cooperating agencies in development of the Kensington Gold Project Supplemental Environmental Impact Statement and are considering conditions in the Section 404 permits and tidelands leases respectively, to address the NMFS conservation recommendations. The authority for implementing and enforcing any conditions lies with USACE and ADNR.

The mitigation section in this assessment reflects the mitigation measures that have already been adopted by the City and Borough of Juneau and are expected to be included in the USACE permits and State tidelands leases.

EFH of Species and Their Life History Stages Potentially Affected

An EFH assessment is applied to the defined EFH for all species managed under a federal FMP. Three FMPs have fisheries resources that might be affected by the proposed actions:

1. The FMP for Groundfish of the Gulf of Alaska.

2. The FMP for Scallop Fishery off Alaska.

3. The FMP for the Salmon Fisheries in the Exclusive Economic Zone (EEZ) off the Coast of Alaska.

NOAA Fisheries is writing an environmental impact statement (EIS) to define EFH for the Alaska region affected by these and other FMPs (*Draft Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska*, NMFS, 2004). An earlier assessment of these FMPs by the North Pacific Fishery Management Council (NPFMC, 1999) supplied the definitions of EFH for Alaska used in the preliminary draft EIS. Because NOAA Fisheries has not finalized the EFH definitions, the information from the Council document is used herein to supply definitions of species and habitat that might be affected by the proposed actions.

The NPFMC (1999) document provides descriptions of species, life history stages, and habitat in Alaska, including species present in the Berners Bay region. Relevant tables from that document are included here as Tables B-1, B-2, and B-3. These tables describe the species and life stages likely to be present in habitat types found in Alaska marine waters. Although not all the species and life stages in these tables are in Berners Bay, most groundfish found under the habitat headings “Beach” (intertidal) and “Inner shelf” (1 to 50 m) in Table B-1 are likely to be present and potentially affected by the Proposed Action and alternatives. However, because Table B-1 includes the Bering Sea, Aleutian Islands, and Gulf of Alaska, some of the species might not be present in the project area. Based on species distribution maps presented by NPFMC (1999), the species in Table B-1 unlikely to be present in Berners Bay are the Greenland turbot, Alaska plaice, yelloweye rockfish, and Atka mackerel. The remaining species in the table might occur in the Berners Bay project area.

Some scallop species might also be present in the project area, as indicated in Table B-2, which shows weathervane scallop habitat use. The EFH distribution maps for the weathervane scallop (NPFMC, 1999) suggest that Berners Bay does not contain this species. However, other scallops, including pink, spiny, and rock scallops, could be present in the project area because they have life stages on the inner continental shelf, which could include Berners Bay habitat (NMFS, 2003).

In addition, all five species of salmon—chinook, coho, pink, chum, and sockeye—would be present in marine waters of the project area (Table B-3). Pink, chum, and coho salmon would also be present in the lower reaches of some of the project area’s affected streams, including Sherman, Slate, and Johnson creeks. Detailed life history and species distribution information for FMP species can be found in the *Preliminary Draft Environmental Impact Statement for Essential Fish Habitat and Conservation in Alaska* (NMFS, 2003). The more important FMP species found in the project area and the relevant environmental conditions that affect these species are described in the Final SEIS in Sections 3.9, Aquatic Resources: Freshwater, and 3.10, Aquatic Resources: Marine.

Evaluation of Potential Effects on EFH

Potential effects of the proposed actions on aquatic resources relevant to EFH are described in the SEIS in Section 4.9, Aquatic Resources: Freshwater, and 4.10, Aquatic Resources: Marine. The effects described in the draft SEIS are summarized below.

The evaluation is based on potential effects on various parameters potentially affecting FMP species. These parameters include water quality, sediment quality, hazardous spills, habitat conditions, and prey resource availability. The EFH effects evaluation is discussed separately for freshwater and marine activities because of different patterns of species habitat utilization between these habitat types. Cumulative effects are also discussed separately.

Table B-1. Summary of Habitat Associations for Groundfish in the Bering Sea/Aleutian Islands and Gulf of Alaska Areas

		HABITAT ASSOCIATIONS: Location										Substrate								Veg.		Pelagic Domain					Oceanography					
	Life Stage/Activity	Beach (intertidal)	Inner Shelf (1-50 m)	Middle Shelf (50-100 m)	Outer Shelf (100-200 m)	Upper Slope (200-1000 m)	Lower Slope (>1000m)	Basin (> 3000 m)	Bay/Estuarine	Island pass	Not Known	Mud/Clay/Silt	Sand/Granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Not Applicable	Kelp Forest	Sea Grasses	Near Surface	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Not Known	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)	Life Stage/Activity
Yelloweye rockfish	A			X	X	X			X	X				X		X	X								X							A
	J			X	X	X			X	X				X		X									X							J
	L										X			X		X									X							L
Thornyhead rockfish	A			X	X	X	X					X	X	X	X	X	X	X							X							A
	J			X	X	X						X	X	X	X	X	X	X							X							J
	L										X												X									L
	E										X												X									E
Atka mackerel	A		X	X	X					X				X	X	X				X				X						X	X	A
	J										X															X						J
	L										X											X										L
	E		X							X				X	X	X				X					X							E
Squid	A		X	X	X	X	X	X																X			X			X		A
	J		X	X	X	X	X	X											X			X	X				X			X		J
	E					X	X					X	X												X							E
Capelin	A	X	X	X	X								X	X									X	X	X					X	X	A
	J		X	X															X				X							X	X	J
	L		X	X															X			X	X									L
	E	X											X			X									X							E
Eulachon	A			X	X	X			X				X			X							X		X					X		A
	J			X	X	X													X				X							X		J
	L		X																X				X									L
	E								X				X			X									X							E
Sculpins	A	X	X	X	X	X						X	X	X											X							A
	J	X	X	X	X	X						X	X	X											X							J
	L		X	X	X	X													X			X	X									L
	E	X	X	X	X									X	X	X									X							E
Sharks	A		X	X	X	X													X				X		X							A
	J		X	X	X	X													X				X		X							J
	L										X								X													L
Skates	A			X	X	X																			X							A
	J			X	X	X																			X							J
	E			X	X	X																			X							E
Octopus	A		X	X	X	X						X	X	X											X							A
	J		X	X	X	X					X													X								J
	E		X	X	X	X					X			X	X	X									X							E

Table B-1. Summary of Habitat Associations for Groundfish in the Bering Sea/Aleutian Islands and Gulf of Alaska Areas (continued)

		HABITAT ASSOCIATIONS																														
		Location										Substrate								Vegetation		Pelagic Domain					Oceanography					
	Life Stage/Activity	Beach (intertidal)	Inner Shelf (1-50 m)	Middle Shelf (50-100 m)	Outer Shelf (100-200 m)	Upper Slope (200-1000 m)	Lower Slope (>1000m)	Basin (> 3000 m)	Bay/Estuarine	Island pass	Not Known	Mud/Clay/Silt	Sand/Granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Not Applicable	Kelp Forest	Sea Grasses	Near Surface	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Not Known	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)	Life Stage/Activity
Alaska plaice	A		X	X								X	X												X							A
	J		X	X								X	X												X							J
	L		X	X																			X									L
	E		X		X																		X									E
Rex sole	A			X	X	X						X	X	X											X							A
	J		X	X	X							X	X	X											X							J
	L		X	X	X														X				X									L
	E		X	X	X														X				X									E
Flathead sole	A		X	X	X							X	X												X						X	A
	LJ		X	X	X							X	X												X							LJ
	EJ		X	X	X							X	X												X							EJ
	L		X	X	X														X				X									L
	E		X	X	X														X				X									E
Sablefish	A					X	X																		X		X					A
	LJ					X	X																		X		X					LJ
	EJ		X	X	X				X	X									X				X	X	X		X					EJ
	L			X	X	X	X	X											X			X					X					L
	E					X	X	X											X				X				X					E
Pacific Ocean perch	A				X	X								X	X	X								X	X		X					A
	J		X	X	X	X								X	X	X	X						X	X			X					J
	L		X	X	X	X	X	X											X				X				X					L
Shortraker & Rougheye rockfish	A				X	X						X	X	X	X	X	X	X						X								A
	J			X	X																					X						J
	L										X								X							X						L
Northern rockfish	A				X	X										X	X							X								A
	J		X	X	X											X	X							X								J
	L										X								X				X									L
Dusky rockfish	A				X	X								X		X	X							X								A
	J		X	X	X									X		X	X									X						J
	L										X								X				X									L

Table B-1. Summary of Habitat Associations for Groundfish in the Bering Sea/Aleutian Islands and Gulf of Alaska Areas (continued) (Source: NPFMC, 1999)

		HABITAT ASSOCIATIONS																														
		Location										Substrate								Vegetation		Pelagic Domain					Oceanography					
	Life Stage/Activity	Beach (intertidal)	Inner Shelf (1-50 m)	Middle Shelf (50-100 m)	Outer Shelf (100-200 m)	Upper Slope (200-1000 m)	Lower Slope (>1000m)	Basin (> 3000 m)	Bay/Estuarine	Island pass	Not Known	Mud/Clay/Silt	Sand/Granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Not Applicable	Kelp Forest	Sea Grasses	Near Surface	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Not Known	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)	Life Stage/Activity
Walleye pollock	A				X			X															X	X			X	X		X	X	A
	J		X	X	X					X									X				X	X				X	X	X		J
	L				X														X				X					X		X		L
	E				X	X		X											X				X					X				E
Pacific cod	A		X	X	X							X	X												X							A
	LJ		X	X	X							X	X												X							LJ
	EJ		X	X								X	X												X							EJ
	L										X								X			X										L
	E		X	X	X							X	X												X							E
Yellowfin sole	A	X	X	X	X				X				X												X						X	A
	LJ		X	X	X				X				X												X							LJ
	EJ		X	X	X				X				X												X							EJ
	L	X	X						X										X				X									L
	E	X							X										X				X									E
Greenland turbot	A				X	X	X					X	X											X	X							A
	LJ		X	X	X	X						X	X											X	X							LJ
	EJ		X	X	X														X							X						EJ
	L		X	X	X														X				X									L
	E			X	X																			X	X							E
Arrowtooth flounder	A		X	X	X	X			X			X	X	X											X						X	A
	LJ		X	X	X	X						X	X	X											X							LJ
	EJ		X	X	X	X						X	X	X											X							EJ
	L		X	X	X				X														X									L
	E		X	X	X																		X									E
Rock sole	A		X	X	X								X	X											X						X	A
	LJ		X	X	X				X				X	X											X							LJ
	EJ		X	X	X				X				X	X											X							EJ
	L		X	X	X																		X									L
	E				X																				X							E
Dover sole	A			X	X	X						X	X												X							A
	LJ		X	X								X	X												X							LJ
	EJ		X	X								X	X												X							EJ
	L		X	X	X	X													X				X									L
	E		X	X	X	X													X				X									E

Table B-2. Summary of Weathervane Scallop Habitat and Biological Associations and Reproductive Traits for the Bering Sea/Aleutian Islands and Gulf of Alaska Areas (Source: NPFMC, 1999)

		HABITAT ASSOCIATIONS																														
		Location										Substrate								Vegetation		Pelagic Domain					Oceanography					
	Life Stage/Activity	Beach (intertidal)	Inner Shelf (1-50 m)	Middle Shelf (50-100 m)	Outer Shelf (100-200 m)	Upper Slope (200-1000 m)	Lower Slope (>1000m)	Basin (> 3000 m)	Bay/Estuarine	Island pass	Not Known	Mud/Clay/Silt	Sand/Granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Not Applicable	Kelp Forest	Sea Grasses	Near Surface	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Not Known	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)	Life Stage/Activity
Weathervane scallop	A			X								X	X	X											X							A
	J			X								X	X	X											X							J
	L			X	X														X				X									L
	E		X	X																					X							E

		BIOLOGICAL ATTRIBUTES																							
		Feeding Type						Movements					Social Behavior				Longevity of Life Stage								
	Life Stage/Activity	Carnivore	Herbivore	Omnivore	Planktivore	Detritivore	Not Known	Drift With Ocean Conditions	Reside in Nursery Areas	Alongshore Migrations	Inshore/Offshore Migrations	Not Known	Solitary	Schooling	Shoaling	Not Known	1 Day	1 - 30 Days	1 - 12 Months	1 - 5 Years	5 - 20 Years	20 - 50 Years	> 50 Years	Not Known	Life Stage/Activity
Weathervane scallop	A				X							X				X								X	A
	J				X							X				X								X	J
	L				X			X																X	L
	E							X																X	E

	Reproductive Traits																							
	Age at Maturity				Fertilization/Egg Development					Spawning Behavior						Spawning Season								
	Female		Male																					
	50%	100%	50%	100%	External	Internal	Oviparous	Ovoviviparous	Viviparous	Batch Spawner	Broadcast Spawner	Egg Case Deposition	Nest Builder	Egg/Young Guarder	Egg/Young Bearer	Early Spring	Late Spring	Early Summer	Late Summer	Early Fall	Late Fall	Early Winter	Late Winter	Not Known
Weathervane scallop					X						X						X	X						

Table B-3. Summary of Pacific Salmon Habitat associations for the Bering Sea/Aleutian Islands and Gulf of Alaska Areas (Source: NPFMC, 1999)

HABITAT ASSOCIATIONS	Chinook Salmon						Coho Salmon						Pink Salmon						Chum Salmon						Sockeye Salmon					
Life Stage/Activity	EL	JF	JE	JM	AM	AF	EL	JF	JE	JM	AM	AF	EL	JF	JE	JM	AM	AF	EL	JF	JE	JM	AM	AF	EL	JF	JE	JM	AM	AF
Habitats: Fresh Water	M	M				M	M	M				M	M	M				M	M	M				M	M	M				M
Habitats: Estuarine			M	M		M			M	M		M	M		M	M		M	M		M	M		M			M	M		M
Habitats: Nearshore (50-200m)			M	M	M				M	M	M				M	M	M				M	M	M				M	M	M	
Habitats: Offshore (>200m)				M	M					M	M					M	M					M	M					M	M	
Habitats: Vertical Depth (m)				<200 m	<200 m					<50 m	<200 m					<50 m	<200 m					<200 m	<200 m					<50 m	<200 m	
Benthic Domain, Shelf: Intertidal													M					M	M					M						
Benthic Domain, Shelf: Subtidal (<30m)																														
Benthic Domain, Shelf: Intermediate (30-100m [Break])																														
Benthic Domain, Slope: Upper (Break-500 m)																														
Benthic Domain, Slope: Intermediate (500-1000m)																														
Benthic Domain, Slope: Lower (>1000m)																														
Benthic Domain, Canyon: Head (<100m)																														
Benthic Domain, Canyon: Upper and Middle (100-500 m)																														
Benthic Domain, Canyon: Lower (>500m)																														
Benthic Domain: Not Known																														
Structure: Bars				M	M					M	M					M	M					M	M					M	M	
Structure: Banks				M	M					M	M					M	M					M	M					M	M	
Structure: Sinks																														
Structure: Slumps/Rockfalls/Debris Field																														
Structure: Channels				M	M					M	M					M	M					M	M					M	M	
Structure: Ledges				M	M					M	M					M	M					M	M					M	M	
Structure: Pinnacles				M	M					M	M					M	M					M	M					M	M	
Structure: Reefs				M	M					M	M					M	M					M	M					M	M	
Structure: Vertical Walls				M	M					M	M					M	M					M	M					M	M	
Structure: Artificial				M	M					M	M					M	M					M	M					M	M	
Substrate: Organic Debris																														
Substrate: Mud/Clay/Silt																														
Substrate: Sand/Granule																														
Substrate: Gravel	M						M						M						M						M					
Substrate: Pebble	M						M						M						M						M					
Substrate: Cobble																														
Substrate: Boulder																														
Substrate: Bedrock																														
Vegetation: Estuarine, eg. Algal Cover																														
Vegetation: Kelp Forest																														
Vegetation: Marine, eg. Sea Grasses																														
Structure, Substrate, and Vegetation: Not Known																														
Pelagic Domain: Near Surface		M						M	M	M	M			M	M	M	M					M	M						M	
Pelagic Domain: Midwaters		M	M	M	M			M			M					M	M						M			M	M	M	M	
Pelagic Domain: Near Bottom		M	M		M			M												M	M		M							
Pelagic Domain: Not Known																														
Oceanography: Temperature (Celsius)				<15 C	<15 C					<15 C	<15 C					<15 C	<15 C					<15 C	<15 C					<15 C	<15 C	
Oceanography: Salinity (ppt)																														

Fresh Water

The elements of the project that modify freshwater conditions could affect EFH for the pink, chum, and coho salmon that use some of the streams in the project area. Potential effects from construction and operation would be limited because these actions would occur away from stream sections containing anadromous fish (Sherman, Johnson, or Slate creeks). The bullets below summarize the potential effects by major factor in fresh water.

- As indicated in the SEIS, discharges that might ultimately enter anadromous streams would meet NPDES permit requirements for water quality and are not expected to have adverse effects. In addition, any changes in discharge resulting from water utilization changes would have to meet requirements established by the Alaska Department of Fish and Game (ADF&G), ensuring protection of EFH in the streams.

- Sediment input to stream gravels from construction (e.g., a dam on Lower Slate Lake, road construction, and stream crossings) would be short-lived (less than 1 year for specific activities) and would occur upstream of anadromous fish zones in Sherman, Slate, and Johnson creeks. Road construction would follow Forest Service standards and guidelines, and disturbance would not occur within designated riparian areas except at crossings. Crossings of the major streams would be bridged and upstream of anadromous regions. Construction of crossings would be regulated through timing windows to prevent impact on fish resources. Dam construction on Lower Slate Lake, upstream of anadromous regions, would occur primarily outside the creek; stream flow would be diverted around the dam during construction to reduce sediment input to Slate Creek. Also, during operations tailings discharge could increase fine sediment to stream gravels, but this effect would be slight due to use of the lake for settling and reverse osmosis treatment under Alternative D. Because of the very coarse nature of the substrate, any downstream sediment input would be transported rapidly through the stream reaches, including the anadromous zone. Best management practices (BMPs), including settling ponds and regulated construction timing, would be used to minimize any sediment additions. Therefore, no adverse effects on EFH are expected from this sedimentation.

- Accidental spills from a tailings pipeline rupture or a fuel transport system into streams are highly unlikely (see SEIS, Section 4.9.1). Spill prevention and containment plans would be implemented to reduce both the occurrence and magnitude of potential spills, so adverse effects on EFH in project area streams are not expected.

- Other than slight sediment input during the construction of two bridges upstream of anadromous regions (with near or instream activity limited to a 1- to 2-month period), habitat conditions would not be altered in the anadromous regions of the three anadromous streams. Anadromous fish passage would not be an issue because all crossings are upstream of anadromous regions. In addition, bridge and culvert structure construction would have to meet ADF&G and Forest Service requirements for timing and design, ensuring resident fish passage and minimizing direct and indirect effects on habitat conditions.

- Prey resources and availability would not be significantly altered in the freshwater EFH of the project area. Most potential activities that could cause adverse effects (e.g., changes in water quality and quantity, increased sedimentation, or toxic conditions from discharges or spills), as noted above, would (1) be regulated by permits and agency requirements, (2) be conducted using BMPs, or (3) be of short duration or small magnitude, eliminating potential effects to a great extent. Moreover, most of the potential direct effects would occur well upstream of anadromous zones, which typically occupy less than a mile of the lower portions of each of these streams (see SEIS, Figures 3-2, 3-3, and 3-4).

Overall, the proposed actions are expected to result in no adverse effects on EFH for salmon species in the freshwater environment of the project area.

Marine

The proposed project activities in the marine environment could affect the EFH of groundfish resources and salmon resources, including the prey base for these species groups. The areas most at risk are the nearshore habitat areas of Berners Bay. However, much of the potential risk of adverse effects on EFH in this region would be reduced or eliminated through the use of BMPs and modified design and construction plans. The primary activities that could affect EFH are (1) construction and operation of pier facilities in Berners Bay at Slate Creek Cove and either Cascade Point or Echo Cove and (2) operation of the crew shuttle boat, including fuel use and transport. As noted earlier, potential effects on EFH and other resources are discussed in detail in Section 4.10 of the SEIS and are summarized here by indicator factor.

Water Quality

Construction of the pier facilities, depending on the site, would require dredging, some fill, and piling placement. These activities would temporarily increase turbidity, which in the short term could reduce water clarity in the vicinity of the piers. The timing of pier construction, including any dredging at all sites, would be restricted during the most critical nearshore periods for Pacific herring and juvenile salmon (March 15 to June 15), reducing the chance of increases in turbidity adversely affecting these fish at any of the three locations. Use of silt curtains and other dredging BMPs would help to reduce the magnitude and spread of elevated turbidity. Also, the bay is naturally turbid during the warmer months (due to glacial runoff). It is anticipated that in-water construction would be completed within one summer season at each facility, except for periodic (every few years) maintenance dredging at the entrance of Echo Cove (if Alternative C were chosen).

At Slate Creek Cove, no dredging would occur. The placement of 3.6 acres of fill and piles during construction might slightly increase turbidity, but turbidity in general would remain low. Dredging in Echo Cove would occur in the subtidal entrance to the cove and would have less potential to affect the nearshore areas often used by juvenile salmon than a similar amount of dredging in the nearshore environment. The initial dredging would remove approximately 150,000 cubic yards of material. Because dredging would be repeated periodically, there would be some reoccurring disturbance. The timing window would reduce effects on EFH for salmon and herring, but not for some groundfish that might use this region. The region of increased turbidity would be small relative to the size of Berners Bay.

If Cascade Point were constructed, the placement of about 1.3 acres of fill and dredging of 1.6 acres would cause increased turbidity. In the region where dredging would occur, however, the substrate contains high proportions of gravel and cobble, so the turbidity level during dredging would remain low. Overall, because of the short duration of pier facility construction and timing restrictions, increased turbidity would have only short-term, local adverse effects on EFH at any pier facility. The limited sewage discharge from the mine site under Alternative A would have to meet the conditions of an NPDES permit and therefore would not affect EFH.

Sediment Quality

Marine sediment conditions would change only slightly in the pier construction areas. The change would be at Cascade Point if it were constructed (under Alternatives B and D). Riprap fill equal to 1.3 acres would be added, and another 1.6 acres would be dredged. Much of the fill placed would, however, be similar to the native hard substrate (e.g., cobble and boulder); thus, it would be similar to the surrounding beach regions. The breakwater at Cascade Point, however, would be constructed of much larger substrate. Also, some intertidal substrate areas would be permanently lost due to construction of a breakwater at Cascade Point (if Alternative B or D were selected). This change would affect both fish habitat and potential benthic prey resources. Impacts on the substrate in Slate Creek Cove would also occur with the addition of approximately 29,000 cubic yards of fill over 3.6 acres of beach, intertidal and subtidal habitat; however, no dredging would occur. The fill would be larger substrate than what is currently present in Slate Creek Cove although the existing beach is primarily bedrock, cobble and gravel, not fines so the changes would be slight in overall composition. As noted above, no dredging or filling would occur at the Echo Cove pier, but subtidal dredging would occur at the mouth of Echo Cove. The substrate in Echo Cove would likely remain similar to the original fine substrate (sands) in that region and probably would not be altered. Overall, changes in substrate would be slight and regional but would alter EFH locally around each of the landings, particularly in the Cascade Point area.

Hazardous Spills

Chances of hazardous spills, primarily diesel fuel, would be very low because of the use of isotainers and the limited transportation of fuels needed for operations. The area with the greatest potential for spills would be near Slate Creek Cove, where fuel and other materials would be handled. Although refueling of crew shuttle boats would occur at Echo Cove or Cascade Point, major fuel transportation would not occur at those locations, nor would fuel be stored on-site. The chance of spills from normal ferry operation is very low, as suggested by Alaska Marine Highway Ferry operations in Lynn Canal, which to date have had no in-water fuel spills (URS, 2004). Any fuel spill from delivery would be relatively small because each isotainer would transport no more than 6,500 gallons. The chance of spills from rupture of these containers would be small because of armoring of each container against penetrating damage. Because of reduced flushing relative to other sites, fuel spills potentially occurring in Echo Cove (e.g., crew shuttle boat leakage) would be more confined and would, therefore, have a greater chance to affect local beaches. However, the confined area would reduce risk to the remaining bay and increase ability to contain and clean up any spills. Spills occurring at Slate Creek Cove or Cascade Point would be more rapidly dispersed, reducing concentration levels; however, the ability to confine and clean up spills would be reduced.

Fuel leaks could occur from normal crew shuttle boat operations, but they are expected to be small and would not produce significant concentrations of hydrocarbons in the water column. Any fuel spill that occurred in the spring could affect migrating salmon in the nearshore area and herring spawning near Cascade Point. In addition, any large spill that occurred during the spring could affect migrating adult eulachon that are bound for the major rivers entering Berners Bay. In this case, however, likelihood of these fish being affected is low because they typically congregate in deep water and away from the shoreline areas where hydrocarbons would be concentrated. As discussed in the SEIS, the likelihood of adverse effects would be slight because of the management of fuel transport and limitations on fuel transport and fueling during critical periods, primarily during spring and early summer, when salmon and herring might be in nearshore areas. Because important marine resources such as Pacific herring are sensitive to low concentrations of hydrocarbons, small levels could have adverse affects on these fish. Although the potential for a spill large enough to produce harmful concentrations of hydrocarbons within the water column is low, the effects of a fuel spill could be adverse to EFH in Berners Bay.

Habitat

Habitat changes would occur in the nearshore areas at the crew shuttle boat landing sites and could cause adverse effects on EFH. Overwater structures (docks) proposed at each of the three sites might increase delays in migration and possibly increase predation on fish such as juvenile salmon at all locations. However, these proposed docks would be small.

The construction of a breakwater at Cascade Point would cause some direct loss of habitat (1.3 acres). The breakwater, however, would increase effective shallow-water shoreline length along the breakwater, thereby providing additional shallow-water habitat for marine species. The breakwater at Cascade Point might also impede the movement of certain juveniles, primarily juvenile pink salmon in the spring but other juvenile salmon to a lesser extent and possibly juvenile herring. These species migrate along the shoreline, and the breakwater would interrupt their migration; however, the shoreline opening in the breakwater would reduce these effects. Some direct loss of known herring spawning habitat (possibly 350 feet of shoreline, considering habitat changes due to filling and dredging) would occur. A small portion of the approximately 2 to 10 miles of shoreline in Berners Bay is used annually by spawning herring (see Section 4.10.3 of the SEIS).

Fill at Slate Creek Cove (3.6 acres of beach, intertidal and subtidal habitat) would also likely cause some change to larger substrate (e.g., from boulder/cobble to riprap), possibly changing the use type of a small area of habitat.

The Echo Cove site would not have a breakwater or dredging in the nearshore area; therefore, effects from Alternative C on nearshore habitat would not occur, although some subtital habitat would periodically be disrupted due to channel dredging. Overall, there would be some adverse effects on EFH from loss or alteration of habitat in Berners Bay, although they would be small in magnitude.

Prey Resources

The prey resources for FMP species that could be affected are nearshore benthic organisms, Pacific herring, eulachon, and possibly capelin. Pile placement would result in short-term loss of benthic organisms at any of the three piers. Overwater structures would cause some shading effects, causing minor long-term reduction of benthic prey sources. Some of this loss might be augmented by increased marine growth directly on the piling and docks. The dredging and filling at Cascade Point and Slate Creek Cove would cause some short-term loss of benthic resources that constitute prey resources for many FMP species, such as salmon and flatfish. These areas would be recolonized by benthic organisms (in most cases within 2 to 3 months) after construction. At the Cascade Point facility, some permanent loss of benthic resources would occur from the presence of the breakwater. The breakwater also has the potential to affect herring, a major prey resource for salmon and other fish, by affecting important herring spawning habitat (see Section 4.10.3 in the SEIS for additional discussion). The abundance of the Lynn Canal herring stock is already greatly reduced relative to historical levels. The overall effect of the Proposed Action and alternatives on this herring stock is not clear. Although this area is used for herring spawning, many other regions within and outside Berners Bay are used by other life stages of the herring stock.

If the Echo Cove facility were selected, periodic (every few years) subtidal channel entrance dredging, in addition to initial construction dredging, would reduce prey resources for some FMP species (e.g., flatfish). Because of lack of dredging and minimal fill at Slate Creek Cove, prey effects would be slight and would occur primarily during construction at this site.

Schooling pelagic prey species like herring, eulachon, and capelin might temporarily avoid the crew shuttle boat route due to their noise avoidance, although some acclimation to frequent noise events would be expected. Construction activity near piers could also cause short-term avoidance of the local areas. Avoidance along the route of the crew shuttle boat route would likely be short-term, with effects lasting only minutes, because of the infrequent occurrence and duration of the ferry traffic (three to five round trips per day). The duration of avoidance near the marine terminals might be longer depending on the magnitude and duration of underwater noise at these sites.

Eulachon could be markedly affected from an unlikely oil spill during their spring spawning run period (typically about 2 weeks in duration) when they are present in large numbers near the river deltas, but they would not be affected from minor leaks from normal operations due to their distribution away from shorelines and the short residence time of most individuals in the bay (see Hazardous Spills).

Overall, there would be adverse effects on EFH prey resources, though most would be short-term. These effects would be most pronounced and long-lasting for Cascade Point landing if it were constructed.

Marine Summary

The overall effect on EFH in the marine environment of Berners Bay would be adverse, primarily in the short term, due to the loss of prey resources and habitat modification. Potential impacts on herring spawning from dock operations would be minimal assuming that the State of Alaska requires no use of the facility during the herring spawning period and no fueling for an extended period (i.e., through the eggs hatching). Coeur is sponsoring a monitoring plan (Coeur, 2004) by NOAA Fisheries and the state, which began in spring 2004 and will continue through project operations, to assess the effects of petroleum releases into Berners Bay. Some long-term adverse effects on EFH would also occur, primarily from potential delay in migration for some salmon species and increased predation of salmon around each pier. Long-term prey resource reduction would occur primarily if Alternative B or D were selected. The associated breakwater construction at Cascade Point would cause permanent loss of benthic areas and herring spawning habitat. Other alternatives would result in a smaller, long-term reduction in habitat from overwater structures and pilings and would not include a breakwater constructed in herring spawning habitat.

Cumulative Effects

Cumulative effects are the result of past, present, or future actions, including project actions, that are reasonably likely to occur. Potential cumulative effects on the freshwater and marine resources that include EFH are discussed in detail in Section 4.21, Cumulative Effects, in the SEIS. Based on the analysis presented in that section, development in the freshwater areas near Sherman, Johnson, and Slate creeks would not be expected to contribute substantially to adverse effects on EFH of salmon in this area from the potential extension of mine development or potential construction of a Juneau access road. Mine extension would primarily affect the east fork of Slate Creek from increased tailings fill upstream of the anadromous zone. These processes would occur under the same regulatory constraints that are currently in place, preventing significant effects on this habitat. Construction of a Juneau access road along the east side of Berners Bay could increase the sediment loading to salmon habitat, primarily during construction, by adding road crossings of the Berners and Antlers rivers and other tributary streams. However, this sedimentation is expected to be minor due to agency-regulated controls on construction timing and techniques, as well as road maintenance. The actual effects, however, would partly depend on the alternative selected and could include loss of intertidal habitat in Berners Bay (URS, 2004). If the complete road alternative were to be selected, over 30 acres of intertidal and subtidal fill would be placed in Lynn Canal, although none of it would be placed in Berners Bay.

Mitigation

Several actions are in place as part of an existing mitigation plan to help reduce the adverse effects of the considered actions. The plan includes the following actions:

- Modified pier design, including reduced breakwater size.
- Using BMPs, including spill prevention and protection programs.
- Adjusting construction timing to minimize effects on instream migrating fish and nearshore marine migration
- Reducing transport of fuels from local piers.
- Meeting National Pollutant Discharge Elimination System (NPDES) requirements for discharge.
- Other state and federal permit requirements for both construction and operation.
- Prohibiting in-water construction work between March 15 and June 15.
- Limiting use of Cascade Point to mine only transportation.
- Requiring no fueling at Slate Creek Cove and only fueling from trucks at Cascade Point (no on-site storage).

In addition, it is anticipated that the State Tidelands Leases for Cascade Point (if Alternative B or D were selected) could require shutdown during herring spawning, prohibit fueling for a further extended period to protect sensitive life stages, and extend the in-water construction prohibition until June 30.

Action Agency's View Regarding Effects of Actions on EFH

Based on a review of available information, the proposed actions near freshwater systems would not have adverse effects on EFH. However, the proposed marine actions could have short-term adverse effects on EFH for some groundfish and salmon. In addition, some long-term adverse effects on EFH, though not substantial, might occur from pier placement within Berners Bay, particularly from construction of the Cascade Point pier site and its associated breakwater, and from hydrocarbon spills.

Literature Cited

Coeur Alaska. 2004, March 29. Herring Mitigation Through Agency Research Support. Memorandum to Carl Schrader from Rick Richins, Coeur Alaska.

NMFS (National Marine Fisheries Service). 2004, January. *Draft Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska.* U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region, Juneau, AK.

NPFMC (North Pacific Fishery Management Council). 1999, January 20. *Environmental Assessment for Amendments 55/55/8/5/5, Essential Fish Habitat.* North Pacific Fishery Management Council, Anchorage, AK.

URS (URS Corporation). 2004, March 1. Essential Fish Habitat Assessment Draft. In *Juneau Access Improvements Supplemental Draft Environmental Impact Statement*. Prepared for the Alaska Department of Transportation and Public Facilities by URS Corporation, Juneau, AK.

Appendix C

Ecological Risk Assessment of Aqueous Tailings Disposal at the Kensington Gold Mine

FINAL

Ecological Risk Assessment of Aqueous Tailings Disposal at the Kensington Gold Mine

Prepared for:

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December 2004

ECOLOGICAL RISK ASSESSMENT OF AQUEOUS TAILINGS DISPOSAL AT THE KENSINGTON GOLD MINE

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ACRONYMS AND ABBREVIATIONS

ac	acre
AET	apparent effect threshold
AUF	area use factor
B	bioavailability
BAF	bioaccumulation factor
BW	body weight
CCME	Canadian Council of Ministers of the Environment
cm	centimeters
CMRI	Colorado Mineral Research Institute
COPEC	chemicals of potential ecological concern
CSM	conceptual site model
DEC	Alaska Department of Environmental Conservation
DOE	Department of Energy
EcoSSL	ecological soil screening level
EPC	exposure point concentration
ERA	ecological risk assessment
FEIS	final environmental impact statement
FIR	food ingestion rate
ft	feet
GLI	Great Lakes Initiative
gpm	gallons per minute
ha	hectares
HQ	hazard quotient
ISQG	interim sediment quality guideline
km	kilometers
LC50	lethal concentration for 50% of test organisms
LOAEL	lowest observed adverse effects level
LOEC	lowest observed effect concentration
LSL	Lower Slate Lake
m	meters
m^3	cubic meters
m^3/sec	cubic meters per second
mg/m^2	miligrams per square meter
µmhos/cm	micromhos per centimeter
mg/L	milligrams per liter
µg/L	micrograms per liter
MDEQ	Michigan Department of Environmental Quality
MDL	method detection limits
MEND	mine environment neutral drainage
NOAA	national oceanic and atmospheric administration
NOAEL	no observed adverse effects level
PEC	probable effects concentration
PEL	probable effect level
ppb	parts per billion; equal to µg/L or µg/Kg
ppm	parts per million, equal to mg/L or mg/Kg
RO	reverse osmosis
SEIS	Supplemental Environmental Impact Statement
SIR	soil ingestion rate
TDS	total dissolved solids

TEC	threshold effect concentration
TRV	toxicity reference value
TSF	tailings storage facility
USEPA	United States Environmental Protection Agency
TSS	total suspended solids
UET	upper effects threshold
USFS	United States Forest Service
USL	Upper Slate Lake
WIR	water ingestion rate

1.0 PROJECT BACKGROUND

The Kensington Gold Project is approximately 45 air miles north of Juneau and 35 air miles south of Haines, Alaska. The mine site is within the City and Borough of Juneau and the Tongass National Forest. Proposed mining facilities would be sited on land owned by the U.S. Forest Service, on land owned by the State of Alaska (tidelands), and on private property.

Because of continued refinement of the plan of operations for the project, a Supplemental Environmental Impact Statement (SEIS) is being prepared. Part of the amended plan is to pipe tailings for subaqueous disposal in Lower Slate Lake (LSL). The tailings storage facility (TSF) project involves the construction of a concrete-faced rockfill dam to aid in maintaining a permanent water cover as the tailings fill and raise the lake bottom (Figure 1.1). The slurried tailings (thickened to 35 percent solids prior to transport) would be delivered to the TSF through a gravity pipeline for subaqueous discharge through diffusers at the end of the pipeline. LSL would act as both a tailings repository and a settling pond. Water would be pumped from the TSF using a decant system. Under Alternative D in the SEIS, a portion of this water would be recycled to the mill, while most would be sent to a reverse osmosis (RO) treatment system. The effluent from the RO system would be discharged to East Fork Slate Creek.

At the end of mine operations, the TSF would be closed and maintained as a lake. Reclamation objectives are to return the post-closure TSF to a land use that is similar to pre-mining use and that is compatible with the surrounding ecosystem (Figure 1.2). Reclamation would include establishing a stable freshwater lake capable of sustaining a viable habitat for the headwaters' resident game fish species, Dolly Varden char (*Salvelinus malma*). If necessary, the lake would be restocked, or the natural reintroduction of fish from Upper Slate Lake (USL) would be allowed. The change in lake topography, resulting from tailings deposition, would produce a more gradually sloping lake bottom, which would slightly increase the size of the littoral zone in the lake (Earthworks, 2003; Figure 1.3). A larger photic zone (littoral zone) should increase net photosynthesis, which could increase the food base for the system.

To evaluate the potential ecological risks associated with the operation and closure of the TSF, the U.S. Environmental Protection Agency (USEPA) proposed that an ecological risk assessment (ERA) approach be used. The approach follows USEPA's 1998 guidance for conducting ecological risk assessments. As outlined by USEPA, the approach has three primary steps: Problem Formulation, Risk Analysis, and Risk Characterization. Section 2 of this report presents the Problem Formulation, which is

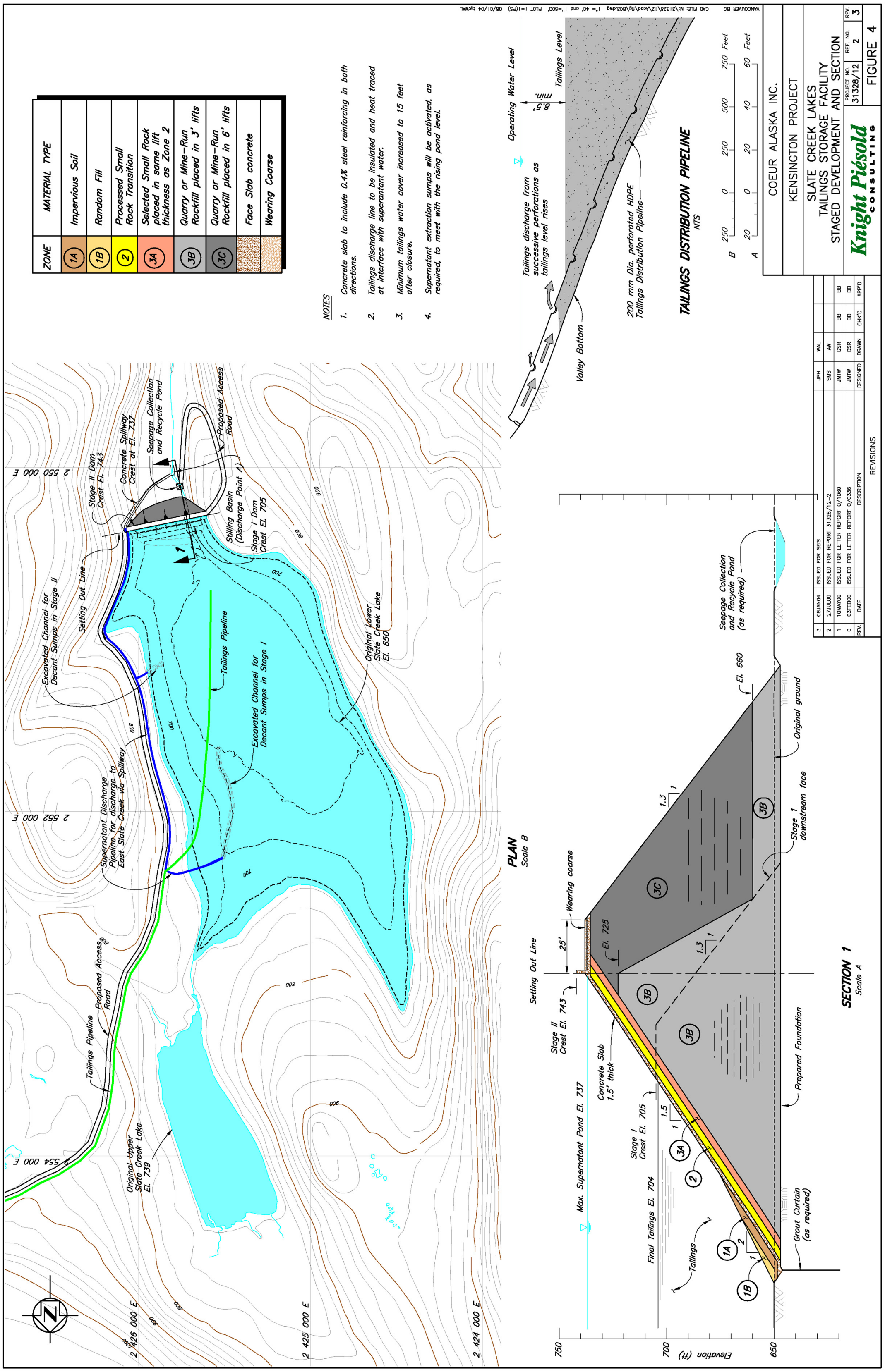


Figure 1.1 Final Extent of TSF and Dam Construction

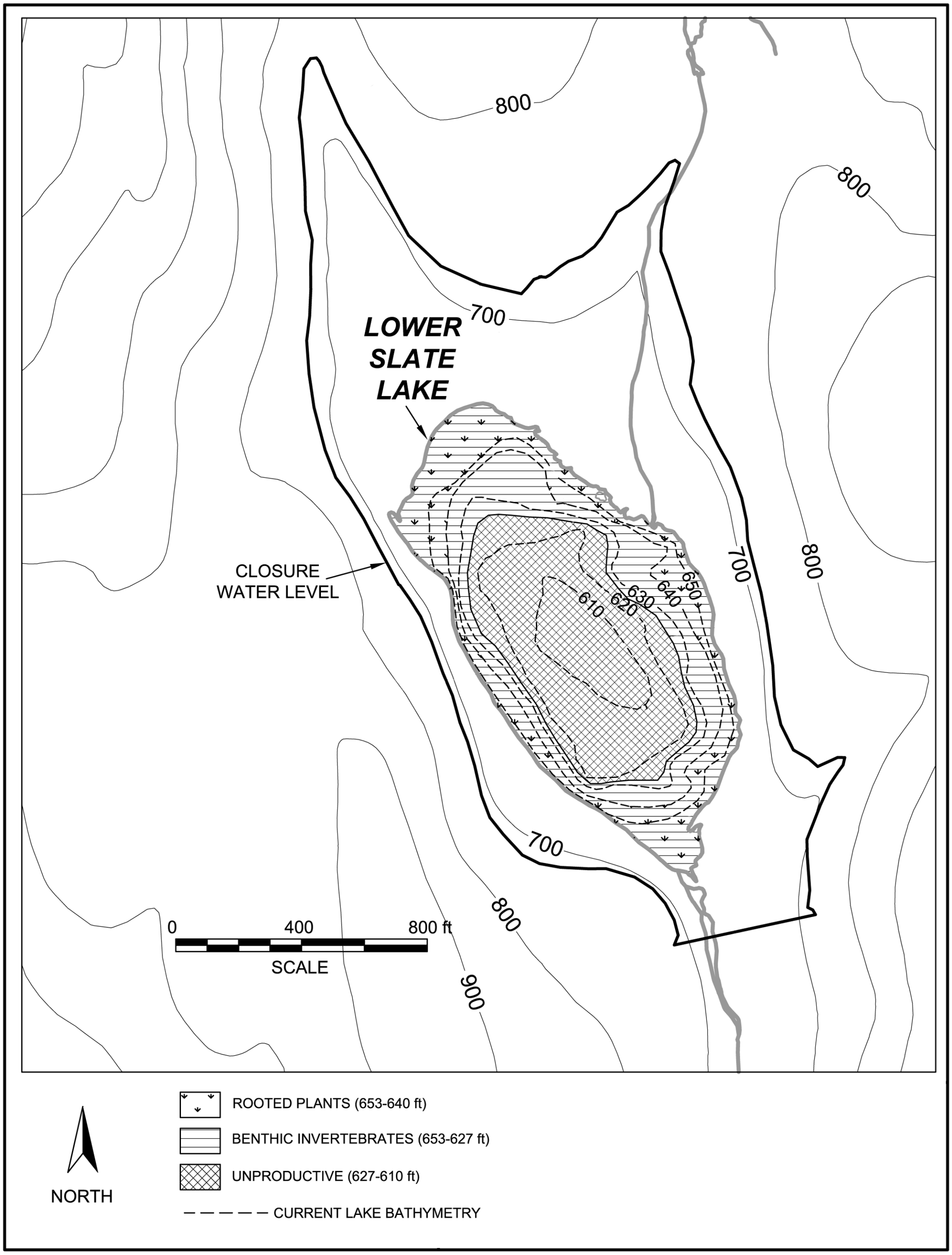


Figure 1.2 Existing Productivity Zones in the TSF

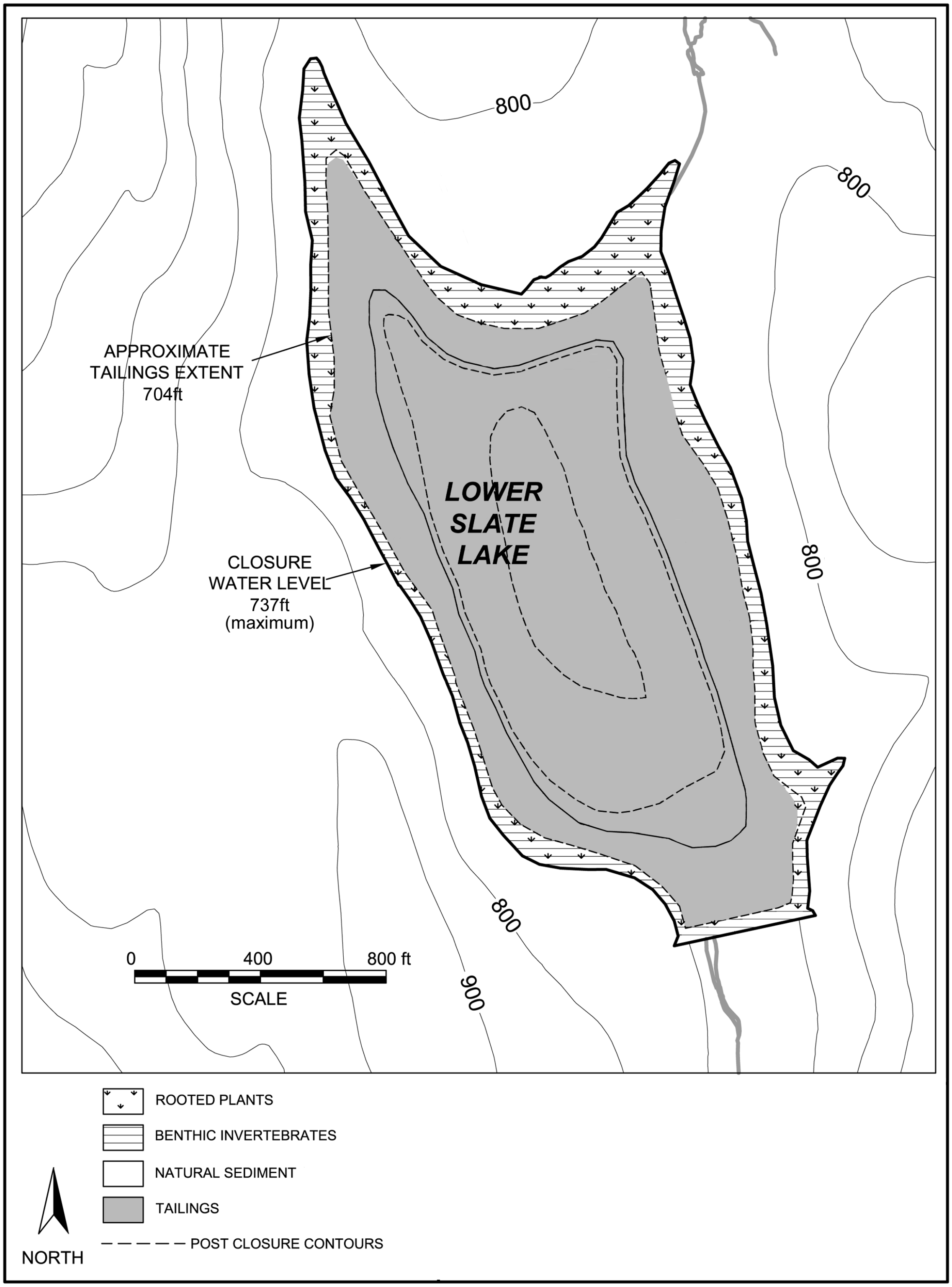


Figure 1.3 Tailings Placement and Expected Productivity Zones in the Final TSF

the planning phase of an ERA in which the goals, scope, focus, and analysis plan are formulated. Section 3 of the report evaluates the existing water and tailings chemistry and determines the chemicals of potential ecological concern (COPECs) that need to be evaluated. The COPECs are evaluated in the Risk Analysis phase, addressed in Section 4 of the report. Section 5 of the report, Risk Characterization, documents the analysis and integrates the results to describe overall risk.

2.0 PROBLEM FORMULATION

This section presents the Problem Formulation step. As part of the Problem Formulation, a conceptual site model has been developed that identifies the physical stressors, the potential sources of COPECs, the fate and transport of the COPECs in the ecosystems at the site, and the receptors that are at potential risk has been developed. A substantial amount of site-specific and relevant area-wide information was available for use in developing the conceptual model. This conceptual model was used to establish a series of management goals, as well as the assessment endpoints that allow for the evaluation of these goals.

2.1 Ecological Resources

The Kensington Mine is in the temperate, or coastal, rain forest of southeastern Alaska. This area is known for its lush vegetation, which is largely dominated by a variety of conifer trees. Dominant tree species in the immediate area near the mine are western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), and Sitka spruce (*Picea sitchensis*). Some common understory species are salmonberry (*Rubus spectabilis*), Alaska blueberry (*Vaccinium alaskaense*), and rusty menziesia (*Menziesia ferruginea*) (USFS, 1992). Other common vegetation types include muskeg, or peat bogs. Sphagnum moss is the dominant plant species, though muskeg areas also contain a wide variety of shrubs and forbs. The vegetation community surrounding LSL is similar to the vegetation community in the overall area, with the addition of stands of yellow cedar (*Chamaecyparis nootkatensis*; Streveler, 2002).

The climate of the project area can best be described as West Coast marine, with temperature extremes moderated by Pacific Ocean currents and high annual precipitation totals resulting from the onshore movement of moist maritime air. Mean annual precipitation at the project area is estimated to be 1,458 millimeters (mm) (58.3 inches). Significant precipitation occurs in all months of the year, although the spring and early summer months are usually the driest and the fall months are usually the wettest. Creeks in the project area flow year-round; the lowest flows occur during the winter months of December to March, and the highest flows occur in the fall and spring.

LSL is approximately 4 miles southeast of the mine at an elevation of approximately 700 feet in the Slate Creek drainage basin. The Slate Creek drainage basin (Figure 2.1) is 839 hectares (ha) in size and has a mean annual flow of 0.95 cubic meters per second (m^3/sec) (Konopacky, 1995). USL and LSL are within the East Fork of Slate Creek. LSL is approximately 1.4 kilometers (km) upstream of the confluence of the East and West forks of Slate Creek and approximately 2.5 km upstream of Berners Bay. There is a permanent barrier to anadromous fish near the confluence of the West and East forks (Konopacky, 1995).

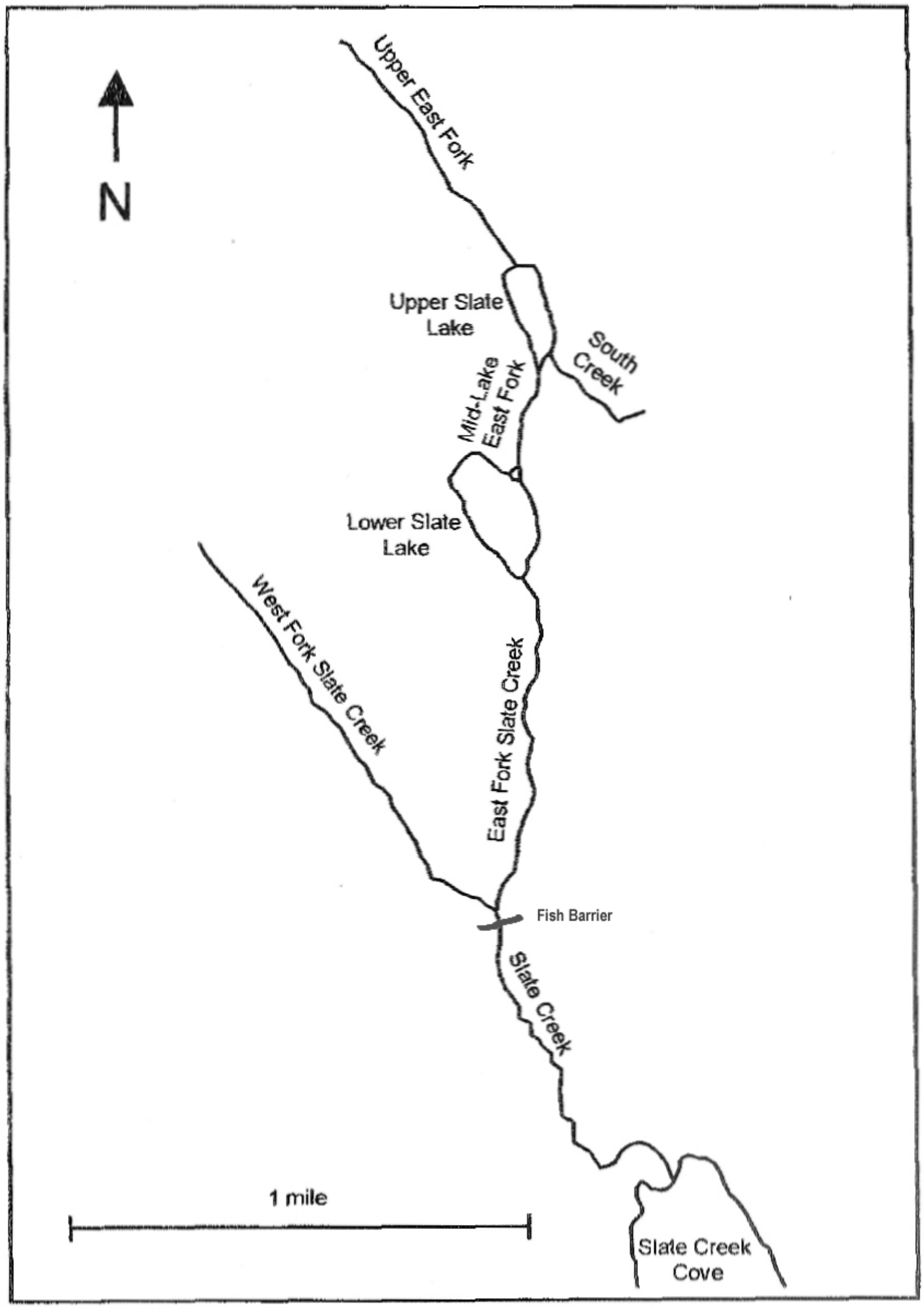


Figure 2.1 Slate Creek Basin

LSL has a surface area of 8.1 ha (20 acres), 1,255 meters (m) (4,125 feet) of shoreline, and a maximum depth of 15.5 m (51 feet). There are five inlets and one outlet to LSL. The single outlet flows from LSL to East Fork Slate Creek, which ultimately discharges into Slate Creek Cove on the northwest side of Berners Bay. A baseline survey conducted in July 1994 found that only two of the five inlets had adequate flow to provide fish habitat (Konopacky, 1995). These two inlets are split channels of Mid-Lake East Fork Slate Creek, which is the only outlet of Upper Slate Lake. LSL has a moderate pH (7–8 standard units [s.u].; Table 2.1), oligotrophic (limited nutrient/productivity) conditions, and slow inflows and outflows. The observed brown color of the lake's water is presumably from muskeg runoff (Streveler and Bosworth, 2002).

Table 2.1 Summary of Water Quality Data for LSL

Parameter	East Fork Slate Creek[a]		Parameter	East Fork Slate Creek[a]	
	Min. (mg/L)	Max. (mg/L)		Min. (mg/L)	Max. (mg/L)
SC (umhos/cm)	45	110	Arsenic	<0.0005	0.00052
pH (s.u.)	7.2	8.2	Barium	<0.01	0.0097
Temperature (^{o}C)	-0.4	20	Boron	<0.025	0.084
TDS	422	84	Cadmium	<0.000015	<0.001
TSS	<4	<4	Chromium	<0.0002	0.00063
Turbidity (NTU)	0.19	1.9	Copper	<0.002	0.00039
Acidity	<2	20	Iron	<0.05	0.3
Alkalinity	17	53	Lead	<0.001	<0.002
Hardness	27	57	Manganese	<0.01	0.056
Carbonate	<0.1	0.44	Molybdenum	<0.0005	0.00012
Bicarbonate	21	64	Mercury	<0.0002	<0.0005
Sulfate	<2	2.68	Nickel	<0.01	0.0008
Chloride	<1.0	3.4	Selenium	<0.0004	<0.005
Calcium	6.8	19	Silver	<0.0001	0.00073
Magnesium	<0.6	3.5	Zinc	<0.002	0.00912
Sodium	<3.0	8.1			
Potassium	<1.0	1.2			
Nitrate	<0.05	0.126			
Ammonia	<0.05	<0.13			
Aluminum	<0.05	0.36			

[a] Sampling location at the outfall of LSL. Samples were collected during 2000–2001 and spring 2004.
Metal concentrations are total.
SC = specific conductance in micromhos per centimeter (umhos/cm); TDS = total dissolved solids; TSS = total suspended solids; NTU = nephelometric turbidity units.

The bottom of LSL contains no large-scale topographic features and slopes to a single low area near the lake's center (Figure 1.5). LSL is bordered by steep terrain to its west, a moderate grade to the east, and nearly level terrain to the north and south. These generalities in the slopes of the riparian areas are reflected in the contours of the lake, with the most gradual bottom slope in the north end. At the high water mark, the transition between the littoral and riparian zones is abrupt, with no distinct shoreline habitat. The canopy and understory of the riparian zone vary between coniferous, deciduous, mixed, or absent, with no generalizable pattern. Submerged and partially submerged snags are common along the steep west shore. Streveler (2002) described the bottom substrate along the nearshore portions of the lake as alternating peaty and rocky. Kline (2001) reported that the deeper portions of littoral zone bottom were composed almost entirely of deep brown organic muck. Peaty substrates at the lake's margin support some sedge and grass species. The deeper "limnic zone" contained *Chara* alga, water lilies (*Nuphar polysepalum*), and pondweed (*Potamogeton natans*) (Streveler, 2002).

Rod/reel, gill net, hoop net, minnow trap, and electrofishing surveys in Upper and Lower Slate Lakes indicate that the headwaters resident Dolly Varden char (*Salvelinus malma*) is the only species of game fish present in LSL. Three-spine sticklebacks *(Gasterosteus aculeatus*) are also known to be present in the lake (Konopacky, 1995). Several estimates of the population of Dolly Varden char in LSL have been made. Buell (1989) set gill nets and captured two fish. The conclusion was that the population was small, likely because of the very oligotrophic conditions in the lake. An acoustic survey conducted in 1994 (Konopacky, 1995) estimated the number of fish to be 439 fish (range of 162–716). This estimate, however, has been questioned because of the lack of success in catching fish in the deeper part of the lake and the limited existence of a benthic macroinvertebrate food supply (Kline, 2001). Kline (2002) estimated a Dolly Varden char population of 996 (+/-292) fish in 2001 by using a mark-recapture survey. There is a limited population (estimated at 85 fish in 1994) of Dolly Varden char below LSL in East Fork Slate Creek (Konopacky, 1995). The population is thought to be small because of limited habitat. Dolly Varden char, sculpin (*Cottus* spp.), cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*O. mykiss*), pink salmon (*O. gorbuscha*), and coho salmon (*O. kisutch*) occur in Slate Creek below the fish barrier (Buell, 1989; Kline, 2001; Konopacky, 1995). Dolly Varden char captured in the streams were four to nine times smaller on average, by weight, than those captured in the lakes, and those below the lower barrier falls were silver in color in contrast to the dark olive color of the Dolly Varden char above the falls and in the lakes (Kline, 2001). There is evidence that Dolly Varden char spawn along the shore of LSL. There is also evidence that Dolly Varden char migrate from USL to LSL (Kline, 2003a).

A wide variety of benthic macroinvertebrates are present in Slate Creek. The most common families that have been collected are the insect family Chironomidae (42 percent) and the molluscan family Sphaeriidae (19 percent) (Konopacky, 1995). Grab samples collected at a depth of 4 m (13 ft) in LSL indicated limited benthic invertebrate populations. Results from three grab samples collected in June 2000 reported 123 individuals from four taxa (Chironomidae, Oligochaeta, Bivalvia, and Acari). A second round of sampling in August 2001 found 187 individuals in three grab samples. The taxa represented were the same as those in 2000 with the addition of Amphipoda, Nematoda, Diptera, Coleoptera, and Tricoptera. For both dates, the vast majority of individuals collected were midges (Chironomidae). Sampling conducted at 15 m (49 ft), on the same dates, yielded essentially no invertebrates (Kline, 2001, 2002, 2003b). These data are discussed in more detail in Section 5. Gut analyses of Dolly Varden char from LSL indicated that larger char consumed sticklebacks, and smaller char consumed chironomids and pill clams. No planktonic organisms were observed in the gut analyses, though copepods, cladocerans, rotifers, and protozoans were found in plankton tows conducted in the lake (Kline, 2001).

Terrestrial animals that might use LSL or the area in the immediate vicinity of the lake have been characterized through surveys conducted to support the SEIS. The most common large herbivore in the area is moose (*Alces alces*), though a small population of Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) might also be present. Other big game animals that might use the site are black bear (*Ursus americanus*) and gray wolf (*Canis lupus*). Smaller herbivores include a variety of rodents such as beaver (*Castor canadensis*) and red squirrel (*Tamiasciurus hudsonicus*). The habitat for snowshoe hare (*Lepus americanus*) is considered marginal. Various herbivorous waterfowl might also use margin vegetation. Mammalian predators that might use the areas near the lake are river otter (*Lutra canadensis*) and mink (*Mustela vison*). Bald eagles (*Haliaeetus leucocephalus*) and red-tailed hawks (*Buteo jamaicensis*) are the only raptors that have been observed around the project area. A variety of waterbirds (waterfowl and shorebirds) might use the lake, though only Vancouver Canada geese (*Branta canadensis*) have been observed to use the Slate Lakes area extensively. The sole amphibian species documented in the area is the boreal toad (*Bufo boreas boreas*), though observations of its occurrence in the overall region are quite limited.

2.2 Contaminant/Stressor Characteristics

Physical stressors and chemical contaminants are considered in the risk assessment of the TSF. Physical stress might result from the creation of high levels of total suspended solids (TSS) in the lake, burial of bottom habitat, and changes in shoreline and shallow-water habitat due to enlargement of the lake.

Chemical analyses were conducted for a wide variety of inorganic chemical elements and general water chemistry parameters in the decant water associated with the tailings produced during pilot milling tests conducted in 1996 and 1998. The results of these analyses are discussed in Section 3, as are the results of chemical analyses conducted on the tailings. In addition, baseline characterization of the chemistry of the existing sediment (baseline conditions) in the lake and in the East Fork of Slate Creek has also been conducted (Kline, 2001, 2002, 2003b). Of the elements measured, four are common ions (Ca, K, Mg, and Na). Although these ions are unlikely to cause toxicity, the addition of calcium and magnesium to the lake might increase the hardness and alkalinity of the water. These changes might increase the productivity of the lake (Manahan, 2000), as well as reduce the potential toxicity of hardness-dependent metals (USEPA, 1999a).

Physical stress is evaluated over two time frames. The first time frame is during the active use of the lake for tailings disposal. During this period, there is a greater likelihood of elevated TSS levels, as well as active burial of bottom habitat by tailings placement. The second time frame is after the cessation of tailings placement. A primary concern during this period is the ability of macroinvertebrates and primary producers (e.g., macrophytes) to recolonize the tailings and reestablish an energy base that can support a viable fishery. The ability of site macroinvertebrates, fish, and plants to tolerate elevated TSS and burial has not been evaluated, though there is extensive information in the scientific literature relative to these questions (see Attachment D). The habitability of tailings by macroinvertebrates has been evaluated. Studies on habitability of the tailings were conducted using both freshwater and marine invertebrates. Although laboratory and field tests indicated that the tailings were as habitable as the native Lynn Canal and Auke Bay sediments by marine macroinvertebrates (Kline, 2003b), tailings testing conducted with freshwater midges (*Chironomus tentans*) and amphipods (*Hyalella azteca*) indicated mixed results (AscI, 2000a, 2000b). Chironomid survival, growth, and egg production in the tailings were not significantly different from those in control or LSL sediment. Although chironomid egg production was not significantly different among control, LSL sediments, and tailings, egg production in tailings and shallow LSL sediment were below the USEPA-recommended minimum endpoint of 800 eggs per female. The percent emergence of chironomids from the tailings was significantly lower than that in control or shallow (4 meters) LSL sediment samples, but it was not significantly different from that in the deep (15 meters) LSL sediment sample (AscI, 2000a). Emergence in the tailings sample was also less than the USEPA-recommended 50 percent minimum endpoint. There was low survival (5 percent) of amphipods in the tailings sample (AScI, 2000b). USEPA's guidance for minimum acceptable survival in control sediments is 80 percent, which was met in the conducted study (USEPA, 2000a). Amphipod survival was insufficient to allow assessment of growth or reproductive endpoints in the tailings sample (AscI, 2000b).

2.3 Conceptual Site Model

Based on characterization of the ecological resources and identification of chemical and physical stressors, a conceptual site model (CSM) was developed to illustrate the potential exposure pathways and receptors. The derived model is shown in Figure 2.2.

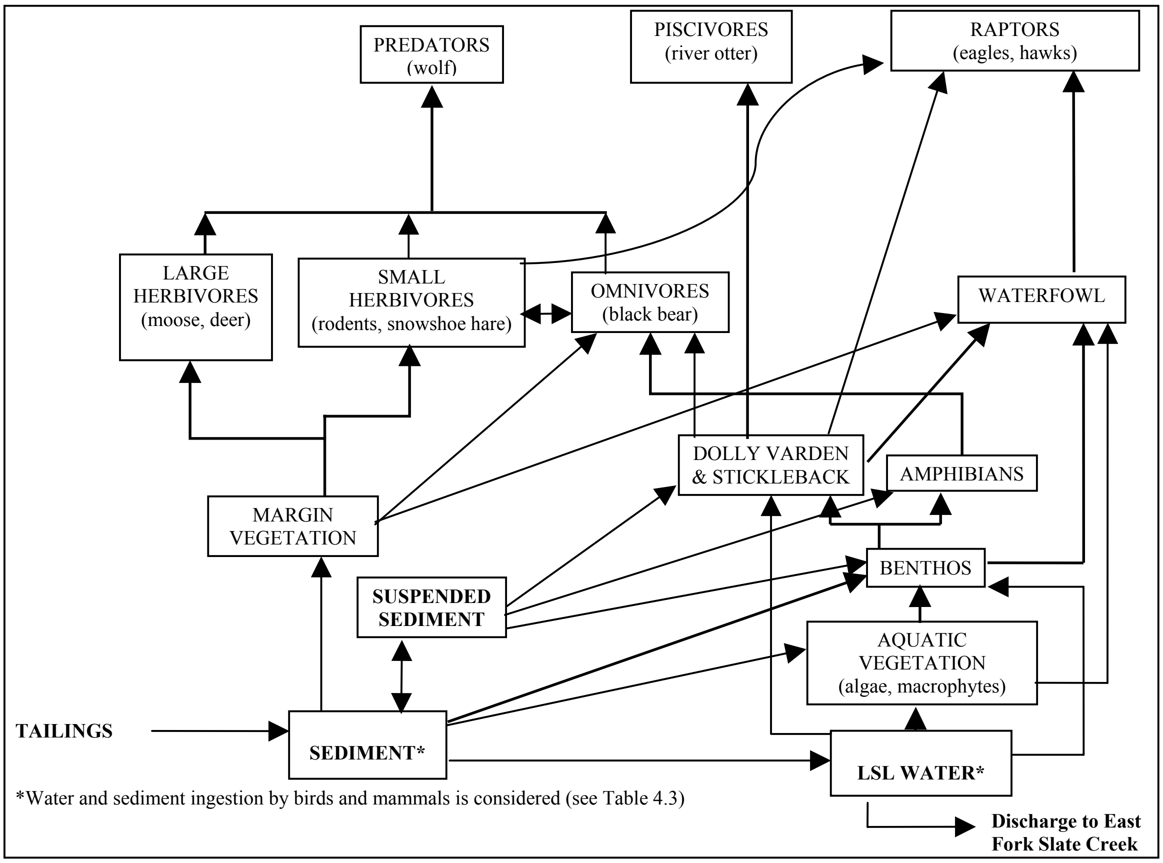


Figure 2.2 Conceptual Site Model of Exposure Pathways and Receptors

Tailings would be piped to the TSF in a slurry through a 12-inch (or smaller) pipe and placed at the bottom of the lake (USFS, 2002). These tailings would be the sole source of COPECs to the lake. Some of the solid materials placed could become suspended, or chemical constituents in the slurry or leached from the tailings could enter the water column in a dissolved form. The CSM shown in Figure 2.2 illustrates the trophic structure of both the aquatic and nearby terrestrial ecosystems at LSL, and it conceptualizes how COPECs could be transferred to different receptor types. Although the primary exposure route is to aquatic organisms, birds and mammals could be directly exposed to COPECs by drinking LSL water or by ingesting sediment while feeding. Indirect exposure to COPECs is also possible through bioaccumulation or bioconcentration processes that could result in some COPECs accumulating in dietary items. For this risk assessment, it is assumed that discharges to East Fork Slate Creek would meet all ambient water quality criteria, as required by the permitting process, and for that reason, no risk analyses are required for East Fork Slate Creek. It is also assumed that the dam would not overflow or fail. The dam is designed according to specific dam safety requirements to contain the maximum volume of tailings plus inflows from the probable maximum flood event. Analysis of the geotechnical stability is documented in the SEIS, along with further evaluation of dam operations and required permitting by the state.

Aquatic receptors can be exposed to COPEC concentrations in sediment and water (pore and overlying), as well as to physical stress from sediment burial, elevated TSS levels, and altered physical conditions (e.g., substrate characteristics, organic carbon concentration). Aquatic vegetation serves as the food base for aquatic invertebrates, which are later consumed by fish, amphibians, and waterfowl. Herbivorous waterfowl also directly consume aquatic vegetation.

As previously noted, terrestrial receptors can be directly exposed to COPECs through ingestion of sediment and water. Several receptor types also rely on aquatic biota as part of their diet, including omnivores (e.g., black bear), piscivores (e.g., river otter), raptors (e.g., bald eagles), and certain types of waterfowl. Bald eagles and black bear are common to the area (USFS, 1992), and there have been limited observations of river otter. Piscivorous waterfowl, however, have not been observed. The exposure pathway, therefore, though potentially complete, could be unlikely for these receptor types. Other terrestrial receptor types that might have exposure to COPECs associated with the tailings are avian and mammalian herbivores that feed on the margin vegetation that grows along the shores of the lake. Potential receptors include moose, deer, rodents, and geese. However, because the sediments would be placed along the bottom of the lake (Earthworks, 2002; Figures 1.3–1.5), it is unlikely that margin vegetation would have significant exposure to COPECs in the tailings. If vegetation has limited exposure, subsequent consumption of COPECs by herbivores would also be limited. The possible exception is moose, which would likely wade into the littoral zone of the lake to feed on pond lilies and pondweed (defined as aquatic vegetation), which would have a greater exposure to the tailings than would the margin vegetation growing on the shore.

2.4 Management Goals and Assessment Endpoints

Assessment endpoints are explicit expressions of the actual environmental value to be protected and are operationally defined by an ecological entity and its attributes (USEPA, 1998). The assessment endpoint is usually a neutral statement of the ecological entity and is typically coupled with a corresponding management goal, which expresses the desired condition of the ecological resource (USEPA, 1998). For the LSL ecological risk assessment, there are several management goals, as well as associated assessment endpoints for two separate time frames. Management goals and assessment endpoints are considered for the period of operation of the TSF and for the period after cessation of tailings placement. For the terrestrial receptors, however, the goals are the same during operation and after closure of the TSF. All assessment endpoints are discussed below.

2.4.1 Primary Goals and Endpoints

Fish, macroinvertebrates, and aquatic vegetation might not tolerate the constantly changing environment during active tailings disposal; a management goal was therefore developed to evaluate the potential for recolonization and possible reintroduction of these organisms into LSL upon cessation of tailings disposal. The management and assessment goals for terrestrial receptors would be the same after cessation of tailings disposal as during operation. If prey items disappear from LSL, however, the projected dietary exposure pathways to terrestrial receptors would be incomplete during operation of the TSF.

Management Goal 1:

⇒ *Reestablishing/enhancing a viable Dolly Varden char fishery in LSL upon cessation of tailings disposal.*

The corresponding assessment endpoints are

⇒ *Creation of conditions conducive to the survival, growth, and reproduction of a viable population of Dolly Varden char in LSL.*

⇒ *Creation of conditions conducive to the survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL.*

These assessment endpoints were identified primarily in view of the desired long-term goal of a viable Dolly Varden char fishery in LSL. The achievement of the management goal would depend on creating habitat conditions conducive to Dolly Varden char and to a community of aquatic plants and macroinvertebrates, as well as to a population of three-spine sticklebacks. These conditions include acceptable water chemistry, successful recolonization by a community of macroinvertebrates that can be used as a prey base for forage fish and char, sufficient primary productivity to support the macroinvertebrate community, and appropriate spawning grounds that allow for successful propagation of char. Existing information on tailings chemistry and ecological characterization are used in conjunction with studies of the scientific literature to evaluate the likelihood of achieving the assessment endpoint.

Management Goal 2:

⇒ *Protecting waterfowl during TSF operation and post-closure from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs from the LSL.*

The corresponding assessment endpoint is

⇒ *Survival, growth, and reproduction of the site populations of herbivorous, invertivorous, and piscivorous waterfowl that may feed in LSL.*

This assessment endpoint was identified primarily to address potential concerns regarding the use of the lake by migratory waterfowl and other aquatic-feeding bird species. Existing data on COPEC concentrations in tailings and studies on COPEC leaching from tailings to water were used to assess direct exposure to these receptors. Literature transfer factors were used to model the bioaccumulation of COPECs in different prey items to estimate exposure from the consumption of aquatic vegetation, macroinvertebrates, and fish from LSL. Exposure estimates were then compared with benchmarks, which are also termed toxicity reference values (TRVs), for assessing the risk of adverse effects on waterfowl. Examples of benchmarks are no observed adverse effect levels (NOAELs) and lowest observed adverse effect levels (LOAELs). In particular, COPEC concentrations in sediment and aquatic vegetation are used to evaluate the risk potential to dabbling ducks. COPEC concentrations in macroinvertebrates and fish are used to evaluate the risk potential to diving ducks. The exposure estimates are compared with benchmarks (e.g., NOAELs and LOAELs) to assess the risk of adverse effects on waterfowl and other aquatic-feeding bird populations at the site.

Management Goal 3:

⇒ *Protecting terrestrial herbivores during TSF operation and post-closure from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs in water and in vegetation along the margins of LSL.*

The corresponding assessment endpoint is

⇒ *Survival, growth, and reproduction of the site populations of grazing and browsing herbivores that may use LSL as a drinking water source and may feed on margin vegetation along LSL.*

This assessment endpoint was identified to address potential risk to terrestrial grazers (e.g., lagomorphs) and browsers (e.g., deer and moose) that might ingest margin vegetation along the lake or use the lake as a drinking water source. Existing data on COPEC concentrations in tailings and studies on COPEC leaching from tailings to water were used to estimate direct exposure to COPECs from ingestion of drinking water and sediment. Literature transfer factors were used to model the transfer of COPECs to vegetation. The exposure estimates were compared with benchmarks (e.g., NOAELs and LOAELs) to assess the risk of adverse effects on herbivore populations.

Management Goal 4:

⇒ *Protecting terrestrial omnivores during TSF operation and post-closure from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs in water and in food items affected by the TSF.*

The corresponding assessment endpoint is

⇒ *Survival, growth, and reproduction of the site populations of omnivores that might drink water and feed on food items affected by tailings placed in LSL.*

This assessment endpoint was identified to address potential risk to omnivores that might ingest COPECs through water and food items that have been affected by COPEC concentrations in tailings. Existing data on COPEC concentrations in tailings and studies on COPEC leaching from tailings to water were used to estimate direct exposure to COPECs from drinking water and sediment ingestion. Modeled COPEC concentrations in potential food items, using literature bioaccumulation factors, were used to estimate exposure from dietary items. The exposure estimates were compared with benchmarks (e.g., NOAELs and LOAELs) to assess the risk of adverse effects on omnivore populations.

<u>*Management Goal 5:*</u>

⇒ *Protecting higher-order mammalian and avian consumers (i.e. predators) during TSF operation and post-closure from the effects of ingesting water and contaminated prey that may result in lethal, mutagenic, reproductive, systemic, or general toxic effects due to COPECs from operation of the TSF.*

The corresponding assessment endpoint is

⇒ *Survival, growth, and reproduction of the populations of predators that may drink water and/or feed on food items affected by tailings placed in LSL.*

This assessment endpoint was identified to address potential risk to higher-order consumers (e.g., predators) that might ingest COPECS through water and food items that have been affected by the tailings. Existing data on COPEC concentrations in tailings and studies on COPEC leaching from tailings to water were used to estimate direct exposure to COPECs from drinking water and sediment ingestion. Projected COPEC transfer to primary consumers was used to estimate exposure of these species. In particular, concentrations of COPECs in herbivore and omnivore tissue were used to estimate exposure in wolves. Modeled COPEC concentrations in tissue of small mammals and Dolly Varden char were used to estimate exposure in river otters and bald eagles. The exposure estimates were compared with benchmarks (e.g., NOAELs and LOAELs) to assess the risk of adverse effects on populations of these species.

2.4.2 Secondary Goals and Endpoints

As discussed earlier, the aquatic community in LSL might not be able to adapt to the constantly changing environment that could result from operation of the TSF. While recognizing that tailings disposal might preclude the existence of a viable population during the operational time period, the risk assessment also evaluates the potential risks to aquatic organisms during TSF operations.

<u>*Management Goal 1(alternative):*</u>

⇒ *Protecting the Dolly Varden char population during operation of the TSF.*

The corresponding assessment endpoints are

⇒ *Survival, growth, and reproduction of the population of Dolly Varden char that currently inhabit LSL.*

⇒ *Survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL.*

This assessment endpoint was identified primarily based on the possibility of maintaining a viable Dolly Varden char population in LSL during TSF operations. Existing data from studies on COPEC leaching from tailings and on tailings chemistry were used to assess direct exposure to Dolly Varden char and their prey base. Exposure estimates were then compared with benchmarks to assess the risk of adverse effects on char and macroinvertebrates. The benchmarks are discussed in Section 4. Effects from physical changes in the TSF were evaluated based on reported tolerances of aquatic organisms to TSS and sediment burial, as reported in the scientific literature.

2.5 Analysis Plan Overview

USEPA (1998) identifies three types of measures that are used to assess ecological risk:

- Measures of Effect – Direct measures of changes in an attribute of the assessment endpoint that can be attributed to exposure to the stressor in question.
- Measures of Exposure – Measures of stressor concentrations and movement in the environment.
- Measures of Ecosystem and Receptor Characteristics – Measures of ecosystem and receptor characteristics that influence the potential for contact between the receptor and stressor.

The available data relative to these three measures are discussed below.

2.5.1 Measures of Effect

There is some information available on the direct measurement of effects on receptors. In particular, the habitability studies conducted by AScI (2000a, 2000b) are relevant to evaluating Management Goal 1. These studies evaluated the toxicity and habitability of the tailings by chironomids and amphipods. As indicated in the macroinvertebrate surveys (Kline, 2001), midges are prevalent in LSL and are an important food source for Dolly Varden char. There have been only limited observations of amphipods in the lake (additional discussion in Section 5), and they were not observed in the gut analyses conducted on char captured in LSL (Kline, 2001). For the other required measures of effects, ecotoxicological benchmarks that represent known levels of effects for specific exposure ranges were compiled. Based on the COPEC screening conducted (discussed in Section 3), available NOAEL and LOAEL benchmarks were compiled for the identified COPECs in water and tailings (see Section 4). The effects of TSS and sediment burial on relevant aquatic receptors available in the scientific literature are also discussed in Section 4.

2.5.2 Measures of Exposure

Although there are some available data that can be used to evaluate the exposure of the different assessment endpoints outlined in Section 2.4, because of the predictive nature of the risk assessment, much of the exposure information requires modeling of the transfer of COPECs through the aquatic and terrestrial ecosystems. Measured COPEC concentrations in tailings, along with the analysis of leachate and decant water from various studies on the tailings, were used to arrive at the measure of exposure to COPECs from these media. Literature transfer factors, or bioaccumulation factors, were compiled to allow for modeling of COPEC concentrations from these media through the exposure pathways outlined in Figure 2.2. The transfer factors compiled from the literature are discussed in Attachment C.

2.5.3 Measures of Ecosystem and Receptor Characteristics

Measures of ecosystem and receptor characteristics, found in the extensive baseline characterizations conducted for the FEIS (USFS, 1992) and subsequent studies in support of the amended plan of operation, were incorporated into the final risk characterization of the potentially impacted ecosystems and receptors that might be exposed to COPECs and physical stressors from operation of the TSF in the lake. Evaluation of ecosystem and receptor characteristics is critical to the assessment of habitat and forage availability for the different receptors. Table 2.2 summarizes the assessment and measurement endpoints for each management goal, as well as the interpretation of the potential risk.

Table 2.2 Summary of Management Goals and Assessment and Measurement Endpoints

Management Goal	Assessment Endpoints	Measurement Endpoints	Interpretation
1. Reestablishing/enhancing a viable Dolly Varden char fishery in LSL upon cessation of tailings disposal	Creation of conditions conducive to the survival, growth, and reproduction of a viable population of Dolly Varden char in LSL	Comparison of chemical water quality after cessation of operation with protective values. Physical stressors are evaluated by review of the literature.	Are there chemical or physical limitations for the survival, growth, and reproduction of char in LSL at closure?
	Creation of conditions conducive to the survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL	Comparison of chemical water and sediment quality after cessation of operation with protective values. Physical stressors are evaluated by review of the literature. Evaluation of tailings habitability through review of tailings toxicity test results.	Are there chemical or physical limitations for the survival, growth, and reproduction of plants, macroinvertebrates, and forage fish in LSL at closure? Evaluation of recolonization/habitability of tailings.
2. Protecting waterfowl from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs from the LSL	Survival, growth, and reproduction of the site populations of herbivorous, invertivorous, and piscivorous waterfowl that may feed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	If NOAEL HQ>1 risk to individuals; if LOAEL HQ>1, risk to population
3. Protecting terrestrial herbivores from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs in water and in vegetation along the margins of LSL	Survival, growth, and reproduction of the site populations of grazing and browsing herbivores that may use LSL as a drinking water source and may feed on margin vegetation along LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	If NOAEL HQ>1, risk to individuals; if LOAEL HQ>1, risk to population
4. Protecting terrestrial omnivores from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingestion of COPECs in water and in food items influenced by the TSF	Survival, growth, and reproduction of the site populations of omnivores that may drink water and feed on food items affected by tailings placed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values.	If NOAEL HQ>1, risk to individuals; if LOAEL HQ>1, risk to population
5. Protecting higher-order mammalian and avian consumers (i.e., predators) from the effects of ingesting water and contaminated prey that may result in lethal, mutagenic, reproductive, systemic, or general toxic effects due to COPECs from operation of the TSF	Survival, growth, and reproduction of the populations of predators that may drink water and/or feed on food items affected by tailings placed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values.	If NOAEL HQ>1, risk to individuals; if LOAEL HQ>1, risk to population
1 alt. Protecting the Dolly Varden char population during operation of the TSF	Survival, growth, and reproduction of the population of Dolly Varden char that currently inhabits LSL	Comparison of chemical water quality in the TSF during operation with protective values. TSS levels are evaluated by comparison with literature values.	Are there chemical or physical limitations for the survival, growth, and reproduction of char during TSF operations?
	Survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char population in LSL	Comparison of chemical water and sediment quality during TSF operation with protective values. Physical stressors are evaluated by review of the literature. Evaluation of tailings habitability through review of toxicity test results.	Are there chemical or physical limitations for the survival, growth, and reproduction of plants, macroinvertebrates, and forage fish during TSF operations?

3.0 REVIEW OF DATA AND COPEC DETERMINATION

Two periods were considered for the determination of COPECs that need to be addressed in the risk assessment. The first period is during active tailings discharge to LSL. Two sets of water chemistry need to be considered for this period. The first set is the water released with the tailings. There would be isolated exposures to these conditions in and around the tailings discharge point and potentially in some of the pore water associated with the tailings themselves. The second set of water chemistry is the "mixed" water chemistry, or the chemical conditions that would be expected to occur throughout most the lake during operations. The second period considered in the risk assessment is after closure of the TSF.

Table 3.1 lists the water chemistry data for the decant water samples from the Montgomery Watson 1996 tailings analysis (MW, 1996) and for the decant water from the CMRI 1998 tailings analysis (CMRI, 1998). The 1996 samples are listed as MW96-C1 through MW96-C5, and the 1998 samples are labeled CMRI C2–C5. The decant water is essentially the process water associated with the tailings slurry. As discussed in Attachment A of the Final SEIS, these samples have been determined to be the most representative data available for the tailings water chemistry. It is important to note, however, that the decant water *generally* represents the worst-case water for the lake, and the concentrations reported would exist only in the vicinity of the tailings discharge and in isolated tailings pore water. Overall, the discharge water would be rapidly integrated with LSL water, resulting in decreased concentrations of COPECs but for some constituents, still elevated in comparison with existing water chemistry in LSL. The mixed water conditions are termed operational water and are discussed in Section 4.

With the exception of aluminum, values are listed for dissolved concentrations, in accordance with USEPA's guidance (USEPA, 1993a, 1999a). USEPA (1999a) recommends that total aluminum concentrations be considered. The minimum, maximum, and mean of the analytes measured in the nine samples are also listed. To be very conservative, the mean was calculated using the detection limit for samples reported as non-detect. Table 3.1 also lists the acute and chronic aquatic life criteria for fresh water in Alaska's water quality standards. The State does not have criteria for all the measured constituents. To provide another means of screening the constituents, the very recent and comprehensive Tier II values issued by the Michigan Department of Environmental Quality (MDEQ, 2003) are listed as well. The Tier II values were calculated using USEPA guidelines (Stephan et al., 1985) and are considered to be appropriate risk-screening values. Tier II values are secondary screening values that are calculated when the scientific database is inadequate to meet USEPA's procedural requirements for establishing a recommended water quality criterion (Tier I value). The toxicities of some elements depend

Table 3.1 Comparison of Decant Water Chemistry with Risk-Based Criteria

Parameter	units	MW96 C1	MW96 C2	MW96 C3	MW96 C4	MW96 C5	CMRI C2	CMRI C3	CMRI C4	CMRI C5	min	max	mean[a]	AK Acute[c]	AK Chronic[c]	MDEQ Acute[e]	MDEQ Chronic[e]
Aluminum	µg/L	<500	<500	<500	<500	<500	2,800	3,900	250	1,100	250	3,900	1,172	750	87		
Antimony	µg/l	NA	NA	NA	NA	NA	3.4	1.1	3	<1	<1	3.4	2.1			2,300	240
Arsenic	µg/L	0.491	0.601	0.943	0.899	0.778	<2	<2	<2	<2	0.491	<2	1.3	340	150	680	150
Barium	µg/L	<500	<500	<500	<500	<500	69	62	88	66	62	<500	309			584.1	100.3
Beryllium	µg/L	NA	NA	NA	NA	NA	<1	<1	<1	<1	<1	<1	1			1.3	0.1
Cadmium	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	0.142	0.111	0.1	0.1	0.1	<0.2	0.16	0.52	0.09	1.9	0.09
Chromium	µg/L	<20	<20	<20	<20	<20	3.62	0.07	0.07	0.519	0.07	<20	11.6	183	23.8	366.1	23.8
Cobalt	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA						740	100
Copper	µg/L	<2	<2	<2	<2	<2	0.0925	0.255	0.286	0.524	0.0925	<2	1.24	3.8	2.9	7.3	2.7
Iron	µg/L	<50	<50	<50	<50	<50	<10	<10	<10	<10	<10	<50	32.2		1,000		
Lead	µg/L	<2	<2	<2	<2	<2	1.16	<0.08	<0.08	<0.08	<0.08	<2	1.27	13.9	0.5	39.4	2.2
Manganese	µg/L	68	78	81	84	88	2.4	1.2	<2	<2	1.2	88	45.2			2464	571
Mercury	µg/L	0.00818	0.00445	0.00301	0.00298	0.0033	0.0280	0.0129	0.0204	0.0309	0.00298	0.0309	0.013	2.4	0.077	2.8	0.077
Molybdenum	µg/L	<500	<500	<500	<500	<500	78	77	74	75	74	<500	311.6			14,000	800
Nickel	µg/L	<10	<10	<10	<10	<10	6.7	3.82	4.15	3.55	3.55	<10	7.58	145	16.1	290	16.1
Selenium	µg/L	0.768	0.948	1.05	1.17	1.05	2.79	<2	2.81	2.00	0.768	2.81	1.62	(b)	4.6	120	5
Silver	µg/L	<0.008	<0.008	<0.008	<0.008	<0.008	<0.05	<0.05	<0.05	<0.05	<0.008	<0.05	0.027	0.3		1.1	0.06
Strontium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA						150,000	8,300
Thallium	µg/L	NA	NA	NA	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1			160	10
Vanadium	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA						220	12
Zinc	µg/L	15	13	13	13	12	75.7	10.3	6.9	3.8	3.8	75.7	18.1	36.2	36.5	72.4	36.5
Ammonia	µg/L	(f)	(f)	(f)	(f)	(f)	950	900	1,050	860	860	1,050	940	4,640[d]	2,010[d]		
Nitrate	mg/L	(f)	(f)	(f)	(f)	(f)	4.1	4.8	5.6	4.0	4	5.6	4.6				
TDS	mg/L	470	650	710	730	810	1,000	900	1,160	1,000	470	1,160	825.5				
TSS	mg/L	<4	6	<4	<4	<4	5	240	110	70	<4	240	49.7				
SO4	mg/L	198	280	310	330	330	710	680	770	550	198	770	462				
pH, field	s.u.	nd	nd	nd	nd	nd	10.5	10.2	10.25	10.3	10.2	10.5	10.3				
pH, lab	s.u.	8.1	8	8.1	8.2	8.1	10.7	10.5	11	11.1	8	11.1	9.3				
hardness	mg/L	210	260	290	310	320	658	583	654	524	210	658	423				

In the shaded cells the min, max, or average value exceeds a criterion.
Data sources are MW (1996) and CMRI (1998). Dissolved values are presented per USEPA guidance (USEPA, 1993c).
NA= not available; nd = non detect.
[a] Calculated using the detection limit for below-detection analytical results.
[b] Dependent on fraction of selenite and selenate.
[c] Cd, Cr, Cu, Pb, Ni, Ag, and Zn values are hardness-dependent and are calculated for a hardness of 25 mg/L (as $CaCO_3$).
[d] Dependent on pH, water temperature, species present, and life stage; values listed assume pH = 8.1, 10 C, and early life stages present.
[e] MDEQ (2003) Tier II values calculated under the Great Lakes Initiative (GLI).
[f] Elevated ammonia and nitrate levels observed in the 1996 samples were due to blasting residues. The 1998 NPDES permit mandated control of these residues. The 1998 data reflect these changes and are representative of expected conditions in the tailings

on the hardness of the water, with toxicity decreasing with increasing hardness. For all hardness-dependent criteria, a low hardness value of 25 milligrams per liter (mg/L) (as $CaCO_3$) was used to derive the listed criteria. Although this value reflects the existing background hardness levels in LSL, it is conservative for the comparison with the discharge water because of localized higher hardness values (210–658 mg/L as $CaCO_3$; Table 3.1), which would decrease the potential toxicity of hardness-dependent metals. Given the relatively low volume of water in the tailings discharge in comparison with the volume of water in LSL, it was determined that if the maximum concentration of a constituent did not exceed the acute criteria and if the maximum concentration required less than a threefold dilution to meet the chronic criteria, the constituent could be screened out and not considered a COPEC in the risk assessment.[1] Under all alternatives considered in the Final SEIS, the predicted daily input of tailings water represents a minor portion of the LSL input.

In Table 3.1, if the minimum, maximum, or mean values exceed either the State criteria or the MDEQ Tier II standards, the values are shaded. Only six constituents—aluminum, barium, beryllium, cadmium, lead, and zinc—are higher than the criteria values. However, beryllium has not been detected in the decant water, and the method detection limit (MDL) is less than the acute value, although the MDL is above the MDEQ's chronic criterion of 0.1 µg/L for beryllium. Because beryllium was not detected in the decant water above its MDL, it was removed from further consideration in the risk assessment. The highest detected barium concentration, 88 µg/L, is less than the chronic criterion of 100 µg/L (Table 3.1). Barium was not retained as a COPEC. The maximum detected cadmium, lead, and zinc concentrations are less than the acute criteria, and approximately only twice as high as the chronic criteria. Since only a dilution/mixing factor of roughly 2 is required to reach the criteria, these constituents were not retained as COPECs.

Neither the State nor the MDEQ lists aquatic life values for nitrate, total dissolved solids (TDS), TSS, or sulfate. For nitrate, Meade (1974) reported that 100 mg/L was safe for trout, and Westin (1973) reported that 5,000 mg/L resulted in 50 percent mortality (LC50). The maximum value of 36 mg/L in the decant water is well below the safe level for trout, and for that reason nitrate was removed from further consideration.

Based on the extensive ion toxicity testing conducted by Mount et al. (1997), sulfate is unlikely to result in toxicity to fish or aquatic macroinvertebrates at concentrations of less than 1,000 mg/L. Therefore, sulfate was not retained as a COPEC for the risk assessment.

[1] As documented in Attachment C, the tailings will not be a source of metals loadings to the TSF after closure.

Chapman et al. (2000) reported no adverse effects on early life stages of trout at TDS concentrations as high as 2,000 mg/L. The same study reported NOAELs of 1,134 to 1,220 mg/L for chironomids. Stekoll et al. (2003) evaluated the effect of TDS on fertilization of different salmonids. The authors state that this is the most sensitive stage in TDS exposure. Although some salmonid species were affected by TDS concentrations as low as 250 mg/L, Dolly Varden char was the least sensitive species tested. The lowest observed effect concentration (LOEC) for Dolly Varden char was 1,875 mg/L. Based on these data, TDS was not retained for further analysis in the risk assessment.

TSS has been retained for further analysis because of expected high levels of TSS in the LSL and the tailings discharge. In addition, pH is a COPEC because the reported pH levels are outside the 6.5–9.0 range listed by USEPA in the National Recommended Water Quality Criteria (USEPA, 1999a). Based on screening of the water chemistry, aluminum, pH, and TSS were retained as COPECs.

In addition to the decant water chemistry, aquatic receptors, especially benthic macroinvertebrates, have direct exposure to sediments, which in this case would be the deposited tailings. Table 3.2 lists the measured concentrations of chemicals in the 1996 and 1998 tailings (based on the Rescan 2000 work). Also shown in Table 3.2 are the measured concentrations of chemicals in the existing LSL sediments, as reported by Kline (2003b). Sediment samples from depths of 4 m (13 ft) and 15 m (49 ft) were analyzed. The Rescan (2000) report lists tailings concentrations from both an aqua regia and a triple-acid digest. The aqua regia digest is a dual-acid (hydrochloric and nitric) method that is more similar to the standard USEPA 3050/3051 digest method, which uses nitric acid, or nitric and hydrochloric acids. Because the aqua regia method is more comparable to the 1996 MW analysis and the LSL sediment analysis, these values were used in the risk assessment and are listed in Table 3.2.

Also shown in Table 3.2 are a variety of risk-based screening values for freshwater sediment. The MacDonald et al. (2000) data are consensus-based values from a review of several different types of sediment quality guidelines. The threshold effect concentration (TEC) is the concentration at which effects are not expected to occur. The probable effect concentration (PEC) is the concentration at which effects are expected to occur more often than not. The same definitions hold for the interim sediment quality guideline (ISQG) and the probable effect level (PEL) from the Canadian Council of Ministers of the Environment (CCME). The ISQG is equivalent to the TEC, and the PEL is the same as the PEC. The final set of values is issued by the National Oceanic and Atmospheric Administration (NOAA). The TEL and PEL are defined in the same way as the MacDonald et al. (2000) and CCME (2002) values. The upper effects threshold (UET) is the lowest of the apparent effect thresholds (AETs) derived from bioassay testing.

Table 3.2 Comparison of Tailings Chemistry with LSL Sediment and Risk-Based Criteria

		Tailings Analyses		LSL Sediment		Sediment Screening Values						
		MW (1996)	Rescan (2000)	Kline (2003b) LSL-Shallow	LSL-Deep	MacDonald et al. (2000)		CCME (2002)		NOAA (1999)		
Analyte	**Unit**	**USEPA 3051**	**Aqua Regia**	**USEPA 3050**	**USEPA 3050**	**TEC**	**PEC**	**ISQG**	**PEL**	**TEL**	**PEL**	**UET**
Aluminum	mg/kg		16,300	17,530	22,567							
Antimony	mg/kg	3		5.35	10.617							3
Arsenic	mg/kg	**8**	2	57	47.9	9.79	33.0	5.9	17	5.9	17	17
Barium	mg/kg	573	110	189	264							
Beryllium	mg/kg		<0.5	0.91	1.0							
Cadmium	mg/kg	<0.1	<0.5	2.07	1.56	0.99	4.98	0.6	3.5	0.596	3.53	3
Chromium	mg/kg	**39**	**119**	26.4	37.1	43.4	111	37.3	90	17.3	90	95
Cobalt	mg/kg	12	8	28.62	34.47							
Copper	mg/kg	30	14	50.12	65.43	31.6	149	35.7	197	35.7	197	86
Iron	mg/kg	31,000	31,100	29,217	41,167							40,000
Lead	mg/kg	25	4	7.2	9.05	35.8	128	35	91.3	35	91.3	127
Manganese	mg/kg	1,286	1,400	3,246	2,158							1,100
Mercury	mg/kg	0.058	0.01	0.15	0.174	0.18	1.06	0.17	0.49	0.174	0.486	0.56
Molybdenum	mg/kg	10	5	4.6	4.55							
Nickel	mg/kg	6	**28**	27.48	31.5	22.7	48.6			18	35.9	43
Selenium	mg/kg	<1		8.042	6.493							
Silver	mg/kg	0.01	<0.2	0.615	0.973							4.5
Strontium	mg/kg		223	45.8	52.3							
Thallium	mg/kg		<10	0.572	0.9							
Vanadium	mg/kg	65	65	67.4	96							
Zinc	mg/kg	55	52	204.8	203.5	121	459	123	315	123.1	315	520

In the shaded cells the tailings concentration exceeds the background LSL concentration. Boldface tailings values exceed a sediment screening value. TEC = threshold effect concentration; PEC = probable effect concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; UET = upper effects threshold.

Shading of cells in Table 3.2 indicates that the tailings concentrations exceed the shallow (4-m) or deep (15-m) sediment concentrations of those particular elements. As shown, barium, chromium, lead, molybdenum, nickel, strontium, and possibly thallium concentrations exceed the ambient concentrations of these elements in the LSL sediments. Values shown in boldface type in Table 3.2 exceed at least one sediment screening value. The concentrations of arsenic, chromium, and nickel in at least one of the analyzed tailings samples exceed a sediment screening value. Each of the elements that exceeds either background or a sediment screening value is further evaluated to see whether it should be further assessed as a COPEC.

As noted in Table 3.2, one of the two tailings samples exceeds some of the sediment screening values for arsenic. The value of 8 mg/kg exceeds the ISQG and TEL values listed by the CCME and by NOAA, though it is below the corresponding PEL values and the consensus values in Macdonald et al. (2000). More important, the value is well below the 48–58 mg/kg concentrations measured in LSL sediments. Arsenic was therefore not retained as a COPEC. One of the measured barium concentrations in the tailings is within the values reported for the LSL sediments, though the MW (1996) value of 573 mg/kg is higher than the LSL sediment values. There are no sediment screening values for barium. Reported typical soil concentrations of barium at uncontaminated sites are between 84 and 960 mg/kg (Kabata-Pendias, 2001). Given the range of barium concentrations recorded for the tailings (110–573 mg/kg), it is unclear whether they are elevated relative to existing concentrations in LSL sediments (189–264 mg/kg). However, because the concentrations in the tailings are similar to background soil values, barium was not retained as a COPEC. Chromium has been retained as a COPEC because the tailings concentrations exceed the LSL sediment values and the sediment screening values. For lead, one of the two tailings samples exceeds the LSL sediment values. The measured lead concentration of 25 mg/kg, however, is below all the sediment screening values. Lead was therefore not retained as a COPEC. There are no sediment screening values for molybdenum, and the measured molybdenum concentrations of 5 and 10 mg/kg are slightly higher than the 4.55–4.6 mg/kg concentrations in the LSL sediments (Table 3.2). The measured concentrations, however, are at the low end of the range of 5–57 mg/kg that is typical of sediment concentrations in U.S. rivers (Eisler, 2000). Molybdenum was therefore not retained as a COPEC. One of the two nickel concentrations in the tailings exceeds the TEC and TEL values listed in Table 3.2, though the measured concentration of 28 mg/kg is less than the corresponding PEC and PEL values. This concentration is also essentially the same as the measured nickel values of 27.5–31.5 mg/kg in the LSL sediments. Nickel was not retained as a COPEC. The single measured strontium tailings concentration of 223 mg/kg exceeds the LSL sediment concentrations of 45.8–52.3. Reported typical soil concentrations at uncontaminated sites range from 17 to 675 mg/kg (Kabata-Pendias, 2001). Based on this comparison, strontium was not retained as a COPEC. The only thallium measurement, < 10 mg/kg, is insufficient for comparisons with the LSL sediments because of a high detection limit. The low concentration of thallium in the decant water (Table 3.1), however, supports that the thallium concentrations in the tailings are low. Based on this, thallium was not retained as a COPEC. In summary, the only COPEC retained for further analysis, based on the comparison with background concentrations and sediment guidance values, is chromium.

In addition to the above screening methods, concentrations of COPECs in the decant water were compared with criteria that are protective of livestock drinking water (Table 3.3). Although wildlife might have a different susceptibility than livestock, the protective criteria assume that livestock are exposed 100 percent of the time. It is unlikely that larger terrestrial wildlife would use LSL as their sole water source. The concentrations of COPECs in the decant water (Table 3.3) are generally much lower than the livestock criteria and should therefore be protective of use by wildlife.

Table 3.3 Comparison of Decant Water Chemistry with Livestock Drinking Water Criteria

Parameter	units	min	max	mean[a]	CCME Livestock[b]
Aluminum	µg/L	250	3,900	1,172	5,000
Antimony	µg/L	<1	3.4	2.1	NA
Arsenic	µg/L	0.491	<2	1.3	25
Barium	µg/L	62	<500	309	NA
Beryllium	µg/L	<1	<1	1	100
Cadmium	µg/L	0.1	<0.2	0.16	80
Chromium	µg/L	0.07	<20	11.6	1,000*
Cobalt	µg/L				1,000
Copper	µg/L	0.0925	<2	1.24	500
Iron	µg/L	<10	<50	32.2	10,000**
Lead	µg/L	<0.08	<2	1.27	100
Manganese	µg/L	1.2	88	45.2	10,000**
Mercury	µg/L	0.00298	0.0309	0.013	3
Molybdenum	µg/L	74	<500	311.6	500
Nickel	µg/L	3.55	<10	7.58	1,000
Selenium	µg/L	0.768	2.81	1.62	50
Silver	µg/L	<0.008	<0.05	0.027	NA
Strontium	µg/L				NA
Thallium	µg/L	<1.0	<1.0	1	NA
Vanadium	µg/L				100
Zinc	µg/L	3.8	75.7	18.1	50,000
Ammonia	µg/L	860	1,050	940	NA
Nitrate	mg/L	4	5.6	4.6	100
TDS	mg/L	470	1,160	825.5	3,000
Sulfate	mg/L	198	770	462	1,000

NA = not available.
[a] Calculated using the detection limit for below-detection analytical results.
[b] Values are from CCME (2002) except those denoted with *, which are values from ANZECC (2000), or those with **, which are values from DWAF (1996).

The bioaccumulation potentials of the COPECs were also screened. Though the water criteria values listed in Table 3.1 are for ambient water conditions and therefore incorporate the potential for bioaccumulation, the sediment criteria might not be protective of potential bioaccumulation (MacDonald et al., 2000). Work conducted to evaluate the placement of tailings in Lynn Canal assessed the bioaccumulation potential of the tailings (EVS, 1999a). These tests were conducted using the marine organisms *Macoma nasuta* (clam) and *Nereis virens* (polychaete). Results of the 28-day bioaccumulation tests are summarized in Table 3.4. The tests compared tissue concentrations of different COPECs in organisms maintained in the tailings and in Lynn Canal sediment. The organisms maintained in the tailings did not have greater accumulation of the COPECs, with a few exceptions. The exceptions are calcium, magnesium, manganese, and strontium for *Macoma nasuta* and mercury for *Nereis virens*. For all the COPECs that were higher for either organism, the increases were less than 1.5 times the control.

Table 3.4 Summary of Bioaccumulation Tests

	Macoma nasuta			*Nereis virens*		
	Tailings (T)	Lynn Canal (S)	Significance[a]	Tailings (T)	Lynn Canal (S)	Significance[a]
Aluminum	1,060	1,600	S>T	841	1,690	NS
Antimony	0.15	0.18	S>T	0.05	0.07	NS
Arsenic	22.3	21.2	NS	17.4	16.9	NS
Barium	10.9	37	S>T	7.07	24.3	NS
Cadmium	0.73	0.71	NS	1.12	1.47	NS
Calcium	8,400	6,080	T>S	3,510	3,140	NS
Chromium	5	6	NS	5.54	5.04	NS
Cobalt	6.22	7.24	S>T	0.8	1.46	NS
Copper	138	132	NS	11	13.3	NS
Iron	1,790	2,080	NS	1,830	2,310	NS
Lead	6.48	6.86	NS	2.26	2.9	NS
Lithium	1.32	2.16	S>T	0.88	2.1	NS
Magnesium	9,590	9,570	T>S	6,580	7,390	NS
Manganese	95.5	72.3	T>S	82	64.5	NS
Mercury	0.515	0.6	NS	0.129	0.09	T>S
Molybdenum	3.78	3.68	NS	4.59	3.64	NS
Nickel	10.8	12.7	NS	2.94	3.4	NS
Potassium	9,990	10,100	NS	17,000	16,600	NS
Selenium	3	3	NS	1	1	NS
Silver	0.8	0.82	NS	32,300	34,400	NS
Sodium	57,400	56,300	NS	37	37.4	NS
Strontium	112	96	T>S	0.22	0.28	NS
Titanium	19	135	S>T	14.8	157	NS
Uranium	0.39	0.52	S>T	0.83	1.05	NS
Vanadium	7	9	NS	5.54	7.3	NS
Zinc	369	366	NS	131	107	NS

All values in milligrams per kilogram (mg/kg) dry weight.
[a] Denotes a significant (S) or nonsignificant (NS) difference as tested using Tukey's HSD and $p<0.05$.

This indicates that the concentrations of these elements would be increased by a factor of less than 1.5 from background values, suggesting that there is a relatively low potential for bioaccumulation from the tailings. Magnesium and strontium had the lowest statistically significant increases (0.2 percent for magnesium and 17 percent for strontium). Though statistically significant, the increase in magnesium in *Macoma nasuta* tissues was inconsequential. Calcium has been found to be essentially nontoxic to aquatic life (Mount et al., 1997) and mammals (Underwood and Suttle, 2001), and therefore it poses a low risk of bioaccumulation. Though mercury and manganese can be problematic in terms of bioaccumulation, the low concentrations present in the tailings relative to background (Table 3.2), along with the results of the bioaccumulation tests, showing limited increases in tissue concentrations, indicate that there is a low risk from these elements in the tailings.

In summary, the COPECs that were retained for further evaluation in the risk assessment under the worst-case scenario during TSF operations are aluminum, chromium, pH, and TSS. All of these COPECs, except chromium, are a result of the water chemistry. TSS and pH are considered only for direct exposure by aquatic plants and animals because there is no food-chain transfer of these constituents.

4.0 RISK ANALYSIS

The Risk Analysis phase combines the exposure assessment with the effects assessment. The exposure assessment predicts the concentrations of COPECs to which the different receptors would be exposed. The effects assessment evaluates the effects that could occur at different levels of exposure.

4.1 Effects Assessment

Two types of values were used in the effects assessment. Plants, fish, and aquatic invertebrates have direct exposure to sediment and water. For these exposures, the scientific literature was surveyed for concentrations in these media that result in no adverse effect and for concentrations that result in an effect. Higher-order birds and mammals also have direct exposure through ingestion of sediment and water. These exposures, which are part of their overall dietary exposure, were evaluated through comparison of exposure to dietary NOAELs and LOAELs for the COPECs. The NOAEL and LOAEL values for chronic exposures and sublethal toxicological endpoints relating to growth and reproduction for each COPEC are listed in Attachment A. Because pH and TSS are not bioaccumulative, dietary values are needed for only aluminum and chromium. Several TRVs for these two COPECs were identified for both bird and mammal dietary exposure to represent a range of potential effects. Identification of multiple TRVs allows for a more complete assessment of the potential for adverse effects. The sources of the TRVs are available databases and the general scientific literature. The specific references and values are listed in Attachment A.

Based on the range of TRV values presented in Attachment A, an initial set of NOAEL and LOAEL values was selected to be used in the risk assessment. These values were selected to conservatively reflect the low end, typically the lowest reported value, of the available range of NOAEL and LOAEL values in the scientific literature. The selected values are listed in Table 4.1 in the column labeled Selected Value. For comparison purposes, TRV values from the Department of Energy's (DOE) Savannah River Site (DOE-SRS, 1999) are listed as well. As shown, the aluminum TRV values selected for this risk assessment are similar to the DOE values, though the selected chromium TRV values are much lower. The DOE values for birds are based on the effects of chromium potassium sulfate rather than the lower effects reported for chrome alum (Attachment A). The mammalian values selected for this assessment are based on long-term studies of rats and mice.

Table 4.1 Selected Dietary TRV Values and Comparisons (mg/kg per day)

		Selected Value		DOE-SRS[a]	
COPEC	**Group**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Al	Mammal	1.93	19.3	1.93	19.3
	Bird	109.7	1,097	110	1,100
Cr	Mammal	5.8	36	2,740	27,400
	Bird	0.57	2.9	1.0	5.0

[a] DOE-SRS (1999).

In addition to the dietary TRVs, safe and toxic concentrations in water and sediment are needed to evaluate the potential risk from direct exposure to these media by plants, benthic macroinvertebrates, and fish. For these organisms, potential risk is assessed by comparing protective concentrations with predicted water and sediment concentrations. Though dietary exposure is also a potential exposure route, direct exposure is generally more significant because of the continual nature of exposure. In addition, the literature on dietary effects on lower organisms is very limited. The reported literature toxicity values for water and sediment are discussed in Attachment B. The values selected as protective, from the reported literature values, are listed in Table 4.2. The rationale for the selection of these values is provided in Attachment B.

Table 4.2 Protective Water and Sediment Concentrations

	ALUMINUM		CHROMIUM	
	Sediment	**Water**	**Sediment**	**Water**
Receptor	**mg/kg (dw[a])**	**mg/L**	**mg/kg (dw[a])**	**mg/L**
Margin vegetation	NVA		630	
Aquatic vegetation	NVA	0.2	630	0.5
Fish		0.075		0.2
Macroinvertebrates	NVA	1	133	0.06

[a] Values are listed on a dry weight (dw) basis.
The shaded cells indicate that this is not an exposure pathway for the receptor listed.
NVA = no value available.

The potential effects of pH and TSS are discussed in Section 4.3.

4.2 Exposure Assessment

4.2.1 Receptors

Based on the CSM (Figure 2.2) and the management goals presented in Section 2.4, representative species or biotic groups were identified for evaluation in the risk assessment. The identified species for each assessment endpoint are discussed below.

<u>*Assessment Endpoint 1a:*</u>

⇒ *Creation of conditions conducive to the survival, growth, and reproduction of a viable population of Dolly Varden char in LSL.*

Representative species: Dolly Varden char

<u>*Assessment Endpoint 1b:*</u>

⇒ *Creation of conditions conducive to the survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL.*

Representative species: benthic macroinvertebrate (community) and aquatic vegetation. Potential risk was assessed based on the available information in the literature, rather than on specific macroinvertebrate and plant species. The evaluation of effects on the Dolly Varden char is assumed to represent potential effects on three-spine sticklebacks. Salmonids are generally considered to be more sensitive to environmental stress than are other fish species.

<u>*Assessment Endpoint 2:*</u>

⇒ *Survival, growth, and reproduction of the site populations of herbivorous, invertivorous, and piscivorous waterfowl that may feed in LSL.*

Representative species: three different species, identified based on dietary composition. The selected species and general diet types are

Canada goose: primarily herbivorous

Common loon: primarily piscivorous

Spotted sandpiper: primarily invertivorous

Spotted sandpipers are assumed to eat benthic macroinvertebrates along the shoreline of LSL.

Assessment Endpoint 3:

⇒ *Survival, growth, and reproduction of the site populations of grazing and browsing herbivores that may use LSL as a drinking water source and may feed on margin vegetation along LSL.*

Representative species: moose and snowshoe hare

Assessment Endpoint 4:

⇒ *Survival, growth, and reproduction of the site populations of omnivores that may drink water and feed on food items affected by tailings placed in LSL.*

Representative species: black bear

Assessment Endpoint 5:

⇒ *Survival, growth, and reproduction of the populations of predators that may drink water and/or feed on food items affected by tailings placed in LSL.*

Representative species: wolf, river otter, and bald eagle

Assessment Endpoint 1a alternative:

⇒ *Survival, growth, and reproduction of the population of Dolly Varden char that currently inhabit LSL.*

Representative species: Dolly Varden char

Assessment Endpoint 1b alternative:

⇒ *Survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL.*

Representative species: benthic macroinvertebrate (community) and aquatic vegetation. Potential risk was assessed using the available information in the literature, rather than specific macroinvertebrate and plant species. The evaluation of effects on the Dolly Varden char is assumed to represent potential effects on three-spine sticklebacks. Salmonids are generally considered to be more sensitive to environmental stress than are other fish species.

4.2.2 Exposure Calculations

Ingestion of food and abiotic media that might contain COPECs is the only significant route of exposure for avian and mammalian wildlife. Therefore, standard methodology (USEPA, 1997a) for estimating COPEC intake rates was used in conjunction with species-specific exposure parameters (e.g., food ingestion rates and water ingestion rates) to calculate intake of COPECs. The following is the general equation for estimating intake:

$$Intake = [(FIR * C_{food} * B) + (WIR * C_{water}) + (SIR * C_{soil/sediment} * B)] * AUF$$

where:

Intake: intake of COPEC (mg/kg body weight[BW]/day)
FIR = daily food ingestion rate (kg/kg BW/day)(wet wight [wt] basis)
WIR = daily water ingestion rate (L/kg BW/day)
SIR = daily rate for incidental ingestion of soil or sediment (kg/kg BW/day)
C_x= concentration of COPEC in food, soil/sediment, or water (mg/kg or mg/L) (wet wt basis)
B = bioavailability (unitless)
AUF = area use factor; the proportion of the daily intake obtained from the study area (unitless)

When multiple food types (e.g., a mixture of fish and invertebrates) are included in a receptor's diet, the term for intake from food expands to the following:

$$Intake_{food} = [(FIR_{food1} * C_{food1} * B) + (FIR_{food2} * C_{food2} * B) + \ldots] * AUF$$

Receptor-specific values used in the risk assessment for the parameters BW, FIR, WIR, and SIR are presented in Table 4.3. To be conservative in the assessment, 100 percent bioavailability (B) and an AUF of 1.0 were assumed. Given the specifics of exposure to the TSF, ingestion of sediment was considered for all receptors, though soil ingestion is more likely for some of the terrestrial receptors.

Because the FIR is on a wet weight basis, the COPEC concentration in food items is expressed on a wet weight basis. Incidental sediment ingestion, however, is expressed in the literature as a percentage of the dry weight diet. For this reason, the concentration of COPECs in ingested sediment is expressed on a dry weight basis in the exposure calculations. However, the percentage of sediment relative to the total diet was converted to be expressed as percent ingestion relative to the wet weight diet. For this conversion, it was assumed that, for sediment ingestion, the diet had 75 percent moisture and the sediment had 50 percent moisture (USEPA, 1997b).

Table 4.3 Exposure Parameters for the Different Receptors

Receptor	BW(g)	FIR (g/g BW-day)	WIR (g/g BW/day)	Sed./soil[b]	Dietary Composition	Reference
Canada goose	3,240- Avg (both sexes)	0.032- adult (both sexes)	0.044	0.05	100% aquatic veg.	USEPA (1993b), Beyer et al. (1994)
Common loon	4,134- Avg (both sexes)	0.038	0.004	0.025	75% fish, 25% aq. invert.	Dunning (1993), Ehrlich et al. (1988), Nagy (1987)
Spotted sandpiper	42.5- Avg (both sexes)	0.18	0.165	0.05	100% aq. invert.	USEPA (1993b)
Black bear	180,000- Avg (both sexes)	0.027	0.059	0.025	70% veg., 10% fish, 20% small mammal	Whitaker (1997), Nagy (1987), Beyer et al. (1994)
Snowshoe hare[a]	1,230- Avg (both sexes)	0.028	0.097	0.0074	20% woody, 80% herbaceous veg.	USEPA (1993b)
Moose	468,000- Avg (both sexes)	0.016	0.054	0.0055	25% aq. veg., 75% woody	Whitaker (1997), Nagy (1987)
Wolf	42,500- Avg (both sexes)	0.04	0.068	0.0088[c]	100% large/small mammals	Whitaker (1997), Nagy (1987), Calabrese and Stanek (1995)
River otter	8,000- Avg (both sexes)	0.047	0.08	~0	100% fish	USEPA (1993b)
Bald eagle	4,150- Avg (both sexes)	0.12- adult (both sexes)	0.036	0.01	19% aquatic birds, 67% fish, 14 small mammal	Kalmbach et al. (1964)

g/g BW-day = grams per gram of body weight per day.

[a] Eastern cottontail information assumed for snowshoe hare.

[b] Sediment/soil ingestion is the percentage of soil ingestion relative to the diet/100; values generally estimated from Beyer et al. (1994), moisture-corrected. Professional judgment, based on the values listed by Beyer et al. (1994), was used to estimate sediment ingestion for species not listed in the paper.

[c] Value for dog (Calabrese and Stanek, 1987) was used.

4.2.3 Bioaccumulation Factors and Exposure Point Concentration Derivation

Because this risk assessment is predictive in nature, no actual measured concentrations of COPECs in the environment were considered in the assessment. As discussed in Section 3, there is information available to allow for the prediction of water and tailings chemistry, during both active tailings disposal and after closure of the facility. To predict the concentrations of the COPECs in other exposure media, such as dietary items, bioaccumulation factors (BAFs) for aluminum and chromium were compiled from the scientific literature. BAFs, which are also termed transfer factors, are unitless conversions factors, which are multiplied by the source concentration to predict the COPEC concentration in the receptor. The BAF values selected for use in the risk assessment are listed in Table 4.4. All the compiled literature values and a discussion of the selection of the values in Table 4.4 are provided in Attachment C. As noted in Attachment C, when multiple values were available, a value was selected to conservatively represent potential exposure. Typically, the highest reported transfer value was selected, which maximizes the potential exposure. For some transfers, no direct measures were available; in such cases, surrogate values were selected (see the discussion in Attachment C).

Table 4.4 Selected Bioaccumulation Factors

Source	Receptor	BAF	
		Al	Cr
Sediment	Aquatic veg.	0.22	0.65
Sediment	Macroinvertebrates	0.04	0.1
Sediment	Margin veg.	0.016	0.65
Sediment	Woody veg.	0.016	0.22
Water	Aquatic veg.	0.56	695
Water	Fish	100	40
Macroinvertebrates	Fish	0.003	0.1
Aquatic veg.	Macroinvertebrates	0.04	0.1
Vegetation	Mammals/birds	0.011	0.06

The exposure point concentrations (EPCs) are the concentrations of COPECs in media (i.e., water and sediment) and dietary items for each of the identified receptors. To be protective, conservative assumptions of concentrations were used. These conservative assumptions include using the maximum measured concentrations of COPECs in water and sediment. As will be discussed in Section 5, this is an especially conservative assumption for aluminum concentrations in water because the pH of the tailings (approximately 10) would be reduced to between 7 and 8 s.u. in LSL, which would result in precipitation of aluminum from the water column and significantly decrease the concentrations in the water of LSL. For transfer to dietary items, the transfer pathway that results in the highest tissue concentration was used.

As an example, COPECs can be transferred into fish when fish drink water or ingest macroinvertebrates. The highest of the predicted values was used as the dietary EPC for receptors that consume fish. Although this assumption is not necessarily realistic, it conservatively estimates potential exposure. The predicted EPCs for aluminum and chromium are listed in Table 4.5. The derivation of the EPC values is provided in Attachment C.

Table 4.5 Exposure Point Concentrations

EPC	Al mg/kg[a]	Cr mg/kg[a]
Sediment	16,300	119
Water (mg/L)	3.9	0.02
Aquatic vegetation	359	7.7
Aq. macroinvertebrates	163	3
Fish	390	0.8
Woody vegetation	78	7.8
Margin vegetation	52.2	15.5
Mammal/bird tissue	0.86	0.93

[a] All values are expressed in wet weight except sediment, which is dry weight.

4.3 Risk Analysis by COPEC

The overall approach to assessing risk associated with the estimated exposures to the bioaccumulative COPECs (aluminum and chromium) is to compare estimates of exposure (e.g., rate of COPEC intake) with TRVs (NOAELs and LOAELs) using the Hazard Quotient (HQ) approach (USEPA, 1997c). An HQ value for each receptor–COPEC combination is calculated using the following equation:

$$HQ = \text{estimated exposure}/TRV$$

If the HQ is less than 1.0 (indicating the exposure concentration or dose is less than the TRV), adverse effects are considered unlikely. A screening-level HQ greater than 1.0 (indicating the exposure concentration or dose is equal to or greater than the TRV) does not automatically indicate unacceptable risk. It indicates that additional analyses are needed to more accurately assess the potential for adverse effects to occur (USEPA, 1992). The estimated risk is based on the spatial area represented by the exposure estimates, the specific adverse effects on which the TRVs are based, and the uncertainty associated with the exposure estimate. As used in risk assessments, the NOAEL value is considered to be protective of individual organisms, whereas the LOAEL value is considered protective of the receptor population (Oregon DEQ, 2000). As shown in Attachment A, there is a large degree of variability in reported NOAEL and LOAEL values. Factors that influence the reported toxicity are the form of chemical tested and the exposure regime, including duration and exposure route. To minimize the uncertainty associated with the use of these values, the literature search focused on long-term (chronic or subchronic) exposures through food or drinking water. In addition, the point values used in calculating the HQ values were selected to conservatively reflect the available information. Typically, the lowest available value was used.

For aquatic receptors, the EPCs in sediment and water were compared with effect levels from the literature. Potential risk to receptors was evaluated for (1) the worst-case condition, which is exposure to the tailings water prior to mixing and geochemically interacting with the LSL water; (2) operational water, or the predicted LSL water chemistry during operations; and (3) expected water quality after tailings disposal has ceased.

4.3.1 Aluminum

Aluminum is an abundant element in the earth's crust. The toxicity of aluminum in water depends to a high degree on the pH conditions. In surface waters of a pH from about 5.5 to 8.5, aluminum is present primarily (90 percent of total) as gibbsite ($AlOH_3$) and is relatively insoluble. It therefore has a lower bioavailability and toxicity than other forms. Concentrations of other monomeric forms are present in this pH range, but they represent a small fraction of the total amount of aluminum. At a pH of about 5.5, the solubility of gibbsite increases rapidly, such that within the narrow range of pH 5.5 to 5.0, gibbsite becomes the minor aluminum form replaced by ionic aluminum (Al^{3+}). From pH 5.0 to about pH 4.0, ionic aluminum represents between 90 to 95 percent of the total aluminum fraction. Ionic aluminum is the more available and toxic form (USEPA, 1988). This reaction is affected by other water quality parameters, including the amount of dissolved organic matter, calcium, chlorides, and sodium. Although the tailings are alkaline (Table 3.1), the overall volume of discharge water relative to the overall water volume in LSL would be small and is not expected to significantly influence pH conditions in LSL.

Aluminum toxicity to birds and mammals is generally limited because of the poor absorption of aluminum into the body. Potential target organs of aluminum toxicity are the lung, bone, and central nervous system (Klaassen, 2001). Potential risk to aquatic and terrestrial receptors is discussed for each of the three scenarios of water chemistry (worst-case, operations, and post-closure).

4.3.1.1 Worst-Case Water

The water chemistry associated with the worst case is shown in Table 3.1. As indicated in the table, the maximum and mean aluminum concentrations exceed the State acute criterion, and the minimum value exceeds the chronic criterion (DEC, 2002). The mean and maximum concentrations also exceed the protective criteria (Table 4.2) for direct exposure to aquatic life. The predicted aluminum concentration in tailings water suggests that there is significant risk to the aquatic receptors from the worst-case water. Protective values for direct sediment exposure are not available in the literature, though the aluminum concentrations in the tailings are less than the background LSL sediments (Table 3.2), suggesting that there is a low risk potential for exposure to aluminum in sediments.

The HQ values for terrestrial receptors are shown in Table 4.6. As indicated, all the HQ values, both NOAEL and LOAEL, for bald eagle, Canada goose, and common loon are less than 1, indicating *de minimis* risk to these receptors. As indicated in Table 4.6, for the worst-case water chemistry, the NOAEL HQ values for spotted sandpiper, snowshoe hare, moose, black bear, river otter, and wolf exceed 1, indicating that there might be risk to individual receptors. None of the LOAEL HQs exceed 1. Based on this very conservative screening evaluation, there might be risk to individual sandpipers and mammals, though there is a low risk potential to the overall populations. The calculated HQ values include exposure to aluminum in water, sediment, and dietary sources. For all the receptors at potential risk, except otters, the exposure estimate is largely (>70 percent of the estimated dose) associated with sediment ingestion or aluminum uptake from sediment into aquatic plants and subsequent ingestion of vegetation (Attachment E). However, since the aluminum concentration in the tailings is less than the concentration in existing LSL sediments (Table 3.2), there would be no incremental increase in the risk from sediment to the terrestrial receptors. Potential risk would be further minimized by the placement of tailings at water depths of more than 9 feet (Figure 1.3), which would further limit exposure. The risk to otters is largely (98 percent) associated with aluminum concentrations in fish tissue. These concentrations result from the transfer of aluminum from water to the fish tissue. It is, however, important to note that this assessment assumes that the receptors are feeding exclusively at the TSF and are 100 percent exposed to the worst-case water (i.e., this assessment assumes an area use factor of 1). A more realistic exposure scenario is discussed in Section 4.3.1.2.

Table 4.6 Aluminum HQ Comparisons

Aluminum	Worst Case NOAEL	Worst Case LOAEL	Operational Water NOAEL	Operational Water LOAEL
Canada goose	0.34	0.034	0.34	0.034
Common loon	0.26	0.026	0.16	0.016
Spotted sandpiper	1.61	0.16	1.61	0.16
Bald eagle	0.47	0.047	0.2	0.02
Snowshoe hare	2.8	0.28	2.6	0.26
Moose	2.1	0.21	1.9	0.19
Black bear	6.9	0.69	6.3	0.63
River otter	9.7	1.0	0.6	0.1
Wolf	3.1	0.31	3.0	0.3

In the shaded cells, the HQ value exceeds 1.

4.3.1.2 Operational Water

As discussed in Section 4.6.5 of the Final SEIS, the total aluminum concentrations in the TSF will be consistent with background conclusions in East Fork Slate Creek and could be as high as 360 µg/L. This level is less than the acute criterion of 750 µg/L, but it exceeds the chronic value of 87 µg/L (Table 3.1) and is within the range currently observed in LSL (Table 2.1). This value also exceeds the protective criterion of 75 µg/L for fish and the protective concentration of 200 µg/L for aquatic plants (Table 4.2). It is important to note, however, that although the background conditions exceed the chronic criterion and protective concentration for fish, there are currently viable populations of Dolly Varden char and sticklebacks, indicating that these values might be overly conservative. The observation that these values might be too conservative is in agreement with USEPA's (2002) recognition that many high-quality waters have aluminum concentrations that exceed the chronic value of 87 µg/L.

As discussed in Section 4.3.1.1, for the worst-case water, terrestrial receptors would most often be exposed to aluminum in sediment. As shown in Figure 1.3, the tailings would be placed at a depth of at least 9 feet, thereby essentially eliminating the sediment exposure pathway for spotted sandpipers and terrestrial herbivores. The only exception is the exposure risk to river otters, which have primary exposure from fish ingestion. As indicated in Table 4.6, the predicted risk for otters is significantly less in the operational water conditions than in the worst-case water, with the NOAEL HQ value equal to 1 and the LOAEL HQ value equal to 0.1. There is low risk to otters as assessed using the aluminum concentrations in the operations water.

4.3.1.3 Post-Closure Water

During processing of the Kensington ore, rock would be ground and subjected to flotation in a moderate to strongly alkaline process. Sulfide minerals would be removed by flotation, leaving trace concentrations of metal-bearing sulfides, metal oxides, and metal sulfate or carbonate salts. The salts would dissolve readily into the process water, and thus they would primarily be removed during operational placement of the tailings and mixing of the process water into the lake. Oxidation of any sulfide minerals that might remain would be virtually eliminated through subaqueous placement of the tailings. Any further release of metals and other trace elements would thus be minimal because salt dissolution would already have occurred and further oxidation would not occur because of low-oxygen conditions at the bottom of the TSF. The flux of metals from tailings placed in subaqueous settings is typically from the overlying water column into the reducing sediments, where metals are sequestered as sulfide precipitates (MEND, 1989). Local variations appear to be related to changes in the organic content of the sediment. Post-closure deposition of natural sediments over the tailings would further isolate them from the water column. These characteristics have been documented in natural lakes with deposits of tailings with considerably higher concentrations of sulfide and metals than those predicted for Kensington; for example, at Buttle Lake in British Columbia (Rescan, 1990).

The Rescan (2000) reactivity tests, which were designed to evaluate the short-term and long-term reactivity of the deposited tailings, are in agreement with the MEND (1989) and Rescan (1990) work. The reactivity tests indicate that leaching of aluminum from the tailings to overlying water rapidly decreases over time. Although these studies were carried out in seawater, similar results are expected in fresh water because of the same low oxidative conditions and associated minimal constituent dissolution. The Rescan work reported that the aluminum flux dropped from 26 mg/m^2 per day within the first 24 hours to 0.5 mg/m^2 per day after 60 days, or a net reduction in flux of 98 percent. Due to the low net flux and the flow-through nature of the closed TSF, aluminum concentrations after closure are expected to essentially mimic the ambient conditions currently present in the water of the lake.

4.3.2 Chromium

Like aluminum, chromium is a common element on earth. The two most common forms are hexavalent (Cr^{+6}) and trivalent (Cr^{+3}). The trivalent form is an essential element and is considered much less toxic than the hexavalent form (Eisler, 2000). The chromium released to the TSF from the milling process would be in the trivalent form, and because the subaqueous disposal would create a low oxidation potential, it would likely remain in the reduced form. Oxidation of chromium is unlikely because of the low-oxygen conditions present in water, relative to surface air exposures.

While both Cr^{+6} and Cr^{+3} are toxic to aquatic organisms, toxicity occurs at much lower concentrations of the hexavalent form. A similar pattern is observed in birds and mammals, in which the hexavalent form is associated with respiratory and skin toxicity and the trivalent form is considered essentially nontoxic (Eisler, 2000).

4.3.2.1 Worst-Case Water

The maximum detected water concentration of 3.6 µg/L is less than the lowest protective concentration of 60 µg/L (Table 4.2) and is much less than the chronic criterion of 136 µg/L (Table 3.1). In addition, the highest tailings concentration of 119 mg/kg is less than the protective sediment concentration of 630 mg/kg for plants and 133 mg/kg for macroinvertebrates (Table 4.2). These comparisons indicate low potential risk to aquatic life from the worst-case conditions projected in the TSF.

The HQ values for chromium exposure to terrestrial receptors are shown in Table 4.7. All the HQ values, both NOAEL and LOAEL, for all the receptors, except spotted sandpiper, are less than 1, indicating *de minimis* risk to these receptors. As indicated in Table 4.7, for the worst-case water chemistry, the NOAEL HQ value for spotted sandpiper exceeds 1, though the LOAEL HQ is less than 1. Based on this very conservative screening evaluation, there might be risk to individual sandpipers, though there is low risk potential to the overall population of sandpipers. Sediment ingestion is the pathway of 83 percent of the overall exposure to sandpipers. However, it is important to note that this assessment assumes that sandpipers are feeding exclusively at the TSF and are 100 percent exposed to the worst-case water and sediment. Overall, it is expected that sandpipers would have low exposure to the emplaced tailings because the tailings would be placed at depths of at least 9 feet of water (Figure 1.3).

Table 4.7 Chromium HQ Comparisons

	Worst-case	
Chromium	**NOAEL**	**LOAEL**
Canada goose	0.77	0.15
Common loon	0.29	0.06
Spotted sandpiper	2.83	0.56
Bald eagle	0.43	0.08
Snowshoe hare	0.07	0.01
Moose	0.02	0.004
Black bear	0.07	0.01
River otter	0.007	0.001
Wolf	0.01	0.002

In the shaded cells, the HQ value exceeds 1.

4.3.3.2 Operational Water

Given the *de minimis* risk posed to all the receptors except sandpipers, in the worst-case conditions, there is essentially no risk posed by chromium during TSF operations. The sole potential exception is to receptors that have a high degree of sediment ingestion, such as sandpipers. This risk, however, would be largely ameliorated because tailings would be placed in deeper portions of LSL (Figure 1.3).

4.3.2.3 Post-Closure Water

The Rescan (2000) reactivity tests, which were designed to evaluate the short-term and long-term reactivity of the deposited tailings, indicate that chromium had a negative flux to the overlying water. Essentially this means that there was no mobility of chromium from the tailings into the water. Although these studies were carried out in seawater, the results are applicable to the freshwater TSF system as well. As indicated by the worst-case water evaluation, chromium concentrations in the tailings water would pose low risk potential to aquatic and terrestrial receptors. There would be possible risk to terrestrial receptors that consume significant amounts of tailings through sediment ingestion. However, because of the depth of tailings placement, this exposure pathway is unlikely. In addition, any exposure to sediment would decrease over time as upstream sediments and inputs of organic matter would ultimately bury the tailings.

4.3.3 pH

Only direct exposure of aquatic receptors to water is considered an issue for pH in the ERA. In general, the scientific literature on pH is concerned with low-pH conditions rather than high-pH conditions. As a result of the milling process, the tailings decant water has high pH levels (Table 3.1). The Gold Book (USEPA, 1986) lists a pH range of 6.5 to 9.0 for aquatic life, though there is no support provided for the upper value of 9.0. McKean and Nagpal (1991) report that a high pH (>9.5) can disrupt ammonia excretion across the gill epithelium and that a pH of more than 10.2 results in salmonid mortality.

4.3.3.1 Worst-Case Water

The decant water has a pH of approximately 10, which is above the protective concentration pH range of approximately 6–9 for aquatic life. Although a pH of 10 would likely pose a risk to aquatic biota in the TSF, elevated pH levels are expected to occur only in the immediate vicinity of the tailings pipe outfall and perhaps in the pore water of small spatial areas around the outfall. The LSL volume of at least 1.4 x

10^8 gallons would be orders of magnitude greater than the projected daily tailings input of 2.1 x 10^5 gallons per day (148 gallons per minute [gpm]).

4.3.3.2 Operational Water

The calculated pH of the mixed operational water is 7.8 s.u. This calculation is based on (1) a monthly time step, (2) 6 million gallons of process water, (3) 140 million gallons of water in the TSF, and (4) an open system where CO_2 gas is able to degas (pCO_2 = -3.5). The pH would be somewhat lower at depth (pH = 6.7), where gas exchange with the atmosphere is not efficient (pCO_2 = -2.5). For the mixing calculation, the 1998 CMRI/MW analytical results for cycle 5 were used because this sample had average flow conditions and it represents typical chemistry conditions. In general, high-pH conditions would be limited to a very small spatial area in the TSF (e.g., the immediate vicinity of the tailings discharge) near the outfall. Fish have avoidance mechanisms, which would likely preclude their occurrence in the isolated areas where the pH conditions might be toxic (West et al., 1997).

4.3.3.3 Post-Closure Water

The pH conditions in the TSF after closure are expected to mimic the pre-TSF conditions in LSL. As discussed in the Rescan (2000) report, the tailings have relatively low sulfide levels (~0.02 percent) and when placed into a low-oxygen environment, such as subaqueous disposal, there is a low potential for generation of hydrogen ions and associated acid conditions. Based on these conditions, pH is not expected to be a long-term source of risk to aquatic receptors in the TSF.

4.3.4 Total Suspended Solids

There are two potential impacts from the generation of TSS during operation of the TSF. The first potential impact is from the TSS levels in the water column. The second potential impact results from deposition of the tailings. The deposited material would alter the physical habitat on the bottom of LSL and would bury macroinvertebrates and plants. There are no potential risks to terrestrial receptors from TSS.

There is an extensive literature base on the potential impacts of sedimentation and TSS concentrations in the water column. Overall, the literature indicates that salmonids are the most sensitive group of aquatic receptors and are therefore the primary focus of the majority of research conducted. Attachment D summarizes the available information and data on TSS and sediment effects, as well as the potential recovery time for fish and macroinvertebrate communities. Potential risk from TSS levels in the water column are discussed in this section.

Although TSS in the water column represents a potential stressor during operations, the impacts from habitat alteration due to burial of bottom habitat is the greater concern after cessation of tailings placement. The potential impacts and recovery are discussed in Section 5.

4.3.4.1 Operational Conditions

In addition to serving as a storage reservoir for the tailings, the TSF is also designed to serve as a settling pond for the deposited tails. Based on the review provided in Attachment D, salmonids (e.g., Dolly Varden char) are expected to be the most sensitive receptors to TSS concentrations in the TSF. Salmonid sensitivity to TSS depends on the life stage; eggs and alevin are the most sensitive stages. Table 4.8 summarizes acceptable and problematic TSS concentrations for the periods when sensitive life stages are present (spawning) and not present (non-spawning). The derivation of this summary table, outlined in Attachment D, is based on a review of the available literature on sediment effects on different life stages of salmonids. The values in Table 4.8 are for suspended concentrations and do not take into account the impact of sedimentation on habitat. The acceptable values are conservative, protective concentrations. The values listed as problematic are concentrations that are reported to result in negative impacts on salmonids.

Table 4.8 Summary of Protective TSS Levels

	Spawning		Non-Spawning	
Duration	Acceptable (mg/L)	Problematic (mg/L)	Acceptable (mg/L)	Problematic (mg/L)
0–12 hours	65	230	500	>1,700
13–96 hours	22	143	500	>750
~1 week	<23	143	200	>750
>2 weeks	<23	>23	100	>300

As indicated in Table 4.8, relatively low concentrations can be detrimental to sensitive life stages over longer periods of exposure. When not spawning, salmonids are less sensitive to TSS and can tolerate concentrations above 500 mg/L for up to a week. As indicated in Tetra Tech (2004), TSS levels in LSL could be as high as 660 mg/L. There is, therefore, risk to aquatic life during operations from TSS.

4.3.4.2 Post-Closure Conditions

As discussed in planning documents, tailings would be placed in a manner that would ensure sufficient water depth to prevent their remobilization (Earthworks, 2002). Modeling further shows that tailings will not resuspend after closure (TetraTech, 2003). Though these steps are expected to prevent the creation of elevated TSS levels in LSL after tailings cease to be deposited in the lake, the longer-term potential impact is from the deposited materials altering the lake bottom composition and burying the existing habitat. It is important to note, however, that tailings would be placed in the deeper portion of the TSF. Much of the bottom habitat that would be buried is unproductive because of limited light penetration. Further evaluation of habitat alteration and projected recovery time from sedimentation (i.e., tailings deposition) are discussed in Section 5.

5.0 RISK CHARACTERIZATION

The purpose of the Risk Characterization is to integrate information from the risk analysis in Section 4 to describe risks for each of the assessment endpoints defined in Section 2.4. The risk analysis used conservative assumptions of effects and exposure to minimize the possibility of underestimating the risk potential. Risk is characterized for both chemical (Al, pH, and Cr) and physical (TSS/sedimentation) stressors.

5.1 Chemical Stressors

The screening evaluation of the worst-case water and sediment conditions in Section 3 showed that aluminum, chromium, and pH needed to be studied as COPECs in the risk analysis. Aluminum and pH were identified based on levels observed in the decant water from initial tailings analyses conducted in 1996 and 1998 (Table 3.1). Chromium was identified as a COPEC because of sediment concentrations exceeding both the existing background concentrations and sediment screening values (Table 3.2). Though direct exposure to all three COPECs was considered for aquatic receptors, only exposure to aluminum and chromium was considered for terrestrial receptors because pH is a measure of hydrogen ion concentration and therefore cannot, in and of itself, be bioaccumulated.

The risk characterization of chemical stressors is summarized in Table 5.1. The comparison of aluminum concentrations in the water associated with the tailings (mean = 1,172 µg/L; range = 250–3,900 µg/L) shows potential risk to aquatic plants, macroinvertebrates, and fish during operations near the outfall of the tailings slurry line. The effects assessment indicated that fish are the most sensitive group (Table 4.2). Though protective sediment concentrations of aluminum were not found in the review of the scientific literature, the aluminum concentration in the tailings is less than the background conditions in the LSL sediment (Table 3.2), indicating that the tailings themselves would likely pose a low risk to the aquatic community. Outside the immediate vicinity of the tailings outfall, the predicted operational aluminum concentrations in the water of the TSF (60 to 360 µg/L) exceed the chronic criterion of 87 µg/L and the safe level of 75 µg/L for fish but are similar to the existing aluminum concentrations in LSL (Table 2.1). This is largely because of the decrease in pH (from 10 to less than 8) that would result in aluminum precipitation and, therefore, water concentrations similar to the existing values. Based on this comparison, the operational water concentrations of aluminum would likely pose a low risk to aquatic life. The leach testing conducted on the tailings (Rescan, 2000) indicates that there is very little flux of aluminum from the tailings into overlying water after 60 days. Based on the operational and leach data, it is expected that

Table 5.1 Summary of Risk Characterization for Chemical COPECs

Management Goal	Assessment Endpoints	Measurement Endpoints	Results—chemistry
1. Reestablishing/enhancing a viable Dolly Varden char fishery in LSL upon cessation of tailings disposal	Creation of conditions conducive to the survival, growth, and reproduction of a viable population of Dolly Varden char in LSL	Comparison of chemical water quality after cessation of operation with protective values. Physical stressors are evaluated by review of the literature	Low risk from water and sediment concentrations of Al and Cr at closure. No limitations from pH values
	Creation of conditions conducive to the survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL	Comparison of chemical water and sediment quality after cessation of operation with protective values. Physical stressors are evaluated by review of the literature. Evaluation of tailings toxicity tests	Low risk from water and sediment concentrations of Al and Cr at closure. No limitations from pH values. Toxicity testing indicates habitability concerns for some species
2. Protecting waterfowl from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingesting COPECs from the LSL	Survival, growth, and reproduction of the site populations of herbivorous, invertivorous, and piscivorous waterfowl that may feed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	Low risk to individual geese, loons, and bald eagles from Al and Cr. Limited risk from Cr to individual sandpipers from sediment
3. Protecting terrestrial herbivores from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingesting COPECs in water and in vegetation along the margins of LSL	Survival, growth, and reproduction of the site populations of grazing and browsing herbivores that may use LSL as a drinking water source and may feed on margin vegetation along LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	Potential risk to individual herbivores from Al but not from Cr. Low risk to populations. Risk associated with sediment ingestion
4. Protecting terrestrial omnivores from lethal, mutagenic, reproductive, systemic, or general toxic effects due to ingesting COPECs in water and in food items influenced by the TSF	Survival, growth, and reproduction of the site populations of omnivores that may drink water and feed on food items affected by tailings placed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	Potential risk to individual omnivores from Al but not from Cr. Low risk to populations. Risk associated with sediment ingestion
5. Protecting higher-order mammalian and avian consumers (i.e. predators) from the effects of ingesting water and contaminated prey that may result in lethal, mutagenic, reproductive, systemic, or general toxic effects due to COPECs from operation of the TSF	Survival, growth, and reproduction of the populations of predators that may drink water and/or feed on food items influenced by tailings placed in LSL	Comparison of estimated doses of COPECs from sediment, water, and food with TRV values	Potential risk to individual predators from Al but not from Cr
1 alt. Protecting the Dolly Varden char population during operation of the TSF	Survival, growth, and reproduction of the population of Dolly Varden char that currently inhabit LSL	Comparison of chemical water quality in the TSF during operation with protective values. TSS levels are evaluated by comparison with literature values	Risk from conditions near tailings discharge from Al in water and pH. Low risk from Cr in water or sediments.
	Survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL	Comparison of chemical water and sediment quality during TSF operation with protective values. Physical stressors are evaluated by review of the literature	Risk from conditions near tailings discharge from Al in water and pH. Low risk from Cr in water or sediments

the concentration of aluminum in the closed TSF would closely approximate the pre-mining conditions and therefore pose low risk to aquatic life. The finding of low risk to aquatic life from chemical stressors is also largely supported by the different bioassay tests conducted with marine organisms (EVS, 1999a, 1999b; Kline, 1998), which generally found growth and survival of macroinvertebrates in tailings similar to growth and survival in natural sediments. These results are discussed in more detail in Section 5.2.2. Although many of the bioassay tests indicate that macroinvertebrate colonization and survival in tailings is possible, as discussed in Section 5.2.2, there are noted differences across the species and endpoints evaluated.

The risk analysis of the terrestrial assessment endpoints indicated a potential risk to individual sandpipers, hares, moose, bears, otters, and wolves (due to NOAEL HQ>1) from aluminum. However, the risk to all the terrestrial receptors, except otters, would be associated with sediment exposure (Attachment E). Nonetheless, aluminum concentrations in tailings would be less than those in the existing LSL sediments, and as shown in Figure 1.3 and discussed in Section 5.2.1, the tailings would be placed in a manner that would minimize, if not eliminate, direct exposure to tailings by terrestrial receptors. Based on this comparison, there would be no increased risk to these receptors from aluminum concentrations in the sediment. The comparison of exposure to LOAEL values shows a potential for minimal risk as all HQ values are less than 1.0 (the value for otters is 0.98). The greatest potential risk is for otters (HQ = 0.98) and is associated with aluminum concentrations in fish, and the exposure assumptions are that otters eat fish only from LSL that are living in the worst-case water. The worst-case water conditions, however, would occur only in the immediate vicinity of the tailings outfall and in some isolated pore waters in recently emplaced tailings. Based on the more realistic operational water quality, or the water quality after mixing and geochemical interactions between the tailings slurry and the LSL waters, operational water poses a low risk to otters. The NOAEL HQ for otters under the operating water conditions (Table 4.6) is 1, indicating a low potential risk to individual otters. The leach testing conducted on the tailings (Rescan, 2000) indicates very little flux of aluminum from the tailings into overlying water after 60 days. Based on the operational and leach data, it is expected that the concentration of aluminum in the closed TSF would closely approximate the pre-mining conditions and therefore pose low risk to all the terrestrial receptors.

As indicated in Table 5.1, chromium would generally pose a low risk to all the assessment endpoints, both aquatic and terrestrial. Under the worst-case water quality at the tailings outfall, the predicted concentration of chromium (Table 3.1) would be below the water quality criteria and the protective values for aquatic life found in the literature (Table 4.2), established in the effects assessment in Section 4.1. This indicates a low risk to the aquatic community from chromium in water under even the worst-case scenario. Chromium concentrations in the tailings (39–119 mg/kg) would be higher than the baseline LSL sediment levels (Table 3.2) but less than the protective sediment concentrations of 133–630 mg/kg (Table 4.2). The toxicity of chromium depends to a large extent on its chemical form, with the reduced trivalent (Cr^{+3}) form having a much lower toxicity than the oxidized Cr^{+6} form. The chromium released with the tailings would be in the reduced form and, because of subaqueous disposal and low oxygen conditions, would not be oxidized to the more toxic hexavalent form. Overall, there would be a low potential risk to aquatic life from chromium. As discussed above with respect to aluminum, this conclusion is consistent with the results of the different bioassay tests conducted with marine organisms (EVS, 1999a, 1999b; Kline, 1998), which generally found growth and survival of macroinvertebrates in tailings similar to growth and survival in natural sediments. These results are discussed in more detail in Section 5.2.2.

Even under the assumed worst-case conditions, chromium poses a low risk to all the terrestrial assessment endpoints except invertivorous waterfowl, as evaluated for the representative species, spotted sandpiper. The NOAEL HQ of 2.83 for sandpipers exceeded the risk threshold of 1, though the LOAEL HQ of 0.56 is less than 1. Over 80 percent of sandpiper's exposure is due to sediment ingestion. These results indicate some potential risk to individual invertivores; however, because the LOAEL HQ is less than 1, there is low risk from chromium to the overall populations. In addition, given the placement of the tailings in the deeper parts of the TSF (Figure 1.3), it is unlikely that shorebirds or waterfowl would have significant exposure to the tailings (i.e., sediment ingestion). The Rescan (2000) leach tests indicate that there is essentially no mobility of chromium from the tailings to the overlying water. Based on the low risk posed under the worst-case conditions and the lack of chromium mobility, there is a low risk potential to terrestrial or aquatic biota from chromium after closure of the TSF.

The final chemical COPEC identified in the screening evaluation (Section 3) is pH. As previously discussed, pH effects are essentially limited to direct exposure to aquatic life. Because the milling process requires elevated pH conditions, the decant water associated with the tailings is projected to have a pH of around 10 (Table 3.1). The scientific literature reports that pH values above 9.5 can affect ammonia processing by fish, and that even higher (~10) pH values can result in salmonid mortality. According to the literature review, fish are likely the most sensitive aquatic receptors. Though the pH conditions in the immediate vicinity of the tailings outfall could be harmful to fish, the relatively low volume of water in the tailings slurry would rapidly intermix with the much larger volume of LSL water, resulting in a pH of approximately 7.8, which is within the existing LSL range of 7.1–8.1 s.u. (Table 2.1).

It is expected that fish in the TSF would use their avoidance mechanisms to avoid the limited areas of elevated pH during operation of the TSF. The pH conditions after closure of the TSF should also pose a low risk. Based on the geology of the tailings (e.g., low sulfide) and the low oxygen conditions in the TSF, it is unlikely that the tailings would create acid conditions and therefore alter the generally neutral pH conditions of LSL (MEND, 1989; Rescan, 2000).

5.2 Physical Stressors

The generation of elevated TSS levels and the deposition of tailings (i.e., sedimentation) are possible stressors to the aquatic receptors in the TSF. Sedimentation and TSS can have both direct effects, primarily from exposure to TSS in the water column, and indirect effects, due to habitat alteration.

5.2.1 Direct Effects

As discussed in Section 4.3.4, fish, particularly salmonids, are the most sensitive aquatic receptors to TSS in the water column. In addition, the early life stages (eggs and alevin) have the greatest sensitivity; adult salmonids have fairly high tolerance levels (Attachment D; Table 4.8). As indicated in Table 4.8, adult salmonids can likely tolerate chronic TSS concentrations of 100 mg/L or greater. Short-term (acute) exposures of up to 1,700 mg/L should be tolerated by adult Dolly Varden char. Early life stages of salmonids are much more sensitive than adults. Because TSS levels as high as 660 mg/L are predicted, there would be risk to fish populations during operations. Potential impacts due to TSS levels are an issue only during the period of active tailings disposal because water levels are projected to be of sufficient depth after closure of the TSF to prevent remobilization of the tailings from wave erosion (Earthworks, 2002; Figure 1.3).

5.2.2 Indirect Effects

Indirect effects of tailings placement are largely associated with changes in habitat. Though certain aspects of tailings placement, such as burial of habitat by the tailings, can be considered a direct effect, they are included in this discussion as part of the overall changes in habitat that result from the placement of tailings. Habitat changes are relevant to Management Goal 1 and the associated endpoints (Table 2.2). As discussed in Section 5.1, the projected chemical risks associated with the tailings are generally limited, primarily because of rather low concentrations of potentially toxic constituents in the tailings. For juvenile and adult char, there would be a greater likelihood of impacts from deposited tailings material than from TSS. The largest potential effect of sedimentation on char would be the displacement of potential spawning habitat in the shallow parts of the lake due to burial by tailings and alterations of the forage base, primarily through habitat alteration and burial of aquatic vegetation and macroinvertebrates. The emplaced tailings would essentially cover the entire existing habitat in LSL (Figure 1.3). Much of the covered area, however, would be the deeper parts of LSL. The deeper parts are largely unproductive because of limited light, whereas the shallower areas (littoral zone) are more productive (Kline, 2001). Though the existing productive habitat would also be covered, the larger lake created as a result would have a greater photic zone, which could increase the overall productivity of LSL. The potential productive zones are discussed in greater detail below.

The dam construction and the placement of tailings in the lake would raise the current water level of the lake from 650 feet to approximately 737 feet and inundate what is currently shoreline habitat (Figures 1.1 and 1.2). The placement of tailings would also raise the existing level of the lake bottom (Figure 1.3). The sequential placement of tailings would therefore ultimately cover the existing deep and shallow lake bottom habitat, as well as inundate existing upland and stream habitats. Approximately 1,110 to 1,300 feet of stream habitat in the lower reach of Slate Creek between USL and LSL would be flooded and become part of LSL as water levels rose with the addition of tailings. The existing spawning gravels that, at closure, occur in the shallow areas of LSL would also be covered by tailings (Figure 1.3). It is expected that, at closure, the margins of LSL would have native substrate not covered by tailings (Figures 1.3). It is not known whether the upland areas that would be flooded would have suitable gravel substrate at an appropriate water depth (<8 inches) to allow for spawning. The final reclamation plan for the TSF needs to address the potential loss of spawning areas for the char and the ability to recreate this habitat. Ongoing monitoring during operations in USL would serve to better define spawning conditions in and around the lakes. These data will be used to further define the reclamation plan.

Sediment sampling conducted during June 2000 and August 2001 showed that a variety of benthic invertebrate species exist at a depth of 4 m (13 ft), whereas samples collected at 12-15m (40-50 ft) were nearly devoid of benthic invertebrates (Table 5.2). The depth limit of rooted plants and benthic invertebrates in lakes often corresponds to a threshold of 1 percent surface light penetration, which is twice the Secchi depth. This threshold is reached at 26 feet in LSL and has been used in past memos and reports to delineate benthic productivity. More recent and sophisticated light penetration profiles conducted in August 2003 (Earthworks, 2003) revealed that the depth of 1 percent light penetration is only 13 feet, which is consistent with observations of rooted plants in LSL; however, 26 feet is used as a conservative estimate of the maximum depth of a diverse benthic invertebrate population. The maximum potential depth of benthic invertebrate colonization in the TSF at closure was assumed to be the same as that in the existing lake. Based on this cutoff, the areas of potential rooted plant growth (0–13 ft) and benthic invertebrate colonization in natural sediment and tailings (0–26 ft) were calculated for the existing LSL and the nearly flat-bottomed tailings impoundment (Figure 1.2 and Table 5.3).

Table 5.2 Summary of Benthic Macroinvertebrate Data from Lower Slate Lake

		4 Meters (13 Feet)		15 Meters (49 Feet)	
Common Names	**Taxon**	**June 2000**	**August 2001**	**June 2000**	**August 2001**
Midges	Chironomidae	86	141	1	3
Aquatic earthworms	Oligochaeta	22	3	0	0
Clams/mussels	Bivalvia	14	21	0	0
Scuds/sideswimmers	Amphipoda	0	7	0	0
Roundworms	Nematoda	0	6	0	0
Mites	Trombidiformes	1	4	0	1
Flies	Diptera (other than chironomids)	0	3	0	0
Beetles	Coleoptera	0	1	0	0
Caddisflies	Trichoptera	0	1	0	0
Total Abundance		123	187	1	4
Number of Taxa		19	23	1	2

Data were pooled from three replicate grab samples at each depth for each year (number/3 x 2.4 L). A 15 cm x 15 cm Ponar Grab (2.4-L volume) sampler was used. Number of taxa includes data for the lowest practical level of taxonomic resolution.

Table 5.3 Zonation of Lower Slate Lake and the Tailings Impoundment Based on Water Surface Area Overlying Bottom Types

Bottom type	**Water Depth (ft)**	**Lower Slate Lake Acreage (natural sediment)**	**Tailings Impoundment Acreage**		
			Natural Sediment	**Tailings[b]**	**Impoundment Total**
Rooted plants	≤ 13	6.3	6.3	0	6.3
Benthic invertebrates[a]	≤ 26	11.3	11.3	2	13.3
Unproductive	>26	9.0	0	43.2	43.2
Total		20.3	11.3	45.2	56.5

[a] This acreage includes the zone of productivity for rooted plants.

[b] Due to uncertainties with habitability, the area overlain with tailings might not support macroinvertebrates (see text discussion).

After closure, the area of submerged natural sediment in the impoundment that receives sufficient sunlight for photosynthesis would be at least equivalent to the existing conditions in LSL (6.3 acres). Studies would be conducted during operation to determine whether amendments would be required to accelerate plant colonization in tailings. It might be revealed, however, that the productivity of tailings is sufficient and that amendments could result in overproduction of plants and in seasonal anoxia.

As indicated in Table 5.3, the acreage of productive bottom habitat not covered by tailings at closure (11.3 acres), would be equal to the existing acreage. To achieve the same productive acreage not covered by tailings, the Plan of Operations specifies that tailings placement be limited to the bottom area that is covered by 9 feet or more of water (Figure 1.3). Another 2 acres of bottom habitat covered by tailings would have sufficient light penetration for macroinvertebrates (Figure 1.3). Even if there were limitations to the short-term habitability of the tailings, even marginal colonization in tailings could result in a benthic population in the impoundment more substantial than that in the existing lake. The potential for habitability is discussed in greater detail below.

Habitability tests were conducted on Kensington mine tailings using marine organisms (EVS, 1999a, 1999b; Kline, 1998) and freshwater organisms (AscI, 2000a; 2000b). In all tests, the results of the mine tailings studies were compared with those conducted on natural sediments. Tests with marine organisms generally indicated good recovery potential and low toxicity, while test results with freshwater organisms were mixed (Figure 5.1 and Table 5.4). The marine investigations consisted of both laboratory testing (EVS, 1999a, 1999b) and in situ testing (Kline, 1998). Test organisms used in the laboratory study consisted of marine amphipods (*Ampelisca abdita* and *Rhepoxinius abronius*), polychaete worms (*Nereis arenaceodentata* and *Nereis virens*), and a bivalve mollusk (*Macoma nasuta*). The amphipods were tested for survival, avoidance, and reburial; the other organisms were tested only for survival. The tests that used *Ampelisca abdita*, however, failed to meet the control validity criteria and are not included in the summary shown in Figure 5.1 and Table 5.4. Although the *Ampelisca abdita* results are not included in the summary, it is important to note that there was lower survival in the tailings as compared to the Lynn Canal and control sediments.

In Kline's (1998) in situ study, trays containing defaunated marine sediment, serving as a reference, and trays of tailings from the proposed Kensington mine were placed at a depth of 21 m on the floor of Auke Bay to allow colonization via settlement from the water column. Trays of reference sediment and tailings, and cores of ambient sediment, were collected 9, 17, and 22 months after placement. Differences between the reference sediment and tailings assemblages were generally insignificant, including total abundance, total biomass, number of taxa, average size of individuals, numerically dominant taxa, abundance by ecological guilds, and overall community composition (Figure 5.1 and Table 5.4).

As shown in Table 5.4, some of the results in the tailings are lower (poorer) than those in the native marine sediments, while some are essentially the same as or higher (better) than those in the marine sediments. The overall comparison of the different studies is provided in Figure 5.1, which shows that most of the marine tests resulted in comparable results in tailings and sediment.

Table 5.4 provides information for each test number shown in Figure 5.1. Values greater than 1 indicate a higher value for a favorable response in tailings (e.g., Test 19, 100 percent polychaete survival in tailings versus 70 percent survival in Lynn Canal sediment, 100/70 = 1.43). Values less than 1 indicate a lower value for a favorable response in tailings (e.g., Test 23, 602 eggs per midge female in tailings versus 772 eggs per female in shallow LSL sediment, 602/772 = 0.78).

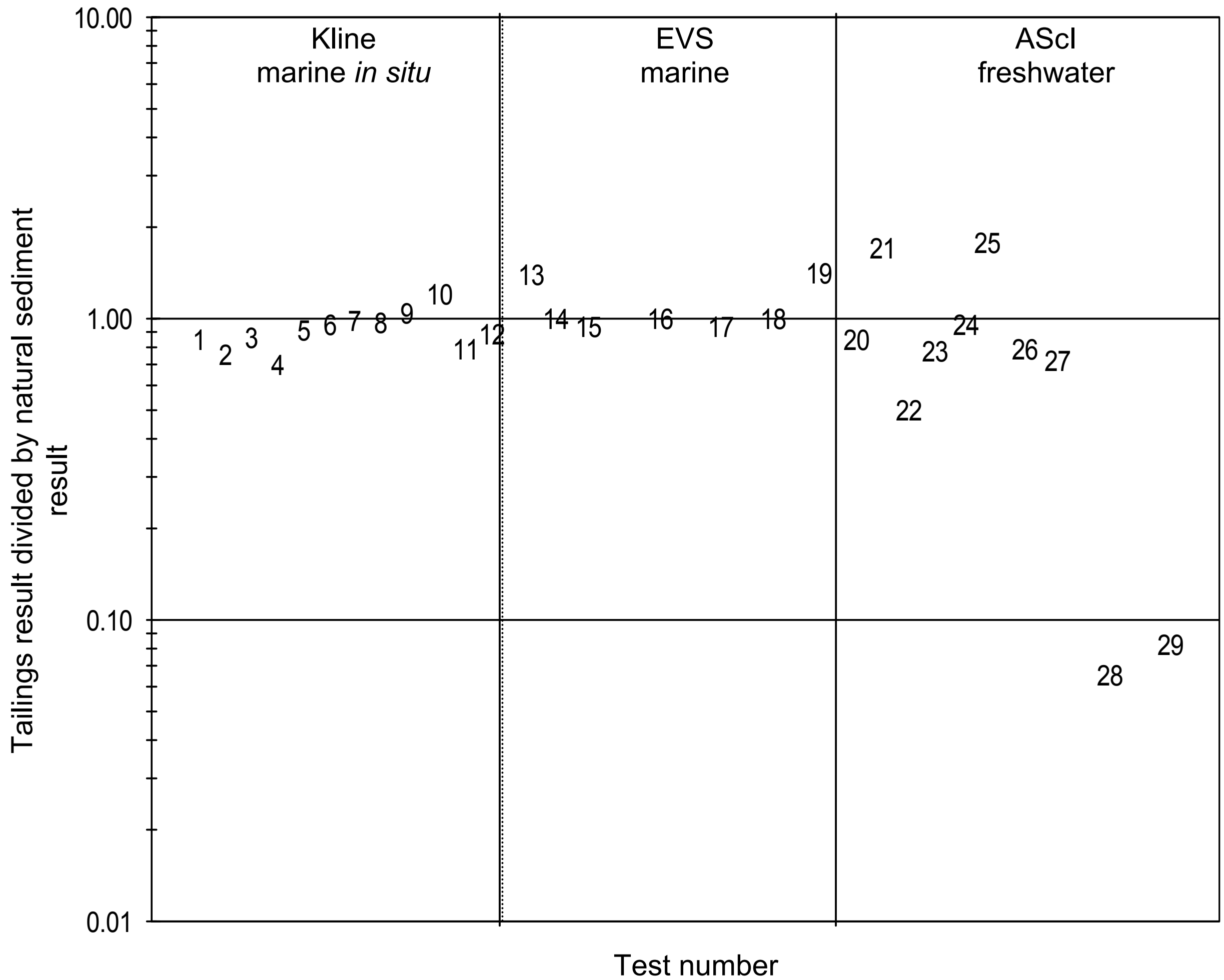


Figure 5.1 Responses of Test Organisms to Kensington Tailings Relative to Concurrently Tested Natural Sediment.

Table 5.4 Data Corresponding to Figure 5.1

Test Number	Tailings Result	Natural Sediment Result	Test Ratio[a]	Test Result Details	Natural Sediment
1	622	730	0.85	Kline 9-month in situ total abundance	Auke Bay
2	486	641	0.76	Kline 17-month in situ total abundance	Auke Bay
3	899	1047	0.86	Kline 22-month in situ total abundance	Auke Bay
4	71	101	0.70	Kline 9-month in situ total biomass	Auke Bay
5	190	206	0.92	Kline 17-month in situ total biomass	Auke Bay
6	373	388	0.96	Kline 22-month in situ total biomass	Auke Bay
7	42.5	43.1	0.99	Kline 9-month in situ number of taxa	Auke Bay
8	39.1	40	0.98	Kline 17-month in situ number of taxa	Auke Bay
9	49.7	47.7	1.04	Kline 22-month in situ number of taxa	Auke Bay
10	0.14	0.115	1.22	Kline 9-month in situ individual size	Auke Bay
11	0.31	0.393	0.79	Kline 17-month in situ individual size	Auke Bay
12	0.367	0.414	0.89	Kline 22-month in situ individual size	Auke Bay
13	90	64	1.41	EVS 10-day amphipod (*Rhepoxinius abronius*) survival	Lynn Canal
14	0.08	0.08	1.00	EVS 10-day amphipod (*R. abronius*) avoidance	Lynn Canal
15	93	98	0.95	EVS 10-day amphipod (*R. abronius*) reburial	Lynn Canal
16	100	100	1.00	EVS 20-day polychaete (*Nereis arenaceodentata*) survival	Lynn Canal
17	13.8	14.7	0.94	EVS 20-day polychaete (*N. arenaceodentata*) individual size	Lynn Canal
18	97.6	97.6	1.00	EVS 28-day clam (*M. nasuta*) survival	Lynn Canal
19	100	70	1.43	EVS 28 day polychaete (*N. virens*) survival	Lynn Canal
20	83	98	0.85	AScI 20-day midge (*Chironomus tentans*) survival	shallow LSL
21	1.69	0.98	1.72	AScI 20-day midge (*C. tentans*) dry weight	shallow LSL
22	42.6	85.4	0.50	AScI 20-day midge (*C. tentans*) emergence	shallow LSL
23	602	772	0.78	AScI 20-day midge (*C. tentans*) eggs/female	shallow LSL
24	83	87	0.95	AScI 20-day midge (*C. tentans*) survival	deep LSL
25	1.69	0.95	1.78	AScI 20-day midge (*C. tentans*) dry weight	deep LSL
26	42.6	53.1	0.80	AScI 20-day midge (*C. tentans*) emergence	deep LSL
27	602	810	0.74	AScI 20-day midge (*C. tentans*) eggs/female	deep LSL
28	5	76	0.07	AScI 42-day amphipod (*Hyalella azteca*) survival	shallow LSL
29	5	62	0.08	AScI 42-day amphipod (*H. azteca*) survival	deep LSL

Source: Kline, 2003a.
[a] Result of test in tailings divided by the result in natural sediment. A value of 1 indicates equivalent results.

AScI (2000a, 2000b) conducted freshwater bioassay tests with *Chironomus tentans* (midge) and *Hyalella azteca* (amphipod) per the ASTM protocols. Chironomids are the dominant macroinvertebrate family sampled in LSL. Amphipods were not collected in the 2000 sampling and were limited in the 2001 sampling (Table 5.2). Both acute and chronic chironomid bioassays were conducted. Chironomid survival, growth, and egg production in the tailings were not significantly different from those in control or LSL sediments. Though chironomid egg production was not significantly different between the control, the LSL sediments, and the tailings, the egg production in tailings and shallow LSL sediment were below USEPA's recommended minimum endpoint of 800 eggs per female. The percent emergence of chironomids from the tailings was significantly lower than that in the control or shallow (4-m) LSL sediment samples, but it was not significantly different from the deep (15-m) LSL sediment sample (AScI, 2000a). Tailings emergence was also less than the USEPA-recommended 50 percent minimum endpoint and the test was terminated after 60 days for the tailings sample, while the other exposures demonstrated emergence over longer periods (e.g., the lab reference ran for 83 days). Tests are terminated after 7 days of no emergence. These results indicate that chironomids could likely recolonize the tailings, though the lower emergence values indicate decreased capabilities. The tests conducted with the amphipods were less supportive: there was low survival (5 percent) of amphipods in the tailings sample. For that reason, growth and reproduction by amphipods were not evaluated (AScI, 2000b).

The results of the freshwater and *Ampelisca abdita* marine amphipod bioassay tests indicate that there are possible limitations to the ultimate habitability of the tailings for certain types of organisms. As discussed in Section 5.1, the analysis of chemical risk and the results of the marine invertebrate habitability tests suggest that the limitations might be physical in nature rather than due to chemical toxicity. Some possible physical limitations are a lack of nutrients (low total organic carbon) and poor substrate composition (e.g., size or structure), though the tests included the feeding of the test organisms, which should have minimized effects from potential nutrient limitations. Possible physical limitations might ultimately be overcome if there is sufficient allochthonous input of organic material from the surrounding terrestrial environment, autochthonous production of organic matter within the lake, and the deposition of stream-discharged sediment over the tailings. These inputs would also limit the biological resuspension of tailings by the burrowing activity of macroinvertebrates. Although the sedimentation rate of LSL is unknown, background TSS levels in East Slate Creek are low (4 mg/L) and sources of sediment loadings are limited. Studies at another tailings disposal facility on Vancouver Island indicate that sediments build up over the tailings at a rate of approximately 2 cm after 17 years (MEND, 1992). Typically, a depth of 10 cm is assumed to be the zone of highest macroinvertebrate colonization (Reynoldson, 1987; USEPA, 2001), which would suggest that 50 or more years would be required to cover the tailings with 10 cm of natural sediment. Potential risks from indirect effects of tailings placement are summarized in Table 5.5. In addition, laboratory studies and in situ experimental work are planned for completion during the operational period. These tests, discussed in Section 5.5, would further evaluate the habitability of tailings and determine whether amendments are needed.

Table 5.5 Summary of Risk Characterization for Physical Effects

Management Goal	Assessment Endpoints	Measurement Endpoints	Results—Physical
1. Reestablishing/ enhancing a viable Dolly Varden char fishery in LSL upon cessation of tailings disposal	Creation of conditions conducive to the survival, growth, and reproduction of a viable population of Dolly Varden char in LSL	Physical habitat changes were discussed relative to population viability.	Spawning areas might need to be recreated. Forage availability should not be limiting.
	Creation of conditions conducive to the survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL	Physical stressors were evaluated in a review of the literature.	Productivity in LSL should be similar to existing conditions soon after closure and could improve over time.
1 alt. Protecting the Dolly Varden char population during operation of the TSF	Survival, growth, and reproduction of the population of Dolly Varden char that currently inhabit LSL	TSS levels were evaluated in comparison with literature values. Physical habitat changes were discussed relative to population viability.	Low risk from TSS levels, though sedimentation will limit recruitment through decreased spawning and might limit the forage base for char.
	Survival, growth, and reproduction of communities of vegetation and macroinvertebrates, and a population of three-spine sticklebacks, sufficient to support a viable Dolly Varden char fishery in LSL	Physical stressors were evaluated in a review of the literature.	Low risk from TSS levels, though sedimentation will affect habitat for plants and macroinvertebrates.

5.2.3 Recovery of Macroinvertebrates

Depending on the ability of the existing macroinvertebrate communities to adapt to the changing water level and bottom habitat in the TSF, at least some degree of macroinvertebrate recolonization would be needed to support the char population. As indicated in Attachment D, macroinvertebrate communities generally have a high recovery potential, especially if there are nearby sources of organisms for recolonization. Possible sources for LSL are organisms from recently inundated areas in the lake, airborne transport, or organisms drifting from Mid-Lake East Fork Slate Creek or USL. In addition, the existing macroinvertebrate community should migrate to new habitat areas as the lake water rises. Reports of heavily disturbed streams (Attachment D; Hill, 1975; Gore, 1985; Thomas, 1985) indicate that macroinvertebrate recovery can occur within time periods ranging from months to a few years. Specific examples of recovery from tailings placement are discussed below.

As shown in Figure 1.3, the final configuration of the TSF would have a slightly larger littoral zone than the existing LSL. While the area associated with native habitat would be the same for the TSF and the existing LSL (11.3 acres; see Table 5.3), an additional 2 acres would be covered by tailings and would have sufficient light for macroinvertebrate productivity. Even if productivitiy in this portion of the TSF was low, overall productivity in the closed facility could be higher than that in the existing lake. Productivity might also be increased by the flooding of the nearby terrestrial ecosystems that would result from the creation of a larger lake. Flooding of these areas would increase the availability of nutrients to primary producers in the flooded areas. Given the presence of an upstream seed source, it is expected that recolonization of the newly flooded areas by plants would be rapid in LSL after the cessation of tailings disposal.

To further evaluate the potential recovery of LSL after the cessation of tailings disposal, several case studies are discussed below. As noted in these case studies, the available evidence suggests that lakes used as tailings repositories can recover after mining activities cease. It is important to recognize that these studies are presented to reflect the information in the literature, not to suggest that recovery in LSL would be equivalent. Moreover, a critical review of these case studies indicates that the field studies and limnologic characterization of the lakes analyzed should be used for “gross”-level comparisons only (MEND, 1992b).

The first case study is a study of Benson Lake, a small, deep (maximum depth 54 m), oligotrophic coastal mountain lake situated in the coastal zone on the north end of Vancouver Island, British Columbia. The lake was used as a tailings depository from August 1962 through January 1973. Tailings had smothered the lake’s profundal sediments, thereby eradicating all traces of benthic invertebrate life (MEND, 1991). In September 1990, more than 17 years after the cessation of tailings disposal, it was reported that Benson Lake showed little evidence of the fact that it had received mine wastes. Physical and chemical water quality sampling conducted at three stations in the lake indicated that the lake water was similar in virtually all respects to the waters of a nearby control lake, Keogh Lake. Some differences between the lakes were noted; however, the differences were attributable to inherent characteristics of Benson Lake's drainage basin and to the presence of a fish farm in the control lake basin. Benson Lake was characterized by higher conductivity, total dissolved solids, alkalinity, calcium, and potassium than the control lake, but the levels of each of these parameters reflected their levels in the water flowing into the lake from the Benson and Raging rivers and Craft Creek. The fish farm on Keogh Lake appeared to have a fertilization effect that resulted in higher levels of nutrients (phosphorus and nitrogen) and plankton growth in the control lake than in Benson Lake. Sediment sampling confirmed that there was no efflux from the sulfide-rich copper-bearing tailings (MEND, 1992a).

Aquatic vegetation was well established in the littoral zone of the lake, particularly along its southern and eastern shorelines. Compared with the control lake, aquatic vegetation in Benson Lake was found to contain elevated levels of arsenic and copper. Arsenic accumulated in both the tops and roots of horsetail (*Equisetum* spp.) and pondweed (*Potamogeton* spp.), while copper accumulated only in the roots of horsetail and in both the tops and roots of pondweed (MEND, 1991).

Lake and surface samples of tailings-rich sediments were collected and examined in detail. Metal and petrographic analyses of lake samples indicated that tailings are quite widespread in the lake. An organic layer is accumulating over the tailings and might be helping to prevent benthic effluxes of metals to the overlying water column. Sequential extractions of tailings-dominated lake samples revealed that underwater samples did not release any significant quantities of metals from the water-soluble or exchangeable cation phases. These preliminary results suggest that the chemical reactivity of the underwater tailings is minimal and that their presence is not degrading the biochemical environment of Benson Lake (MEND, 1992a).

The biota of Benson Lake were also examined in considerable detail. It was found that the benthic invertebrate community in the lake had reestablished itself to reflect the community structure and organism density typical of oligotrophic lakes throughout Canada and the world. It is important to note, however, that Benson Lake had lower diversity than the control lake, with only 8 taxa represented versus approximately 30 in the control lake. Net phytoplankton densities and community structure were similar to densities and assemblages found in the control lake and in other coastal mountain lakes in British Columbia. The composition of zooplankton species in Benson Lake was also similar to the composition of the species in the control lake, but their densities were significantly lower in both lakes than in other oligotrophic coastal lakes (MEND, 1991).

Fish sampling confirmed the presence of rainbow trout in both Benson and Keogh lakes, a species of char in Benson Lake, and cutthroat trout in Keogh Lake. Fish from Benson Lake were significantly larger and had significantly higher condition factors than fish from the control lake. In addition, the concentrations of metals in the flesh of fish from Benson Lake were lower than the body metal burden in fish from the control lake, but the concentrations of metals in the livers of Benson Lake fish were higher. However, the concentrations of all metals in the fish from both lakes were within the range of concentrations for the same metals in fish tissues and livers from unpolluted Canadian waters. The stomach contents of fish from Benson Lake suggested that the fish in the lake were incorporating the reestablished benthic invertebrate community into their diet (MEND, 1991).

Other case studies are from lakes in central Manitoba. Tailings from the processing of copper, lead, and zinc sulfide ores were discharged into Anderson Lake between 1979 and 1994. The mean depth of tailings deposition in Anderson Lake was 2.1 meters. Evaluation of the older areas of deposition showed that they had developed a biologically active organic layer and supported benthic invertebrates (MEND, 1990; as cited in Kline, 2003a). Another example is Mandy Lake near Flin Flon, Manitoba, where sulfide tailings from a copper, gold, and silver mine were deposited during 1943 and 1944. The tailings were predominately pyrite, with elevated concentrations of copper and zinc. When sampling was conducted in 1975 and 1976, no distinction was apparent in the benthic assemblages between the tailings and non-tailings areas of the lake (Hamilton and Fraser, 1978; as cited in Kline, 2003a). These case studies further indicate that benthic invertebrates should recolonize LSL after closure of the Kensington Mine (Table 5.5).

5.3 Uncertainties

Uncertainty in risk estimation and characterization can result from a number of sources. In exposure and risk evaluation, the primary sources of uncertainty can be divided into two categories: (1) the applicability and relevance of the overall exposure and risk models to the site, and (2) the accuracy of the input variables (USEPA, 1997c).

Exposure and risk models include the development of the CSM (Figure 2.2), the selection of TRVs and protective concentrations, and the predictive values and methods used to model the transfer of aluminum and chromium to terrestrial receptors. The CSM was developed early in the risk assessment process and was accepted as reasonable by the agencies involved. Based on descriptions of site use by the different receptors, it is likely that the CSM overestimates exposure by terrestrial receptors. While the exposure estimates are dependent on the selected food, water, and ingestion rates assumed for each receptor (Section 4.2.2 and Table 4.3), uncertainties associated with these values are expected to be overwhelmed by the assumption of 100 percent usage (AUF = 1) of the TSF for foraging by receptors. There is more certainty in the estimate of the exposure of aquatic receptors because they are less mobile. The selected TRVs (Table 4.1) and protective values (Table 4.2) were chosen to conservatively reflect the reported toxicity levels in the scientific literature. The greatest source of uncertainty is related to the prospective nature of the risk assessment. Because it is prospective (i.e., predictive), much of the exposure evaluation relies on modeled concentrations. For terrestrial receptors, bioaccumulation factors are used to model the transfer of aluminum and chromium through the environment. For aquatic receptors, modeling is required to predict the water chemistry in LSL during operations and after closure of the TSF. To minimize the possible impact of these sources of uncertainty on the risk assessment findings, conservative assumptions and approaches have been used.

It is also important to note that, when possible, conservative assumptions of exposure and effects were used. This caution is seen, for example, in the use of the maximum detected concentrations for exposure, the assumption that the AUF = 1, and the selection of more conservative NOAEL and LOAEL values and higher transfer (BAF) factors. There is greater uncertainty in the aluminum NOAEL and LOAEL values for birds due to use of a single set of values for ring doves (Attachment A). Though there is greater uncertainty associated with these effects, the conservative selection of exposure factors should minimize the risk of underestimating potential risk to birds from aluminum.

Specific areas of additional uncertainty are (1) the limited data available for thallium concentrations in sediment and (2) unknown sedimentation rates in LSL. The available decant water data, however, suggest that thallium concentrations in the tailings and associated water are low, and therefore there is limited risk potential. The lack of data on sedimentation rates increases the uncertainty in projecting the time required for the tailings to be covered by natural sediments and thereby aid in the recovery of the macroinvertebrate community. Information in the literature (MEND, 1991) indicates that the deposition of sediment can be a very slow process. Although this might prolong the time frame required for colonization of the tailings, the availability of natural sediments in LSL should allow for sufficient macroinvertebrates to support fish in LSL.

5.4 Conclusions

Overall, the projected risks to aquatic receptors from chemical stressors during operation of the TSF vary (Table 5.1). In the immediate vicinity of the tailings discharge into the TSF, the pH levels are expected to be toxic to aquatic life. The spatial area of toxic conditions would be limited, however, and given the avoidance mechanisms used by fish, these conditions would not be likely to affect fish in the TSF during operations. Because of geochemical interactions and intermixing with LSL water, the alkaline pH would be rapidly neutralized. Aluminum levels would then rapidly decrease to natural levels. Natural levels are, however, above the chronic criterion and could pose a risk. Chromium concentrations, even under the worst-case water scenario, would pose a low risk to aquatic life. In addition, post-closure water concentrations of aluminum and chromium would pose a low risk to aquatic life.

In general, there would be a low risk to terrestrial receptors from chemical COPECs. Though there would be some potential risk to individual terrestrial receptors through sediment ingestion, the placement of tailings in the deeper part of the TSF would essentially eliminate this route of exposure. Under the worst-case water (i.e., exposure to untreated tailings decant water), the greatest potential was calculated for otters (Table 4.6) from aluminum concentrations in fish tissues. However, the LOAEL HQ for this species was less than 1.0 (0.98), suggesting a minimal risk for the worst-case assumptions. The worst case assumes that otters would have 100 percent usage of the TSF for feeding on fish exposed to the maximum concentration of aluminum in the tailings water. However, the volume of tailings decant water is low relative to the overall volume in the TSF, and because of geochemical interactions and intermixing of water, the concentrations of aluminum in the lake are predicted to be lower (360 µg/L) than the maximum concentration used in the assessment. Under more realistic exposure conditions, there would be a low potential risk to otters from aluminum during operation of the TSF. This is in agreement with the low bioaccumulation potential reported by EVS (1999a) for the tailings. After closure of the TSF, there would be a low potential risk from chemical constituents to terrestrial receptors, largely due to the lack of leaching of constituents (Rescan, 2000) from the deposited tailings and the low-oxygen environment created by subaqueous disposal. This conclusion is based on the assumption that tailings would remain in the reducing conditions created by subaqueous disposal. Further testing should be completed prior to any potential use of the tailings for habitat creation above the surface of the lake.

Impacts from physical stress (i.e., TSS generation and sedimentation) are likely to pose a greater risk to the aquatic community than are increased chemical concentrations (Table 5.5). With the exception of the egg and alevin life stages, char and other aquatic receptors are fairly tolerant of TSS levels and are likely at less risk from the expected TSS concentrations in the TSF during operations. TSS is expected to affect the more sensitive early life stages (eggs and alevin). More broadly, the tailings would ultimately cover the existing spawning gravels (Figure 1.3). It is likely that these changes would preclude successful spawning of char during operation of the TSF. At closure, the mitigation plan would need to address the potential loss, due to flooding, of spawning habitat for the char.

The deposition of tailings in LSL is expected to have further effects on the aquatic communities (Table 5.5). During operations, the ability of the char population to thrive would depend most on the ability of the aquatic plant and macroinvertebrate community to adapt enough to the changing water depth and substrate (e.g., burial) to provide a sufficient food base to support the fishery. Though the literature indicates that macroinvertebrate communities are generally able to recolonize disturbed areas relatively quickly (see Attachment D), sufficient plant material is required to support the macroinvertebrates. Plants could have difficulty adapting to the changing conditions, especially changes in water depth, though the flooding of the terrestrial vegetation would provide a pulse of organic matter to the aquatic community, possibly offsetting the loss of aquatic plants. A concurrent pulse of acidity might be associated with the flooding of the muskeg areas, but no long-term changes in the pH of the lake are expected given the large volume of water present and the water turnover in the lake. Overall, there is significant uncertainty whether the TSF would support a fish population during operations.

Upon closure of the TSF, water depths and substrate composition would stabilize, improving the conditions for plants and macroinvertebrates. As shown in Table 5.3, the area of native substrate for plants and benthic macroinvertebrates in the closed facility would be equivalent to that in the current lake (11.34 acres). It is also expected that at least some colonization of the shallower tailings would occur after closure and that conditions would improve in time so that the overall productivity of the closed facility could be higher than that currently present in LSL. The higher productivity should eventually provide better long-term conditions for Dolly Varden char than the current conditions in LSL, although data show this level of recovery could require more than 50 years.

5.5 Monitoring, Research, and Mitigation

This section briefly presents the research and monitoring program planned for the operational period and the post-closure period. Several aspects of the research and monitoring program are designed to provide a better understanding of the potential effects of operations and the ability of the TSF to be returned to a productive char fishery. These efforts are aimed at confirming that all permit requirements are met, as well as providing information to allow for effective management of tailings and the TSF. Primary aspects of the research and monitoring program are listed below:

Research and Monitoring During Operation

- Invertebrate and aquatic plant populations in LSL
- Oxygen/temperature profile monitoring in USL and Spectacle Lake
- Dolly Varden char spawning surveys in USL
- Experimental placement of spawning gravel in USL
- In situ wetland transplant trials in USL
- In situ benthic invertebrate recolonization experiments in USL
- Dolly Varden char population monitoring in impoundment (assumes fish are not removed and the primary objective is operation of the the treatment facility)
- Dolly Varden char tissue chemistry monitoring in impoundment (assumes fish are not removed and the primary objective is operation of the treatment facility)

Research and Monitoring After Closure

- Benthic invertebrate population surveys
- Benthic invertebrate metal content analysis
- Dolly Varden char population surveys
- Dolly Varden char spawning surveys
- Aquatic plant distribution surveys

6.0 REFERENCES

Al-Hamood, M.H., A. Elbetieha, and H. Bataineh. 1998. Sexual maturation and fertility of male and female mice exposed prenatally and postnatally to trivalent and hexavalent chromium compounds. *Reproduction Fertility and Development* 10:179–183.

Anderson, R.A., N.A. Bryden, and M.M. Polansky. 1997. Lack of toxicity of chromium chloride and chromium picolinate in rats. *J. Am. Coll. Nutr.* 16:273–279.

ANZECC (Australian and New Zealand Environment and Conservation Council). 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. October.

AScI. 2000a. Results of life-cycle *Chironomus tentans* habitability test with tailings sample from Utah and lake sediments from Alaska. Samples received June 9–14, 2000. Prepared for Coeur d'Alene Mines Corporation. November.

AScI. 2000b. Results of 42-day *Hyalella azteca* habitability test with tailings sample from Utah and lake sediment samples from Lower Slate Lake, Alaska. Samples received June 9–14, 2000. Prepared for Coeur d'Alene Mines Corporation. October.

Bataineh, H., M.H. Al-Hamood, A. Elbetieha, and I. Bani Hani. 1997. Effect of long-term ingestion of chromium compounds on aggression, sex behavior and fertility in adult male rat. *Drug Chem. Toxicol.* 20 (3):133–149.

Beyer, W.N., E.E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. *J. Wildl. Mgmt.* 58:375–382.

Buell, J.W. 1989. Kensington Mine Environmental Report: On-Land Tailings Disposal Alternatives Freshwater Fisheries (Draft). Prepared for Echo Bay Mines. July.

Calabrese, E.J., and E.J. Stanek III. 1995. A dog's tale: Soil ingestion by a canine. *Ecotox. Environ. Saf.* 32:93–95.

Carriere, D., K.L. Fischer, D.D. Peakall, and P. Anghern. 1986. Effects of dietary aluminum sulphate on reproductive success and growth of ringed turtle doves. *Can. J. Zool.* 64:1500–1505.

CCME (Canadian Council of Ministers of the Environment). 2002. *Canadian Environmental Quality Guidelines.* Winnipeg, MB. Originally published in 1999, updated December 2002.

CDFO (Canadian Department of Fisheries and Oceans). 2000. *Effects of Sediment on Fish and Their Habitat: Placer Mining – Yukon Territor*y. Habitat Status Report 2000/01E. Canadian Department of Fisheries and Oceans, Pacific Region, Pacific Biological Station, Nanaimo, BC.

Chapman, P.M., H. Bailey, and E. Canaria. 2000. Toxicity of total dissolved solids associated with two mine effluents to chironomid larvae and early lifestages of rainbow trout. *Environ. Toxicol. Chem.* 19:210–214.

CMRI (Colorado Minerals Research Institute). 1998. *Kensington Mine Flotation and Leach Studies.* CMRI Project No. 982016.

DEC (Alaska Department of Environmental Conservation). 2002. *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances.* As amended through August 2002.

DEC (Alaska Department of Environmental Conservation). 2003. *Water Quality Standards* (18AAC70). As amended through June 26, 2003.

DWAF (Department of Water Affairs and Forestry, South Africa). 1996. *South African Water Quality Guidelines.* 2nd ed. May.

DOE-SRS (Department of Energy–Savannah River Site). 1999. *Terrestrial Toxicity Reference Values (TRVs)*. Manual ERD-AG-003. Environmental Restoration Division, Savannah River Site. April.

Domingo, J.L., J.L. Paternain, J.M. Llobet, and J. Corbella. 1987. The effects of aluminum ingestion on reproduction and survival in rats. *Life Sci.* 41:1127–1131.

Dunning, J.B. 1993. *CRC Handbook of Avian Body Masses.* CRC Press, Boca Raton, FL.

Earthworks (Earthworks Technology). 2002. Addendum No. 1 to Plan of Operations for the Kensington Gold Project. April.

Earthworks (Earthworks Technology). 2003. Tailings Impoundment with Increased Natural Sediment Acreage. Memorandum from E. Klepfer to R. Rimelman et al. November 3.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds.* Simon & Schuster, New York.

Eisler, R. 2000. *Handbook of Chemical Risk Assessment: Health Hazards to Humans, Plants, and Animals.* Lewis Publishers, Boca Raton, FL.

Elbetieha, A., and M.H. Al-Hamood. 1997. Long-term exposure of male and female mice to trivalent and hexavalent chromium compounds: Effects on fertility. *Toxicology* 116:39–47.

EVS. 1999a. *Kensington Project, Underwater Tailings Placement Studies: Bioaccumulation/ Habitability Testing.*

EVS. 1999b. *Kensington Project, Underwater Tailings Placement Studies: Tailings Habitability Testing.*

Gore, J. 1985. *The Restoration of Rivers and Streams.* Butterworth Publishers, Stoneham, MA.

Hamilton, R., and W.W. Fraser. 1978. A case history of natural underwater revegetation: Mandy Mone high sulfide tailings. *Reclamation Review* 1:61–65.

Haseltine, S.D., L. Sileo, D.J. Hoffman, and B.D. Mulhern. 1985. Effects of chromium on reproduction and growth in black ducks. Unpublished. Cited in Sample et al. (1996).

Hasten, D.L., M. Hegsted, M.J. Keenan, and G.S. Morris. 1997. Dosage effects of chromium picolinate on growth and body composition in the rat. *Nutr. Res.* 17(7):1175–1186.

Heinz, G.H., and S.D. Haseltine. 1981. Avoidance behavior of young black ducks treated with chromium. *Toxicol. Lett.* 8(6):307–310.

Hill, D. 1975. Reclamation of damaged streams as a tool in resource management. Pages 96–101 in *Symposium on Trout Habitat Research and Management Proceedings*. Southeast Forest Experiment Station, USDA Forest Service, Asheville, NC.

Ivankovic, S., and R. Preussman. 1975. Absence of toxic and carcinogenic effects after administration of high doses of chromic oxide pigment in subacute and long-term feeding experiments in rats. *Food Cosmet. Toxicol.* 13:347–351.

Kabata-Pendias, A. 2001. *Trace Elements in Soils and Plants*. 3rd ed. CRC Press, Boca Raton, FL.

Kalmbach, E.R., R.H. Imler, and L.W. Arnold. 1964. *The American Eagles and Their Economic Status*. U.S. Fish and Wildlife Service, Washington, DC.

Klaassen, C.D. 2001. *Casarett & Doull's Toxicology: The Basic Science of Poisons.* 6th ed. McGraw Hill, New York.

Kline (Kline Environmental Research, LLC). 1998. Biological Impacts and Recovery from Marine Disposal of Metal Mining Waste. Ph.D. dissertation, University of Alaska-Fairbanks.

Kline (Kline Environmental Research, LLC). 2001. *Kensington Project August–September 2001 Slate Creek Basin Survey Data Report (Final)*. Prepared for Coeur Alaska, Inc., Juneau, AK.

Kline (Kline Environmental Research, LLC). 2002. *Kensington Project June 2000 Slate Creek Basin Survey Data Report (Final)*. Prepared for Coeur Alaska, Inc., Juneau, AK.

Kline (Kline Environmental Research, LLC). 2003a. Memorandum dated October 15, 2003.

Kline (Kline Environmental Research, LLC). 2003b. Benthic Colonization of Lower Slate Lake after Closure of the Kensington Project. Technical Memorandum to Eric Klepfer, Earthworks Technologies, Inc. February 3.

Konopacky (Konopacky Environmental). 1995, May 24. *Baseline Studies of Aquatic Habitat and Salmonid Populations in the Slate Creek System, Located Near Berners Bay, Southeast Alaska, During Summer 1994.* Volume 2 of 2. Prepared for Coeur Alaska, Inc.

Konopacky (Konopacky Environmental) 1996, June 14. *Supplemental Baseline Studies of Aquatic Habitat and Salmonid Populations in the Slate and Johnson Creek Systems, Located Near Berners Bay, Southeast Alaska, During Summer–Fall 1995.* Volume 2 of 2. Prepared for Coeur Alaska, Inc.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch. Environ. Contam. Toxicol.* 39:20–31.

Manahan, S.E. 2000. *Environmental Chemistry.* 7th ed. Lewis Publishers, Boca Raton, FL.

McKean, C.J.P., and N.K. Nagpal. 1991. *Ambient Water Quality Criteria for pH.* Water Quality Branch, Water Management Division, Ministry of Environment, Lands and Parks, Victoria, BC.

MDEQ (Michigan Department of Environmental Quality). 2003. *Rule 57 Water Quality Values*. Great Lakes Assessment Section, Michigan DEQ. Updated February 2003.

Meade, T.L. 1974. *The Technology of the Closed System Culture of Salmonids.* University of Rhode Island, Narragansett, RI.

Meenakshi, C.E., E. Padmini, and D.B. Motlag. 1989. Comparative toxicity of trivalent and hexavalent chromium in rats. *Indian J. Environ. Health* 31:250–256.

MEND (Mine Environment Neutral Drainage). 1989. *Subaqueous Disposal of Reactive Mine Wastes: An Overview.* June 1989.

MEND (Mine Environment Neutral Drainage). 1990. *Preliminary Assessment of Subaqueous Tailings Disposal in Mandy Lake, Manitoba.* MEND Project 2.11.1a-d. <http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111ad-e.htm>.

MEND (Mine Environment Neutral Drainage). 1991. *Preliminary Biological and Geological Assessment of Subaqueous Tailings Disposal in Benson Lake, British Columbia.* MEND Project 2.11.1c-a. <http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111ca-e.htm>.

MEND (Mine Environment Neutral Drainage). 1992a. *Chemical Diagenesis of Submerged Mine Tailings in Benson Lake and Natural Sediments in Keogh Lake, Vancouver Island, British Columbia.* MEND Project 2.11.1c-b. <http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111ca-e.htm>.

MEND (Mine Environment Neutral Drainage). 1992b. *A Critical Review of MEND Studies Conducted to 1991 on Subaqueous Disposal of Tailings*. MEND Project 2.11.1d. July.

Mount, D.R., D.D. Gulley, J.R. Hockett, T.D. Garrison, and J.M. Evans. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia, Daphnia magna,* and *Pimephales promelas* (fathead minnow). *Environ. Toxicol. Chem.* 16:2009–2019.

MW (Montgomery Watson). 1996. *Kensington Mine Project, Rougher Tailings Evaluation Report.* June 1996.

Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and birds. *Ecol. Monogr.* 57:111–128.

NOAA (National Oceanic and Atmospheric Administration). 1999. *Screening Quick Reference Tables (SQuiRTs)*. Updated September 1999.

Ondreicka, R., E. Ginter, and J. Kortus. 1966. Chronic toxicity of aluminum in rats and mice and its effects on phosphorus metabolism. *Br. J. Indust. Med.* 23:305–312.

Oregon DEQ (Department of Environmental Quality). 2000. *Guidance for Ecological Risk Assessment-Level III Baseline.* Updated in March.

Rescan. 1990. *Geochemical Assessment of Subaqueous Tailings Disposal in Buttle Lake, British Columbia.*

Rescan. 2000. *Assessment of the Geochemical Stability of Tailings Placed in a Submarine Environment.* Report prepared for Coeur Alaska, Inc. March 2000.

Reynoldson, T.B. 1987. Interactions between sediment contaminants and benthic organisms. *Hydrobiol.* 149:53–66.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological Benchmarks for Wildlife.* Oak Ridge National Laboratory, Oak Ridge, TN.

Sample, B.E., G.W. Suter II, M.B. Shaeffer, D.S. Jones, and R.A. Efroymson. 1997. *Ecotoxicological Profiles for Selected Metals and Other Inorganic Chemicals*. Oak Ridge National Laboratory, Oak Ridge, TN.

Saner, G. 1980. Chromium in Nutrition and Disease. 12. Toxicity of Chromium. Pages 129–130 in G. Saner (ed.), *Current Topics in Nutrition and Disease, Vol. 2: Chromium in Nutrition and Disease.* Alan R. Liss, Inc., New York.

Stekoll, M.S., W.W. Smoker, I.A. Wang, and B.J. Failor. 2003. *Salmon as a Bioassay Model of Effects to Total Dissolved Solids*. Final Report for ASTF Grant #98-1-012. Prepared for the Alaska Science and Technology Foundation. February.

Stephan, C.E., D.I. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman, and W.A. Brungs. 1985. *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses.* USEPA, Washington, DC.

Streveler, G. 2002. Observations on the Slate Lakes Area Ancillary to Our Search for *Isoetes*. Memorandum to Gene Weglinski, Tetra Tech. November 5.

Streveler, G., and K. Bosworth. 2002. Reconnaissance of the Slate Lakes Area for the Occurrence of *Isoetes truncata*. November 5.

TetraTech. 2004. Memorandum prepared by John Hamrick and Ron Rimelman, Tetra Tech, regarding model results for Lower Slate Lake. May 18, 2004.

Thomas, V.G. 1985. Experimentally determined impacts of a small, suction gold dredge on a Montana stream. *N. Am. J. Fish. Mgmt.* 5:480–488.

Underwood, E.J., and N.F. Suttle. 2001. *The Mineral Nutrition of Livestock.* 3rd ed. CABI Publishing, UK.

USEPA (U.S. Environmental Protection Agency). 1986. *Water Quality Criteria* (Gold Book). EPA-440/9-76-023. USEPA, Washington, DC.

USEPA (U.S. Environmental Protection Agency). 1988. *Ambient Water Quaility Criteria for Aluminum.* EPA 440/5-86-008. August.

USEPA (U.S. Environmental Protection Agency). 1992. *Framework for Ecological Risk Assessment.* EPA/630/R-92/001. USEPA, Office of Research and Development, Washington, DC.

USEPA (U.S. Environmental Protection Agency). 1993a. *Memorandum: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Metals Criteria.* EPA 822/F-93-009.

USEPA (U.S. Environmental Protection Agency). 1993b. *Wildlife Exposure Factors Handbook.* EPA 600/R-93/187.

USEPA (U.S. Environmental Protection Agency). 1993c. Memorandum: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Metals Criteria. EPA 822/F-93-009.

USEPA (U.S. Environmental Protection Agency). 1997a. *EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund.* EPA 910-R-97-005. June.

USEPA (U.S. Environmental Protection Agency). 1997b. *Exposure Factors Handbook, Volume II.* EPA/600/P-95/002Fb. August.

USEPA (U.S. Environmental Protection Agency). 1997c. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* Interim Final. EPA 540-R-97-006.

USEPA (U.S. Environmental Protection Agency). 1998. *Guidelines for Ecological Risk Assessment.* Final. April.

USEPA (U.S. Environmental Protection Agency). 1999a. *National Recommended Water Quality Criteria—Correction*. EPA-822-R-99-002. January.

USEPA (U.S. Environmental Protection Agency). 1999b. *1999 Update of Ambient Water Quality Criteria for Ammonia.* EPA-822-R-99-014. September.

USEPA (U.S. Environmental Protection Agency). 2000a. *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates.* 2nd ed. EPA-600-R-99-064. March.

USEPA (U.S. Environmental Protection Agency). 2000b. *Ecological Soil Screening Level Guidance.* Draft. USEPA, Office of Emergency and Remedial Response, Washington, DC.

USEPA (U.S. Environmental Protection Agency). 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual.* EPA-823-B-01-002. October.

USEPA (U.S. Environmental Protection Agency). 2002. *National Recommended Water Quality Criteria: 2002.* EPA-822-R-02-047. USEPA, Washington, DC.

USFS (U.S. Forest Service). 1992. *Kensington Gold Project. Final Environmental Impact Statement (FEIS), Volume 1.* R10-MB-159. U.S. Forest Service, Tongass National Forest. January.

USFS (U.S. Forest Service). 2002. *Kensington Gold Project Amended Plan of Operations. Supplemental Environmental Impact Statement—Scoping Document*. U.S. Forest Service, Juneau Ranger District. September.

West, D.W., J.A.T. Boubee, and R.F.G. Barrier. 1997. Responses to pH of nine fishes and one shrimp native to New Zealand freshwaters. *New Zealand Journal of Marine and Freshwater Research* 31:461–468.

Westin, D.T. 1973. Nitrate and Nitrite Toxicity to Salmonid Fishes in Fresh and Brackish Waters. M.S. Thesis, University of Rhode Island.

Whitaker, J.O. 1997. *National Audubon Society Field Guide to North American Mammals.* Alfred A. Knopf, New York.

Zahid, Z.R., Z.S. Al-Hakkak, A.H.H. Kadhim, E.A. Elias, and I.S. Al-Jumaily. 1990. Comparative effects of trivalent and hexavalent chromium on spermatogenesis of the mouse. *Toxicol. Environ. Chem.* 25:131–136.

Attachment A. Dietary NOAEL and LOAEL TRV Values

COPEC	Group (Mammal, Bird)	COPEC Form Administered	Test Species	Route of Exposure	Duration of Exposure	Duration Category	Life Stage Test Species	Endpoint	NOAEL (mg/kg day)	LOAEL (mg/kg day)	Effects	Reference*
Aluminum	Bird	Aluminum	Ring Dove	Oral in diet	4 months	Yes	Adult	Reproduction	109.7	1097	No effects were noted at the highest dose level	Carriere et al., 1986; Sample et al., 1996
	Mammal	Aluminum	Mouse	Drinking water	3 generations	Yes	All	Growth/ Reproduction	1.93	19.3	Growth was reduced in offspring	Ondreika et al., 1966; Sample et al., 1996
		Aluminum	Rat	Gavage	1 generation	Yes	Juvenile	Growth/ Mortality	180	360	Growth and survival reduced in offspring	Domingo et al., 1987; Sample et al., 1997
Chromium III	Bird	Chrome Alum	Black Duck	In diet	1 year	Chronic	Adult	Reproduction	0.57	2.9	Reproductve success	Haseltine et al. 1985;USEPA, 2000b
		Chrome Alum	Black Duck	In diet	1 year	Chronic	Adult	Mortality	0.57	2.9	Mortality	Haseltine et al., 1985;USEPA, 2000b
		Chromium Potassium Sulfate	Black Duck	In diet	10 months	Chronic	Adult	Reproduction	1	5	Reduced reproductive success	Haseltine et al., 1995; Sample et al., 1996
		Chrome Alum	Black Duck	In diet	1 year	Chronic	Adult	Reproduction	2.9		No effects were noted at the highest dose level	Haseltine et al., 1985;USEPA, 2000b
		Chrome Alum	Black Duck	In diet	1 year	Chronic	Adult	Reproduction	2.9		No effects on the weight of offspring were noted at the highest dose level	Haseltine et al., 1985;USEPA, 2000b
		Chromium Potassium Sulfate	Black Duck	In diet	5 months	Chronic	Adult	Reproduction	4.9		No effects were noted at the highest dose level	Heinz and Haseltine, 1981; USEPA, 2000b
		Chrome Alum	Black Duck	In diet	1 year	Chronic	Adult	Growth	2.9		No effects noted at the highest dose level	Haseltine et al., 1985;USEPA, 2000b
		Chromium Chloride	Chicken	In diet	21 days			Mortality	32		No effects noted at the highest dose level	Saner, 1980; USEPA, 2000b
	Mammal	Chromium Sulphate	Mouse	In diet	35 days	Chronic	Juvenile	Reproduction		1.5	Reduced sperm production	Zahid et al., 1990; USEPA, 2000b
		Chromium Chloride	Rat	Drinking water	12 weeks	Chronic	Adult	Reproduction		36	Reproduction	Bataineh et al., 1997; USEPA, 2000b
		Chromium Chloride	Rat	Drinking water	12 weeks	Chronic	Adult	Growth		36	Decreased body weight	Bataineh et al., 1997; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water			Juvenile	Reproduction		48.9	Reduced testicular weight	Al-Hamood et al., 1998; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water		Chronic	Juvenile	Growth		49	Decreased body weight - male	Al-Hamood et al., 1998; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water			Juvenile	Reproduction		50.6	Reproduction	Al-Hamood et al., 1998; USEPA ,2000b
		Chromium Chloride	Mouse	Drinking water		Chronic	Juvenile	Growth		51	Decreased body weight - female	Al-Hamood et al., 1998; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water	90 days	Chronic	Adult	Growth		91	Decreased body weight - male	Elbetieha and Al-Hamood, 1997; USEPA, 2000b

Attachment A. Dietary NOAEL and LOAEL TRV Values (continued)

COPEC	Group (Mammal, Bird)	COPEC Form Administered	Test Species	Route of Exposure	Duration of Exposure	Duration Category	Life Stage Test Species	Endpoint	NOAEL (mg/kg day)	LOAEL (mg/kg day)	Effects	Reference*
		Chromium Chloride	Mouse	Drinking water	90 days	Chronic	Adult	Reproduction		91.3	Reduced testicular weight	Elbetieha and Al-Hamood, 1997; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water	90 days	Chronic	Adult	Reproduction	91	228	Reproduction	Elbetieha and Al-Hamood, 1997; USEPA, 2000b
		Chromium Sulphate	Mouse	In diet	35 days	Chronic	Juvenile	Reproduction	5.8		Reduced testicular weight	Zahid et al., 1990; USEPA, 2000b
		Chromium Chloride	Rat	In diet	20 weeks	Chronic	Adult	Reproduction	8.3		Reduced testicular weight	Anderson et al., 1997; USEPA, 2000b
		Chromium Chloride	Rat	Drinking water	12 weeks	Chronic	Adult	Reproduction	36		Reproductive success	Bataineh et al., 1997; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water	NR		Juvenile	Reproduction	51		Reproductive success	Al-Hamood et al., 1998; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water	90 days	Chronic	Adult	Reproduction	228		No effects were noted at the highest dose level	Elbetieha and Al-Hamood, 1997; USEPA, 2000b
		Chromium Trioxide	Rat	In diet	90 days	Chronic	Adult	Reproduction	547		No effects were noted at the highest dose level	Ivankovic and Preussman, 1975; USEPA, 2000b
		Chromium Picolinate	Rat	In diet	12 weeks	Chronic	Juvenile	Growth	0.12		No effects were noted at the highest dose level	Hasten et al., 1997; USEPA, 2000b
		Chromium Sulphate	Mouse	In diet	35 days	Chronic	Juvenile	Growth	5.8		No effects were noted at the highest dose level	Zahid et al., 1990; USEPA, 2000b
		Chromium Chloride	Rat	In diet	20 weeks	Chronic	Adult	Growth	8.3		No effects were noted at the highest dose level	Anderson et al., 1997; USEPA, 2000b
		Chromium Chloride	Mouse	Drinking water	90 days	Chronic	Adult	Growth	227		No effects were noted at the highest dose level - female	Elbetieha and Al-Hamood, 1997; USEPA, 2000b
		Chromium Trioxide	Rat	In diet	90 days	Chronic	Adult	Growth	547		No effects were noted at the highest dose level	Ivankovic and Preussman, 1975; USEPA, 2000b
		Chromic Chloride	Rat	Oral gavage	60 days	Chronic	Adult	Mortality	10		No mortality noted at the highest level	Meenakshi et al., 1989; USEPA, 2000b

* Listed in the Reference section of the main report.

ATTACHMENT B. SEDIMENT AND WATER TOXICITY

The scientific literature was surveyed to look for toxicity of aluminum and chromium to aquatic vegetation, macroinvertebrates; and fish. For aquatic vegetation and macroinvertebrates, the literature was searched for reported safe and toxic concentrations of aluminum in water and in sediment. Fish, especially salmonids, are not expected to have significant exposure to sediments; for that reason, only the effects of water on fish were researched. Reported safe and toxic concentrations in sediment/soil for margin vegetation as well as aquatic plants were also gathered.

Aluminum

The available data for aluminum from the literature survey are listed in Table B.1. The values listed first are concentrations in water reported as "safe," or as not resulting in toxicity. These values are listed from lowest to highest and are unshaded. Toxic values are listed next, also from lowest to highest, and are shaded. No information was found on toxic and safe sediment concentrations for vegetation or macroinvertebrates. There are several studies that look at the toxicity of aluminum in solution to plants. The highest safe value reported is 0.27 parts per million (ppm). The lowest reported toxic concentration is 0.2 ppm, but typical toxic concentrations reported tend to be in the 1 to 50 ppm range. A safe value of 0.2 ppm was selected as protective of aquatic vegetation. For fish, the highest reported safe concentration is a no observed adverse effect level (NOAEL) of 0.075 ppm for brown trout. Reported toxic concentrations range from 0.118 to 2 ppm. A protective level of 0.075 ppm was selected for the exposure of fish to aluminum in water. The highest safe water concentration for macroinvertebrates is 1.02 ppm, which is also the lowest reported toxic concentration. A value of 1 ppm was selected as the protective concentration for macroinvertebrates. Though this value is similar to the concentration reported as toxic to *Daphnia catawba*, it has been reported as protective for general larval stages of benthic organisms (Havas and Likens, 1985; Ormerod et al., 1987) and for species of Chironomidae and Chaeboridae (Havas and Likens, 1985). The selected protective values are listed in Table 4.2 in the main report.

Table B.1 Safe and Toxic Water Concentrations of Aluminum

Species	Al ppm	Effect	Reference
Plants - Solution Exposure			
Eucalyptus spp. -solution	0.001	Enhanced growth	Blamey et al. (1990a and b)
Rice -solution	0.003	Enhanced growth	Blamey et al. (1990a and b)
Corn -solution	0.004	Enhanced growth	Blamey et al. (1990a and b)
Peach -solution	0.027	Enhanced growth	Blamey et al. (1990a and b)
Lolium pedunculatus -solution, pH 4.7, lower CEC	0.27	40% increase in growth	Blamey et al. (1990a and b)
Seed plants - nutrient solution	0.2	Toxicity begins	Bowen (1979); Chapman (1966)
Lolium corniculatus -solution, pH 4.7	0.27	40% decrease in growth	Blamey et al. (1990a and b)
White spruce seedlings -solution	1.3	Reduced root growth	Nosko et al. (1988)
Picea abies -solution	2.7	Reduced root growth	Eldhuset et al. (1987)
Betula pendula -solution	2.7	Reduced root growth	Eldhuset et al. (1987)
Fagus sylvatica - pH 5,solution	2.7	Reduced leaf, stem, and root mass	Bengtsson et al. (1988)
Populus spp. - pH 3.9,solution	3	Toxic	Steiner et al. (1984)
Prunus persica -solution	3	Toxic	Baes and McLaughlin (1987)
Pinus sylvestris -solution	13.5	Level at which first signs of decreased root growth appeared	Eldhuset et al. (1987)
Sugar maple -solution	27	Toxic	Thornton et al. (1986)
Pinus banksiana, pH 3.8 -solution	40	Reduced root growth	Hutchinson et al. (1986)
Balsam fir, pH 3.8,solution	50	Reduced root growth	Schier (1985)
Picea glauba, pH 3.8 -solution	50	Reduced root growth	Hutchinson et al. (1986)
Red spruce, pH 3.8,solution	50	Reduced root growth	Schier (1985)
Pinus strobus, pH 3.8 -solution	80	Reduced root growth	Hutchinson et al. (1986)
Balsam fir, pH 3.8,solution	200	24% decreased shoot growth	Schier (1985)
Macroinvertebrates - Freshwater			
Daphnia magna	0.03	Normal	Lithner (1989)
Insect larval benthic pH 4.2	0.35	No effect	Havas and Likens (1985); Ormerod et al. (1987)
Isopod (*Asellus intermedius*)	0.5	No effect	Burton and Allen (1986)
Caddisfly larvae (*Lepidostoma liba*)	0.5	No effect	Burton and Allen (1986)
Snail (*Physella heterostropha*)	0.5	No effect	Burton and Allen (1986)
Insect larval benthic pH4.2	1	No effect	Havas and Likens (1985); Ormerod et al. (1987)
Chaoborus punctipennis pH 3-7, soft water	1.02	No effect	Havas and Likens (1985)
Chironomus anthrocinus pH 3-7, soft water	1.02	No effect	Havas and Likens (1985)
Daphnia catawba pH6.5, soft water	1.02	Acutely toxic	Havas and Likens (1985)
Nematode	1.8	LC50 96 hr	Williams and Dusenbery (1990)
Nematode	1.9	LC50 72 hr	Williams and Dusenbery (1990)
Nematode	2	LC50 48 hr	Williams and Dusenbery (1990)

Table B.1 Safe and Toxic Water Concentrations of Aluminum (continued)

Species	Al ppm	Effect	Reference
Fish - freshwater			
Brown trout pH 6.9	0.035	NOAEL	Karlsson-Norrgren et al. (1986)
Brown trout pH 7.2	0.044	NOAEL	Segner et al. (1988)
Brown trout pH 5.0	0.075	NOAEL	Segner et al. (1988)
Rainbow trout pH 5.2	0.118	31.5-hr LT50	Reid et al. (1991)
Rainbow trout pH 6.5	0.118	36-hr LT50	Reid et al. (1991)
Fish - acidic water	0.15	Acutely toxic	Muniz and Leivestad (1980)
Brown trout low pH	0.17	Threshold lethal level	Orr et al. (1986)
Brown trout pH 6.9	0.208	many types of lesions; malformed mitochondria	Karlsson-Norrgren et al. (1986)
Brown trout pH 5.8	0.216	many types of lesions; malformed mitochondria + excess mucus	Karlsson-Norrgren et al. (1986)
Brown trout pH 5.0	0.23	Growth depression	Segner et al. (1988)
Brown trout pH 6.3	0.288	many types of lesions; malformed mitochondria	Karlsson-Norrgren et al. (1986)
Brown trout pH 4.9	0.29	Lethal	Schofield and Trojnar (1980)
Brown trout pH 5.5	0.3	Lethal	Cleveland et al. (1986)
Rainbow trout	2	Toxic	Hapke (1991)

Chromium

The available data for chromium from the literature survey are listed in Table B.2. The values listed first are concentrations reported as "safe," or as not resulting in toxicity. These values are listed from lowest to highest, and are unshaded. Toxic values are listed next, also from lowest to highest, and are shaded. The lowest reported toxic concentration of chromium in soil/sediment is 634 ppm, though safe values as high as 6,000 ppm are also reported. A protective concentration of 630 ppm for exposure of aquatic and margin vegetation to chromium in sediment was selected for use in the risk assessment. For macroinvertebrates, the recent work conducted for the Washington Department of Ecology was used (Michelsen, 2003). This work reported apparent effect thresholds (AETs) of >348 mg/kg (dry weight) for *Hyalella* spp. mortality, 133 mg/kg for chironomid growth and mortality, and 95 mg/kg for the Microtox luminescence test. The AET of 133 mg/kg for chironomids was selected for protection of macroinvertebrates. For fish, the highest reported safe water concentration of 0.2 ppm for brook trout was selected as the protective concentration. The lowest reported toxic concentration is 1.2 ppm. The range of safe water concentrations for macroinvertebrates is 0.0003 to 0.7 ppm. The lowest toxic concentration reported is 0.059 ppm for nematodes, though the next lowest value is 6.4 ppm for *Daphnia*. A protective concentration of 0.06 ppm was selected based on this data. The selected protective values are listed in Table 4.2 in the main report.

Table B.2 Safe and Toxic Soil and Water Concentrations of Chromium

Species	Cr ppm	Effect	Reference
Plants: Soil			
Agronomic crop plants	0.6	Normal	Bowen (1966); Allaway (1968)
Plants	500	No effect	Sykes et al. (1981)
Geranium	6,000	No effect	Shivas (1980)
Rhubarb	6,000	No effect	Shivas (1980)
Oats	634	Toxic	Anderson et al. (1973)
Plants: Solution			
Ascophyllum nodosum	0.0004	Normal	Foster (1976)
Fucus vesiculosus	0.0004	Normal	Foster (1976)
Hordeum vulgare solution Cr(III)	8	Upper critical level	Davis et al. (1978)
Seed plants (Cr VI) - nutrientsolution	0.5	Toxicity begins	Bowen (1979)
Duckweed	10	No chlorosis; 8% growth reduction	Zayed et al. (1998)
Macroinvertebrates: Freshwater			
Daphnia magna (III)	0.0003	Normal	Lithner (1989)
Daphnia magna (45 ppm $CaCO_3$; $CrCl_3$)	0.33	Safe limit - 16% reproduction impairment	Biesinger and Christensen (1972)
Mayfly	2	96-hr median tolerance limit	Warnick and Bell (1969)
Caddisfly	64	96-hr median tolerance limit	Warnick and Bell (1969)
Daphnia magna	0.7	Toxic threshold	Bringman and Kuhn (1959) via Warnick and Bell (1969)
Nematode	0.059	LC 96 hr	Williams and Dusenbery (1990)
Daphnia	6.4	LC 96 hr	Williams and Dusenbery (1990)
Nematode	40	LC 72 hr	Williams and Dusenbery (1990)
Nematode	63	LC 48 hr	Williams and Dusenbery (1990)
Fish: Freshwater			
Salmo gairdneri (528g) hexavalent Cr	0.00025	No effect	Buhler et al. (1977)
Brook trout (45 ppm $CaCO_3$; $Na_2Cr_2O_7$)	0.2	Safe limit	Biesinger and Christensen (1972)
Stickelback (1 mg Ca/l) Cr (III)	1.2	Lethal	Jones (1939)
Fish (4 species) hexavalent Cr	17	LC50	Pickering and Henderson (1966) via Strik et al. (1975)
Fish	250	LC50	Peres (1980)

References

Allaway, W.H. 1968. Agronomic controls over environmental cycling of trace elements. *Adv. Agron*. 20:235–274.

Anderson, A.J., D.R. Meyer, and F.K. Mayer. 1973. Heavy metal toxicities: Levels of nickel, cobalt and chromium in the soil and plants associated with visual symptoms and variation in growth of an oat crop. *Aust. J. Agric. Res*. 24:557.

Baes, C.F., III, and S.B. McLaughlin. 1987. Trace metal uptake and accumulation in trees as affected by environmental pollution. Pages 307–319 in T.C. Hutchinson and K.M. Meems (eds.), *Effects of Atmospheric Pollutants on Forests, Wetlands and Agricultural Ecosystems.* Vol. G16, NATO ASI Series. Springer-Verlag, Berlin.

Bengtsson, B., H. Asp, P. Jensen, and D. Berggren. 1988. Influence of aluminum on phosphate and calcium uptake in beech (*Fagus sylvatica*) grown in nutrient solution and soil solution. *Physiol. Plant* 74:299–305.

Biesinger, K.E., and G.M. Christensen. 1972. Effects of various metals on survival, growth, reproduction and metabolism of *Daphnia magna*. *Journal of the Fisheries Research Board of Canada* 29:1691–1700.

Blamey, F.P.C., D.C. Edmeades, and D.M. Wheeler. 1990a. Role of root cation-exchange capacity in differential aluminum tolerance of *Lotus* species. *J. Plant Nutr.* 13:729–744.

Blamey, F.P.C., D.M. Wheeler, D.C. Edmeades, and R.A. Christie. 1990b. Independence of differential aluminum tolerance in *Lotus* on changes in rhizosphere pH or excretion of organic ligands. *J. Plant Nutr.* 13:713–728.

Bowen, H.J.M. 1966. *Trace Elements in Biochemistry*. Academic Press, New York.

Bowen, H.J.M. 1979. *Environmental Chemistry of the Elements.* Academic Press, London.

Bringman, G., and R. Kuhn. 1959. The toxic effects of wastewater on aquatic bacteria, algae, and small crustaceans. *Gesundh. Ingr*. 80:1–115.

Buhler, D.R., R.M. Stokes, and R.S. Caldwell. 1977. Tissue accumulation and enzymatic effects of hexavalent chromium in rainbow trout (*Salmo gairdneri*). *J. Fish. Res. Bd. Can.* 34:9–18.

Burton, T.M., and J.W. Allen. 1986. Influence of pH, aluminum, and organic matter on stream invertebrates. *Can. J. Fish. Aquat. Sci.* 43:1285–1289.

Chapman, H. D. (ed.). 1966. *Diagnostic Criteria for Plants and Soils.* Div. Agric. Sci., University of California.

Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. 1986. Interactive toxicity of aluminum and acidity to early life stages of brook trout. *Trans. Am. Fish. Soc.* 115:610–620.

Davis, R.D., P.H.T. Beckett, and E. Wollan. 1978. Critical levels of twenty potentially toxic elements in young spring barley. *Plant Soil* 49:395–408.

Eldhuset, T., A. Goransson, and T. Ingestad. 1987. Aluminum toxicity in forest tree seedlings. Pages 401–409 in T.C. Hutchinson and K. M. Meems (eds.), *Effects of Atmospheric Pollutants on Forests, Wetlands and Agricultural Ecosystems.* Vol. G16, NATO ASI Series. Springer-Verlag, Berlin.

Foster, P. 1976. Concentrations and concentration factors of heavy metals in brown algae. *Environ. Pollut.* 10:45–53.

Hapke, H.J. 1991. Effects of metals on domestic animals. Pages 531–546 in E. Merian (ed.), *Metals and Their Compounds in the Environment.* VCH, New York.

Havas, M., and G.E. Likens. 1985. Toxicity of aluminum and hydrogen ions to *Daphnia catawba, Holopedium gibberum, Chaoborus punctipennis,* and *Chironomus anthrocinus* from Mirror Lake, New Hampshire. *Can. J. Zool.* 63:1114–1119.

Hutchinson, T.C., L. Bozic, and G. Munoz-Vega. 1986. Responses of five species of conifer seedlings to aluminum stress. *Water Air Soil Pollut*. 31:283–294.

Jones, J.R.E. 1939. The relation between electrolytic solution pressures of the metals and their toxicity to the stickleback (*Gasterosteus oculeatus* L.). *Jour. Exp. Biol.* (*Birt.*) 16:425.

Karlsson-Norrgren, L., W. Dickson, O. Ljungberg, and P. Runn. 1986. Acid water and aluminum exposure: Gill lesions and aluminum accumulation in farmed brown trout, *Salmo trutta* L. *Journal of Fish Diseases* 9:1–9.

Lithner, G. 1989. Some fundamental relationships between metal toxicity in freshwater, physico-chemical properties and background levels. *The Science of the Total Environment* 87/88:365–380.

Michelsen, T. 2003. *Development of Freshwater Sediment Quality Values for Use in Washington State. Phase II Report: Development and Recommendation of SQVs for Freshwater Sediments in Washington State*. Prepared by Avocet Consulting for the Washington Department of Ecology.

Muniz, I.P. and H. Leivestad. 1980. Acidification—Effects of freshwater fish. Pages 84–92 in *Proceedings of an International Conference on Ecological Impact of Acid Precipitation.* Norway SNSF project, ISBN 82-90376-07-3.

Nosko, P., P. Brassard, J.R. Kramer, and K.A. Kershaw. 1988. The effect of aluminum on seed germination and early seedling establishment, growth, and respiration of white spruce (*Picea glauca*). *Can. J. Bot.* 66:2305–2310.

Ormerod, S.J., P. Boole, C.P. McCahon, N.S. Weatherly, D. Pascoe, and R.W. Edwards. 1987. Short-term experimental acidification of a Welsh stream: Comparing the biological effects of hydrogen ions and aluminum. *Freshwater Biol.* 17:341–356.

Orr, P.L., R.W. Bradley, J.B. Sprague, and N.J. Hutchinson. 1986. Acclimation induced changes in toxicity of aluminum to rainbow trout (*Salmo gairdneri*). *Can. J. Fish. Aquat. Sci.* 43:243–246.

Peres, G. 1980. Proceedings Interpretation of oecotoxicologic Test Results, SECOTOX, Antibes, France. Cited in *Chem. Rundsch.* 48:33.

Pickering, Q.H., and C. Henderson. 1966. *Air Water Pollut.* 10:453.

Reid, S.D., D.G. McDonald, and R.R. Rhem. 1991. Acclimation to sublethal aluminum: Modifications of metal-gill surface interactions of juvenile rainbow trout (*Oncorhynchus mykiss*). *Can. J. Fish. Aquat. Sci.* 48:1996–2005.

Schier, G.A. 1985. Response of red spruce and balsam fir seedlings to aluminum toxicity in nutrient solutions. *Can. J. For. Res.* 15:29–33.

Schofield, C.L., and J.R. Trojnar. 1980. Aluminum toxicity to brook trout (*Salvelinus fontinalis*) in acidified waters. Pages 341–363 in M.W. Toribara, M.W. Miller, and P.E. Morrow (eds.), *Polluted Rain*. Plenum Press, New York.

Segner, H., R. Marthaler, and M. Linnenbach. 1988. Growth, aluminum uptake and mucous cell morphometrics of early life stages of brown trout, *Salmo trutta*, in low pH water. *Environ. Biol. Fishes.* 21:153–159.

Shivas, S.A.J. 1980. The effects of trivalent chromium from tannery wastes on plants. *J. Am. Leather Chem. Assoc*. 75:288–299.

Steiner, K.C., J.R. Barbour, and L. H. McCormick. 1984. Response of *Populus* hybrids to aluminum toxicity. *For. Sci.* 30:404–410.

Strik, J.J.T.W.A., H.H. de Iongh, J.W.A. van Rijn van Alkemade, and T.P. Wuite. 1975. Pages 31–41 in J.H. Koeman and J.J.T.W.A. Strik (eds.), *Sublethal Effects of Toxic Chemicals on Aquatic Animals*. Elsevier Scientific Publishing Co., New York.

Sykes, R.L., D.R. Corning, and N.J. Earl. 1981. The effect of soil chromium (III) on the growth and chromium absorption of various plants. *J. Am. Leather Chem. Assoc.* 76:102–125.

Thornton, F.C., M. Schaedle, and D.J. Raynal. 1986. Effect of aluminum on the growth of sugar maple in solution culture. *Can. J. For. Res.* 6:892–896.

Warnick, S.L., and H.L. Bell. 1969. The acute toxicity of some heavy metals to different species of aquatic insects. *Journal WPCF 41*(2):280–284.

WDOE (Washington Department of Ecology). 1997. *Creation and Analysis of Freshwater Sediment Quality Values in Washington State.* Publication No. 97-323a.

Williams, P.L., and D.B. Dusenbery. 1990. Aquatic toxicity testing using nematode, *Caenorhabditis elegans*. *Environmental Toxicology and Chemistry* 9:1285–1290.

Zayed, A., S. Gowthaman, and N. Terry. 1998. Phytoaccumulation of trace elements by wetland plants: 1. Duckweed. *J. Environ. Qual.* 27:715–721.

ATTACHMENT C. BIOACCUMULATION FACTORS AND EPC DETERMINATION

Because the risk assessment is prospective, or predictive, in nature, the fate and transport of aluminum and chromium concentrations from sediment and water to dietary items must be modeled. The scientific literature was surveyed for reported transfer, or bioaccumulation factors (BAFs), to be used in the model. In particular, information was gathered from the literature on the following transfers:

Sediment→ Aquatic Vegetation
Sediment→ Margin Vegetation (Herbaceous plants)
Sediment→ Margin Vegetation (Woody plants)
Sediment→ Aquatic Macroinvertebrates
Water→ Aquatic Vegetation
Water→ Fish
Macroinvertebrates→ Fish
Aquatic Vegetation→ Macroinvertebrates
Vegetation→ Bird and Mammal Tissue

ALUMINUM

Table C.1a summarizes the literature values for the transfer of aluminum to margin vegetation and aquatic receptors. Table C.1b lists values for the transfer of aluminum from the diet to mammal tissue. The selected BAF values to be used in the risk assessment are discussed below, and the selected values are listed in Table 4.4 in the main report. Overall, the highest reported transfers were selected as the BAFs because these values are conservative. The highest reported sediment to aquatic plant value of 0.22 parts per million (ppm) (Sprenger and McIntosh 1989) was selected as the BAF for use in the risk assessment. The highest reported value of 0.56 ppm for the transfer from water to aquatic plants (Miller et al., 1983) was selected. For transfer from sediment to margin vegetation (herbaceous), the highest reported BAF of 0.16 ppm for *Astragalus tenellus* (Pierce, 1994) was selected. The same value of 0.16 ppm was selected for the transfer from sediment to woody plant, based on the highest reported value from Pierce (1994) for *Chrysothamnus viscidiflorus*. For the transfer of aluminum from sediment to macroinvertebrates and from vegetation to macroinvertebrates, the soil-to-amphibian transfer value of 0.04 ppm was selected (Sparling and Lowe, 1996). While there is a higher value available, it is for transfer to the gut coil, and is therefore not as representative for whole-body transfer. The food-to-fish transfer value of 0.003 ppm from Handy (1993) was selected as the BAF for macroinvertebrate-to-fish transfer.

Table C.1a Bioaccumulation Factors for Aluminum

Species	Substrate ppm	Tissue ppm	BAF	Reference
Soil/Sediment→ Margin Vegetation				
Plants – soil (aw/aw)	81,000	20	0.0003	Brooks (1972)
Oryzopsis hymenoides (Indian ricegrass) – sludge dw/dw	11,200	62.1	0.0006	Pierce (1994)
Astragalus tenellus (pulse milkvetch) – sludge (dw/dw)	11,200	62.1	0.006	Pierce (1994)
Agropyron spicatum (bluebunch wheatgrass) – sludge (dw/dw)	11,200	24.9	0.002	Pierce (1994)
Agropyron smithii (western wheatgrass)- sludge (dw/dw)	8,400	27.7	0.003	Pierce (1994)
Agropyron spicatum (bluebunch wheatgrass) – sludge (dw/dw)	9,100	39.7	0.004	Pierce (1994)
Agropyron smithii (western wheatgrass)- sludge (dw/dw)	9,100	49.4	0.005	Pierce (1994)
Agropyron spicatum (bluebunch wheatgrass) – sludge (dw/dw)	7,800	42.2	0.005	Pierce (1994)
Agropyron smithii (western wheatgrass)- sludge (dw/dw)	7,800	50.2	0.006	Pierce (1994)
Oryzopsis hymenoides (Indian ricegrass) – sludge dw/dw	9,100	75.1	0.008	Pierce (1994)
Oryzopsis hymenoides (Indian ricegrass) – sludge dw/dw	8,400	76.3	0.009	Pierce (1994)
Astragalus tenellus (pulse milkvetch) – sludge (dw/dw)	9,100	99.2	0.011	Pierce (1994)
Astragalus tenellus (pulse milkvetch) – sludge (dw/dw)	7,800	125.8	0.012	Pierce (1994)
Oryzopsis hymenoides (Indian ricegrass) – sludge dw/dw	7,800	104.3	0.013	Pierce (1994)
Astragalus tenellus (pulse milkvetch) – sludge (dw/dw)	8,400	104	0.016	Pierce (1994)
Soil→ Woody Plants				
Spruce needles - soil (dw/dw)	29	70000	0.0004	Wyttenbach and Tobler (1998)
Artemisia tridentate (big sagebrush) - sludge (dw/dw)	8,400	23.8	0.003	Pierce (1994)
Artemisia tridentate (big sagebrush) - sludge (dw/dw)	11,200	54.2	0.005	Pierce (1994)
Artemisia tridentate (big sagebrush) - sludge (dw/dw)	9,100	54.2	0.006	Pierce (1994)
Chrysothamnus viscidiflorus (Douglas rabbitbrush) - sludge (dw/dw)	11,200	74	0.007	Pierce (1994)
Artemisia tridentate (big sagebrush) - sludge (dw/dw)	7,800	70.7	0.009	Pierce (1994)
Chrysothamnus viscidiflorus (Douglas rabbitbrush) - sludge (dw/dw)	8,400	72.4	0.009	Pierce (1994)
Chrysothamnus viscidiflorus (Douglas rabbitbrush) - sludge (dw/dw)	9,100	91.3	0.01	Pierce (1994)
Chrysothamnus viscidiflorus (Douglas rabbitbrush) - sludge (dw/dw)	7,800	131.5	0.016	Pierce (1994)
Sediment→ Aquatic Plants				
Juncus sp. Shoots/soil (dw/dw)	12,000	111	0.009	Sprenger and McIntosh (1989)
Scirpus sp. Shoots/soil (dw/dw)	12,000	172	0.014	Sprenger and McIntosh (1989)
Isoetes sp. Shoots/ soil(dw/dw)	12,000	400	0.03	Sprenger and McIntosh (1989)
Potamogeton sp. Shoots/ soil (dw/dw)	12,000	2,670	0.22	Sprenger and McIntosh (1989)
Water→ Aquatic Plants				
Eriocaulon septangulare shoots, pH 6.5 (dw/water)	7,300	2,000	0.27	Miller et al. (1983)
Eriocaulon septangulare roots, pH 6.5 (dw/water)	7,300	2,900	0.39	Miller et al. (1983)
Eriocaulon septangulare shoots, pH 4.4 (dw/water)	7,300	3,800	0.52	Miller et al. (1983)
Eriocaulon septangulare roots, pH 4.4 - (dw/water)	7,300	4,100	0.56	Miller et al. (1983)
Food→ Fish				
Rainbow trout from dry feed (dw/dw)	10,000	33	0.003	Handy (1993)
Water→ Fish				
Rainbow trout pH 5.4 – 1 hr (ww/water)	0.95	50	53	Handy and Eddy (1989)
Brown trout pH 5.0 (dw/water)	0.23	50	217	Segner et al. (1988)
Brown trout pH 5.0 (dw/water)	0.075	20	267	Segner et al. (1988)
Fish pH 5.2 – 22 hr - ww/water	1	361.5	361.5	Lee and Harvey (1986)
Brown trout pH 7.2 (dw/water)	0.044	16	364	Segner et al. (1988)

Table C.1a Bioaccumulation Factors for Aluminum (continued)

Species	Substrate ppm	Tissue ppm	BAF	Reference
Soil→Amphibians				
R. clamitans, tadpoles soil/body (dw/dw)	15,720	634	0.04	Sparling and Lowe (1996)
R. clamitans, tadpoles soil/gut coil (dw/dw)	15,720	20,840	1.3	Sparling and Lowe (1996)

Table C.1b Transfer Factors for Aluminum in the Diet to Mammals

Species	Source	Diet ppm	Tissue	Tissue ppm	BAF	Reference
Diet→Birds/Mammals						
White rabbits (ww/ww)	Drinking water (12 wks, AlCl)	100	Kidney	1.1	0.002	Fulton and Jeffery (1990)
White rabbits (ww/ww)	Drinking water (12 wks, AlCl)	500	Kidney	1	0.011	Fulton and Jeffery (1990)

The average of the five water-to-fish transfer factors, 100 ppm, was used to model the transfer of aluminum from water to fish. The dry weight (dw) transfer values from Segner et al. (1988) were divided by 10 (assuming 90 percent moisture in fish) to convert them to a wet weight (ww) basis. The higher (0.011 ppm) of the two values from Fulton and Jeffery (1990) in Table C.1b was selected for the transfer of aluminum from vegetation to bird and mammal tissue.

Table C.2 shows the aluminum exposure point concentrations (EPC) calculated using the selected BAF values discussed above. The sediment and water concentrations are the maximum values measured in the initial testing of tailings (see Section 3 of the main report). The maximum values are used because they are conservative. The more typical exposure would be based on a measure of central tendency, such as the mean. The macroinvertebrate tissue concentration of 163 ppm used to model the transfer to fish tissue is the value calculated for the transfer of aluminum from sediment to macroinvertebrate tissue. The calculated aquatic vegetation tissue concentration of 359 ppm used to model the transfer to macroinvertebrate tissue was calculated based on the transfer of aluminum from sediment to aquatic vegetation. The higher of the two calculated margin vegetation concentrations—78.2 ppm (for woody vegetation)—was used to model transfer to bird and mammal tissue. Again, the higher values were used to conservatively reflect the potential exposure. It is expected that actual exposure would be less. If there is more than one pathway for calculated transfer to a tissue type, the higher value (shown in bold) was selected for use in the risk assessment. The selected values are listed in Table 4.5 of the main report.

Table C.2 Calculated Aluminum EPC Values

Source From	Aluminum (ppm)	Receptor To	BAF Al	Predicted Concentration (ppm) (dw)	Factor[a]	(ww)
Sediment	16,300	Aquatic Veg.	0.22	3586	0.1	**359**
Sediment	16,300	Macroinvertebrates	0.04	652	0.25	**163**
Sediment	16,300	Margin Veg.	0.016	260.8	0.2	**52.2**
Sediment	16,300	Woody Veg.	0.016	260.8	0.3	**78.2**
Water	3.9	Aquatic Veg.	0.56	2.184	0.1	0.22
Water	3.9	Fish	100	390.0	1	**390**
Macroinvertebrates	163	Fish	0.003	0.489	1	0.49
Aquatic Veg.	359	Macroinvertebrates	0.04	14.36	1	14.4
Vegetation	78.2	Mammals/birds	0.011	28.688	1	**0.86**

[a] Used to convert from a dry weight to a wet weight basis.

CHROMIUM

Table C.3a summarizes the values found in the scientific literature for the transfer of chromium to margin vegetation and aquatic receptors. Table C.3b the lists values for the transfer of chromium from the diet to mammal tissue. The selected BAF values to be used in the risk assessment are discussed below, and the selected values are listed in Table 4.4 in the main report. As with aluminum, the highest reported transfer values were typically selected as the BAFs in order to conservatively model potential exposures to chromium. The highest value of 0.65 ppm for transfer of chromium from soil/sediment to herbaceous vegetation was selected for both the sediment to aquatic plants and sediment to margin vegetation (herbaceous) BAFs in the risk assessment. The highest value of 0.22 ppm for transfer to woody plants was selected as the BAF for sediment-to-woody-vegetation transfer. For chromium transfer from water to aquatic plants, the reported values ranged from 12 to 695 ppm. The highest value of 695, which is the mean for 32 different species evaluated in the study by Timofeeva-Resovskya et al. (1961), was selected as the water-to-aquatic-vegetation BAF. The soil-to-amphibian transfer factor of 0.1 from Sparling and Lowe (1996) was selected as the BAF value for the transfers from sediment to macroinvertebrate, from aquatic vegetation to macroinvertebrate, and from macroinvertebrate to fish. The BAF value of 40 ppm from Buhler et al. (1977) for the transfer of chromium from water to rainbow trout was selected as the water-to-fish BAF. As shown in Table C.3b, there is generally very little transfer of chromium from the diet to animal tissue. The highest reported value of 0.059 ppm from Dressler et al. (1986) was selected as the BAF for the vegetation to bird and mammal tissue BAF.

Table C.3a Bioaccumulation Factors for Chromium

Species	Substrate ppm	Tissue ppm	BAF	Reference
Soil/Sediment→ Herbaceous Vegetation				
Barley grain	241	1	0.004	Mazur and Koc (1976a, 1976b)
Horse beans	175	1	0.006	Mazur and Koc (1976a, 1976b)
Horse beans	241	1.5	0.006	Mazur and Koc (1976a, 1976b)
Potato tubers	175	1	0.006	Mazur and Koc (1976a, 1976b)
Wheat grain	175	1.4	0.008	Mazur and Koc (1976a, 1976b)
Horse beans	90	0.8	0.009	Mazur and Koc (1976a, 1976b)
Potato tubers	241	2.2	0.009	Mazur and Koc (1976a, 1976b)
Barley grain	90	1.2	0.01	Mazur and Koc (1976a, 1976b)
Wheat grain	241	2.8	0.01	Mazur and Koc (1976a, 1976b)
Wheat grain	100	1	0.01	Cary et al. (1977); Diez and Rosopulo (1976)
Wheat grain	150	2	0.01	Cary et al. (1977); Diez and Rosopulo (1976)
Potato tubers	90	1	0.01	Mazur and Koc (1976a, 1976b)
Barley grain	175	3.3	0.02	Mazur and Koc (1976a, 1976b)
Wheat grain	90	1.7	0.02	Mazur and Koc (1976a, 1976b)
Wheat grain	200	3	0.02	Cary et al. (1977); Diez and Rosopulo (1976)
Natural vegetation			0.026	Thorne and Coughtrey (1983)
Pasture grass			0.026	Thorne and Coughtrey (1983)
Barley grain	100	3	0.03	Cary et al. (1977); Diez and Rosopulo (1976)
Barley grain	150	4	0.03	Cary et al. (1977); Diez and Rosopulo (1976)
Horse beans	11.5	0.3	0.03	Mazur and Koc (1976a, 1976b)
Barley grain	50	2	0.04	Cary et al. (1977); Diez and Rosopulo (1976)
Radish roots (field)			0.05	Harrison and Chirgawi (1989b)
Cereal grains			0.051	Thorne and Coughtrey (1983)
Agropyron smithii - sludge	14.3	0.9	0.06	Pierce (1994)
Agropyron spicatum - sludge	9.7	0.6	0.06	Pierce (1994)
Agropyron spicatum - sludge	11.7	0.7	0.06	Pierce (1994)
Agropyron spicatum - sludge	14.3	0.8	0.06	Pierce (1994)
Barley grain	11.5	0.7	0.06	Mazur and Koc (1976a, 1976b)
Plants (general)			0.06	Kloke et al. (1984)
Potato tubers	11.5	0.7	0.06	Mazur and Koc (1976a, 1976b)
Radish roots (lab)			0.07	Harrison and Chirgawi (1989a)
Agropyron spicatum - sludge	10.6	0.7	0.07	Pierce (1994)
Wheat grain	11.5	0.8	0.07	Mazur and Koc (1976a, 1976b)
Agropyron smithii - compost	14	1.2	0.08	Harris-Pierce (1994)
Oryzopsis hymenoides - sludge	11.7	1.1	0.09	Pierce (1994)
Oryzopsis hymenoides - sludge	14.3	1.2	0.09	Pierce (1994)
Astragalus tenellus - sludge	14.3	1.3	0.09	Pierce (1994)
Lettuce (field)			0.1	Harrison and Chirgawi (1989b)
Agropyron smithii - compost	12	1.2	0.1	Harris-Pierce (1994)
Oryzopsis hymenoides - sludge	9.7	1	0.1	Pierce (1994)
Wheat straw	100	10	0.1	Cary et al. (1977); Diez and Rosopulo (1976)
Lettuce (lab)			0.11	Harrison and Chirgawi (1989a)
Corn leaves	75	8	0.11	Cary et al. (1977); Diez and Rosopulo (1976)
Oryzopsis hymenoides - sludge	10.6	1.2	0.11	Pierce (1994)
Wheat straw	150	18	0.12	Cary et al. (1977); Diez and Rosopulo (1976)
Agropyron smithii - sludge	9.7	1.3	0.13	Pierce (1994)
Agropyron smithii - sludge	10.6	1.4	0.13	Pierce (1994)
Agropyron smithii - sludge	11.7	1.4	0.14	Pierce (1994)

Table C.3a Bioaccumulation Factors for Chromium (continued)

Species	Substrate ppm	Tissue ppm	BAF	Reference
Soil/Sediment→ Herbaceous Vegetation				
Corn leaves	100	15	0.15	Cary et al. (1977); Diez and Rosopulo (1976)
Wheat straw	200	29	0.15	Cary et al. (1977); Diez and Rosopulo (1976)
Pea pods and leaves (field)			0.15	Harrison and Chirgawi (1989b)
Corn leaves	125	23	0.18	Cary et al. (1977); Diez and Rosopulo (1976)
Agropyron smithii - sludge	5.5	1.2	0.2	Harris-Pierce (1994)
Astragalus tenellus - sludge	11.7	2.3	0.2	Pierce (1994)
Agropyron smithii - sludge	5.8	1.2	0.22	Harris-Pierce (1994)
Pea pods and leaves (lab)			0.22	Harrison and Chirgawi (1989a)
Astragalus tenellus - sludge	9.7	2.2	0.23	Pierce (1994)
Astragalus tenellus - sludge	10.6	2.6	0.24	Pierce (1994)
Bouteloua gracilis - compost	14	3.6	0.26	Harris-Pierce (1994)
Buchloe dactyloides - sludge	5.8	1.5	0.26	Harris-Pierce (1994)
Buchloe dactyloides - compost	14	3.7	0.26	Harris-Pierce (1994)
Bouteloua gracilis - sludge	5.8	1.6	0.28	Harris-Pierce (1994)
Bouteloua gracilis - compost	12	3.3	0.28	Harris-Pierce (1994)
Buchloe dactyloides - sludge	5.5	1.6	0.29	Harris-Pierce (1994)
Bouteloua gracilis - sludge	5.5	1.8	0.32	Harris-Pierce (1994)
Buchloe dactyloides - compost	12	7.8	0.65	Harris-Pierce (1994)
Soil→ Woody Plants				
Spruce needles - soil			0.002	Wyttenbach and Tobler (1998)
Artemisia tridentata - sludge	14.3	0.7	0.05	Pierce (1994)
Chrysothamnus viscidiflorus - sludge	14.3	1.2	0.08	Pierce (1994)
Artemisia tridentata - sludge	11.7	1.3	0.11	Pierce (1994)
Artemisia tridentata - sludge	10.6	1.2	0.12	Pierce (1994)
Artemisia tridentata - sludge	9.7	1.4	0.15	Pierce (1994)
Chrysothamnus viscidiflorus - sludge	11.7	1.8	0.15	Pierce (1994)
Chrysothamnus viscidiflorus - sludge	9.7	1.7	0.18	Pierce (1994)
Artemisia frigida - sludge	5.8	1.1	0.19	Harris-Pierce (1994)
Artemisia frigida - compost	12	2.2	0.19	Harris-Pierce (1994)
Chrysothamnus viscidiflorus - sludge	10.6	2	0.19	Pierce (1994)
Artemisia frigida - compost	14	2.8	0.2	Harris-Pierce (1994)
Artemisia frigida - sludge	5.5	1.2	0.22	Harris-Pierce (1994)
Water→ Aquatic Plants				
Water hyacinth Cr(VI) Shoot	10	119	12	Zhu et al. (1999)
Duckweed	10	2870	287	Zayed et al. (1998)
Water hyacinth Cr(VI) Root	10	3951	395	Zhu et al. (1999)
Duckweed	0.1	42	420	Zayed et al. (1998)
Duckweed	1	660	660	Zayed et al. (1998)
Aquatic plants (32 spp.) - Cr (III)			695	Timofeeva-Resovskaya et al. (1961)
Water→ Fish				
Salmo gairdneri 528g - hexavalent Cr white muscle(ww/ww)	0.00025	0.01	40	Buhler et al. (1977)
Soil→ Amphibians				
R. clamitans, tadpoles soil/body	16.6	1.7	0.1	Sparling and Lowe (1996)

Table C.3b Transfer Factors for Chromium in the Diet to Mammals

Species	Substrate	Substrate ppm	Tissue	Tissue ppm	BAF	Reference
Diet→Birds/Mammals						
Cottontail	Diet	8.48	Kidney	0	0	Dressler et al. (1986)
Cottontail	Diet	8.48	Liver	0	0	Dressler et al. (1986)
Rats (Cr VI) 20d (ww/ww)	Drinking water	250	Fetus	0.069	0.000276	Kanojia et al. (1996)
Rats (Cr VI) 20d (ww/ww)	Drinking water	750	Fetus	0.241	0.000321	Kanojia et al. (1996)
Rats (Cr VI) 20d (ww/ww)	Drinking water	500	Fetus	0.163	0.000326	Kanojia et al. (1996)
Cottontail	Diet	8.48	Muscle	0.5	0.059	Dressler et al. (1986)

Table C.4 shows the exposure point concentrations (EPC) calculated for chromium using the selected BAF values discussed above. The sediment and water concentrations are the maximum values measured in the initial testing of tailings (see Section 3 of the main report). Maximum values are used to conservatively reflect potential exposure. The macroinvertebrate tissue concentration of 3.0 ppm used to model the transfer to fish tissue is the value calculated for the sediment to macroinvertebrate tissue. The calculated aquatic vegetation tissue concentration of 7.7 ppm used to model the transfer to macroinvertebrate tissue was calculated based on the transfer of chromium from sediment to aquatic vegetation. The higher of the two calculated margin vegetation concentrations—15.5 ppm (for herbaceous vegetation)—was used to model the transfer to bird and mammal tissue. If there is more than one pathway for calculated transfer to a tissue type, the higher value, shown in bold, was selected for use in the risk assessment. As noted earlier, the higher values are selected to conservatively estimate potential exposure. The selected values are listed in Table 4.5 of the main report.

Table C.4 Calculated Chromium EPC Values

Source	Chromium	Receptor	BAF	Predicted Concentration (ppm)		
From	(ppm)	To	Cr	(dw)	Factor[a]	(ww)
Sediment	119	Aquatic Veg.	0.65	77.35	0.1	**7.7**
Sediment	119	Macroinvertebrates	0.1	11.9	0.25	**3.0**
Sediment	119	Margin Veg.	0.65	77.35	0.2	**15.5**
Sediment	119	Woody	0.22	26.18	0.3	**7.8**
Water	0.02	Aquatic Veg.	695	13.9	0.1	1.4
Water	0.02	Fish	40	0.8	1	**0.80**
Macroinvertebrates	3.0	Fish	0.1	0.3	1	0.30
Aquatic Veg.	7.7	Macroinvertebrates	0.1	0.77	1	0.77
Vegetation	15.5	Mammals/birds	0.06	0.93	1	**0.93**

[a]Used to convert from a dry weight to a wet weight basis.

REFERENCES

Brooks, R.R. 1972. Elemental uptake by plants. Pages 92–111 in *Geobotany and Biogeochemistry in Mineral Exploration.* Harper & Row, New York.

Buhler, D.R., R.M. Stokes, and R.S. Caldwell. 1977. Tissue accumulation and enzymatic effects of hexavalent chromium in rainbow trout (*Salmo gairdneri*). *J. Fish. Res. Bd. Can.* 34:9–18.

Cary, E.E., W.H. Allaway, and O.E. Olson. 1977. Control of chromium concentrations in food plants. I. Absorption and translocation of chromium in plants. II. Chemistry of chromium in soils and its availability to plants. *J. Agric. Food Chem.* 25: I, 300; II, 305.

Diez, Th., and A. Rosopulo. 1976. Schwermetallgehalte in Boden and Pflanzen nach extrem hohen Klarschlammgaben. *Sonderdruck Landw. Forsch.* 33:236.

Dressler, R.L., G.L. Storm, W.M. Tzilkowski, and W.E. Sopper. 1986. Heavy metals in cottontail rabbits on mined lands treated with sewage sludge. *J. Environ. Qual.* 15: 278-281.

Fulton, B., and E.H. Jeffery. 1990. Absorption and retention of aluminum from drinking water. *Fund. Appl. Toxicol.* 14:788–796.

Handy, R.D. 1993. The accumulation of dietary aluminum by rainbow trout, *Oncorhynchus mykiss*, at high exposure concentrations. *J. Fish Biol.* 42:603–606.

Handy, R.D., and F.B. Eddy. 1989. Surface absorption of aluminum by gill tissue and body mucus of rainbow trout, *Salmo gairdneri*, at the onset of episodic exposure. *J. Fish Biol.* 34:865–874.

Harrison, R.M., and Chirgawi, M.B. 1989a. The assessment of air and soil as contributors of some trace metals to vegetable plants. I. Use of a filtered air growth cabinet. *Sci. Total Environ.* 83:13–34.

Harrison, R. M. and Chirgawi, M. B. 1989b. The assessment of air and soil as contributors of some trace metals to vegetable plants. III. Experiments with field grown plants. *Sci. Total Environ.* 83: 47–63.

Harris-Pierce, R.L. 1994. The Effect of Sewage Sludge Application on Native Rangeland Soils and Vegetation. M.S. Thesis. Colorado State University. Fort Collins.

Kanojia, R.K., M. Junaid, R.C. Murthy. 1996. Chromium induced teratogenicity in female rat. *Toxicol. Lett.* 89:207–213.

Kloke, A., D.R. Sauerbeck, and H. Vetter. 1984. The contamination of plants and soils with heavy metals and the transport of metals in terrestrial food chains. Page 113 in J.O. Nriagu (ed.), *Changing Metal Cycles and Human Health*. Springer-Verlag, Berlin.

Lee, C., and H.H. Harvey. 1986. Localization of aluminum in fish. *Water Air Soil Pollut.* 30:649–655.

Mazur, T., and J. Koc. 1976a. Investigations into the fertilizing value of tannery sludge. III. Effect of tannery sludge fertilizing on the chemical composition of crops. *Roczniki Gleboznawcze* 27:123–135.

Mazur, T., and J. Koc. 1976b. Investigations into the fertilizing value of tannery sludge. IV. Effect of fertilizing with tannery sludges on changes in chemical properties of soil. *Roczniki Gleboznawcze* 27:137–146.

Miller, G.E., I. Wile, and G.G. Hitchin. 1983. Patterns of accumulation of selected metals in members of the softwater macrophyte flora of the central Ontario lakes. *Aq. Bot.* 15:53–64.

Pierce, B.L. 1994. The Effect of Biosolids Application on a Semiarid Rangeland Site in Colorado. M.S. Thesis. Colorado State University, Fort Collins. CO.

Segner, H., R. Marthaler, and M. Linnenbach. 1988. Growth, aluminum uptake and mucous cell morphometrics of early life stages of brown trout, *Salmo trutta*, in low pH water. *Environ. Biol. Fishes.* 21:153–159.

Sparling, D.W., and T.P. Lowe. 1996. Metal concentrations of tadpoles in experimental ponds. *Environ. Pollut.* 91:149–159.

Sprenger, M., and A. McIntosh. 1989. Relationship between concentrations of aluminum, cadmium, lead and zinc in water, sediments, and aquatic macrophytes in six acidic lakes. *Arch Environ. Contam. Toxicol.* 18:225–231.

Thorne, M.C., and P.J. Coughtrey. 1983. Dynamic models for radionuclide transport in soils, plants and domestic animals. Pages 127–139 in P.J. Coughtrey, J.N.B. Bell, and T.M. Roberts (eds.), *Ecological Aspects of Radionuclide Release.* Blackwell Scientific, Oxford.

Timofeeva-Resovskaya, E.A., N.V. Timofeeva-Resovskaya, and E.A. Gileva. 1961. *Dokl. Akad. Nauk. SSSR*. 140: 1437.

Wyttenbach, A., and L. Tobler. 1998. Effect of surface contamination on results of plant analysis. *Commun. Soil Sci. Plant Anal.* 29:809–823.

Zayed, A., S. Gowthaman, and N. Terry. 1998. Phytoaccumulation of trace elements by wetland plants: 1. Duckweed. *J. Environ. Qual.* 27:715–721.

Zhu, Y.L., A.M. Zayed, J.H. Qian, M. de Souza, and N. Terry. 1999. Pytoaccumulation of Trace Elements by Wetland Plants: II. Water Hyacinth. *J. Environ. Qual.* 28:339–344.

ATTACHMENT D. REVIEW OF TSS TOXICITY TO AQUATIC LIFE

The scientific literature was reviewed and summarized for the effects of both suspended and deposited sediments on aquatic biota and aquatic habitat. The literature survey focused on the Dolly Varden char (*Salvelinus malma*) and the aquatic macroinvertebrate community, though effects on the threespine stickleback (*Gasterosteus aculeatus*) were also considered.

Sediment Effects on Fish

There is a substantial body of knowledge about the effects of suspended sediments on fish, primarily on coldwater salmonids (e.g., trout). Wallen's (1951) early work indicated that most warmwater fish are relatively insensitive to suspended sediments, with only limited effects occurring at concentrations as high as 100,000 parts per million (ppm) of suspended montmorillonite clay with 16 species of fish (summarized in Waters, 1995). Later work indicated that salmonids are more sensitive, overall, than warmwater fish and are therefore the primary focus of most subsequent research into sediment effects.

Published reviews on sediment effects discuss both direct and indirect effects of sediments (Cordone and Kelly, 1961; Sorensen et al., 1977; Langer, 1980; Alabaster and Lloyd, 1982; Waters, 1995). Sediment can cause direct mortality to fish, or indirectly impact them by reducing growth rates or resistance to disease. Smaller fish are more susceptible than larger fish, and sac fry (alevin) likely the most vulnerable stage after egg hatching (Waters, 1995). Sublethal effects of sediment, however, are more important to consider than mortality since they can occur at lower concentrations of either suspended or deposited sediment. Sublethal effects can impact reproduction, development of eggs and larvae, and feeding success, and can modify natural movements and migration (Newcombe and MacDonald, 1991; Waters, 1995). In general, deposited sediments reduce reproductive success in salmonids by reducing the permeability of gravel, thereby decreasing intragravel flow and dissolved oxygen concentrations. Deposited sediments can also trap early life stages of salmonids (alevins or sac fry). It has been shown, however, that once the gravel beds are cleared of deposited materials, fish rapidly return and breeding success increases (Hamilton, 1961; Everest et al., 1987).

Short-term exposure to elevated concentrations of total suspended solids (TSS) or chronic exposure to relatively low TSS concentrations may not produce detrimental effects. Turbidity is elevated in all streams for short durations during storm and snowmelt events. Juveniles and adult salmonids seem to be little affected (Sorenson et al., 1977) by these transitory episodes, though Bisson and Bilby (1982) reported that coho salmon avoid waters exceeding a TSS concentration of 70 nephelometrric turbidity units (NTU). In a laboratory setting, juvenile coho salmon and steelhead trout exhibited reduced growth rates and higher emigration rates in turbid streams (25–50 NTU) compared with clear streams (Sigler et al., 1984). Turbidity also influences the foraging behavior of adult resident salmonids by reducing the distance from which they can locate drifting prey (Spence et al., 1996). Lloyd (1987) found that turbid streams were avoided by juveniles except when the fish must pass through them along migration routes. Newcombe and MacDonald (1991) presented a concentration-duration response model intended to be used as a tool for assessing environmental effects caused by suspended sediments. Results indicated that duration of exposure as well as concentration must be considered. Upper duration thresholds and lower concentration thresholds must be incorporated into any effective stress index model (Newcombe and Jenson, 1996).

There is also some evidence that fish can adapt to high-suspended sediment loads. Everest et al. (1987) reported that for coho salmon, suspended sediment levels of 2,000–3,000 ppm caused an initial mild stress response. However, the fish quickly adapted, and no further response was observed. In a study from Oregon, TSS loads of 40–20,000 ppm caused a decrease in the standing crop of fish in the spring. However, some fish did remain in pools over the summer. After some seasonal flushing, the standing crop returned to nearly 50 percent of the pre-sediment density by the next spring (Gammon, 1970).

Table D.1 shows the generic values listed in the literature for suspended sediment levels that are protective of fish habitat.

Table D.1 Reported Generic TSS Levels Protective of Fisheries

Citation	Level of Protection: High TSS (ppm)	Level of Protection: Moderate TSS (ppm)
EIFAC (1964)	0–25	
Alabaster (1972)		26–80
NAS/NAE (1973)	0–25	26–80
Alabaster and Lloyd (1980)	0–25	26–80
Newport and Moyer (1974)	0–25	26–100
Wilber (1983)	0–30	30–85
Hill (1974)	0–10	
DFO (1983)	0	1–100
Thurston et al. (1979)	0–100	

Table D.2 lists values from the scientific literature that are specific to different species, duration of sediment loading, particle size, and life stage. The majority of these values are for salmonid species, though there are a few values for non-salmonids that may be more relevant to understanding sediment toxicity to the stickleback. Factors that are known to influence the potential toxicity of sediment are particle size, duration of elevated TSS levels, life stage of the exposed fish, and temperature. Waters (1995) indicates that temperature is most likely only an indirect factor in toxicity, as it may result in an additional source of stress to fish. Greater TSS toxicity was observed when temperatures neared the tolerance limits for salmonids (i.e., at temperatures of less than 4 °C or more than 18 °C). Values in Table D.2 are listed from the lowest to highest TSS levels that resulted in no effects (no shading), followed by values from lowest to highest that resulted in an effect on fish (shaded). It is important to note that though an effect may be reported, it may not be detrimental to the overall health and viability of the population of concern.

Table D.2 Literature Values for Sediment Effects on Fish

Species	Sediment Type	Sediment Amount (ppm)	Time	Effect	Location	Reference
Rainbow trout eggs-fry	suspended	6	3 months	NOAEL	Simulated stream	Slaney et al. (1977b)
Rainbow trout eggs-fry	suspended- silty loam	18	2 months	NOAEL	Centennial Creek, BC	Slaney et al. (1977b)
Brown trout	suspended	60	1 year	No effect on population size	UK rivers	Herbert et al. (1961)
Rainbow trout eggs-fry	suspended- silty loam	73	2 months	NOAEL	Centennial Creek, BC	Slaney et al. (1977b)
Yellow perch & striped bass eggs	suspended fine-grained	500	To hatch	NOAEL	Chesapeake Bay, MD	Schubel et al. (1974)
Rainbow trout	suspended gypsum	553	3.5 weeks	Safe level for this time frame (100% survival)	Lab	Herbert and Wakeford (1962)
Coho salmon fingerlings	suspended	8100	96 hours	NOAEL at 7 °C	Lab	Servizi and Martens (1991)
Coho salmon fingerlings	suspended	8200	96 hours	LC 1 at 7 °C	Lab	Servizi and Martens (1991)
Fish: 16 species warmwater	suspended/clay/silt	20000	---	Critical concentration	Lab	Wallen (1951)
Coho salmon-juveniles	suspended	14	1 hour	Reduction in feeding efficiency		Berg and Northcote (1985)
Arctic grayling	suspended	20	96 hours	13% mortality of sac fry		Reynolds et al. (1989)
Rainbow trout	suspended	23	7 weeks	62% red. in egg-to-fry survival	---	Slaney et al. (1977b)
Arctic grayling	suspended	22	72 hours	15% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	25	24 hours	6% mortality of sac fry		Reynolds et al. (1989)
Cutthroat trout	suspended	35	2 hours	Feeding ceased		Bachmann (1958)
Rainbow trout	suspended silty loam	37	2 months	46% reduction in egg to fry survival		Slaney et al. (1977b)
Arctic grayling	suspended	48	48 hours	14% mortality of sac fry		Reynolds et al. (1989)
Rainbow trout	coal washery solids	50	40 days	Reduced growth rate	Lab	Herbert and Richards (1963)
Coho salmon juvenile	suspended	53.5	12 hours	Physiological stress		Berg (1983)
Rainbow trout	suspended silty loam	57	2 months	23% reduction in egg to fry survival		Slaney et al. (1977b)
Arctic grayling	suspended	65	24 hours	15% mortality of sac fry		Reynolds et al. (1989)
Rainbow trout	suspended	68	30 days	25% population reduction	Montana	Peters (1967)
Chinook salmon	suspended	75	7 days	Harm to habitat quality		Slaney et al. (1977a)
Chinook salmon, rainbow trout	suspended fire clay	84	14 days	Reduction in growth rate		Sigler et al. (1984)
Rainbow trout	suspended	90	19 days	5% mortality of subadults		Herbert and Merkins (1961)
Chum salmon	suspended	97	23 weeks	77% mortality of eggs and alevins	---	Langer (1980)
Coho salmon juvenile	suspended	100	1 hour	45% reduction in feeding rate		Noggle (1978)
Arctic grayling juveniles	suspended	100	6 weeks	Impaired feeding, red. growth rates	Lab	McLeay et al. (1987)
Rainbow trout	suspended	101	60 days	98% mortality of eggs (controls, 14.6%)	---	Turnpenny and Williams (1980)
Brown trout	suspended	110	8.5 weeks	98% mortality of eggs	South Wales River	Scullion and Edwards (1980)
Chum salmon	suspended	111	23 weeks	90% mortality of eggs and alevins	---	Langer (1980)
Rainbow trout	suspended	120	16 days	60–70% mortality (controls 32%)	---	Erman and Ligon (1988)
Arctic grayling	suspended	143	96 hours	26% mortality of sac fry	---	Reynolds et al. (1989)

Table D.2 Literature Values for Sediment Effects on Fish (continued)

Species	Sediment Type	Sediment Amount (ppm)	Time	Effect	Location	Reference
Rainbow trout	suspended	157	10 weeks	100% mortality of eggs	Lab	Shaw and Maga (1943)
Rainbow trout	suspended	171	96 hour	Histological damage		Goldes (1983)
Arctic grayling	suspended	185	72 hours	41% mortality of sac fry	---	Reynolds et al. (1989)
Rainbow trout	coal washery solids	200	24 hours	5% fry mortality	Lab	Herbert and Richards (1963)
Rainbow trout	coal washery solids	200	7 days	8% fry mortality	Lab	Herbert and Richards (1963)
Rainbow trout	coal washery solids	200	98 days	50% fry mortality	Lab	Herbert and Richards (1963)
Arctic grayling	suspended	230	48 hours	47% mortality of sac fry	---	Reynolds et al. (1989)
Coho salmon juvenile	suspended	250	1 hour	90% reduction in feeding rate		Noggle (1978)
Rainbow trout	suspended wood fiber	270	2.7 weeks	80% mortality of subadults	Lab	Herbert and Merkins (1961)
Coho salmon juvenile	suspended	300	1 hour	Feeding ceased		Noggle (1978)
Arctic grayling	suspended	300	6 weeks	10% reduction in growth rate	Lab	McLeay et al. (1987)
Rainbow and brown trout	suspended	300	4 weeks	97% reduction in population size	Blue Water Creek, MT	Peters (1967)
Chinook salmon	suspended	488	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Rainbow trout	suspended	500	9 hours	Physiological ill effects		Redding and Schreck (1980)
Coho salmon	suspended	509	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Rainbow trout	suspended kaolin	810	19 days	5–80% mortality of subadults		Herbert and Merkins (1961)
Rainbow trout	suspended diatomaceous earth	810	19 days	80–85% mortality of subadults		Herbert and Merkins (1961)
Rainbow trout eggs	suspended	1,000	6 days	100% mortality compared with 6% mortality in control	Powder River, OR	Campbell (1954)
Rainbow trout fingerlings	suspended	1,000	20 days	57% mortality compared with 9.5% control	Powder River, OR	Campbell (1954)
Arctic grayling juveniles	suspended	1,000	42 days	33% reduction in growth rates	Lab	McLeay et al. (1987)
Rainbow trout	suspended	1,000	2 months	85% reduction in population size		Herbert and Merkins (1961)
Brown trout	suspended	1,040	1 year	85% reduction in population size	UK rivers	Herbert et al. (1961)
Coho salmon	suspended	1,200	96 hours	50% mortality of juveniles	Clearwater River, WA	Noggle (1978)
Coho salmon	suspended	1,217	96 hours	50% mortality of pre-smolts (High temp)		Stober et al. (1981)
Chinook and sockeye salmon	suspended	1,400	36 hours	10% mortality of juveniles	Lab	Newcomb and Flagg (1983)
Chinook salmon juveniles	suspended	1,547	96 hours	Histological damage to gills		Noggle (1978)
Rainbow trout	suspended gypsum	4,250	3.5 weeks	50% mortality	Lab	Herbert and Wakeford (1962)
Rainbow trout	suspended	5,000	7 days	Fish survived, but gill epithelium harmed		Slanina (1962) via Newcombe and MacDonald
Shiner perch (marine)	suspended bentonite	5,000	10 days	LC50	San Francisco Bay	Peddicord et al. (1975)
Striped bass (marine)	suspended bentonite	5,000	10 days	LC50	San Francisco Bay	Peddicord et al. (1975)
Brown trout	suspended	5,838	1 year	85% reduction in population size	UK rivers	Herbert et al. (1961)
Coho salmon fingerlings	suspended	7,500	96 hours	LC 50 at 18°C	Lab	Serivzi and Martens (1991)
Coho salmon swim-up	suspended	8,000	96 hours	LC 50 at 7°C	Lab	Serivzi and Martens (1991)
Chinook and sockeye salmon	suspended	9,400	36 hours	50% mortality of juveniles	Lab	Newcomb and Flagg (1983)

Table D.2 Literature Values for Sediment Effects on Fish (continued)

Species	Sediment Type	Sediment Amount (ppm)	Time	Effect	Location	Reference
Sockeye salmon juvenile	suspended	17,600	96 hours	LC 50 at 8°C	Lab	Servizi and Martens (1987)
Coho salmon	suspended	18,672	96 hours	50% mortality of pre-smolts	Lab	Stober et al. (1981)
Chinook salmon	suspended	19,364	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Arctic grayling	suspended	20,000	96 hours	10% mortality of age 0 fish	Lab	McLeay et al. (1987)
Coho salmon fingerlings	suspended	22,700	96 hours	LC 50 at 7°C	Lab	Servizi and Martens (1991)
Chum salmon	suspended	28,000	96 hours	50% mortality of juveniles		Smith (1939)
Coho salmon	suspended	28,184	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Coho salmon	suspended	29,580	96 hours	50% mortality of smolts		Stober et al. (1981)
Chinook salmon juvenile	suspended	31,000	96 hours	LC 50 at 7°C	Lab	Servizi and Gordon (1990)
Coho salmon	suspended	35,000	96 hours	50% mortality of juveniles		Noggle (1978)
Chinook and sockeye salmon	suspended	39,400	36 hours	90% mortality of juveniles		Newcomb and Flagg (1983)
Rainbow trout	suspended	49,000	96 hours	50% mortality of juveniles		Lawrence and Scherer (1974)
Chum salmon	suspended	55,000	96 hours	50% mortality of juveniles		Smith (1939)
Chinook and sockeye salmon	suspended	82,000	6 hours	60% mortality of juveniles		Newcomb and Flagg (1983)
Arctic grayling	suspended	100,000	96 hours	20% mortality of age 0 fish	Lab	McLeay et al. (1987)
Fish: 16 species warmwater	suspended/clay/silt	100,000	1 week	Most species survived	Lab	Wallen (1951)
Fish: 16 species warmwater	clay/silt turbidity	175,000	1 week	Lethal	Lab	Wallen (1951)
Chinook and sockeye salmon	suspended	207,000	1 hour	100% mortality of juveniles	Lab	Newcomb and Flagg (1983)
Chinook salmon	suspended sediment	390,000	To hatch	77% reduction in survival	Washington	Shelton and Pollack (1966)

Shaded areas indicate an adverse effect reported.
NOAEL = no observed adverse effect level.

Values from Table D.2 are presented in Tables D.2a–D.2d according to the salmonid life stages (eggs, alevin, fry, and adults). In these subtables, conditions that were reported to have no impact are shown without shading. Conditions that had limited impact are lightly shaded, and those that had significant impacts are more deeply shaded. Significant impacts are those deemed to have resulted in a larger than 25 percent decrease in populations. If growth or other physiological parameters were affected, or if there was less than 25 percent mortality, these conditions are deemed to have resulted in a limited impact.

Table D.2a Sediment Effects on Salmonid Egg Stage

Species	Sediment Type	TSS (ppm)	Time	Effect	Location	Reference
Rainbow trout	suspended	6	3 months	NOAEL	Simulated stream	Slaney et al. (1977b)
Rainbow trout	suspended silty loam	18	2 months	NOAEL	Centennial Creek, BC	Slaney et al. (1977b)
Rainbow trout	suspended	20	3 months	NOAEL	Bluewater Creek, MT	Peters (1965)
Rainbow trout	suspended silty loam	73	2 months	NOAEL	Centennial Creek, BC	Slaney et al. (1977b)
Rainbow trout green eggs	**Deposited** coarse (0.84–4.6mm) sediment	100,000	To hatch	NOAEL	Lab	Reiser and White (1988)
Chinook green eggs	**Deposited** coarse (0.84–4.6mm) sediment	100,000	To hatch	NOAEL	Lab	Reiser and White (1988)
Rainbow trout	suspended	23	3 months	62% red. in egg-to-fry survival	Simulated stream	Slaney et al. (1977b)
Rainbow trout	suspended silty loam	37	2 months	46% reduction in egg to fry survival	Centennial Creek, BC	Slaney et al. (1977b)
Rainbow trout	suspended silty loam	57	2 months	23% reduction in egg to fry survival	Centennial Creek, BC	Slaney et al. (1977b)
Chum salmon	suspended	97	23 weeks	77% mortality- eggs and alevins	---	Langer (1980)
Rainbow trout	suspended	100–150	3 months	39% mortality of embryos	Bluewater Creek, MT	Peters (1965)
Rainbow trout	suspended	101	60 days	98% mortality of eggs (controls, 14.6%)	---	Turnpenny and Williams (1980)
Brown trout	suspended	110	8.5 weeks	98% mortality of eggs	South Wales River	Scullion and Edwards (1980)
Chum salmon	suspended	111	23 weeks	90% mortality- eggs and alevins	---	Langer (1980)
Rainbow trout	suspended	120	16 days	60-70% mortality (controls 32%)	---	Erman and Ligon (1988)
Rainbow trout	suspended	150–275	3 months	90% mortality of embryos	Bluewater Creek, MT	Peters (1965)
Rainbow trout	suspended	157	10 weeks	100% mortality of eggs	Lab	Shaw and Maga (1943)
Rainbow trout eggs	suspended	1,000	6 days	100% mortality compared to 6% mortality in control	Powder River, OR	Campbell (1954)
Rainbow trout eyed eggs	**deposited** fine (<0.84mm) sediment	100,000	To hatch	40% decrease in hatch success	Lab	Reiser and White (1988)
Rainbow trout green eggs	**deposited** fine (<0.84mm) sediment	100,000	To hatch	60% decrease in hatch success	Lab	Reiser and White (1988)
Chinook green eggs	**deposited** fine (<0.84mm) sediment	100,000	To hatch	60% decrease in hatch success	Lab	Reiser and White (1988)
Rainbow trout green eggs	**deposited** coarse (0.84–4.6mm) sediment	300,000	To hatch	50% decrease in hatch success	Lab	Reiser and White (1988)
Chinook green eggs	**deposited** coarse (0.84–4.6mm) sediment	300,000	To hatch	45% decrease in hatch success	Lab	Reiser and White (1988)
Chinook salmon	suspended sediment	390,000	To hatch	77% reduction in survival	Washington	Shelton and Pollack (1966)

NOAEL = no observed adverse effect level.
Shaded areas indicate an adverse effect reported.

Table D.2b TSS Effects on Salmonid Alevin Stage

Species	Sediment Type	TSS (ppm)	Time	Effect	Location	Reference
Arctic grayling	suspended	20	96 hours	13% mortality of sac fry		Reynolds et al. (1989)
Arctic grayling	suspended	22	72 hours	15% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	25	24 hours	6% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	48	48 hours	14% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	65	24 hours	15% mortality of sac fry		Reynolds et al. (1989)
Chum salmon	suspended	97	23 weeks	77% mortality of eggs and alevins	---	Langer (1980)
Chum salmon	suspended	111	23 weeks	90% mortality of eggs and alevins	---	Langer (1980)
Arctic grayling	suspended	143	96 hours	26% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	185	72 hours	41% mortality of sac fry	---	Reynolds et al. (1989)
Arctic grayling	suspended	230	48 hours	47% mortality of sac fry	---	Reynolds et al. (1989)

Shaded areas indicate an adverse effect reported.

Table D.2c TSS Effects on Salmonid Fry/Juvenile Stage

Species	Sediment Type	TSS (ppm)	Time	Effect	Location	Reference
Coho salmon fingerlings	suspended	8,100	96 hours	NOAEL at 7 °C	Lab	Servizi and Martens (1991)
Coho salmon juveniles	suspended	14	1 hour	Reduction in feeding efficiency		Berg and Northcote (1985)
Coho salmon juvenile	suspended	53.5	12 hours	Physiological stress		Berg (1983)
Chinook salmon	suspended	75	7 days	Harm to habitat quality		Slaney et al. (1977a)
Arctic grayling juveniles	suspended	100	6 weeks	Impaired feeding, red. growth rates	Lab	McLeay et al. (1987)
Coho salmon juvenile	suspended	100	1 hour	45% reduction in feeding rate		Noggle (1978)
Rainbow trout	coal washery solids	200	24 hours	5% fry mortality	Lab	Herbert and Richards (1963)
Rainbow trout	coal washery solids	200	7 days	8% fry mortality	Lab	Herbert and Richards (1963)
Rainbow trout	coal washery solids	200	98 days	50% fry mortality	Lab	Herbert and Richards (1963)
Coho salmon juvenile	suspended	250	1 hour	90% reduction in feeding rate		Noggle (1978)
Coho salmon juvenile	suspended	300	1 hour	Feeding ceased		Noggle (1978)
Arctic grayling juveniles	suspended	300	6 weeks	10% reduction in growth rate	Lab	McLeary et al. (1987)
Chinook salmon	suspended	488	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Coho salmon	suspended	509	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Rainbow trout fingerlings	suspended	1,000	20 days	57% mortality compared with 9.5% control	Powder River, OR	Campbell (1954)
Arctic grayling juveniles	suspended	1,000	42 days	33% reduction in growth rates	Lab	McLeay et al. (1987)
Coho salmon	suspended	1,200	96 hours	50% mortality of juveniles	Clearwater R., WA	Noggle (1978)
Coho salmon	suspended	1,217	96 hours	50% mortality of pre-smolts (high temp)		Stober et al. (1981)
Chinook and sockeye salmon	suspended	1,400	36 hours	10% mortality of juveniles	Lab	Newcomb and Flagg (1983)
Chinook salmon juveniles	suspended	1,547	96 hours	Histological damage to gills		Noggle (1978)
Coho salmon fingerlings	suspended	7,500	96 hours	LC 50 at 18 °C	Lab	Serivzi and Martens (1991)
Coho salmon swim-up	suspended	8,000	96 hours	LC 50 at 7 °C	Lab	Serivzi and Martens (1991)
Coho salmon fingerlings	suspended	8,200	96 hours	LC 1 at 7 °C	Lab	Servizi and Martens (1991)
Chinook and sockeye salmon	suspended	9,400	36 hours	50% mortality of juveniles	Lab	Newcomb and Flagg (1983)
Sockeye salmon juvenile	suspended	17,600	96 hours	LC 50 at 8 °C	Lab	Servizi and Martens (1987)
Coho salmon	suspended	18,672	96 hours	50% mortality of pre-smolts	Lab	Stober et al. (1981)
Chinook salmon	suspended	19,364	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Arctic grayling juveniles	suspended	20,000	96 hours	10% mortality	Lab	McLeay et al. (1987)
Coho salmon fingerlings	suspended	22,700	96 hours	LC 50 at 7 °C	Lab	Servizi and Martens (1991)
Chum salmon	suspended	28,000	96 hours	50% mortality of juveniles		Smith (1939)
Coho salmon	suspended	28,184	96 hours	50% mortality of smolts	Lab	Stober et al. (1981)
Coho salmon	suspended	29,580	96 hours	50% mortality of smolts		Stober et al. (1981)
Chinook salmon juvenile	suspended	31,000	96 hours	LC 50 at 7 °C	Lab	Servizi and Gordon (1990)
Coho salmon	suspended	35,000	96 hours	50% mortality of juveniles		Noggle (1978)
Chinook and sockeye salmon	suspended	39,400	36 hours	90% mortality of juveniles		Newcomb and Flagg (1983)
Rainbow trout	suspended	49,000	96 hours	50% mortality of juveniles		Lawrence and Scherer (1974)
Chum salmon	suspended	55,000	96 hours	50% mortality of juveniles		Smith (1939)
Chinook and sockeye salmon	suspended	82,000	6 hours	60% mortality of juveniles		Newcomb and Flagg (1983)
Arctic grayling juveniles	suspended	100,000	96 hours	20% mortality	Lab	McLeay et al. (1987)
Chinook and sockeye salmon	suspended	207,000	1 hour	100% mortality of juveniles	Lab	Newcomb and Flagg (1983)

NOAEL= no observed adverse effect level. Shaded areas indicate an adverse effect reported.

Table D.2d TSS Effects on Adult Salmonids

Species	Sediment Type	TSS (ppm)	Time	Effect	Location	Reference
Brown trout	suspended	60	1 year	No effect on population size	UK rivers	Herbert et al. (1961)
Rainbow trout	suspended gypsum	553	3.5 weeks	Safe level (100% survival)	Lab	Herbert and Wakeford (1962)
Cutthroat trout	suspended	35	2 hours	Feeding ceased		Bachmann (1958)
Rainbow trout	coal washery solids	50	40 days	Reduced growth rate	Lab	Herbert and Richards (1963)
Rainbow trout	suspended	68	30 days	25% population reduction	Montana	Peters (1967)
Chinook salmon, rainbow trout	suspended	84	14 days	Reduction in growth rate		Sigler et al. (1984)
Rainbow trout	suspended	90	19 days	5% mortality of subadults		Herbert and Merkins (1961)
Rainbow trout	suspended	171	96 hours	Histological damage		Goldes (1983)
Rainbow trout	suspended wood fiber	270	2.7 weeks	80% mortality of subadults	Lab	Herbert and Merkins (1961)
Rainbow and brown trout	suspended	300	4 weeks	97% reduction in population size	Blue Water Creek, MT	Peters (1967)
Rainbow trout	suspended	500	9 hours	Physiological ill effects		Redding and Schreck (1980)
Rainbow trout	suspended kaolin	810	19 days	5–80% mortality of subadults		Herbert and Merkins (1961)
Rainbow trout	suspended diatomaceous earth	810	19 days	80–85% mortality of subadults		Herbert and Merkins (1961)
Rainbow trout	suspended	1,000	2 months	85% reduction in population size		Herbert and Merkins (1961)
Brown trout	suspended	1,040	1 year	85% reduction in population size	UK rivers	Herbert et al. (1961)
Rainbow trout	suspended gypsum	4,250	3.5 weeks	50% mortality	Lab	Herbert and Wakeford (1962)
Rainbow trout	suspended	5,000	7 days	Fish survived, but gill epithelium harmed		Slanina (1962)
Brown trout	suspended	5,838	1 year	85% reduction in population size	UK rivers	Herbert et al. (1961)

Shaded areas indicate an adverse effect reported.

The effects at different TSS concentrations and durations for each life stage, along with a matrix table specific to each salmonid life stage, are provided below.

Eggs

The information on TSS effects on eggs is limited in relation to time points. The only value for short time periods is a 100 percent mortality under 1,000 ppm TSS for 6 days. For longer periods (2–3 months), the following effects may occur:

TSS Concentration	Status
0–73 ppm	acceptable (no effects)
57	only limited effects
23+ ppm	significant mortality of eggs

A matrix table outlining the limited available values is shown in Table D.3.

Table D.3 Matrix table for egg stage of trout

Egg (June–July)				
--------------TSS Levels (ppm)---------------------				
Duration	**No Effect**	**Only Limited Effects**	**Problematic**	**Lethal**
0–6 days				1000
2–3 months	6–73	57		23–157
>3 months				97

It is important to note that the majority of these experiments are very long-term chronic studies. The observed effects reported in the studies are likely not a result of TSS itself, but of deposition of material into the gravels containing the eggs. The study by Slaney et al. (1977b), which provides the lowest values in Table D.2a, is inconsistent in the reported effects. In the study, a stream in British Columbia was evaluated over 2 years at different locations. In one year analyzed, one test location showed no effects on eggs at 73 ppm for 2 months, though at a separate location in the same year, 37 ppm resulted in a 46 percent reduction in egg-to-alevin survival. For a different year, 18 ppm TSS did not affect eggs, but 57 ppm TSS reduced egg survival by 23 percent (Slaney et al., 1977b). The authors conclude that deposition of sediment is the real issue affecting egg survival. Deposition depends on the stream gradient, flow conditions, and particle size, among other variables; thus the utility of the values shown in Table D.3 is limited.

Alevin

There is good information available on short-term exposure of alevins to TSS. The work from Reynolds et al. (1989) supports the following conclusions:

Duration	TSS Concentration	Status
0–24 hours	0–65 ppm	only limited effects
	230 ppm	problematic
25–48 hours	0–48 ppm	only limited effects
	185 ppm	problematic
49–72 hours	0–22 ppm	only limited effects
	143 ppm	problematic

Alevins are expected to be found at the site in the fall. The above information is summarized in Table D.4.

Table D.4 Matrix Table for Alevin Stage of Trout

Alevin				
	---------------TSS Levels (ppm)----------------------			
Duration	**No Effect**	**Only Limited Effects**	**Problematic**	**Lethal**
0–24 hours		0–65	230	
25–48 hours		0–48	185	
49–72 hours		0–22	143	

Fry/juvenile

There is a large amount of information on TSS effects on the fry to juvenile stages of salmonids. The following is a breakout of effects for different concentration-time intervals:

Duration	TSS Concentration	Status
0–1 hour	0–250 ppm	only limited effects
	207,000 ppm	100% lethal
1–6 hours	82,000 ppm	60% lethal
7–36 hours	54 ppm	acceptable
	200–1400 ppm	only limited effects
	9,400–39,000 ppm	high mortality
37–96 hours	highly dependent on fish species, with some “no effect” levels to >80,00 ppm, as well as reported high mortality at ~500ppm	
<7 days	0–200 ppm	only limited effects
<6 weeks	0–100 ppm	only limited effects
	1,000 ppm	high mortality possible

A matrix table for the fry stage is shown in Table D.5.

Table D.5 Matrix Table for Fry Stage of Trout

Fry/Juvenile				
---------------TSS Levels (ppm)----------------------				
Duration	**No effect**	**Only Limited Effects**	**Problematic**	**Lethal**
0–1 hours		0–250		207,000
1–6 hours			82000	
7–36 hours	54	200–1,400		9,400–39,000
37–96 hours	data inconsistent			
<7 days		0–200		
< 6 weeks		0–100		1,000

<u>Adult</u>

A summary of TSS toxicity by duration and concentrations is shown below:

Duration	TSS Concentration	Status
0–9 hours	0–500 ppm	only limited effects
10–96 hours	0–171 ppm	only limited effects
1–4 weeks	0–90 ppm[a]	only limited effects
	300–800 ppm[a]	significant mortality

[a] Literature inconsistent; some authors report no significant effects at concentrations up to 553 ppm.

The information above is also shown in Table D.6:

Table D.6 Matrix Table for Adult Trout

Adult				
---------------TSS Levels (ppm)----------------------				
Duration	**No effect**	**Only Limited Effects**	**Problematic**	**Lethal**
0–9 hours		0–500		
10–96 hours		0–171		
1–4 weeks		0–90		300–800

Non-salmonids

Non-salmonid sediment toxicity information is shown in Table D.2e. All of the available information is for adult fish, with the exception of Schubel et al. (1974). These authors reported that suspended fine-grained sediments of 500 ppm did not impact the hatching success of yellow perch or striped bass. From the work of Wallen (1951) on 16 different freshwater fish, it is unlikely that non-salmonids would be affected by suspended sediment concentrations below 20,000 ppm. The lower values listed in Table D.2e from Peddicord et al. (1975) are for a marine environment, and thus are likely less relevant than the Wallen work. Assuming that eggs are the most sensitive stage, based on the salmonid knowledge base (Waters 1995), the likely safe level for juvenile non-salmonids is greater than 500 ppm and less than 20,000 ppm, as shown in Table D.7.

Table D.2e TSS Effects on Non-Salmonid Fish

Species	Sediment Type	TSS (ppm)	Time	Effect	Location	Reference
Yellow perch and striped bass eggs	suspended fine-grained	500	to hatch	NOAEL	Chesapeake Bay, MD	Schubel et al. (1974)
Fish: 16 species warmwater	suspended/clay/silt	20,000	---	Critical concentration	Lab	Wallen (1951)
Fish: 16 species warmwater	suspended/clay/silt	100,000	1week	Most species survived	Lab	Wallen (1951)
Shiner perch-marine	suspended bentonite	5,000	10 days	LC50	San Francisco Bay	Peddicord et al. (1975)
Striped bass-marine	suspended bentonite	5,000	10 days	LC50	San Francisco Bay	Peddicord et al. (1975)
Fish: 16 species warmwater	clay/silt turbidity	175,000	1 week	Lethal	Lab	Wallen (1951)

NOAEL= no observed adverse effect level.
Shaded areas indicate an adverse effect reported.

Table D.7 Matrix Table for Non-Salmonids

Concentration Intervals (Min – Max, ppm)	Loading Duration Days	Life Stage Egg	Life Stage Juvenile	Life Stage Adult
0–500	>20	Acceptable	acceptable	acceptable
500–20,000	7	?	likely acceptable	acceptable
20,000–100,000	7	?	potentially unacceptable	potentially unacceptable
175,000	7	?	lethal	lethal

?= no data available to help determine effect levels.

Sediment Effects on Aquatic Macroinvertebrates

The literature is inconsistent in its description of the effects of sediment on aquatic macroinvertebrates. Hamilton (1961) stated that fine particles did not adversely affect benthic fauna. For example, some Chironomidae prefer fine sediment as habitat (Wood and Armitage, 1997). However, it is also reported that certain chironomid species are sensitive to sediment. Some species of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Tricoptera), which are generally considered "clean-water" aquatic insects, require clean gravel for the filtering of stream water. The resultant filtered water supplies food and oxygen, as well as a means of removing wastes (Langer, 1980). Chironomids, tubificid worms, and naidid worms are generally less sensitive and can tolerate turbid waters (Everest et al., 1987). Langer (1980) also reported that sediment can indirectly affect grazing invertebrates by smothering their periphyton food base.

Table D.8 lists the sediment values reported in the literature as safe or adversely affecting stream invertebrates. Safe values are reported up to 1,700 ppm TSS (Fairchild et al., 1987), and effects are reported at concentrations as low as 8 ppm (Rosenberg and Wiens, 1978). In attempting to evaluate the literature data, two important points must be considered. First, any safe concentration that is established must be defined in terms of specific endpoints. What is safe for one species, group of species, or ecosystem may not be safe for another. Therefore, is the endpoint the protection of the single most sensitive species or the protection of most species? Similarly, is ecosystem diversity the proper endpoint, or is ecosystem function the better choice? Protection of ecosystem diversity requires protection of all species, regardless of how minor a species may be to the particular ecosystem. This may be very important if these minor species are rare species, but it is less important if the species are widely distributed. On the other hand, protection of ecosystem function is seldom dependent on protection of all species in the ecosystem. In many ecosystems, the majority of species, when viewed individually, are of only minor importance functionally. Their individual removal has little effect on the overall structure, function, and stability of the system. For this ERA, a functional approach was used. This means that the protection of sufficient diversity and biomass of organisms in a particular trophic level to ensure an acceptable diversity and biomass of organisms in all higher trophic levels sufficient for preserving an adequate food base for fish.

Table D.8 Literature Values for Sediment Effects on Stream Invertebrates

Species	Sediment Type	Sediment Amount (ppm)	Time	Effect	Location	Reference
Zoomacro-invertebrates	suspended	10–500	4 weeks	Increased drift (not conc-dependent), no red. in standing crop	NW Ter. Canada	Rosenberg and Snow (1977)
Aquatic organisms	suspended	25	long-term	High protection	General U.S.	USEPA (1977)
Aquatic organisms	suspended	80	long-term	Moderate protection	General U.S.	USEPA (1977)
Aquatic organisms	suspended	100	long-term	Protective	General U.S.	Thurston et al. (1979)
Cladocerans, Copepods	suspended	300–500	---	Critical concentration	Germany	Stephen (1953) in Alabaster and Lloyd (1982)
Aquatic insects	suspended, from dredging	340	Short-term	Decrease in insect #'s but a recovery of all but caddisfly species in 1 month	Montana, August	Thomas (1985)
Benthic invertebrates	suspended	1,700	2h/week-6 weeks	No red. in numbers, diversity, or evenness	U.S. lab	Fairchild et al. (1987)
Benthic invertebrates	suspended	8	8.5 weeks	Up to 50% reduction (via drift) in standing crop, no mortality	NW Ter. Canada	Rosenberg and Wiens (1978)
Benthic invertebrates	suspended	16	60 days	Reduction in standing crop		Slaney et al. (1977b)
Trichoptera, Ephemeroptera, Crustacea species and mollusca species	suspended	29	30 days	Populations disappeared		Alabaster and Lloyd (1982) via Newcombe and MacDonald (1991)
Benthic invertebrates	suspended	32	60 days	Reduction in standing crop		Slaney et al. (1977b)
Macro-invertebrates	suspended	40	---	25% density reduction	Oregon	Gammon (1970)
Macro-invertebrates	suspended	53–92	1 day	Reduction in population size	Oregon	Gammon (1970)
Benthic invertebrates	suspended	62	Continual	52–74% red. in density, no impact on community biomass	Alaska	Wagener and LaPerriere (1985)
Benthic invertebrates	suspended	77	Continual	33–63% red. in density, no impact on community biomass	Alaska	Wagener and LaPerriere (1985)
Cladocera	suspended	82–392	72 hours	Survival and reproduction harmed		Robertson (1957) via Alabaster and Lloyd (1982)
zoomacro-invertebrates	suspended	>100	28 days	Reduction in standing crop		Rosenberg and Snow (1977)
Macro-invertebrates	suspended	120	---	60% density reduction	Oregon	Gammon (1970)
Stream invertebrates	suspended/China clay	130	52 weeks	38% reduction in species diversity, reduction in density	UK	Nuttall and Bielby (1973)
Bottom fauna	suspended	261–390	30 days	Reduction in population size		Tebo (1955)
Benthic invertebrates	suspended	278	Continual	70–84% red. in density, no impact on community biomass	Alaska	Wagener and LaPerriere (1985)
Cladocera and Copepoda	suspended	300–500	72 hours	Gills and gut clogged		Stephen (1953) via Alabaster and Lloyd (1982)
Benthic invertebrates	suspended	390	30 days	Reduction in population size		Tebo (1955)
Aquatic organisms	suspended	400	long-term	Low protection	General U.S.	USEPA (1977)
Benthic invertebrates	suspended	743	Continual	79–88% red. in density, decreased community biomass	Alaska	Wagener and LaPerriere (1985)
Benthic invertebrates	suspended	5,108	Continual	>88% red. in density, decreased community biomass	Alaska	Wagener and LaPerriere (1985)
Stream invertebrates	suspended/ China clay	25,000	52 weeks	81% reduction in diversity, >90% reduction in density	UK	Nuttall and Bielby (1973)

Shaded areas indicate an adverse effect reported.

A summary of the available data for TSS effects on macroinvertebrates is given below, as well as in Table D.9.

Duration	TSS Concentration	Status
0–72 hours	0–50 ppm	no impact
	50–500 ppm	some effects though not significant
1–4 weeks	<100 ppm	no significant impact
	100–390 ppm	some decreases in populations
	743–25,000 ppm	decreases in biomass of community
5+ weeks	0–16 ppm	only limited effects
	17–100 ppm	some decreases in populations
	743–25,000 ppm	decreases in biomass of community

Table D.9 Matrix Table for Macroinvertebrates

Macroinvertebrates				
---------------TSS Levels (ppm)----------------------				
Duration	**No Effect**	**Only Limited Effects**	**Problematic**	**Lethal**
0–72 hours	0–50	50–500	> 1700	
1–4 weeks	<100	100–390	743–25,000	
5+ weeks	0–16	17–100	743–25,000	

Sediment Effects on Habitat

Suspended sediment is not expected to significantly impact habitat until concentrations reach levels well above those reported to adversely affect fish or macroinvertebrates. Deposited sediment and burial of primary producers (i.e., periphyton), young salmonids (embryos and alevin), and macroinvertebrate communities are of more concern to aquatic habitat than are TSS levels. Reported deposited sediment effects on fish are shown in Table D.10.

Table D.10 Effects of Deposited Sediment on Fish

Species	Sediment Type	% Sed.	Time	Effect	Location	Reference
Rainbow trout green eggs	deposited coarse (0.84–4.6 mm) sediment	10%	To hatch	NOAEL	Lab	Reiser and White (1988)
Chinook green eggs	deposited coarse (0.84–4.6 mm) sediment	10%	To hatch	NOAEL	Lab	Reiser and White (1988)
Brook trout	deposited sediment, <2 mm sand	20%	Embryo to emergence	Critical concentration	Lab	Hausle and Coble (1976)
Bull trout	deposited sediment, <6.4 mm	30%	Embryo to emergence	Critical concentration	Montana	Shephard et al. (1984)
Rainbow trout eyed eggs	deposited fine (<0.84 mm) sediment	10%	To hatch	40% decrease in hatch success	Lab	Reiser and White (1988)
Rainbow trout green eggs	deposited fine (<0.84 mm) sediment	10%	To hatch	60% decrease in hatch success	Lab	Reiser and White (1988)
Chinook green eggs	deposited fine (<0.84 mm) sediment	10%	To hatch	60% decrease in hatch success	Lab	Reiser and White (1988)
Steelhead salmon	deposited sediment, fines (1–3 mm)	20%	To hatch	16% reduction in emergence	Oregon	Hall and Lantz (1969)
Coho salmon	deposited sediment, fines (1–3 mm)	20%	To hatch	21% reduction in emergence	Oregon	Hall and Lantz (1969)
Rainbow trout green eggs	deposited coarse (0.84–4.6 mm) sediment	30%	To hatch	50% decrease in hatch success	Lab	Reiser and White (1988)
Chinook green eggs	deposited coarse (0.84–4.6 mm) sediment	30%	To hatch	45% decrease in hatch success	Lab	Reiser and White (1988)
Bull trout	deposited sediment, <6.4 mm	40%	Embryo to emergence	33% reduction in emergence	Montana	Shephard et al. (1984)

NOAEL= no observed adverse effect level.
Saded areas indicate an adverse effect reported.

Natural streambed gravels used by salmonids consist of a mixture of particle sizes that can range from clay-sized particles (<4 μm) up to gravel-sized particles of roughly 100 mm (Kondolf, 2000). The upper size limit is dictated by the ability of a female salmonid to move gravel in order to excavate a depression for a redd (Kondolf 2000). Too much fine sediment (<0.5 mm) limits the flow of water through the gravel, resulting in reduced oxygen supply to eggs and reduced removal of metabolic wastes. Even when sufficient oxygen is present to allow successful egg incubation, if the pore space connections are limited by fine sediment (defined as 1–10 mm), alevin may not be able to emerge into the water column (Kondolf 2000). However, in the process of redd building, fine sediment is removed from the system, thus helping cleanse the gravel of sediments (Kondolf, 2000).

The macroinvertebrate community shifts in species composition as the substrate composition changes (Cummins and Lauff, 1969). The seasonality of deposition also influences changes in the species composition of the macroinvertebrate community (Chutter, 1969). In addition, Wallace and Gurtz (1984) reported that as the streambed goes from pebble- or gravel-dominated habitat to a sand-dominated habitat, the biomass of the macroinvertebrate community dropped from 1.4–2.6 mg/m^2 to 0.8 mg/m^2. Some macroinvertebrates, however, are largely unimpacted by deposited sediment. Marking and Bills (1980) reported that the emergence of the majority of freshwater mussels tested was not significantly impacted by sediment burial of up to 15 cm for 96 hours or 10 cm for 14 days.

Summary

From the literature review, it is possible to derive TSS concentrations over different temporal durations that are expected to be “acceptable” or “problematic” to the various receptors and life stages. The concentrations listed in Table D.11 as acceptable may result in some limited effects, but are not expected to result in any significant reduction in population sizes or viability of a species or overall aquatic community. Concentrations listed as problematic have the potential to result in significant risk to stream biota.

Table D.11 Summary of Acceptable and Problematic TSS Levels

Duration	**0–12 hours**		**13–96 hours**		**1 week**		**>2 weeks**	
TSS (ppm)	**Acceptable**	**Problematic**	**Acceptable**	**Problematic**	**Acceptable**	**Problematic**	**Acceptable**	**Problematic**
Salmonid eggs	(65)	1,000	(22)	1,000	(<23)	(>23)	<23	>23
Trout alevin (July-Aug.)	65	230	22	143	(22)	(143)	NA	NA
Trout fry (Aug.-Oct.)	500	82,000	500	9,400	200	1,000	100	1,000
Trout adult (all year)	500	(82,000)	171–(500)	(9,400)	(200)	(1,000)	90	>300
Non-Salmonids (all year)	500	20,000+	500	20,000+	500	20,000+	500	20,000+
Macroinvertebrates (all year)	500	>1,700	500	(>750)	390	743–25,000	100	743–25,000

Values in parentheses are extrapolated from other life stages or time periods.
NA = not applicable.

As shown in Table D.11, the most sensitive receptors to TSS effects are the early life stages of salmonids (eggs and alevin). The remaining receptors and lifestages—adult salmonids, non-salmonids, and macroinvertebrates—all have similar TSS tolerance profiles, though the least sensitive of the receptors are most likely non-salmonid fishes.

The information in Table D.11 are further summarized in a single matrix table, Table D.12, which provides acceptable and possible problematic TSS concentrations for all of the receptors.

Table D.12 Matrix Table for All Receptors

	Spawning		Non-Spawning	
Duration	Acceptable (ppm)	Problematic (ppm)	Acceptable (ppm)	Problematic (ppm)
<12 hours	65	230	500	>1,700
13–96 hours	22	143	500	>750
~1 week	<23	143	200	>750
>2 weeks	<23	>23	100	>300

The critical season, as shown, is the spawning period, when eggs and alevin are expected to be present.

Potential Recovery

Habitat for fish and macroinvertebrate populations can be affected by excess sediment, especially depositional sediments that fill interstitial spaces between gravel and cobbles. Embedding gravel and cobbles in fine sediment likely adversely affects benthic invertebrates and the hatching success of fish eggs, depending on the amount of sediments deposited. Because nutrients are entrained in sediment loads, aquatic biota production can also benefit from slightly elevated depositional sediment loads. Everest et al. (1987) found that the optimal composition of fine sediments in bed substrates of salmonid streams is between 12 and 26 percent. Conversely, excessive sediment deposition can cause the streambed to become embedded with small particles, which usually leads to a reduction in macroinvertebrates and the hatching success of salmonids. Embeddedness, which is defined as the degree that gravel and larger sized particles on the streambed surface are surrounded by smaller sediments (i.e., sand and smaller fines), is an important parameter in assessing stream health (Waters, 1995). While the degree of embeddedness is highly dependent on geologic, climatologic, and hydrogeomorphic characteristics of the specific system, roughly one-third embeddedness in streams is not uncommon. Except in spawning gravels, fish are less directly affected by deposited tailings than are macroinvertebrates.

Macroinvertebrate recolonization

Macroinvertebrates, which are a primary food source to salmonids, are known to have a high recovery potential. Recovery can be facilitated in several ways:

- Flying insects renew populations quickly because of their mobility
- Macroinvertebrates drift in from undisturbed upstream reaches to recolonize

- Macroinvertebrates move within the substrate or from the adjacent bank storage areas
- Macroinvertebrates migrate upstream

As noted above, the flying adult stage of aquatic insects are very mobile and can recolonize disturbed areas quickly from relatively long distances. Gore (1985) reported that for every 200-meter increase in distance from upstream drift colonizers, only 75 additional days were required for recovery, to the maximum attainment of density and diversity in the invertebrate community. While downstream drift may be the most important mechanism for recolonization, downstream colonizers (i.e., upstream migration) are important for recovery as well. Gore et al. (1995) reported that upstream movements of benthic invertebrates might account for as much as 20 percent of newly colonizing macroinvertebrates in upstream locations. Dragonfly nymphs (Odonata) are reported to move upstream distances of 40 kilometers in 6 weeks or less. In addition, depending on the time of year, flying insects can enhance recovery times because they are able to travel long distances very quickly, and therefore migrate from other nearby aquatic systems.

Thomas (1985) studied the impacts of suction dredging on aquatic insects and bottom habitat in a Montana stream. This type of activity essentially eliminates all sediment from the substrate. It was reported that even though the dredge nozzle removed all material smaller than 6.4 centimeters (the optimum substrate size for macroinvertebrate invertebrates is listed as 3 centimeters) and redeposited it in piles downstream, the macroinvertebrate community in the dredged area completely recovered within a 30-day period. The downstream area where the material was redeposited was unaffected. The study also noted that cutthroat trout were observed feeding on dislodged macroinvertebrates in the area of the outflow where the sediment concentration was 340 ppm, without apparent adverse effects on the fish themselves.

The time required for recovery of macroinvertebrate populations can be quite variable, depending on the severity of sedimentation, the distance to viable colonizers, and the amount of resources available. For the cases discussed above, recovery occurred within a few months. For other cases, recovery is reported to take several years. One example is an Appalachian Mountain strip mine reclamation study undertaken by Hill (1975) on the South Fork Holston River in Tennessee. Extreme turbidities and siltation had reduced faunal populations by 90 percent or more in entire lengths of tributary streams. For this system, recovery to a functionally complete system required approximately 6 years.

Specific Examples of Subaqueous Tailings Disposal

Available evidence indicates that lakes used as tailings repositories can recover after the cessation of mining activities. As an example, Benson Lake, a small, deep, oligotrophic coastal mountain lake situated in the coastal zone on the north end of Vancouver Island, British Columbia, was used as a tailings depository during the period of August 1962 through January 1973. Tailings had smothered the lake's profundal sediments, thereby eradicating all traces of benthic invertebrate life (MEND, 1991). In September 1990, more than 17 years after the cessation of tailings disposal, it was reported that Benson Lake showed little evidence of the fact that it had received mine wastes. Physical and chemical water quality sampling conducted at three stations in the lake indicated that lake water was similar in virtually all respects to the waters of a nearby control lake, Keogh Lake. Some differences were noted; however, the differences were attributable to inherent characteristics of Benson Lake's drainage basin and to the presence of a fish farm in the control lake. Overall, Benson Lake was characterized by higher conductivity, total dissolved solids, alkalinity, calcium, and potassium than the control lake, but the levels of each of these parameters reflected their levels in the water flowing into the lake from the Benson and Raging Rivers and Craft Creek. The fish farm on Keogh Lake appeared to have a fertilization effect that resulted in higher levels of nutrients (phosphorus and nitrogen) and plankton growth in the control lake compared with Benson Lake.

Lake and surface samples of tailings-rich sediments in Benson Lake were collected and examined in detail. Metal and petrographic analyses of lake samples indicated that tailings are areally widespread in the lake. An organic layer is accumulating over the tailings and may be helping to prevent benthic effluxes of metals to the overlying water column. Sequential extractions of tailings-dominated lake samples revealed that underwater samples did not release any significant quantities of metals from the water-soluble or exchangeable cation phases. These preliminary results suggest that the chemical reactivity of the underwater tailings is minimal and that their presence is not degrading the biochemical environment of Benson Lake.

The biota of Benson Lake were also examined in considerable detail. It was found that the benthic invertebrate community in the lake had reestablished itself to reflect the community structure and organism density typical of oligotrophic lakes throughout Canada and the world. Net phytoplankton densities and community structure were similar to densities and assemblages found in the control lake and in other coastal mountain lakes in British Columbia. The composition of zooplankton species in Benson

Lake was also similar to the composition of zooplankton species in the control lake, but their densities were significantly lower in both lakes than in other oligotrophic coastal lakes.

Fish also were successful in recolonizing Benson Lake. Sampling confirmed the presence of rainbow trout in both Benson and Keogh Lakes, a species of char in Benson Lake, and cutthroat trout in Keogh Lake. Fish from Benson Lake were significantly larger and had significantly higher condition factors than fish from the control lake. In addition, the concentrations of metals in the flesh of fish from Benson Lake were lower than the body metal burden in fish from the control lake, but the concentrations of metals in their livers were higher. However, the concentrations of all metals in the fish from both lakes were within the range of concentrations for the same metals in fish tissues and livers from unpolluted Canadian waters. The stomach contents of fish from Benson Lake suggested that the fish in the lake were incorporating the reestablished benthic invertebrate community into their diet.

A second relevant case study is Mandy Lake in Manitoba. A preliminary field assessment of long-term subaqueous disposal of reactive mine wastes in Mandy Lake was conducted as part of the Mine Environment Neutral Drainage (MEND) program. Mandy Lake is a small lake (59 acres) situated in the Precambrian Shield near Flin Flon, Manitoba. The lake, originally part of Schist Lake, was isolated by construction of a causeway. The lake is shallow (mean depth = 3.6 meters) with a maximum depth of 5.5 meters. Mandy Lake received approximately 73,000 metric tonnes of high-sulphur-base metal tailings discharged from a single launder into the lake during 1943–1944.

During a 1975 study, lake inflow and outflow was found to be minimal. No thermocline was observed in the water column, but low dissolved oxygen concentrations (anaerobic conditions) were found below a depth of 2.0 meters. The high biological productivity (mesotrophic to eutrophic conditions) of the lake has created sediments with high organic content and high sediment oxygen demand (MEND, 1990). Lake biota were examined in considerable detail. Benthic invertebrate densities are low, and the community is dominated by oligochetes and dipteran larvae. Phytoplankton density and community structure characterize the lake as mesotrophic to eutrophic with higher densities than two oligotrophic lakes situated nearby. Diatoms are the predominant phytoplankton. Zooplankton densities are slightly lower than in other Manitoba lakes, and the community is dominated by rotifers, cladocerans, and copepods (MEND, 1990).

The study indicated that natural revegetation of tailings in the shallower areas had occurred. Aquatic vegetation in the lake was mapped and samples collected for metals analyses. Since 1975, the vegetation community in the tailings area has become more diverse and comparable to other areas in the lake. Metal levels in pondweeds (*Potamogeton* sp.) are higher in the tailings area.

The study also found that the water quality was considered good and that aquatic vertebrates and invertebrates had moved into the tailings area. Fish sampling revealed a healthy fish population comprising northern pike, white sucker, lake whitefish, yellow perch, and spottail shiner. Metal levels in fish tissues are generally low compared with levels found in fish in other lakes in Manitoba and are within background levels observed elsewhere in Canada (MEND, 1990).

<u>Summary</u>

The scientific literature indicates that aquatic communities can successfully recover from depositional sediment and tailings placement. While recovery time depends on many factors, the literature reviewed indicated that full recovery was generally completed in less than 20 years, and often much sooner.

References

Alabaster, J.S. 1972. Suspended solids and fisheries. *Proceed. Royal Soc. London B. Biol. Sci*. 180: 395–406.

Alabaster, J.S., and R. Lloyd. 1980. *Water Quality Criteria for Freshwater Fish.* Butterworth, London.

Alabaster, J.S., and R. Lloyd. 1982. Finely divided solids. Pages 1–20 in J.S. Alabaster and R. Lloyd (eds.), *Water Quality Criteria for Freshwater Fish.* 2nd ed. Butterworth, London.

Bachmann, R.W. 1958. The Ecology of Four North Idaho Trout Streams with Reference to the Influence of Forest Road Construction. Master's thesis, University of Idaho, Moscow.

Berg, L. 1983. Effects of Short-Term Exposure to Suspended Sediments on the Behavior of Juvenile Coho Salmon. Master's thesis, University of British Columbia, Vancouver.

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. *Can. J. Fish. Aq. Sci.* 42:1410–1417.

Bisson, P.A., and R.E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. *N. Am. J. Fish. Mgmt.* 2:371–374.

Campbell, H. J. 1954. The effect of siltation from gold dredging on the survival of rainbow trout and eyed eggs in the Powder River. *Oregon State Game Commission:* 3.

Chutter, F.M. 1969. The effects of silt and sand on the invertebrate fauna of streams and rivers. *Hydrobiologia* 34:57–76.

Cordone, A.J., and D.W. Kelly. 1961. The influences of inorganic sediment on the aquatic life of streams. *California Fishery and Game.* 47:189–228.

Cummins, K.W., and G.H. Lauff. 1969. The influence of substrate particle size on the microdistribution of stream macromacroinvertebrates. *Hydrobiologia* 34:145–181.

DFO (Department of Fisheries and Oceans). 1983. *A Rationale for the Suspended Solids Standards for Yukon Streams Subject to Placer Mining.* Report to Interdepartmental Committee on Placer Mining, New Westminister, Canada.

EIFAC (European Inland Fisheries Advisory Commission). 1964. *Water Quality Criteria for European Freshwater Fish: Report on Finely Divided Solids and Inland Fisheries.* European Inland Fisheries Advisory Commission (EIFAC), Working Party on Water Quality for European Freshwater Fish. EIFAC Techn. Paper 1.

Erman, D.C., and F.K. Ligon. 1988. Effects of discharge fluctuation and the addition of fine sediment on stream fish and macroinvertebrates below a water-filtration facility. *Environmental Management* 12 (1):85–97.

Everest, F., R. Beschta, J. Scrivener, V. Koski, J. Sedell, and C. Cederholm. 1987. Fine sediment and salmonid production: a paradox. Pages 98–142 in E.O. Salo and T.W. Cundy (eds.), *Streamside Management: Forestry and Fishery Interactions.* College of Forest Resources, University of Washington, Seattle, WA.

Fairchild, J.F., T. Boyle, W.R. English, and C. Rabeni. 1987. Effects of sediment and contaminated sediment on structural and functional components of experimental stream ecosystems. *Water Air Soil Pollut.* 36:271–293.

Gammon, J.R. 1970. *The Effect of Inorganic Sediment on Stream Biota.* W.P.C.R.S. EPA. Washington DC, U.S. Government Printing Office: 1-141.Geological Survey Water-Supply Paper 2055. Washington, DC.

Goldes, S.A. 1983. Histological and Ultrastructural Effects of the Inert Clay Kaolin on the Gills of Rainbow Trout (*Salmo gairdneri* Richardson). Master's thesis, University of Guelph, Guelph, Ontario.

Gore, J. 1985. *The Restoration of Rivers and Streams.* Butterworth Publishers, Stoneham, MA.

Gore, J., F. Bryant, and D. Crawford. 1995. Pages 245–275 in J. Cairns (ed.), *Rehabilitating Damaged Ecosystems.* Lewis Publishers, Boca Raton, FL.

Hall, J.D., and R.L. Lantz. 1969. Effects of logging on the habitat of coho salmon and cutthroat trout in coastal streams. Pages 355–375 in T.G. Northcote (ed.), *Symposium on Salmon and Trout in Streams.* H.R. MacMillan Lectures in Fisheries, University of British Columbia, Vancouver.

Hamilton, J.D. 1961. The effect of sand-pit washings on a stream fauna. *Limnio.* 14:435–439.

Hausle, D.A., and D.W. Coble. 1976. Influence of sand in redds on survival and emergence of brook trout (*Salvelinus fontinalis*). *Trans. Am. Fish. Soc.*105:57–63.

Herbert, D.W.M., and A.C. Wakeford. 1962. The effect of calcium sulphate on the survival of rainbow trout. *Water and Waste Treatment.* 8:608–609.

Herbert, D.W.M., and J.C. Merkins. 1961. The effect of suspended mineral solids on the survival of trout. *Int. J. Air Wat. Poll.* 5:46–55.

Herbert, D.W.M., and J.M. Richards. 1963. The growth and survival of fish in some suspensions of solids of industrial origin. *Int. J. Air Wat. Poll.* 7:297–302.

Herbert, D.W., J.S. Alabaster, M.C. Dart, and R. Lloyd. 1961. The effect of china-clay wastes on trout streams. *Intl. J. Air Water Poll.* 51:56–74.

Hill, D. 1975. Reclamation of damaged streams as a tool in resource management. Pages 96–101 in *Symposium on Trout Habitat Research and Management Proceedings*. Southeast Forest Experiment Station, USDA Forest Service, Asheville, NC.

Hill, R.D. 1974. Mining impacts on trout habitat. Pages 47–57 in *Proceedings of a Symposium on Trout Habitat Research and Management.* Appalachian Consortium Press, Boone, NC.

Kondolf, G. Mathias. 2000. Assessing salmonid spawning gravel quality. *Trans. Am. Fish. Soc*. 129:262–281.

Langer, O. 1980. *Effects of Sedimentation on Salmonid Stream Life*. Department of Indian Affairs, Whitehorse, Yukon Territory. Report on the Techinal Workshop on Suspended Solids on the Aquatic Environment. Environmental Protection Service, West Vancouver, BC.

Lawrence, M., and E. Scherer. 1974. *Behavioral Responses of Whitefish and Rainbow Trout to Drilling Fluids.* Canada Fisheries and Marine Service Technical Report 502.

Lloyd, D.S. 1987. Turbidity as a water quality standard for salmonid habitats in Alaska. *N. Am. J. Fish. Mgmt.* 7:34–45.

Lloyd, D.S., J.P. Koenings, and J.D. LaPerriere. 1987. Effects of turbidity in fresh waters of Alaska. *N. Am. J. Fish. Mgmt.* 7:18–33.

Marking, L.L., and T.D. Bills. 1980. Acute effects of silt and sand sedimentation on freshwater mussels. Pages 204–211 in J.L. Rasmussen (ed.), *Proceedings of the Symposium on Upper Mississippi River Bivalve Mollusks.* Upper Mississippi River Conservation Committee, Rock Island, IL.

McLeay, D.J., I.K. Birtwell, G.F. Hartman, and G.L. Ennis. 1987. Responses of Arctic grayling (*Thymallus arcticus*) to acute and prolonged exposure to Yukon placer mining sediment. *Can. J. Fish. Aq. Sci.* 44:658–673.

MEND (Mine Environment Neutral Drainage). 1990. Preliminary assessment of subaqueous tailings disposal in Mandy Lake, Manitoba. MEND Project 2.11.1a-d. <http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111ad-e.htm>.

MEND (Mine Environment Neutral Drainage). 1991. Preliminary biological and geological assessment of subaqueous tailings disposal in Benson Lake, British Columbia. MEND Project 2.11.1c-a. <http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111ca-e.htm>.

NAS/NAE (National Academy of Sciences/National Academy of Engineering). 1973. *Water Quality Criteria 1972*. EPA Ecol. Res. Series EPA-R3-73-033. U. S. Environmental Protection Agency, Washington DC.

Newcomb, T.W., and T.A. Flagg. 1983. Some effects of Mount St. Helen ash on juvenile salmon smolts. *U.S. National Marine Fisheries Service Review.* 5:77–86.

Newcombe, C.P., and D.D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. *N. Am. J. Fish. Mgmt.* 11:72–82.

Newcombe, C.P., and J.O.T. Jensen. 1996. Channel suspended sediment and fisheries: A synthesis for quantitative assessment of risk and impact. *N. Am. J. Fish. Mgmt.* 164:693–727.

Newport, B.D., and J.E. Moyer. 1974. *State-of-the-Art: Sand and Gravel Industry*. U. S. Environmental Protection Agency, EPA-660/2-74-066, Corvallis, OR.

Noggle, C.C. 1978. Behavioral, Physiological and Lethal Effects of Suspended Sediment on Juvenile Salmonids. University of Washington, Seattle, WA.

Nuttall, P.M., and G.H. Bielby. 1973. The effect of china-clay wastes on stream invertebrates. *Environ. Pollut.* 5:77–86.

Peddicord, R.K., V.A. McFarland, D.P. Belfiori, and T.C. Byrd. 1975. *Effects of Suspended Solids on San Fransisco Bay Organisms.* Appendix G, Physical Impact Study, Dredge Disposal Study San Fransisco Bay and Estuary. U.S. Army Engineering District, San Fransisco Corps of Engineers.

Peters, J.C. 1965. The effects of stream sedimentation on trout embryo survival. Pages 275–279 in Tarzwell, C.M. (ed.), *Biological Problems in Water Pollution, Third Seminar.* U.S. Dept. of Health, Education, and Welfare, Cincinnati, OH.

Peters, J.C. 1967. Effects on a trout stream of sediment from agriculture practices. *J. Wildl. Mgmt.* 31:805–812.

Redding, J.M., and C.B. Schreck. 1980. Mount St. Helen's ash causes sublethal stress responses in steelhead trout. In *Symposium on Mount St. Helen: Effects on Water Resources*. Portland, OR.

Redding, J., C. Schrek, and F. Everest. 1987. *Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids.* U.S. Fish and Wildlife Service, Oregon Cooperative Research Unit, Oregon State University, Corvallis, OR.

Reiser, D.W. and R.G. White. 1988. Effects of two sediment size-classes on survival of steelhead and chinook salmon eggs. *N. Am. J. Fish. Mgmt*. 8:432–437.

Reynolds, J.B., R.C. Simmons, and A.R. Burkholder. 1989. Effects of placer mining discharge on health and food habits of Arctic grayling. *Water Res. Bull.* 25:625–635.

Robertson, M. 1957. The effects of suspended material on the reproductive rate of *Daphnia magna*. *Publications of the Institute of Marine Science, University of Texas* 4:265–277.

Rosenberg, D.M., and N.B. Snow 1977. A design for environmental impact studies with special reference to sedimentation in aquatic systems of the Mackenzie, and Porcupine river drainages. *Proceedings of the Circumpolar Conference on Northern Ecology.* National Research Council, Ottawa.

Rosenberg, D.M., and A.P. Wiens 1978. Effects of sediment addition on macroinvertebrate invertebrates in a Northern Canadian River. *Water Res.* 12:753–763.

Schubel, J.R., A.H. Auld, and G.M. Schmidt. 1974. *Effects of Suspended Sediment on the Development and Hatching Success of Yellow Perch and Striped Bass Eggs*. Johns Hopkins University, Chesapeake Bay Institute, Special Report No. 35.

Scullion, J., and R.W. Edwards. 1980. The effects of coal industry pollutants on the macro-invertebrate fauna of a small river in the South Wales coalfield. *Freahwater Biology* 10:141–162.

Servizi, J.A., and R.W. Gordon. 1990. Acute lethal toxicity of ammonia and TSS mixtures to chinook salmon (*Oncorhynchus tshawytscha*). *Bull. Environ. Contam. Toxicol.* 44:650–656.

Servizi, J.A., and D.W. Martins. 1987. Some effects of suspended Fraser River sediments on sockeye salmon (*Oncorhynchus nerka*). Pages 254–264 in H. D. Smith, L. Margolis, and C. C. Wood (eds.), *Sockeye Salmon* (Oncorhynchus nerka) *Population Biology and Future Management*. Can. Spec. Publ. Fish. Aquat. Sci. 96.

Servizi, J.A., and D.W. Martens. 1991. Effect of temperature, season, and fish size on acute lethality of suspended sediments to coho salmon (*Oncorhynchus kisutch*). *Can. J. Fish. Aquat. Sci.* 49:493–497.

Shaw, P.A., and J.A. Maga. 1943. The effect of mining silt on yield of fry from salmon spawning beds. *California Fish and Game* 29:29–41.

Shelton, J.M., and R.D. Pollack. 1966. Siltation and egg survival in incubation channels. *Trans. Amer. Fish. Soc.* 95:183–187.

Shepard, B.B., S.A. Leathe, T.M. Weaver, and M.D. Enk. 1984. Monitoring levels of fine sediment within tributaries to Flathead Lake, and impacts of fine sediment on bull trout recruitment. Pages 146–156 in F. Richardson and R.H. Hamre (eds.), *Wild Trout III*. Federation of Fly Fishers and Trout Unlimited, Vienna, VA.

Sigler, J.W., T.C. Bjorn, and F.H. Everest. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. *Trans. Am. Fish. Soc.* 113:142–150.

Slaney, P.A., T.G. Halsey, and H.A. Smith. 1977a. *Some Effects of Forest Harvesting on Salmonid Rearing Habitat in Two Streams in the Central Interior of British Columbia*. Report 71. British Columbia Ministry of Environment, Fish and Wildlife Branch, Fisheries Management, Vancouver, BC.

Slaney, P.A., T.G. Halsey, and A.F. Tautz. 1977b. *Effects of Forest Harvesting Practices on Spawning Habitats of Stream Salmonids in the Centennial Creek Watershed*. Report 73. British Columbia Ministry of Environment, Fish and Wildlife Branch, Fisheries Management, Vancouver, BC.

Slanina, K. 1962. Beitrag zur wiking mineralischer suspensionen auf fische. *Wasser und Abwasser* 7. Cited in Alabaster and Lloyd (1982).

Smith, O.R. 1939. Placing mining silt and its relation to the salmon and trout on the Pacific coast. *Trans. Am. Fish. Soc*. 69:225–230.

Sorensen, D.L., M.M. McCarthy, E.J. Middlebrooks, and D.B. Porcella. 1977. *Suspended and Dissolved Solids Effects on Freshwater Biota: A Review.* EPA Report 600/3-77-042. U.S. Environmental Protection Agency, Washington, DC.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. *An Ecosystem Approach to Salmonid Conservation.* Management Technology. TR-4501-96-6057. December 1996.

Stephen, H. 1953. Seefischerei und Hochwasser. Der Einfluss von anorganischen Schwebestoffen auf Cladoceran und Copepoder. Dissertation, Naturw. Fakultat, Muchen. Cited in Newcombe and MacDonald (1991).

Stober, Q.J., B.D. Ross, C.L. Melby, P.A. Dinnel, T.H. Jagielo, and E.O. Salo. 1981. *Effects of Suspended Volcanic Sediment on Coho and Chinook Salmon in the Toule and Cowlitz Rivers.* Technical

Completion Report, FRI-UW-8124. Fisheries Research Institute, University of Washington. Seattle, WA.

Tebo, L.G. 1955. Effects of siltation, resulting from improper logging, on the bottom fauna of a small trout stream in the southern Appalachians. *Progressive Fish-Culturist* 17:64–70.

Thomas, V.G. 1985. Experimentally determined impacts of a small, suction gold dredge on a Montana Stream. *N. Am. J. Fish. Mgmt.* 5:480–488.

Thurston, R.V., R.C. Russo, C.M. Fetterolf, Jr., T.A. Edsall, and Y.M. Barber, Jr. (eds.). 1979. *A Review of the EPA Red Book: Quality Criteria for Water.* American Fisheries Society, Water Quality Section, Bethesda, MD.

Turnpenny, A.W.H., and R. Williams. 1980. Effects of sedimentation on the gravels of an industrial river system. *Journal of Fish Biology* 17:681–693.

USEPA (U.S. Environmental Protection Agency). 1977. *Quality Criteria for Water* (Red Book). Office of Water and Hazardous Materials, USEPA, Washington, DC.

Wagener, S.M., and J.D. LaPerriere. 1985. Effects of placer mining on the invertebrate communities of interior Alaska streams. *Freshwat. Invert. Biol.* 44:208–214.

Wallace, J.B., and M.E. Gurtz. 1986. Response of Baetis mayflies Ephemeroptera to catchment logging. *Am. Midland Naturalist* 115:25–41.

Wallen, I.E. 1951. The direct effect of turbidity on fishes. *Bulletin of Oklahoma Agriculture and Mechanical College* 482:1–27.

Waters, T.F. 1995. *Sediment in Streams: Sources, Biological Effects and Control.* American Fisheries Society, Bethesda, MD.

Wilber, C.G. 1983. *Turbidity in the Aquatic Environment: An Environmental Factor in Fresh and Oceanic Waters*. Charles C. Thomas, Springfield, IL.

Wood, P.J., and P.D. Armitage. 1997. Biological effects of fine sediment in the lotic environment. *Environ. Mgmt*. 21:203–217.

ATTACHMENT E. DOSE AND HAZARD QUOTIENT CALCULATIONS

Table E.1 lists the calculated dose of aluminum and chromium from each of the dietary sources (water, sediment, and food) for the evaluated receptors. The different dietary items and ingestion rates for water, food, and sediment are listed in Table 4.3. The doses for dietary items are based on the percent dietary consumption listed in Table 4.3. Doses were calculated using the equations detailed in Section 4.2.2, and were calculated using the maximum EPC values, as listed in Table 4.5. The derivation of these values is provided in Appendix C, except the values for water and sediment, which are the maximum values listed in Tables 3.1 and 3.2. As listed, herbaceous and woody vegetation are margin vegetation, as opposed to aquatic vegetation, which are plants growing in the water of Lower Slate Lake (LSL). The column labeled Waterfowl Tissue Dose refers to the consumption of waterfowl that consumed vegetation at LSL. The values in the column labeled Mammal Tissue Dose are calculated tissue concentrations for small mammals consuming margin vegetation. Additional details of these calculations are provided in Appendix C. The values in the column labeled Total Dose are the sum of doses from water, sediment, and the different dietary items.

Table E.1 Calculated Doses for Each Receptor

Receptor	COPEC	Statistic	Water Dose	Sediment Dose	Herbaceous Veg. Dose	Woody Veg. Dose	Aquatic Veg. Dose	Macro-invertebrate Dose	Fish Dose	Water-fowl Tissue Dose	Mammal Tissue Dose	Total Food Dose	Total Dose
Bald eagle	Al	Max EPC	0.14	19.56	0	0	0	0	31.36	0.02	0	31.38	51.08
Canada goose	Al	Max EPC	0.17	26.08	0	0	11.488	0	0	0	0	11.49	37.74
Common loon	Al	Max EPC	0.016	15.485	0	0	0	1.5485	11.12	0	0	12.67	28.17
Spotted sandpiper	Al	Max EPC	0.64	146.7	0	0	0	29.34	0	0	0	29.34	176.68
Black bear	Al	Max EPC	0.23	11.0025	0.98658	0	0	0	1.05	0	0.004644	8.04	13.27
Snowshoe hare	Al	Max EPC	0.38	3.37736	1.16928	0.4368	0	0	0	0	0	1.61	5.36
Moose	Al	Max EPC	0.21	1.4344	0	0.936	1.436	0	0	0	0	2.37	4.02
Wolf	Al	Max EPC	0.27	5.7376	0	0	0	0	0	0	0.0344	0.03	6.04
River otter	Al	Max EPC	0.31	0	0	0	0	0	18.33	0	0	18.33	18.64
Bald eagle	Cr	Max EPC	0.00072	0.1428	0	0	0	0	0.04512	0.059148	0	0.10	0.25
Canada goose	Cr	Max EPC	0.00088	0.1904	0	0	0.2464	0	0	0	0	0.25	0.44
Common loon	Cr	Max EPC	0.00008	0.11305	0	0	0	0.0285	0.0228	0	0	0.05	0.16
Spotted sandpiper	Cr	Max EPC	0.0033	1.071	0	0	0	0.54	0	0	0	0.54	1.61
Black bear	Cr	Max EPC	0.00118	0.080325	0.29295	0	0	0	0.00216	0	0.005022	0.30	0.38
Snowshoe hare	Cr	Max EPC	0.00194	0.0246568	0.3472	0.04368	0	0	0	0	0	0.39	0.42
Moose	Cr	Max EPC	0.00108	0.010472	0	0.0936	0.0308	0	0	0	0	0.12	0.14
Wolf	Cr	Max EPC	0.00136	0.041888	0	0	0	0	0	0	0.0372	0.04	0.08
River otter	Cr	Max EPC	0.0016	0	0	0	0	0	0.0376	0	0	0.04	0.04

The doses listed in Table E.1 were used to calculate hazard quotient (HQ) values using the following formula:

HQ= Estimated Exposure (Table E.1)/TRV (Table 4.1)

As indicated in the equation, the toxicity reference values (TRVs) are those listed in Table 4.1. The calculations are shown in Table E.2.

Table E.2 Calculated HQ Values

Receptor	COPEC	Total Dose	NOAEL TRV	LOAEL TRV	NOAEL HQ	LOAEL HQ
Bald eagle	Aluminum	51.08	109.7	1097	0.4656	0.0466
Canada goose	Aluminum	37.74	109.7	1097	0.3440	0.0344
Common loon	Aluminum	28.17	109.7	1097	0.2568	0.0257
Spotted sandpiper	Aluminum	176.68	109.7	1097	1.6106	0.1611
Black bear	Aluminum	13.27	1.93	19.3	6.8756	0.6876
Moose	Aluminum	4.02	1.93	19.3	2.0829	0.2083
River otter	Aluminum	18.64	1.93	19.3	9.6580	0.9658
Snowshoe hare	Aluminum	5.36	1.93	19.3	2.7772	0.2777
Wolf	Aluminum	6.04	1.93	19.3	3.1295	0.3130
Bald eagle	Chromium	0.24	0.57	2.9	0.4290	0.0844
Canada goose	Chromium	0.44	0.57	2.9	0.7679	0.1509
Common loon	Chromium	0.16	0.57	2.9	0.2885	0.0567
Spotted sandpiper	Chromium	1.61	0.57	2.9	2.8321	0.5567
Black bear	Chromium	0.38	5.8	36	0.0658	0.0106
Moose	Chromium	0.14	5.8	36	0.0234	0.0038
River otter	Chromium	0.04	5.8	36	0.0068	0.0011
Snowshoe hare	Chromium	0.42	5.8	36	0.0720	0.0116
Wolf	Chromium	0.08	5.8	36	0.0139	0.0022

Appendix D

Preliminary Reclamation Plan

Appendix D: Preliminary Reclamation Plan

1.0 INTRODUCTION

1.1 Overview

The Kensington Gold Project is a proposed underground gold mine approximately 45 miles north of Juneau in Southeast Alaska (Figure Sheet 1 of 10). The project covers both private land managed by the Alaska Department of Natural Resources (ADNR) and public lands managed by the Forest Service. Coeur Alaska, Inc. (Coeur), a wholly owned subsidiary of Coeur d'Alene Mines Corporation, is the operator.

This appendix addresses conceptual reclamation principles that are required as part of the Plan of Operations. The final reclamation plan, with a comprehensive cost estimate, would be used for bonding purposes and must reflect the alternative chosen in the Record of Decision (ROD) on the Final Supplemental Environmental Impact Statement (SEIS). The plan would be an important element of the Final Plan of Operations. It would incorporate key reclamation, mitigation, and monitoring requirements, which are outgrowths of the Final SEIS; the ROD; and individual, applicable permits for the project.

The major components associated with the project are an underground mine, a mill site, a tailings disposal facility, borrow areas, an administrative office, a maintenance and generator facilities complex, and a marine dock facility. Ancillary facilities include the access road, topsoil stockpiles, diversion systems, wastewater facility, water supply, and other minor facilities.

The focus of the project is underground mining of a mesothermal gold deposit. The mine's life is estimated to be approximately 10 years, at a production rate of approximately 2,000 tons of ore and 400 tons of underground development rock (waste rock) per day. Ore reserves are estimated to be approximately 7.5 million tons.

The mine would be accessed through the existing 850 level lower portal and a newly defined portal on the Jualin side of the project (1,000 level portal in Figure Sheet 2 of 10). Mined ore would be hauled or conveyed to the process facilities adjacent to the Jualin Portal. Processing of the ore would consist of a flotation circuit producing a concentrate from the diorite host rock. The concentrate would contain the gold-bearing mineral calaverite or gold telluride ($AuTe_2$), native gold, pyrite, chalcopyrite, and other minerals, principally silicate. The concentrate comprises approximately 5 percent of the ore by weight and would be transported off-site for processing.

The flotation tailings would be slurried by gravity through a pipeline to the proposed tailings storage facility (TSF) at Lower Slate Lake (Figure Sheet 3 of 10). The bathymetry of the lake is conducive to the conventional slurried disposal of tailings behind an embankment, which allows for the reestablishment of the lake at closure.

Mining would occur 365 days per year; year-round processing would occur over the estimated 10-year life of the mine. Site closure and final reclamation are expected to take 2 years after cessation of all mining activities.

Based on applicable site reclamation requirements under 36 Code of Federal Regulations (CFR) Part 228 Subpart A, a Final Reclamation Plan was submitted to the Forest Service in January

1998; it reflected the August 1997 ROD for the previous SEIS. This plan addressed reclamation activities for the approved dry tailings facility (DTF) alternative (Alternative A in the 2004 SEIS) on the Lynn Canal side of the property. The cost estimates used in the Reclamation Principles are escalated unit costs, based on the engineered costs defined in the 1998 plan. Once the selected alternative is established in the expected 2004 ROD, a revised reclamation cost estimate would be submitted to the Forest Service with an updated study.

The updated reclamation plan would also serve as the basis for establishing a financial mechanism for the site to ensure that the initial reclamation and long-term operating and monitoring costs are guaranteed. This would also include insurance coverage for unplanned budget cost overruns and unexpected events that could cause an adverse effect on the environment.

1.2 Purpose

The principal purpose of this appendix is to identify and describe the required reclamation tasks that would have to be completed either concurrently with, or at the cessation of, the optimized project's mining activities. These tasks are costed for the purpose of estimating a bond amount for determining the best bonding mechanism for the project to ensure that adequate funds are available for both reclamation and post-closure purposes.

The reclamation principles as outlined herein, in combination with the reclamation commitments presented in the pending ROD, constitute the current reclamation proposal for the project. These principles would be updated every 3 years, throughout the life of the project. Prior to initiating closure activities, Coeur would submit a final reclamation and closure plan. The final reclamation and closure plan would be the basis for ultimate closure and reclamation cost estimates.

In the event a new operator assumes control of the project, the new operator or landowner would agree to assume full responsibility for the reclamation and maintenance of all affected land and structures that are the subject of these principles. The new owner/operator would also be required to assume all related permit conditions that may apply to the overall reclamation process. The new operator would transfer to its name all applicable state and federal permits. It would also provide evidence that a surety acceptable to the agency responsible for the reclamation of disturbed land, including post-closure maintenance, is filed.

2.0 COEUR CORPORATE ENVIRONMENTAL POLICY AND RECLAMATION PLANNING

Coeur has adopted a Corporate Environmental Policy, which states, in summary, that the company is committed to protecting the environment, while at the same time operating the project in a responsible manner to maximize the benefits of a modern extractive industry. This is the primary goal upon which these reclamation principles are built.

Coeur's long-term goals of reclamation during and after mining and processing operations are to return the land to a safe and stable condition, consistent with the establishment of productive post-mining uses. The designated post-mining uses for the project area are defined as wildlife habitat and recreational use. Coeur would incorporate sound engineering practices and these reclamation principles to achieve these goals and uses.

Coeur would adhere to the above philosophy in developing and implementing the following reclamation principles at the project site:

1. Stabilization and protection of surficial soil materials from wind and water erosion;

2. Stabilization of steep slopes through recontouring and leveling in order to provide rounded landforms and suitable growth media surfaces for natural invasion and recolonization by native plants;

3. Establishment of long-term, self-sustaining vegetation communities by reseeding with native plants and promoting natural invasion (recolonization) and succession;

4. Protection of surface and ground water quality;

5. Protection of public health by reducing potential hazards typically associated with mines and processing facilities;

6. Establishment of fisheries and wildlife habitat and recreational resources; and

7. Minimization of long-term closure requirements, especially for ongoing care and maintenance.

Coeur considers reclamation to be a progressive process directly tied to the design, construction, operation, and closure of the mining operation. Reclamation would, therefore, generally occur in the following phases:

1. Reclamation occurring during and directly after the mine and process component construction. (This includes some interim reclamation to stabilize and maintain the viability of topsoil stockpiles.)

2. Reclamation concurrent with mining (water management focus).

3. Final reclamation upon cessation of mining operations and process component closure. Reclamation would involve final contouring of haul roads, borrow areas, waste rock dumps, the TSF, building and facility sites, the marine facility, and other affected land that cannot practicably be reclaimed concurrently during mining operations. Final reclamation would be initiated immediately upon cessation of mining and processing operations and completed within 2 years.

4. Passive reclamation (activities following final reclamation) consisting of monitoring and maintenance until closure and reclamation performance standards are achieved. Passive reclamation may include, for example, passive water treatment to meet requirements of the Alaska Department of Environmental Conservation (ADEC). The duration of the passive reclamation phase is estimated to be approximately 5 years, the initial period immediately following cessation of all mining activities. Post-closure monitoring is expected to be required for 20 years, except that it would be regularly reviewed, and reclamation progress, if demonstrated, may result in a reduction of the monitoring period.

2.1 Permanent Closure and Final Reclamation

For the purpose of these principles, final closure is defined as the cessation of all mining and processing as a result of project completion, or depletion of the economic mineral resources for the project to the extent that the operation is no longer feasible. Final closure would occur according to the provisions of the final reclamation and closure plan required in the ROD, which incorporates these reclamation principles for the Kensington Gold Project.

Under the present permitting and economic scenario and proposed mine plan, construction would begin in 2005, and production would cease in about 2015. Final reclamation would be initiated at the cessation of mining and processing operations. Notification of final closure (in writing) would be given to the Forest Service 90 days prior to cessation of mining and processing operations. This notice would state the date on which final reclamation activities would begin.

2.2 Temporary Closure

Temporary closure means the cessation of the mining and processing operations for a period of not more than 3 years. If conditions require temporary closure to extend beyond 3 years, final reclamation would begin unless Coeur requests an extension. Temporary closure scenarios that require modifications to the plan of operations or reclamation plan would be coordinated with and submitted to the appropriate federal and state agencies for approval.

Temporary closure may include planned or unplanned cessation of mining and processing operations. Planned temporary closures that have specific conditions defining their beginning and end include the following:

1. Interruptions in the active beneficiation process for metallurgical or operating reasons;
2. Any other planned conditions that interrupt active mining or beneficiation, including modification to process components or suppressed market economics; and
3. Change in ownership requiring the temporary cessation of operations while operating permits are transferred to the new owner/operator.

Unplanned temporary closures may include the following:

1. Closure because of unforeseen weather events;
2. A failure in a major mining or processing system component, or a system failure that causes the system or a portion thereof to shut down;
3. Discontinuation of operations due to temporary economic considerations or unforeseen labor disputes; and
4. Discontinuation of operations due to litigation or other legal constraints.

Within a specified time frame defined in the mine permit, Coeur would notify the Forest Service of temporary closure. Notification principles or requirements include the following:

1. Reasons for shutdown;

2. Estimated schedule for resuming production; and
3. Outline of reclamation, water management, and monitoring activities to be implemented by Coeur during this period.

During temporary closure, Coeur would maintain all environmental programs according to agreed-upon schedules. Interim water management and erosion control measures would be implemented to protect on-site water quality. Interim reclamation activities would continue as planned. All permit requirements would also be met.

3.0 RECLAMATION PRINCIPLES

Coeur would implement the following list of environmental design criteria and standards to achieve the primary goal of the final reclamation and closure plan to return all areas disturbed by the mining operation to their pre-mining use and capability.

3.1 Reclamation Goals and Objectives

Reclamation goals and objectives outlined in the final reclamation and closure plan would be consistent with the above-stated post-mining land use objectives and the reclamation principles described in this document.

3.2 Final Reclamation Plan

The final reclamation and closure plan would include pertinent mitigation requirements identified in the Final SEIS, the ROD, monitoring plans, and other applicable permit conditions.

3.3 Administrative Principles

The following administrative principles would apply for the life of the project and during closure:

- The reclamation principles would be reviewed and updated every 3 years and 2 years prior to closure. This review would cover the status of reclamation activities, task scheduling and completion, and costs, particularly as related to financial assurance requirements.
- The reclamation principles would include provisions for concurrent reclamation in the coming year. They would be reviewed every 3 years. This may also take the form of an annual progress report that outlines the activities described above and priorities for the coming operating season.
- The reclamation principles would describe reclamation requirements as they relate to seasonal closure, interim long-term shutdown (more than 365 days), and final reclamation at closure.
- All surface mining disturbances associated with the Kensington Gold Project would be bonded for an amount equal to the actual cost estimate of reclaiming the disturbed areas.
- Bond release criteria would be developed for all reclamation activities.

- Bond calculations would also be presented for concurrent reclamation, such that specific costs for partial bond release are provided.

3.4 Environmental Principles

The following environmental principles would apply to the reclamation principles for the Kensington mine project:

- Soil or soil-like growth media (organic material and/or suitable subsoil) would be inventoried for volume and general reclamation suitability and stored for future reclamation use. Protection from erosion would be provided.

- Mine revegetation test plot research would be conducted after Year 1 of operation at the site to evaluate the potential of native species revegetation and dormant seeding of natural species in the spring and fall seasons.

- Disturbed areas no longer involved in mining operations would receive reclamation treatment within 2 years, as described in the Initial 1997 Reclamation Plan and these reclamation principles.

- Best management practices (BMPs) for interim drainage stabilization and erosion control would be implemented throughout the life of the project.

- Sediment control facilities such as dispersion terraces, ponds, dikes, and infiltration basins would be designed and installed before surface-disturbing activities begin.

- Sediment control facilities would be inspected regularly, and maintained according to agreed-upon maintenance criteria.

- Following construction, cut-and-fill embankments and growth media stockpiles would be seeded with native grasses to reduce the potential for soil erosion and to enhance natural plant reestablishment.

- Unchanneled runoff from disturbed surface areas would be dispersed into undisturbed forest areas, to the extent practicable.

- Engineering properties and material durability would be monitored during construction, operation, and a defined post-closure period.

3.5 Specific Reclamation Objectives

The Kensington Gold Project has been divided into six primary reclamation units for the purposes of this plan (Figure Sheet 4 of 10). The following represent the main areas of disturbance for construction and mining activities:

- Slate Creek Cove Dock Area – Jualin Side (Figure Sheet 5 of 10)

- Slate Creek Lake Tailings Storage Area – Jualin Side (Figure Sheet 6 of 10)

- Ancillary Facilities and Access Road Area – Jualin Side (Figure Sheet 7 of 10)
- 1000 Level Portal Area – Jualin (Figure Sheet 8 of 10)
- 850 Level Portal Area – Kensington Side (Figure Sheet 9 of 10)
- Comet Beach Area – Kensington Side (Figure Sheet 10 of 10)

Specific reclamation objectives and treatments are shown in the attached sheets. A more detailed description of reclamation applications for the phases of the project—construction, operation, closure, and post-closure—is presented below. These form the basis for the reclamation cost estimate provided as Attachment D-1, Preliminary Reclamation Cost Estimate—Kensington Gold Project.

3.5.1 Tailings Storage Facility

Reclamation Objectives

1. Reestablish aquatic habitat within the TSF;
2. Reestablish riparian habitat at the margins of the TSF;
3. Maintain the integrity of the impoundment; and
4. Maintain the water quality and aquatic habitat downstream of the TSF.

Construction Phase

Maintenance of the fish population in Lower Slate Lake is not an objective during construction and operation of the TSF. Prior to operation of the TSF, if the resource agencies identify a suitable location, the majority of Dolly Varden char would be trapped from Lower Slate Lake using minnow traps or other methods and relocated. Alternatively, the Dolly Varden char and three-spine stickleback populations would be left in the lake, but with no expectation of survival during construction or operation.

Except for emergency spillways that are unlikely to be used, a spillway for downstream movement of Lower Slate Lake fish would not be available until closure. Consequently, Lower Slate Lake Dolly Varden char would not migrate to East Fork Slate Creek, as they do now, until a population is reestablished in the TSF after closure and a spillway is installed. To replace the source of Dolly Varden char to East Fork Slate Creek and prevent their migration from Upper Slate Lake to the TSF during construction and operation, downstream migrants from Upper Slate Lake would be manually relocated or routed through diversion of Mid-Lake Slate Creek. By relocating migrants, subtleties of timing and life stage relating to downstream movement would be preserved. Ensuring fish passage is a condition of ADNR’s Title 41 authorization.

If selected, manual relocation would involve capturing Dolly Varden char from Mid-Lake Slate Creek and releasing them to East Fork Slate Creek below the dam. The capture location would be near the uppermost cascade to minimize capture of Dolly Varden char that may have otherwise returned to Upper Slate Lake. Capture would be accomplished by determining the most effective and low-maintenance method that does not cause unacceptably high mortality. Capture methods that would be considered for manual relocation are a fence trap, net trap, inclined plane trap, rotary screw trap, or minnow traps or other methods. If Mid-Lake Slate Creek is diverted through a pipe, passive relocation through the diversion pipe may be used.

All timber would be removed from the dam site and the perimeter of Lower Slate Lake between the existing shoreline (elevation 650 feet) up to the maximum project closure water elevation (~737 feet). Logging of the perimeter would be done in stages, corresponding with rises in lake elevation. BMPs for erosion control would be used during and after logging to minimize sediment transport to Lower Slate Lake and East Fork Slate Creek.

The dam site would be excavated as necessary for dam construction. Topsoil would be stockpiled and used for reclamation of project components outside the area disturbance of the TSF, unless it is used as a tailings capping material at closure.

Operation Phase

Dolly Varden char relocation alternatives that apply to the construction phase, addressed above, also apply to the operation phase. Dolly Varden char monitoring during operation would focus on their relocation from the upper reach of Mid-Lake Slate Creek to below the dam in East Fork Slate Creek. A holding pen would be used on occasion after Dolly Varden char relocation to permit health observations before releasing fish to East Fork Slate Creek. More broadly, an extensive water quality and aquatic life monitoring program as described in Section 2 of the Final SEIS and incorporated into the Final Plan of Operations would be conducted to allow further optimization of the Final Reclamation Plan prior to closure.

No habitat reclamation measures would be taken during operation. BMPs for erosion control would continue to be applied.

Temporary Shutdown

In the event of a temporary shutdown of the mine or discharge to the TSF, BMPs for erosion control, maintenance of flow to East Fork Slate Creek, and relocation of Dolly Varden around the TSF would continue.

Closure Phase

After cessation of tailings placement, it is expected that the water in the TSF would be consistent with background water quality. Under Alternative D in the Final SEIS, the reverse osmosis treatment system, if needed, would continue to be operated until Coeur demonstrates to the U.S. Environmental Protection Agency (USEPA) and ADEC that it is no longer required. If Mid-Lake Slate Creek is diverted (as under Alternatives C and D), the diversions would be removed and the TSF would be allowed to fill (see below). A spillway would be constructed to allow safe and unobstructed downstream movement of fish from the TSF to lower East Fork Slate Creek. The spillway would be designed to avoid injury to fish resulting from impact, supersaturation of dissolved gases, or entrainment, under all flow conditions. The opportunity for upstream movement of fish from East Fork Slate Creek to the TSF would not be provided.

The tailings would be deposited to a final elevation of approximately 704 feet with an assumed cover of approximately 9 feet; i.e., the lake would be at an elevation of 713 feet prior to implementation of the closure/reclamation plan. Coeur would initially ensure that all remaining tailings in the lake have settled (or been discharged). The plan then calls for the lake elevation to rise to a final elevation of 737 feet, which would be maintained by the spillway in the dam. Raising the lake to the final elevation would provide for inundation of an area of natural ground (uncovered by tailings) equivalent in size (approximately 11.3 acres) to the current productive zone within Lower Slate Lake. Based on the findings of the Ecological Risk Assessment, this "productive" zone would support initial reestablishment of macroinvertebrate populations as needed to support restored fish populations. As discussed in this Final SEIS, the settled tailings would not resuspend; i.e., the inundated natural area would not be affected by tailings. Airborne introduction and inflow from Upper Slate Lake would provide macroinvertebrate sources to Lower Slate Lake. Over an extended period, the tailings would be covered by natural materials entering the lake from Mid-Lake East Fork Slate Creek and should also support macroinvertebrate populations. This would be limited, however, by the depth of much of the lake (greater than 30 feet) at which macroinvertebrates have historically not been observed in Lower Slate Lake.

If the operational monitoring shows that exposed tailings will affect the ability of the lake to be restored to at least pre-mining aquatic conditions, Coeur could have to install a natural tailings cover of native glacial deposits, organic material, or imported alluvial material. The capping material would be stored adjacent to the TSF. At closure, the material would be mixed with tailings water and pumped to a floating barge equipped with a submerged diffuser. The slurry would then be distributed throughout the TSF by the diffuser and allowed to settle to the necessary cap thickness. The cover material is expected to be installed to a depth of 10 centimeters or more over the tailings. After installation of the cover, the final lake level would be established (with a spillway) at an elevation optimized for restoration of aquatic resources. Note that the final elevation would likely not be as high as the elevation without a tailings cover because there would be no need to inundate natural areas.

In contrast, operational monitoring may show that the tailings habitability would actually be better than predicted in the laboratory and/or can be enhanced by other modifications or additions to the reclamation plan. For example, organic material could be added either with or separately from the tailings. In such a case, it may not be necessary to inundate natural areas, and uncovered tailings would provide a large area of shallow water habitat for macroinvertebrates and plants.

Numbers of three-spine stickleback and Dolly Varden char that migrate out of Upper Slate Lake would be well understood before closure through the measures that would be taken to bypass the TSF during operation. This information would be used to determine whether passive restocking of the TSF after closure via natural downstream migration would result in a balanced reestablishment of fish along with their food source. It may be determined that restocking can be accelerated by trapping and relocating Upper Slate Lake fish, or that fish should be blocked from entering the TSF until a sufficient prey base is established. If the resource agencies prefer, any remaining physical barriers to upstream movement from the TSF to Upper Slate Lake would be removed.

The TSF would not contain any flooded timber and much of the riparian zone would be forested with the timber that currently exists along the ~737-foot contour. Disturbed areas would be planted to reestablish the existing woody and non-woody vegetation types. Studies would be conducted in Upper Slate Lake during operation to determine substrate requirements and transplanting methods for submergent and emergent macrophytes. A transplanting plan would then be developed to accelerate establishment of an aquatic plant community that is similar to the existing community.

Post-Closure Phase

Abundance and diversity of phytoplankton, zooplankton, benthic invertebrates, macrophytes, three-spine sticklebacks, and Dolly Varden char would be monitored in the TSF, beginning at closure and continuing until a self-sustaining community has become established. It is expected that macroinvertebrates would colonize the natural areas and support a restored fish population within 1 year of closure. Two surveys per year would be conducted for the first 2 years after closure, followed by one survey per year until restoration of the aquatic community is determined to be complete. Coeur would work with the Forest Service and the state to establish “measures” of reclamation success, monitoring programs, reporting, and corrective measures to be taken if goals are not achieved. Corrective measures, such as replanting, restocking, substrate additions, or other habitat modifications, would be taken as necessary to accelerate recovery. Studies to be conducted during operation (see above) would provide the necessary information to establish a schedule for reestablishment of the aquatic community in the TSF. Upper Slate Lake would serve as a model since it has been shown to support a more productive population of Dolly Varden than Lower Slate Lake. Use of Upper Slate Lake as a model should therefore ensure that the objective of restoring a similar community is exceeded.

3.5.2 Process Area

Decommissioning

Following permanent closure of the operation, all salvageable equipment, instrumentation, furniture, and used reagents not required for reclamation and closure would be removed from the site. Decommissioning of the facilities would include neutralization of reagents and chemicals that remain in the system. Pipes, tanks, and other items that contained chemical or product during operation would be rinsed to neutralize the container prior to removal. Rinsed solutions would be collected and treated according to applicable rules and regulations.

Buildings, Equipment and Ancillary Facilities Removal

The following are facilities associated with the process area:

- Mill, lab, and refinery
- Warehouse
- Maintenance shop
- Offices
- Fueling station
- Miner change room

- Power plant
- Ancillary facilities

After decommissioning, these facilities would be dismantled and removed from the site. Since salvage would be the main method of removal, it is expected that minimal disposal of material would be required. However, items such as concrete foundations and sewage treatment concrete vaults would be broken up and buried in place.

No major structures associated with mining and processing would remain on site unless they were necessary for other reclamation and resource management activities, or met solid waste management criteria. A phased removal program would be followed because many of the buildings and much of the equipment would be needed to complete reclamation activities. As specified units were no longer needed, they would be removed from the site.

Water Supply

Once the infiltration gallery is no longer required for decommissioning and other reclamation activities, the water supply intake would be removed.

Site Regrading and Revegetation

Once all the major facilities are removed from the site, the area would be prepared for final reclamation activities. The mill area would be inspected to ensure that fuel or other chemical contaminants are not present in the surface of the soil, before regarding activities are initiated, Regrading would approximate original topography and promote surface runoff from adjacent areas.

Sedimentation ponds and stormwater diversion structures would be removed (if appropriate) or filled to preclude the storage of any water resources. BMPs would be used during this interim stage to minimize sedimentation from the disturbed sites. BMPs would remain in place until sufficient vegetation growth has been established.

Sufficient growth, for the purposes of reclamation, would be defined in the final reclamation plan. The exact definition (e.g., 90 percent vegetative cover within 5 years after final closure) would be derived after consultation with vegetative experts familiar with the area.

The goal of revegetation would be to mimic the adjacent muskeg/spruce communities. However, the focus of the revegetation effort would be on establishing grasses, shrubs, and forbs to stabilize the reclaimed landforms and to provide successful plant communities that would lead to the natural recolonization of muskeg/spruce.

Coeur would construct a reclamation/revegetation test plot facility after Year 1 of operation for the purpose of conducting revegetation test work to develop data that would accelerate rapid and successful reclamation of the DTF and other upland sites. This research would also consider the following:

1. Species of native trees, shrubs, grasses, and forbs to determine the revegetation combination for the site;

2. Topsoil or soil resource needs, to determine the best methods for applying and stabilizing topsoil as well as the depth for optimum plant growth; and

3. Potential mulching and best method of application.

The results of this research would be used to optimize the revegetation scheme at the site.

3.5.3 Mine/Portal Areas

Building Removal

All buildings associated with the mine and portal areas would be removed as part of the final reclamation and closure plan. Ventilation fans, compressors, and other support equipment for the underground mining operations would be dismantled and removed after permanent closure of the operations.

Portal Plugging

An engineered portal plugging procedure would be designed as part of the final reclamation plan. The objective is to provide long-term safety for the public by preventing entry into the mine workings. The plug may consist of reinforced concrete, although state-of-the-art engineering may dictate an alternative plug type. Rock material may also be placed over the plugged opening to minimize visual impacts from the portal. Coeur would apply for a permit under the National Pollutant Discharge Elimination System (NPDES) to allow for discharge of water drainage from the adit upon completion of mining, if required.

Regrading and Revegetation

The mine portals are located in steep rocky terrain; minimal reclamation can be accomplished at these locations. The total disturbed area would be small; however, regrading efforts would be attempted to bring the site back to a natural contour. Reclamation would be accomplished in a manner that maximizes the human safety aspects of the closure plan and minimizes the amount of additional disturbance necessary to meet the reclamation objective.

Monitoring of Acid Rock Drainage

Throughout operations and at closure, conditions would be monitored as they relate to potential acid rock drainage (ARD). Extensive pre-project test work indicates that ARD would not be a problem. A specific monitoring strategy for the mine waste components would be developed as a part of the monitoring plan and incorporated into the final reclamation plan.

Development Rock Piles

A limited amount of development rock (waste rock not used in the TSF construction or as backfill mix) would be generated during the life of the project. Therefore, only small quantities of mine waste rock would need to be reclaimed as separate waste rock piles. The regrading objectives would be to blend the remaining rock piles into the existing terrain. Regrading would involve creating undulating surfaces to break up the sharp lines of the pile where feasible. The ultimate regraded surface would be sloped to allow natural revegetation of the pile and minimize erosion potential.

Growth media would be placed over the waste rock piles at depths dependent on the amount of soil available, as stability considerations allow. Placement of soil would enhance habitat development (e.g., minimize north/south facing slopes, vary soil depths, create boulder patches) and site-specific reclamation needs.

The revegetation activities would adhere to the approved reclamation principles. Revegetation would not be possible on boulder piles developed for habitat enhancement. Natural revegetation would typically provide the seed base for these types of areas. Coeur may initiate sowing in these areas, even though limited soil material may be present.

Slate Creek Cove Facilities

Once the laydown area is no longer required to support the reclamation effort, remaining fuel storage tanks (isotainers) would be removed from the site. All contaminated synthetic lining material would be removed and disposed of in the appropriate manner. Sampling would be conducted to ensure that hydrocarbon contamination would not exist in the area.

The area would be regraded to eliminate any ongoing drainage containment areas and aid in returning the site to an approximate natural contour. Regrading objectives would involve directing water away from these previously disturbed areas.

Growth media would be placed over disturbed areas. Revegetation of the area would meet post-mining land use criteria developed in the final reclamation plan.

Comet Beach Facilities

In addition to the fuel transfer facility, a maintenance shop, core sheds, support buildings, and other structures would remain from the exploration and development stages. These would be removed as part of the reclamation program. Any beach mooring, lighting, or buildings used in fuel transfer or general barge operation, but not required for reclamation activities, would be removed at closure. Previous activities associated with the beach area that lies between the high tide and low tide mark would consist mainly of cobble material, and have limited reclamation needs. Compacted cobble areas would be scarified (if necessary) to remove the visual aspect of the compaction. It is expected that winter sea action would also naturally scarify the area, once the loading and unloading of barges has ceased. Those areas above the high tide mark where soil was removed would be regraded, scarified, resoiled, and revegetated consistent with the final reclamation and closure plan.

Roads and Other Disturbance

This subsection describes general reclamation objectives for the various disturbances associated with the mining operations that have not otherwise been specifically identified. This would include areas such as access roads, explosives storage areas, borrow sites, helicopter landing pads, monitoring sites, and other similar disturbances or structures necessary to support the mining and milling activities.

The general reclamation procedures for these types of disturbances and facilities would involve removing all aboveground structures and regrading and revegetating these areas. It is expected that a certain level of regrading, scarifying/ripping, and soil placement would be completed at each of the sites. Regrading would approximate the natural terrain and contours of the areas.

Access roads would play a key role in the reclamation effort and the long-term monitoring and maintenance programs. Coeur intends to reclaim all project roads, using a phased approach. Once they are no longer required, road regrading would be completed to provide for reclaimed surfaces, but still allow further access to the site. Coeur intends to remove nonpermanent features (culverts, drainage facilities) from the roads where sufficient final grades would allow safe equipment operation. Certain access roads would be necessary for reclamation activities, regulatory inspections, and long-term reclamation maintenance activities. These access roads may not be reclaimed because of federal and state right-of-way requirements.

Providing a phased road reclamation effort would fulfill the access concern and help to stabilize the site. The three phases are described below.

Phase I - This phase assumes that final closure of the TSF, mill facilities, portals, and ancillary facilities has been completed. Only the roads necessary to monitor the diversions and provide access to the TSF and the mine area via the main access road from the beach would remain. This phase of the reclamation/closure activities would include minor repairs to revegetated areas, diversion maintenance (if necessary), and sampling programs and other general reclamation monitoring activities. The bulk of the reclamation activities would be completed during this phase, but not released from financial assurance requirements. Partial release of the TSF bond would have occurred, consistent with Coeur's concurrent reclamation program.

Phase II - Several years would have passed since the completion of general revegetation of the area. Monitoring would continue, but the need for access to the various Phase I sites would be diminishing. Access would be limited. At this point, those roads that remain for access to the diversions, TSF, and other monitoring or maintenance sites could be revegetated.

As described above, regrading of these roads would be designed to promote runoff and long-term stability. Culverts would be removed, water bars built, and other activities completed to meet the objectives of the final reclamation plan. Regrading efforts would not preclude entrance of maintenance equipment as may be required. Maintenance-type revegetation of these areas (for the purpose of erosion control) would be initiated. No further regrading would occur. The main access road from Comet Beach would remain as a public access road.

Phase III – This phase would be the final stage of reclamation. Long-term monitoring provisions would be under way. Various areas would be released from reclamation liability; maintenance would be performed as needed (access needs would be limited). Coeur would apply for release of all reclamation-related financial assurance requirements.

3.5.4 Growth Media

Growth media would be placed over all disturbed areas, excluding rock cuts and development rock storage piles, areas of riprap, open water, and slopes too steep to retain topsoil. Development rock storage piles would be treated as described elsewhere in this document.

The goal would be to apply a depth of 1 foot of growth media to disturbed areas. Growth media are expected to be limited, based on measured depths of the soil resource. A minimum of 6 inches of growth media would be applied to all disturbed areas, other than those areas noted above. If it is determined that there is not enough topsoil material to cover all the required areas with a minimum of 6 inches of growth media, a detailed report would be prepared to identify all areas of the mine site that require topsoil as part of the reclamation process. These areas would be rated as to their environmental sensitivity. This rating would include erosion and sediment accumulation rate calculations. Those areas identified as being the least environmentally sensitive may receive less than the minimum of 6 inches of growth media.

3.5.5 Reclamation Success

The success of reclamation would be monitored in two ways. Physical reclamation such as earthwork and growth media application would be checked for erosion periodically and immediately following major rainstorms. Remedial action to correct instability would be taken as soon as feasible following detection of substantial erosion or loss of growth media. Coeur and appropriate regulatory agency personnel would monitor vegetation success qualitatively by visual inspection on an ongoing basis and quantitatively once per year. Quantitative analysis would be conducted at the end of the growing season (end of August) by a qualified professional. The appropriate regulatory agencies and Coeur would determine performance criteria for vegetation success. Coeur would seek release of the reclamation surety on a facility-by-facility basis, as quantitative data indicate that the agreed-upon criteria have been met.

3.5.6 Long-Term Monitoring and Maintenance

A long-term monitoring and maintenance (LTMM) program would be developed as a part of the final reclamation plan, and from ongoing operational experience. Modifications to the LTMM program would be consistent with periodic reclamation review. It is expected that historical data would play a key role in developing a specific LTMM program.

The proposed configuration of the TSF at final closure has a spillway, constructed in bedrock, to reestablish the natural runoff and flows from Upper Slate Lake. Maintaining the long-term integrity of the TSF and protecting long-term water quality is the focus of the reclamation monitoring and maintenance program. Monitoring and long-term maintenance of the TSF would be part of the post-closure program implemented in the final reclamation plan.

During mining operations, inspections would be part of the normal mine operation and maintenance schedule. Therefore, important information necessary for developing detailed post-closure monitoring and maintenance schedules and costs and related financial assurance requirements would be collected during this time. This would involve special efforts necessary to document unusual climatic events that could result in extraordinary maintenance needs. Operational monitoring would continue after operations cease as long as Coeur personnel are available on-site. This would include inspections during the vegetation reestablishment period. At the time of release of the TSF from reclamation liability, long-term monitoring and maintenance would be implemented based on the schedule developed in the final reclamation plan. The LTMM schedule to be developed would include the following:

Post-Mining Inspection Schedule

- Sediment and debris build-up in the diversions would be assessed annually during and after operation.
- Annual inspections of the TSF would occur during the first 5 years after cessation of mining and processing, with a comprehensive inspection after the fifth year.
- The TSF would be inspected following any extreme event believed to exceed the 100-year, 24-hour storm event.
- A comprehensive inspection and review would be conducted at Year 10 and at Year 20 (final closure).

Post-Mining Maintenance Schedule

- Any necessary remedial work would be carried out as needed, based on site inspections.
- Diversion maintenance and cleaning would be completed as required.

Long-Term Monitoring and Maintenance Cost Estimates

LTMM is a key component of the reclamation program and post-closure effort. Factors expected to play a key role in the development of a final LTMM are listed below:

- Initial cost estimates for LTMM would be based on inspection and maintenance costs during the operating life of the project.
- Historical data and costs collected during the life of the mine and accepted engineering practices would be used to adjust the initial estimates of LTMM costs.
- Accepted engineering practices and reviews would be used in determining the LTMM plan.

3.6 Post-Closure Financial Assurance

There would be three distinct phases of closure:

- Phase I would cover the period after operations cease and reclamation is actively under way.
- Phase II would cover the period after final reclamation has been completed; monitoring and maintenance would be ongoing. Phase II bonding would still be provided by the reclamation bond.
- Phase III would cover the period when all agencies accept the reclamation effort and release the bonds. Phase III financial assurance would be provided in accordance with the terms of the ROD.

The construction of the TSF would necessitate some long-term maintenance and monitoring for a number of years after the closure and final reclamation of the mine.

To provide bonding to cover the costs of maintenance and monitoring activities, the costs associated with post-closure maintenance and monitoring would be estimated as part of the development of the final reclamation plan. For example, when operation of the TSF is completed and final reclamation has started, funding must be established for the post-closure maintenance and monitoring of the TSF. This would avoid reaching the closure point of the mine, only to discover that funds are not available to cover the post-closure costs. To accommodate the need for such funding, Coeur is developing a policy that will ensure that future funding will be available to cover those estimated costs with an insurance-backed program that guarantees against cost overruns and unforeseen events that could cause environmental degradation.

At a minimum, the estimates of costs for monitoring and maintenance would include monitoring and maintenance as follows:

Monitoring

- Water quality measurements as may be required by NPDES permits still in force.
- Inspections and measurements required to assess the physical integrity of the diversion structures, the TSF, and the mine.

Maintenance

- Maintenance of the physical integrity of the following facilities:

  TSF

  Diversions

  Mine portal plug

  Mine access roads

- Mobilization of personnel and equipment to make any necessary replacements or repairs, or to clear any obstructions, diversions, or other natural occurrences that might threaten the integrity or safety of the reclaimed facility.

3.7 Principles for the Reclamation Cost Estimate and Bond Adjustment

Table D-1 lists the estimated acreage of proposed surface disturbance. The total life-of-mine estimated cost to reclaim the Kensington Gold Project, as presented in Table D-2, is $3.154 million. The estimates are based on unit costs developed as part of the independent third-party reclamation cost estimate provided to the Forest Service in January 1998, and adjusted to reflect 2004 conditions.

Coeur would provide an acceptable financial assurance as a condition of the ROD for a revised reclamation cost estimate for the approved project. Coeur would apply for partial release of reclamation surety bond monies in subsequent years, as the final reclamation costs are reduced by allotting credit for successfully completed discrete reclamation procedures. Coeur would request a full release of the surety once all requirements of the final reclamation and closure plan have been met. The funds for future costs, however, would still be guaranteed against the insurance-backed policy established prior to the development of the project.

Project designs were completed to minimize long-term post-reclamation maintenance. Limited diversions associated with stormwater management would be retained to maintain surface flow, consistent with operational objectives. Limited long-term maintenance and monitoring requirements are expected in connection with the TSF, waste rock dumps, and planned portal plugging. Concurrent reclamation would also be completed and would further reduce post-closure reclamation liability and long-term maintenance requirements.

Table D-1
Proposed Mine Facility Surface Disturbance

	Facility	**Acres**
1	Marine Facilities (Comet Beach)	2.4
2	Kensington Access Roads	7.2
3	Approved Kensington Mine Area Disturbance (Development Rock Storage and Water Treatment Ponds)	31.3
4	Existing Kensington Borrow Area	1.3
5	Proposed Mine Access Road	27.8
6	Laydown Area	5.0
7	Borrow Area	3.7
8	Borrow Area	1.4
9	Marine Facilities (Slate Creek Cove)	3.6
10	Topsoil Stockpiles (4 locations)	1.5
11	Borrow Area	1.5
12	Tailings Storage, Pipeline, and Maintenance Roads	86.1
13	Mine Area Complex	17.2
14	Development Rock Storage	4.8
15	Borrow Area	0.7
	TOTAL	**195.5**

Table D-2
Estimated Reclamation Cost Summary

Task	Total Costs
1.0 Demolition	$834,400
2.0 TSF Closure	$294,500
3.0 Excavation	$31,360
4.0 Ripping	$98,690
5.0 Fill Placement and Regrading	$34,611
6.0 Growth Media Placement and Spreading	$232,408
7.0 Growth Media Scarifying and Seeding	$72,975
8.0 Additional Costs	
Mobilization/Demobilization	$200,000
Reclamation Monitoring (water and vegetation)	$200,000
Post-Closure Monitoring (water)	$300,000
Reclamation Monitoring (hydrocarbons)	$44,500
Subsurface Flow Wetlands	$180,000
9.0 Contingency Costs	
Government Contract Oversight	$126,172
Engineering/Surveying	$126,172
General and Administrative	$126,172
General Contingency	$252,344
Total Estimate	**$3,154,305**

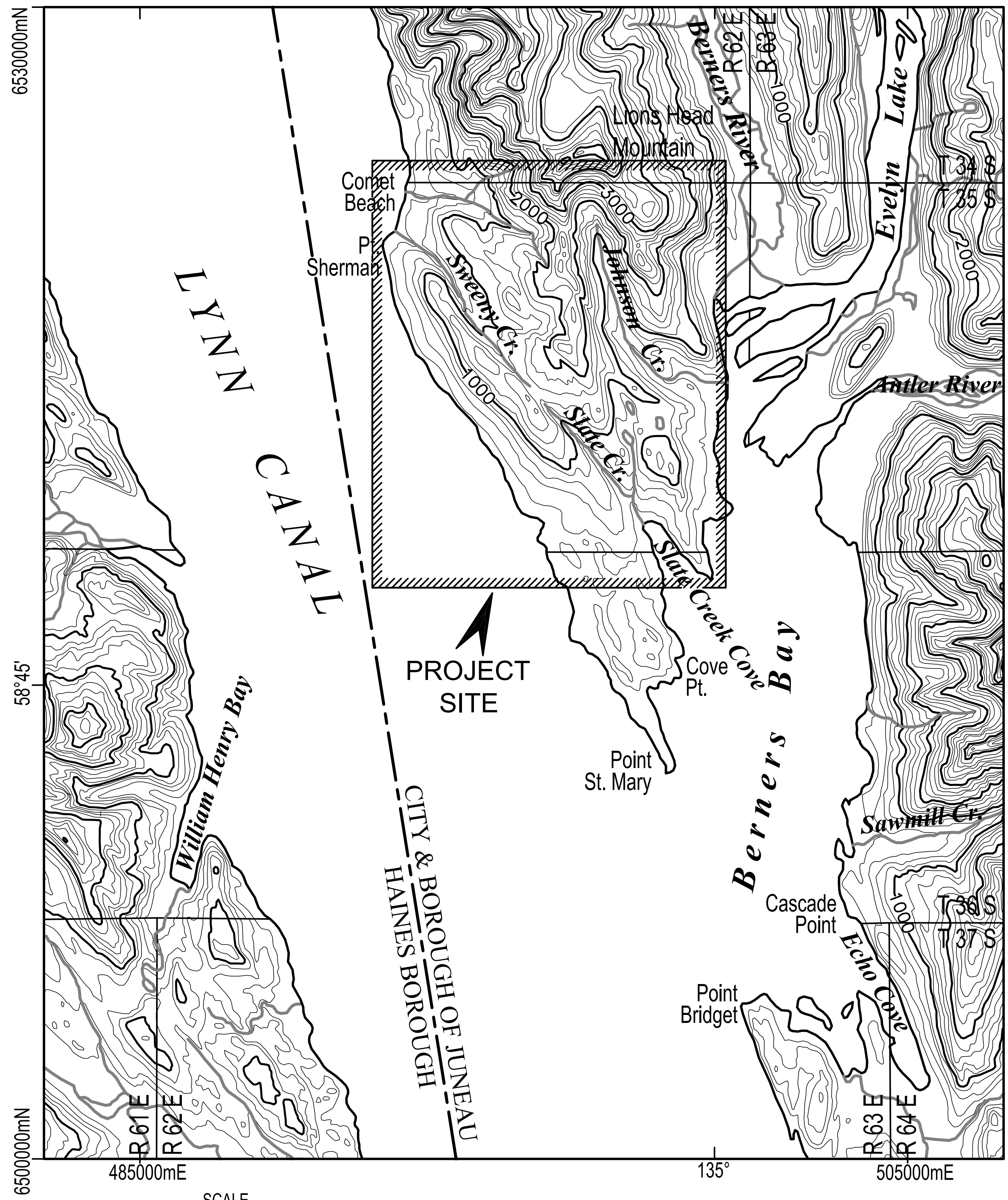
Attachment D-1

Preliminary Reclamation Cost Estimate - Kensington Gold Project

Task	Description	Units	Unit Cost	Labor	Material - Equipment Cost	TOTAL COST
1.0	**Demolition**					
1.1	Marine Facilities (Slate Creek Cove)	LS	NA	$ 56,000.00	$ 55,000.00	$ 111,000.00
1.2	Kensington Camp (Comet Beach)	LS	NA	$ 30,000.00	$ 2,400.00	$ 32,400.00
1.3	Process Area Buildings and Equipment	LS	NA	$ 168,000.00	$ 132,000.00	$ 300,000.00
1.4	Administrative Area Buildings	LS	NA	$ 40,000.00	$ 60,000.00	$ 100,000.00
1.5	Water Treatment Plant Pond	LS	NA	$ 5,000.00	$ 10,000.00	$ 15,000.00
1.6	Process Area Sediment Ponds	LS	NA	$ 5,000.00	$ 10,000.00	$ 15,000.00
1.7	Water Treatment Plant Building	LS	NA	$ 35,000.00	$ 20,000.00	$ 55,000.00
1.8	Roads, Culverts, Bridges	LS	NA	$ 25,000.00	$ 20,000.00	$ 45,000.00
1.9	Portals	LS	NA	$ 20,000.00	$ 80,000.00	$ 100,000.00
1.10	Power/Telephone Lines	LS	NA	$ 15,000.00	$ 20,000.00	$ 35,000.00
1.11	Fuel Storage Tank Removal	LS	NA	$ 5,000.00	$ 3,000.00	$ 8,000.00
1.12	Infiltration Gallery	LS	NA	$ 500.00	$ 500.00	$ 1,000.00
1.13	Earth-Retaining Bin Walls	LS	NA	$ 3,500.00	$ 13,500.00	$ 17,000.00
2.0	**Tailings Storage Facility Closure**					
2.1	Installation of the Spillway	10,000 CY	$5.00	$ -	$ -	$ 50,000.00
2.2	Riparian Habitat Enhancement	250 CY	$30.00	$ -	$ -	$ 7,500.00
2.2	TSF Pump Back Sump and Discharge Pipeline	LS	NA	$ 27,000.00	$ 23,000.00	$ 50,000.00
2.3	Tails/Reclaim Water Pipeline	LS	NA	$ 96,000.00	$ 21,000.00	$ 117,000.00
2.4	Decommission Reclaim Barge	LS	NA	$ 22,000.00	$ 23,000.00	$ 45,000.00
2.5	Diversion Dam and Pipeline	LS	NA	$ 12,000.00	$ 13,000.00	$ 25,000.00
3.0	**Excavations**					
3.1	Culvert Removal	3200 CY	$ 2.80	$ -	$ -	$ 8,960.00
3.2	Bridge Abutments	7800 CY	$ 2.80	$ -	$ -	$ 21,840.00
3.3	Infiltration Gallery	20 CY	$ 28.00	$ -	$ -	$ 560.00
4.0	**Ripping**					
4.1	Access Roads	35.0 acres	$ 710.00	$ -	$ -	$ 24,850.00
4.2	Process Area	17.2 acres	$ 710.00	$ -	$ -	$ 12,212.00
4.3	Development Rock Bench - Jualin	4.8 acres	$ 710.00	$ -	$ -	$ 3,408.00
4.4	Development Rock Bench - Kensington	21.5 acres	$ 710.00	$ -	$ -	$ 15,265.00
4.5	Marine Facilities (Slate Creek Cove)	3.6 acres	$ 710.00	$ -	$ -	$ 2,556.00
4.6	Kensington Camp (Comet Beach)	2.4 acres	$ 710.00	$ -	$ -	$ 1,704.00
4.7	Water Treatment Plant Area	10.0 acres	$ 710.00	$ -	$ -	$ 7,100.00
4.8	Borrow Areas	8.4 acres	$ 710.00	$ -	$ -	$ 5,964.00
4.9	Laydown Areas	5.0 acres	$ 710.00	$ -	$ -	$ 3,550.00
4.10	Tails Facility Areas (pipeline corridors, roads)	31.1 acres	$ 710.00	$ -	$ -	$ 22,081.00
5.0	**Fill Placement and Regrading**					
5.1	Access Roads	35.0 acres	$ 249.00	$ -	$ -	$ 8,715.00
5.2	Process Area	17.2 acres	$ 249.00	$ -	$ -	$ 4,282.80
5.3	Development Rock Bench - Jualin	4.8 acres	$ 249.00	$ -	$ -	$ 1,195.20
5.4	Development Rock Bench - Kensington	21.5 acres	$ 249.00	$ -	$ -	$ 5,353.50

5.5	Marine Facilities (Slate Creek Cove)	3.6 acres	$ 249.00	$ -	$ -	$ 896.40
5.6	Kensington Camp (Comet Beach)	2.4 acres	$ 249.00	$ -	$ -	$ 597.60
5.7	Water Treatment Plant Area	10.0 acres	$ 249.00	$ -	$ -	$ 2,490.00
5.8	Borrow Areas	8.4 acres	$ 249.00	$ -	$ -	$ 2,091.60
5.9	Laydown Areas	5.0 acres	$ 249.00	$ -	$ -	$ 1,245.00
5.10	Tails Facility Areas (pipeline corridors, roads)	31.1 acres	$ 249.00	$ -	$ -	$ 7,743.90
6.0	**Growth Media Placement and Spreading**					
6.1	Access Roads	35.0 acres	$ 1,672.00	$ -	$ -	$ 58,520.00
6.2	Process Area	17.2 acres	$ 1,672.00	$ -	$ -	$ 28,758.40
6.3	Development Rock Bench - Jualin	4.8 acres	$ 1,672.00	$ -	$ -	$ 8,025.60
6.4	Development Rock Bench - Kensington	21.5 acres	$ 1,672.00	$ -	$ -	$ 35,948.00
6.5	Marine Facilities (Slate Creek Cove)	3.6 acres	$ 1,672.00	$ -	$ -	$ 6,019.20
6.6	Kensington Camp (Comet Beach)	2.4 acres	$ 1,672.00	$ -	$ -	$ 4,012.80
6.7	Water Treatment Plant Area	10.0 acres	$ 1,672.00	$ -	$ -	$ 16,720.00
6.8	Borrow Areas	8.4 acres	$ 1,672.00	$ -	$ -	$ 14,044.80
6.9	Laydown Areas	5.0 acres	$ 1,672.00	$ -	$ -	$ 8,360.00
6.10	Tails Facility Areas (pipeline corridors, roads)	31.1 acres	$ 1,672.00	$ -	$ -	$ 51,999.20
7.0	**Growth Media Scarifying and Seeding**					
7.1	Access Roads	35.0 acres	$ 525.00	$ -	$ -	$ 18,375.00
7.2	Process Area	17.2 acres	$ 525.00	$ -	$ -	$ 9,030.00
7.3	Development Rock Bench - Jualin	4.8 acres	$ 525.00	$ -	$ -	$ 2,520.00
7.4	Development Rock Bench - Kensington	21.5 acres	$ 525.00	$ -	$ -	$ 11,287.50
7.5	Marine Facilities (Slate Creek Cove)	3.6 acres	$ 525.00	$ -	$ -	$ 1,890.00
7.6	Kensington Camp (Comet Beach)	2.4 acres	$ 525.00	$ -	$ -	$ 1,260.00
7.7	Water Treatment Plant Area	10.0 acres	$ 525.00	$ -	$ -	$ 5,250.00
7.8	Borrow Areas	8.4 acres	$ 525.00	$ -	$ -	$ 4,410.00
7.9	Laydown Areas	5.0 acres	$ 525.00	$ -	$ -	$ 2,625.00
7.10	Tails Facility Areas (pipeline corridors, roads)	31.1 acres	$ 525.00	$ -	$ -	$ 16,327.50
8.0	**Additional Costs**					
8.1	Mobilization/Demobilization	LS	NA	$ -	$ -	$ 200,000.00
8.2	Reclamation Monitoring (water and vegetation)	5 years	$ 40,000.00	$ -	$ -	$ 200,000.00
8.3	Post-Closure Monitoring (water)	15 years	$ 20,000.00	$ -	$ -	$ 300,000.00
8.4	Reclamation Monitoring (hydrocarbons)	1 year	$ 44,500.00	$ -	$ -	$ 44,500.00
8.5	Subsurface Flow Wetland	3,000 CY	$ 60.00	$ -	$ -	$ 180,000.00
9.0	**Contingency Costs**					
9.1	Government Contract Oversight	5%				$ 126,172.20
9.2	Engineering/Surveying	5%				$ 126,172.20
9.3	General and Administration	5%				$ 126,172.20
9.4	General Contingency	10%				$ 252,344.40
	TOTAL COST					**$ 3,154,305.00**

Note: LS = lump sum; CY = cubic yard(s).



SCALE

0 — 20,000 FEET

0 — 5 MILES

0 — 5 KILOMETERS

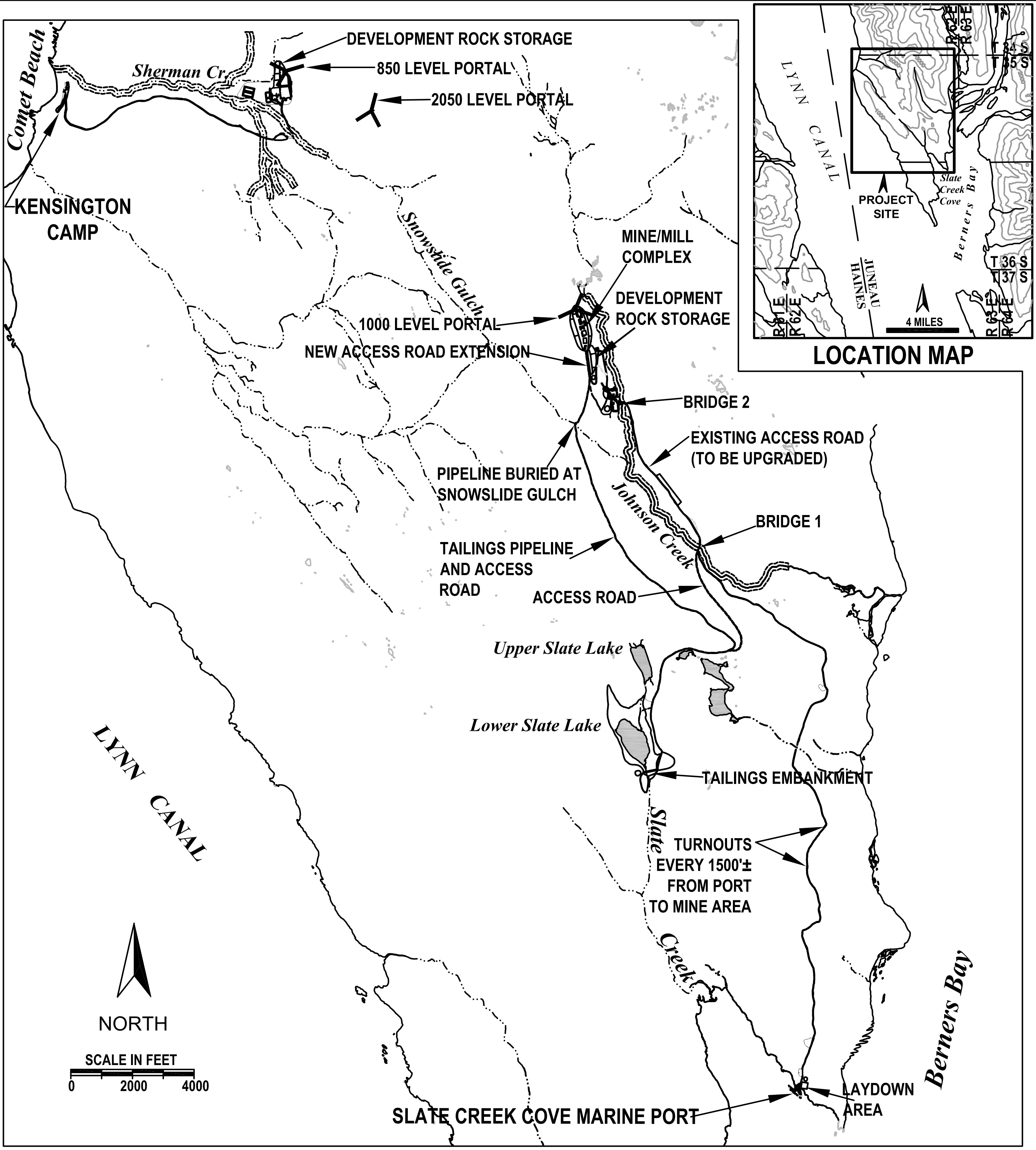
NORTH

CONTOUR INTERVAL 200 FEET

SOURCE: USGS 1:250,000 SERIES TOPOGRAPHIC QUADRANGLE, JUNEAU, ALASKA-CANADA, REVISED 1985, NGVD 1929.

SHEET 1 OF 10		**DATE: JUNE 2004**
RTRO Resource Management, Inc.	**SCALE: AS SHOWN**	**DRAWN: *JASPER GEOGRAPHICS***
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

SITE LOCATION MAP
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



SHEET 2 OF 10 | DATE: JUNE 2004

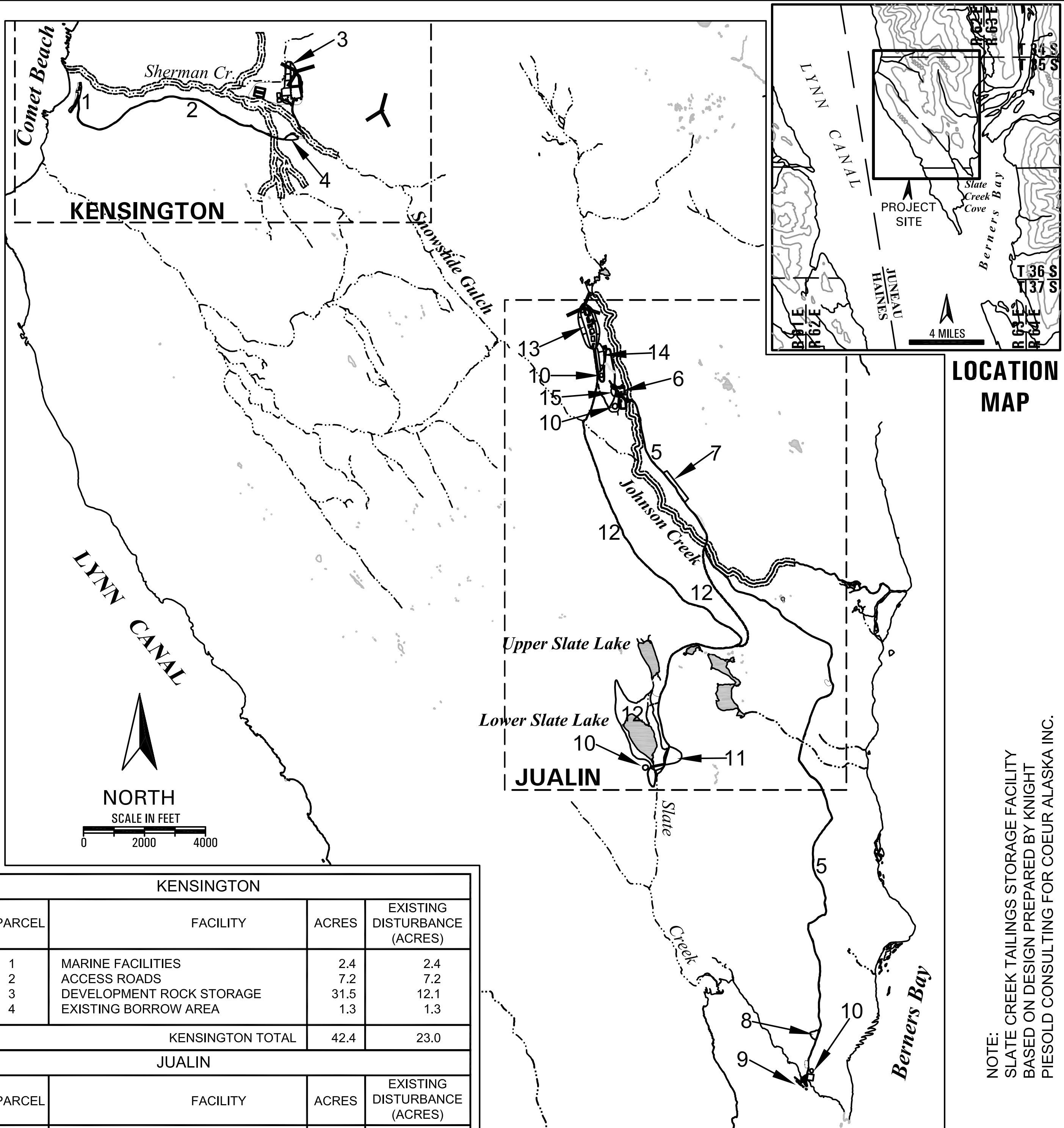
RTRO Resource Management, Inc.

SCALE: AS SHOWN | DRAWN: *JASPER GEOGRAPHICS*

LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU

GENERAL FACILITIES ARRANGEMENT
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA

NOTE:
SLATE CREEK TAILINGS STORAGE FACILITY BASED ON DESIGN PREPARED BY KNIGHT PIESOLD CONSULTING FOR COEUR ALASKA INC.



KENSINGTON			
PARCEL	FACILITY	ACRES	EXISTING DISTURBANCE (ACRES)
1	MARINE FACILITIES	2.4	2.4
2	ACCESS ROADS	7.2	7.2
3	DEVELOPMENT ROCK STORAGE	31.5	12.1
4	EXISTING BORROW AREA	1.3	1.3
	KENSINGTON TOTAL	42.4	23.0

JUALIN			
PARCEL	FACILITY	ACRES	EXISTING DISTURBANCE (ACRES)
5	MINE ACCESS ROAD	27.8	27.6
6	LAYDOWN AREA	5.0	2.0
7	BORROW AREA	3.5	1.2
8	BORROW AREA	1.4	1.4
9	MARINE TERMINAL	3.6	
10	TOPSOIL STOCKPILES	1.5	
11	BORROW AREA	1.5	
12	TAILINGS STORAGE, PIPELINE AND ACCESS ROADS	86.1	
13	PROCESS AREA	17.2	
14	DEVELOPMENT ROCK STORAGE	4.8	
15	BORROW AREA	0.7	
	JUALIN TOTAL	153.1	32.2
	TOTAL	195.5	55.2

SHEET 3 OF 10

DATE: JUNE 2004

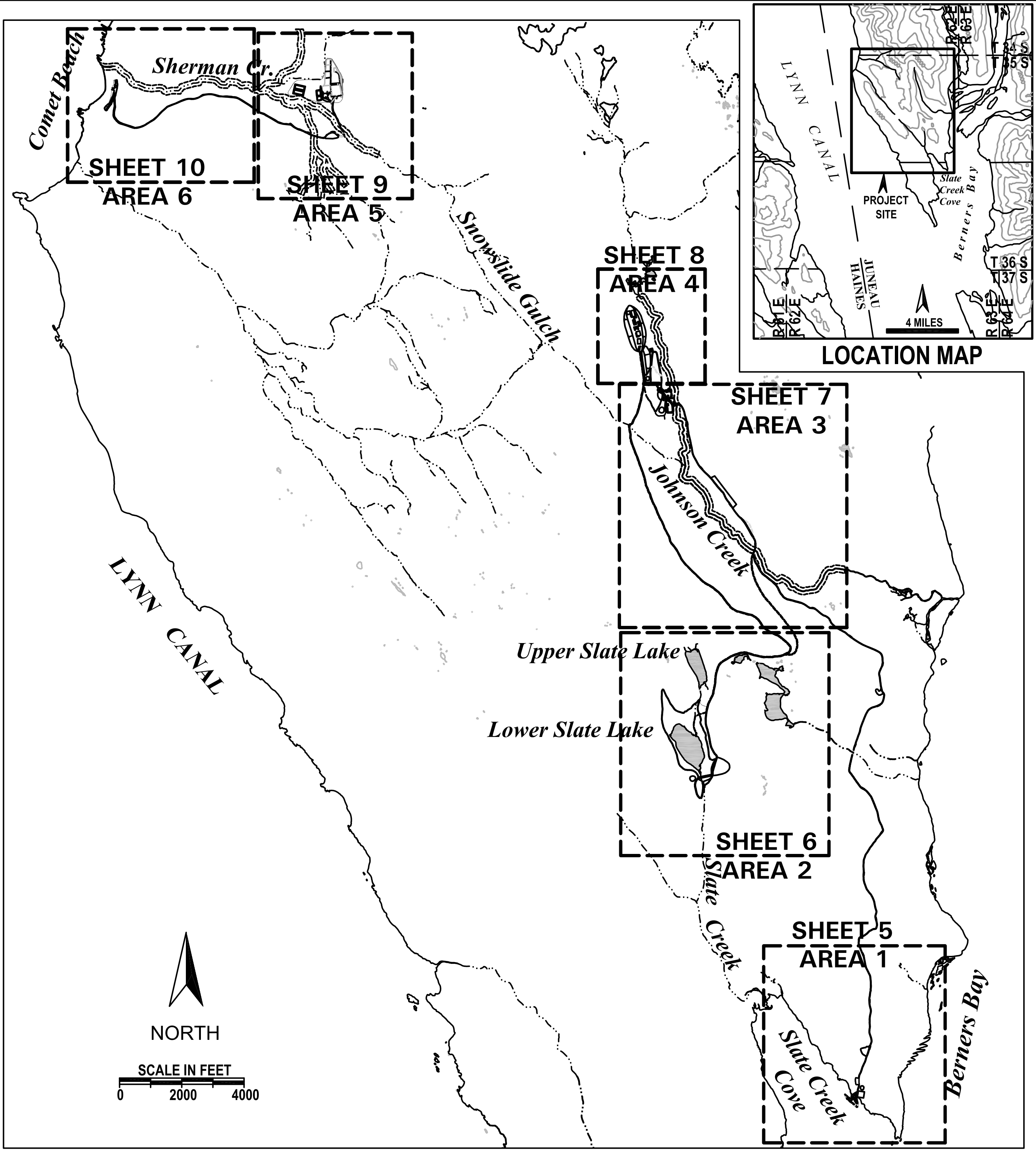
RTRO Resource Management, Inc.

SCALE: AS SHOWN

DRAWN: *JASPER GEOGRAPHICS*

LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU

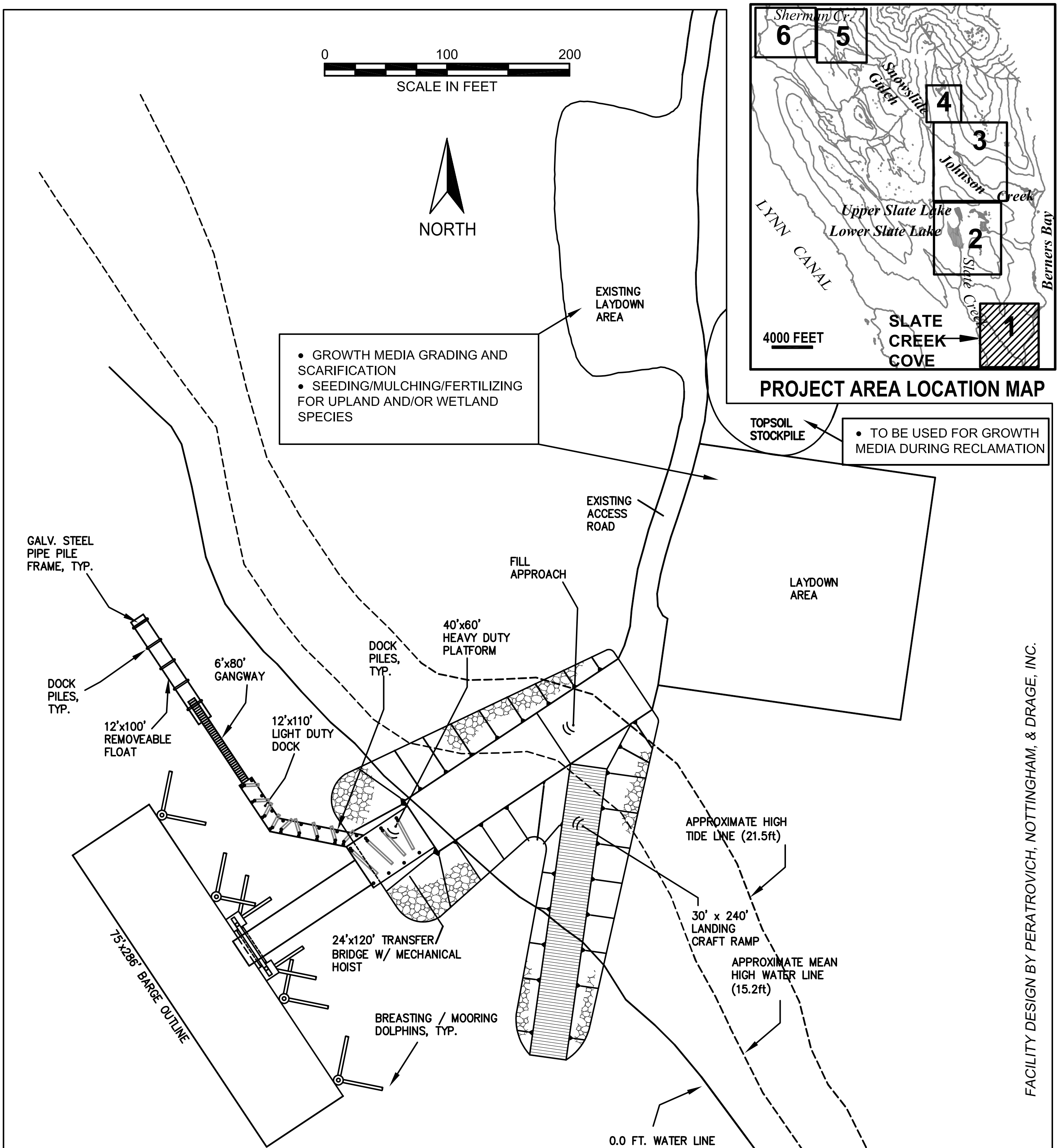
DISTURBANCE ACREAGES
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



SHEET BOUNDARIES

SHEET 4 OF 10		DATE: JUNE 2004
RTRC Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

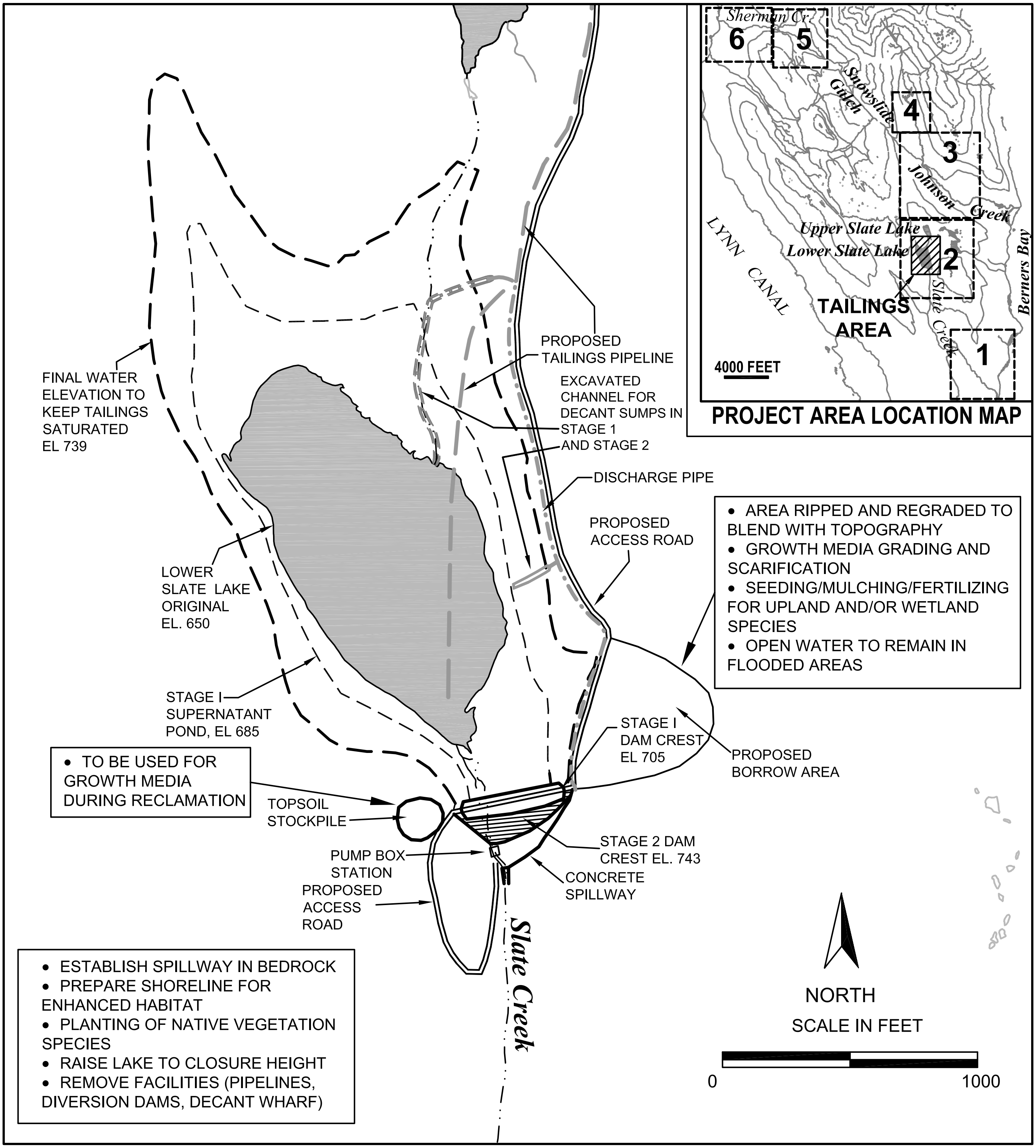
SHEET INDEX FOR PROJECT AREAS
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



- ALL FACILITIES TO BE REMOVED
- CONCRETE SLABS <1 FOOT THICK, BROKEN AND BURIED
- CONCRETE SLABS >1 FOOT THICK, FILLED/COVERED IN PLACE
- BENCH AREA RIPPED AND REGRADED TO BLEND WITH TOPOGRAPHY
- GROWTH MEDIA GRADING AND SCARIFICATION
- SEEDING/MULCHING/FERTILIZING FOR UPLAND AND OR WETLAND SPECIES

SHEET 5 OF 10		DATE: JUNE 2004
RTR Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

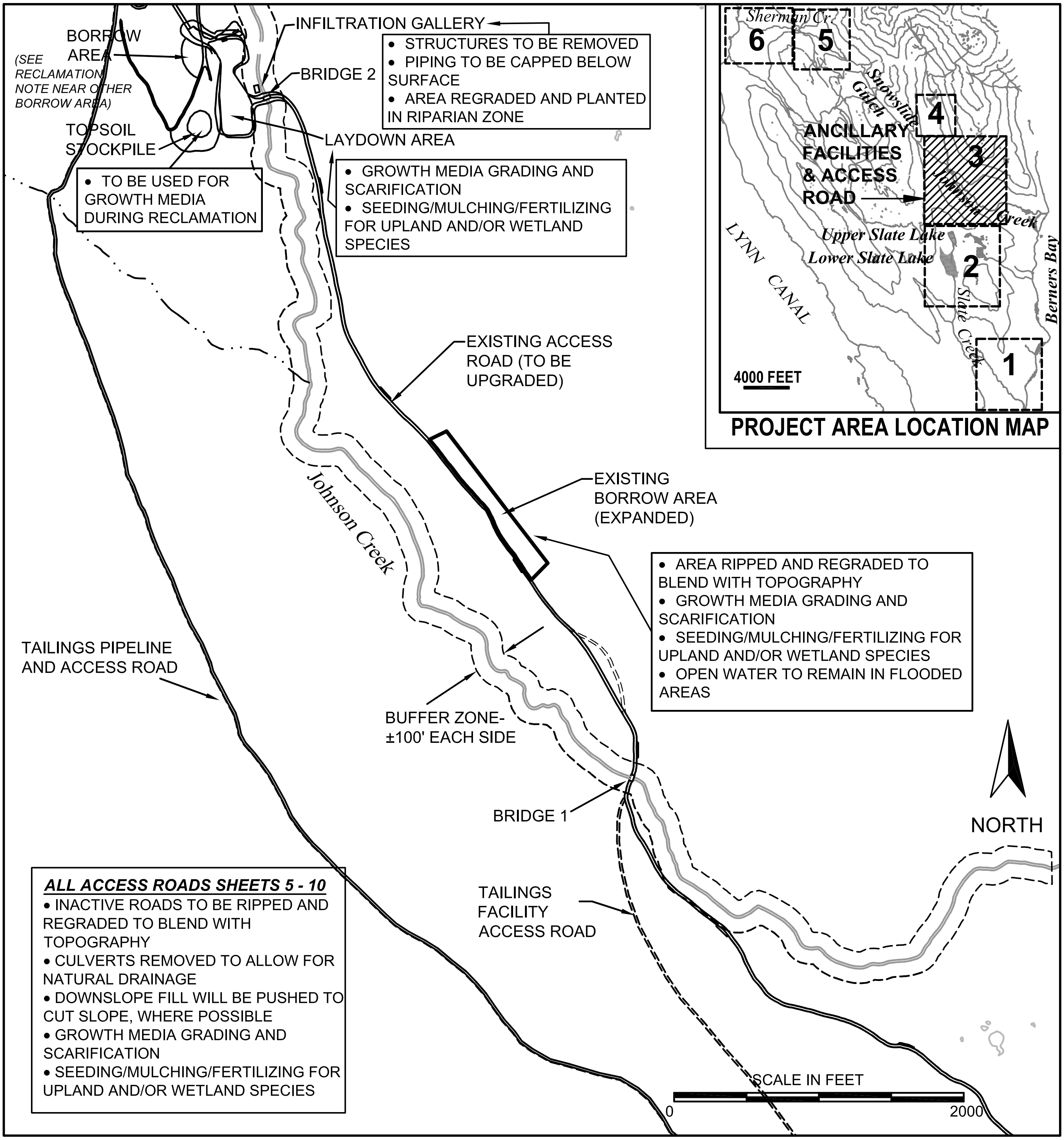
AREA 1-SLATE CREEK COVE MARINE FACILITY
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



SHEET 6 OF 10		DATE: JUNE 2004
RTRO Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

AREA 2 - TAILINGS STORAGE FACILITY
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA

SLATE CREEK TAILINGS STORAGE FACILITY BASED ON DESIGN PREPARED BY KNIGHT PIESOLD CONSULTING FOR COEUR ALASKA, INC.

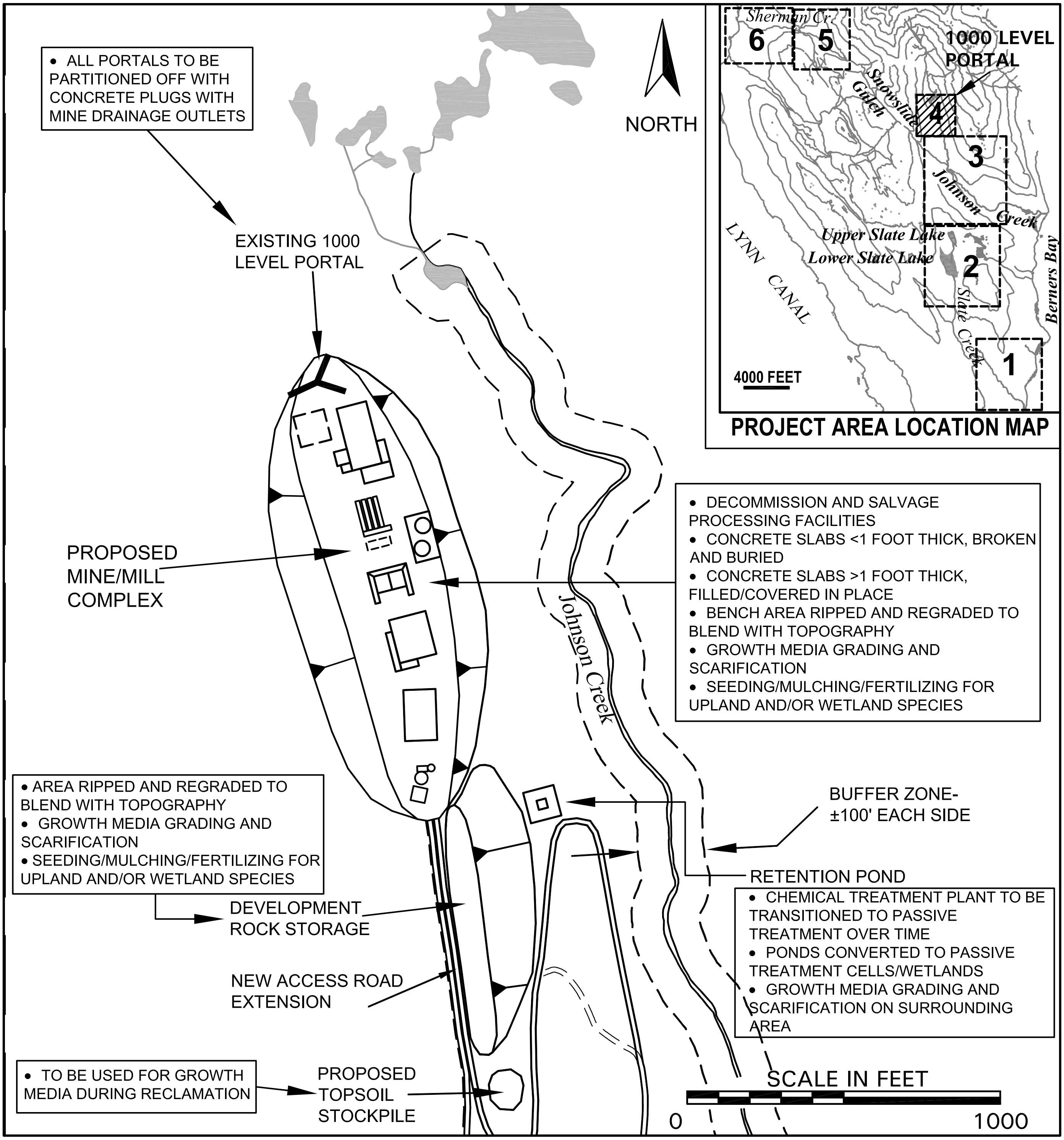


SHEET 7 OF 10		DATE: JUNE 2004
RTRO Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

AREA 3-ANCILLARY FACILITIES & ACCESS RD.

KENSINGTON GOLD PROJECT - RECLAMATION

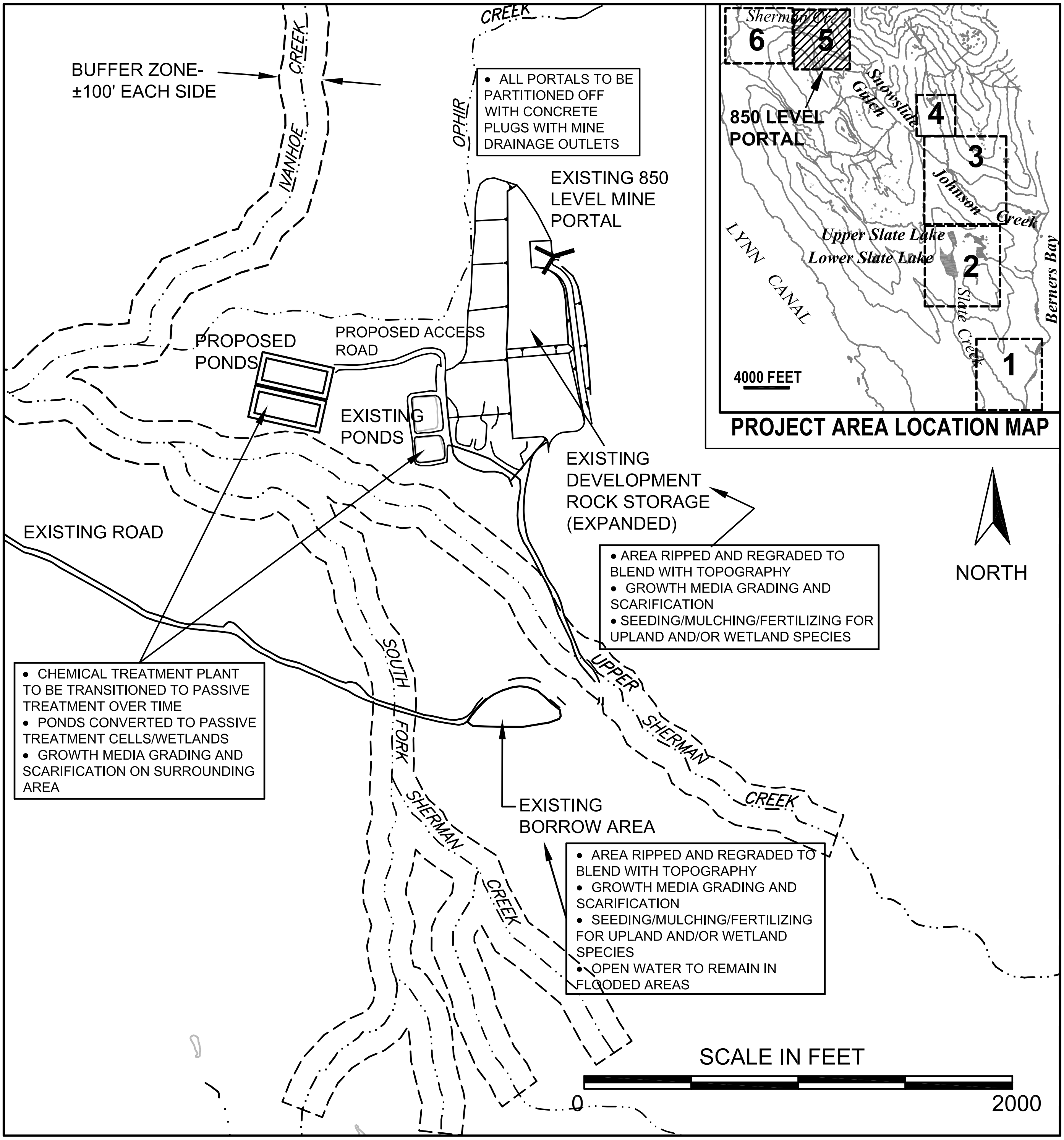
BERNERS BAY, ALASKA



SHEET 8 OF 10	DATE: JUNE 2004
SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

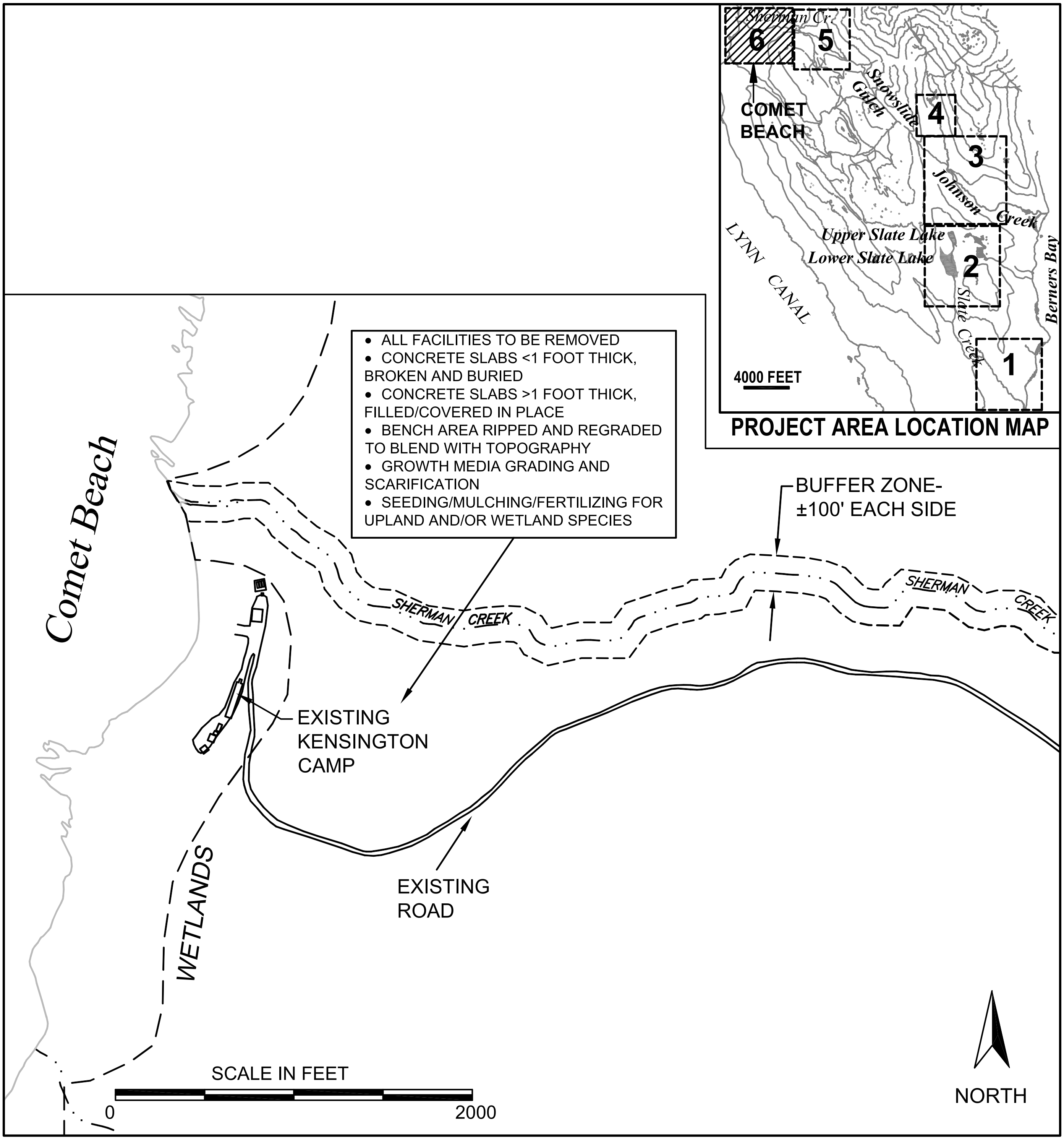
RTRO Resource Management, Inc.

AREA 4 - 1000 LEVEL PORTAL
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



SHEET 9 OF 10		DATE: JUNE 2004
RTRC Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

AREA 5 - 850 LEVEL PORTAL
KENSINGTON GOLD PROJECT - RECLAMATION
BERNERS BAY, ALASKA



SHEET 10 OF 10		DATE: JUNE 2004
RTRC Resource Management, Inc.	SCALE: AS SHOWN	DRAWN: *JASPER GEOGRAPHICS*
	LOCATION: T.35S., R.62E., CITY & BOROUGH OF JUNEAU	

AREA 6 - COMET BEACH

KENSINGTON GOLD PROJECT - RECLAMATION

BERNERS BAY, ALASKA

Appendix E

Best Management Practices and Mitigation Measures

Appendix E: Best Management Practices and Mitigation Measures

The following best management practices (BMPs) and mitigation measures have been identified either as part of permit applications or in the SEIS. The focus of these BMPs and mitigation measures is to reduce the sources and likelihood of a spill into the marine environment, limit the extent of a spill that might occur, and ensure a rapid response in the event of a spill. This appendix includes Coeur's Draft Spill Response and BMP Plan and Coeur's Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan.

Goals and Objectives

- Avoid incremental water quality impacts on Berners Bay.
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species.
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove to facilitate fish passage and intertidal flushing at the facilities.

Standard Operating Procedures

- A Storm Water Pollution Prevention Plan (storm water management control practices, measures to reduce pollutants in storm water, Spill Prevention, Control, and Countermeasures [SPCC] Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) will be implemented at the two dock sites.
- Controls for erosion and sediment, containment, oil and grease separation, storm water diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade Point and Slate Creek Cove transport facilities, and by boat operations serving the project.
- BMPs for boats and docks will include the following**:**
    - ✓ Provide designated work area(s) for outside boat repairs and maintenance. No maintenance would be permitted outside these areas.
    - ✓ Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area (upland area(s) required).
    - ✓ Perform maintenance over tarps to ease cleanup at these upland maintenance areas.
    - ✓ Provide upland cleanup areas with adequate storm water management facilities.
    - ✓ Use oil and water separators for storm water collection and treatment, as appropriate.
    - ✓ Inspect storm water drainage and washing systems regularly at these upload sites.
    - ✓ Require (contractually) that service providers and users abide by approved BMPs at the two docks.
    - ✓ Develop and implement standard operating procedures BMPs for the management of all solid waste associated with the dock and boat transport facilities, including recycling, compacting, and reuse as appropriate.
    - ✓ Use flyers, pamphlets, and newsletters to raise operators' and passengers' awareness of need to implement BMPs.

- ✓ Provide and maintain appropriate storage, transfer, containment, and disposal facilities for all liquid and solid wastes generated by the mine transportation operations.
- ✓ Separate containers for disposal and clearly mark them for used antifreeze, oils, greases, solvents, and other materials.
- ✓ Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code. (Designated storage areas should be covered and the inside area sloped to a dead-end sump with total containment provided; all drains are to be equipped with positive control valves or devices.)
- ✓ Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container.
- ✓ Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors.
- ✓ Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur, and attendance will be mandatory.
- ✓ An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: (1) Cascade Point dock, (2) Slate Creek Cove dock, and (3) the mine site.
- ✓ Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters.
- ✓ Regular inspection of fuel lines and hoses for chaffing, wear, and general deterioration is required (replace with USCG Type A).
- ✓ Non-spill vacuum systems for spillproof oil changes or to pump out oily bilge water are required.
- ✓ Engines must be tuned and operating at peak efficiencies.
- ✓ Waste oil must be removed from the maintenance site by a permitted waste oil transporter.
- ✓ Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary.
- ✓ All sewage must be disposed of at approved land-based facilities.
- ✓ Use of biodegradable treatment chemicals in holding tanks is required.
- ✓ Use of low-phosphate detergents to reduce phosphorus loads to approved treatment systems is required.

Other Construction and Operational Requirements

- The following construction BMPs will be implemented at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the facilities:
  - ✓ Limit fill placement in subtidal areas to the extent practicable to minimize effects on marine fish rearing habitat.
  - ✓ Use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment.

- ✓ Prohibit the use of creosote- or pentachlorophenol-treated wood materials that would have contact with the water in order to avoid toxic effects on juvenile fish.
- ✓ Promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks, and gangways) to facilitate light penetration for aquatic plants.
- ✓ Restrict the use of impact hammers to the extent practicable, from a scheduling, engineering, and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity.
- ✓ Fueling of Coeur marine transport vessels will occur at Slate Creek Cove dock or the Auke Bay transit/maintenance site.
- ✓ Implementation of a strategic spill prevention and response plan at the dock sites and mine site, as described earlier in this document.

Kensington Gold Project

SPILL RESPONSE and BMP PLAN

Including the

EMERGENCY RESPONSE PLAN

(Preliminary Draft)

Prepared by
RTR Resource Management, Inc.

for
Coeur Alaska Inc.

Version 0 – October, 2004

Annual Certification:________________________________Date:_______________
Signature Required

Table of Contents

Kensington Gold Project – Spill Response and BMP Plan

Figures:

Appendices:

INTRODUCTION

This document has been prepared for inter-agency review and comment. It is not intended to serve as a replacement document for any one of the four existing plans, listed below, that cover the current configuration of the Kensington Gold Project:

1. Marine Transfer-Related Facility Response Plan (USCG);
2. Spill Prevention, Control, and Countermeasures Plan (USEPA);
3. Emergency Response Action Plan (ADEC); and the
4. Facility Operations Plan (USCG).

These documents have been incorporated into a unified Facility Response Plan as required by 33 CFR 154, Subpart F for marine transportation-related facilities. As dictated, these plans and associated facilities are required to be reviewed by a Registered Professional Engineer and will be updated to include the revised facilities at Kensington once they have been constructed.

The following document has been designed to incorporate all of the considerations for the transportation, handling, and storage of hazardous materials for the optimized Kensington Gold Project as described in the Draft Supplemental Environmental Impact Statement for discussion purposes only. Special planning serves as partial mitigation to minimize the effects associated with handling these materials and responding to accidents or spills in this remote area in a timely manner and this document serves as a mechanism to receive regulatory agency comments and considerations for Standard Operating Procedures adopted for the Kensington Gold Project. Recently Coeur Alaska has distributed the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004),* for comments in the same manner that this document is being distributed.

There are two main sections to this document: the Emergency Response Plan and the Spill Prevention and Response Manual. The Emergency Response Plan appears in Section 1 as it was considered the most time critical section, first to be seen upon opening the document. It is intended that the Emergency Response Form, on the inside front cover of this document is the only piece of paper required to systematically gather and report the required information in the event of an emergency situation. All potential users of this document must be made

aware that in an emergency, only the Emergency Response form needs to be completed initially. The Spill Prevention and Response Manual, Section 2, first lists the industry standard preventative measures required when storing bulk materials at the facility, then identifies the potential risks to the environment, and finally suggests appropriate mitigation for the identified risks.

Section 1 – Emergency Response Plan

The FIRST ACTION in the event of an emergency is to comply with the Emergency Response Form located inside the front cover of this document. Do not read any further, please refer immediately to the Form on the inside cover of this binder.

This section of the plan is to document the systematic approach that will be taken by Coeur Alaska personnel to respond to accidents along the regularly traveled corridor to access the minesite. The response plan is targeted towards personal injury and/or spills as defined in the following section and on the Emergency Response Form located inside the front cover of this document.

These plans must **only** be located at:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk.

There shall **only** be 4 copies of this document in existence and each of the documents must receive the same update information (i.e. be of the same version and date as shown in the footer of each page). Updating this document is the responsibility of the Environmental Manager.

The first person to learn of the accident and refer to the Emergency Response Plan assumes the role of Incident Commander and must comply with the form inside the front cover.

1.1 Emergency Action Form for Accidents and Spills

All employees of Coeur Alaska will be made aware that there is an Emergency Response Form located immediately inside the front cover of this document. The purpose of the Form

is to streamline the gathering and reporting of accurate information to provide to the appropriate response agency(ies) and the appropriate Coeur Alaska staff. Subsequent follow-up reporting, once the emergency situation has been attended to, is the individual responsibility of the environmental and safety managers, as described in Section 1.5.

1.2 Identification and Notification of Spills

A spill is defined as "any discharge of hazardous materials or special waste upon land or into waters of the State of Alaska". This would include accidental spills involving discharge outside of a defined total containment system to the environment.

Per state regulation 18 AAC 75.300 releases of hazardous substances other than oil, or discharges of oil to water, or discharges in excess of 55 gallons of oil outside of a containment area require immediate notification. Releases in excess of 10 gallons, but less that 55 gallons of oil to land require notification in 48 hours.

The policy of Coeur Alaska will be to comply with all ADEC and federal regulations by responding and reporting all of the minor and major spills occurring as a result of Coeur Alaska operations.

1.3 Incident Command System

Once an emergency is discovered, one of the 4 Emergency Response Plan locations will be contacted:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk

Once contact has been established, that person, equipped with the Emergency Response Plan will refer to the Emergency Response Form and assume the role of Incident Commander. The Incident Commander then becomes responsible for completing, or assigning the tasks listed on the Emergency Response Form located in the front cover of this document. The

acceptance and potential transfer of the role of Incident Commander is documented on the Emergency Response Form by signature.

1.4 Product Characteristics

The potentially hazardous materials that will be transported to the Kensington Gold Project site include: lime, cement, diesel, hydraulic fluid, oils and greases, anti-freeze, acids, reagents (PAX, MIBC, surfactant, scale inhibitor), polymers, and flocculants.

Each potential hazardous material has an updated Material Safety Data Sheet located in Appendix 4. These sheets should be consulted in the event of an accident to determine if any special precautions or handling requirements are warranted.

1.5 Standard Reporting Form and Contact Information

The responsibilities of the Incident Commander filling out the Emergency Response Form are defined to immediately attend to any reported incidents of personal injury and spills that could potentially degrade waters of the State.

Follow-up post-emergency reporting is deferred to the appropriate environmental and safety managers with Coeur Alaska. Their responsibilities are to determine the extent of reporting required for the incident and contact the appropriate agencies to comply with required incident reporting. Emergency reporting for releases of hazardous materials other than oil, discharges of oil to water, and discharges greater than 55 gallons of oil outside of secondary containment is required to be submitted to the Alaska Department of Environmental Conservation (Appendix 2 – Spill Report Form) and incidents of personal injury require reporting to MSHA.

Once the Mine Manager has been notified of the incident, all subsequent notices to company personnel and others are the responsibility of the Mine Manager. The Incident Commander does not release any information to the public or media.

Subsequent to any accident, Coeur Alaska personnel will commit to completing and documenting a formal post-accident review to ensure that any changes to the existing

operating and response procedures that are warranted, will be implemented. The Safety Manager will also be included in the debriefing session to evaluate the cause of the accident with the intent to rectify any identified contributing issues.

Coeur Alaska will commit to an annual review of all planning and response documents, to be certified by signature on the front cover of this document.

Section 2 – Spill Prevention and Response Manual

As described in the previous section, Coeur Alaska is committed to providing employees, contractors, and suppliers with the skills and knowledge required to ensure that the maximum effort is afforded to spill prevention and response. The following text describes the specific actions to be taken by Kensington staff.

2.1 Prevention Programs and Training

All employees of the Kensington Gold Project are covered by the regulatory jurisdiction and training requirements of the Mine Safety and Health Administration (MSHA) while engaged in their normal work duties. Training for all employees, contractors, and suppliers working onsite, will include emergency response for accidents and spills as well as spill response containment and clean-up as part of the required MSHA hazard training requirements. All personnel that would be exposed to petroleum or chemical products, or assisting in the clean-up of petroleum or chemical products, will be tasked trained according to the following programs.

2.1.1 Prevention Training Program

All employees using petroleum products stored at the Kensington Gold Project, or involved in maintenance of petroleum storage and dispensing systems, will receive training and instruction in the areas of:

1. Operation and maintenance of equipment necessary to prevent unintended discharges.
2. The location and use of spill containment and cleanup supplies.
3. Applicable pollution control laws, rules, and regulations.
4. Discharge prevention.
5. Changes pertaining to any of the above items.

Employees handling, using, or who are otherwise exposed to petroleum products will also receive training in accordance with applicable MSHA (30 CFR 48, 57) and Occupational

Safety and Health Administration (OSHA), Hazard Communication regulations (29 CFR 1910.1200). This training will address:

1. Hazards
2. Appropriate work practices, procedures, and protective equipment to be used during both normal operations and in the event of a foreseeable emergency.

Employees designated or expected to perform emergency response functions for releases of hazardous substances (including petroleum products) will receive training as required by OSHA (29 CFR 1910.38).

Training will be conducted by supervisory personnel, and/or training program contractors according to the following table.

Table 1 - Kensington Annual Training Schedule

Position	Type of Training				
	Hazwoper	Oil Spill Response	Confined Entry	Incident Command	Wildlife Hazing
Key Managers	24 hour, 8 hr Annual refresher	Annual with drills	For selected personnel	Initial training, Annual refresher	Initial training, Annual update
Facility Response Personnel	As above for all response personnel	As above for all response personnel	For selected Personnel	As above for all response personnel	For selected personnel
Contractors and Suppliers	Required for selected personnel	Initial Training, Annual Refresher	For selected personnel	Initial Training, Annual Refresher	Upon introduction to the project

All personnel who have spill response duties as part of their job function will be trained at the time they first report for work. Employees transferring to new job functions which have oil spill response duties will be trained at the time they assume their new responsibilities.
Any changes or new information concerning discharge prevention and operational and emergency procedures for petroleum storage and dispensing systems will be communicated to all affected employees by either memoranda, routine safety meetings, and/or supplemental

training sessions. Training sessions will be recorded and filed in the safety department's filing system.

2.1.2 Drug and Alcohol Abuse Program

Accidents are often a result of human error due to poor judgment or delayed response caused by the effects of drugs or alcohol. Coeur Alaska's zero tolerance drug and alcohol abuse program is presented below. Contractors and Suppliers will also be required by signed contract to abide by the Program as described below:

Statement of Policy

To ensure a safe and productive work environment at all Coeur Alaska facilities and to safeguard Coeur Alaska employees and property, Coeur Alaska strictly prohibits the use, sale, transfer or possession of alcohol, drugs, or controlled substances or the presence of an illegal drug, illegal drug metabolite, or alcohol in the employee's system, on any Coeur Alaska premises, work sites, or during work time. Excluded are prescribed drugs when used in the manner, combination, and quantity intended unless job performance could be affected. This policy applies to all personnel, including supervision and management. Compliance with this policy is required as a condition of continued employment. Any employee found in violation of this policy will be terminated. Depending on the circumstances, other actions, including notification of appropriate law enforcement agencies, will be taken in response to a violation of the policy.

Purpose

The purpose of this policy is to outline standards and procedures for dealing with employee and drug abuse. Substance abuse has been linked to numerous on-the-job accidents. Employees not only endanger themselves when they are impaired, but also their fellow workers. Providing a safe work place is a strict policy of Coeur Alaska. To avoid the many problems that result from employee substance abuse, Coeur Alaska maintains a zero tolerance drug and alcohol policy.

In order to provide high quality service and a safe and efficient work environment, Coeur Alaska requires its employees to report to work fit to perform their jobs. To ensure this,

Coeur Alaska has established the following policies and procedures dealing with employee drug and alcohol abuse:

Definitions

Alcohol or Alcoholic Beverages: "Alcohol" means beer, wine, and all forms of distilled liquor containing ethyl alcohol. References to the use of, or the possession of alcohol, include the use or possession of any beverage, mixture, or preparation containing ethyl alcohol.

Drug: Any substance (other than alcohol) that has known mind- or function-altering effects on a person, including psychoactive substances, and substances prohibited or controlled by State and Federal controlled substance laws.

Prescribed Drug: Any substance prescribed by a licensed medical practitioner for the individual consuming it.

Under the Influence: Being unable to perform work in a safe and productive manner, being in a physical or mental condition which creates a risk to the safety and well being of the individual, other employees, the public, or Coeur Alaska's property. The symptoms of influence and/or impairment are not confined to those consistent with misbehavior or to obvious impairment of physical or mental ability such as slurred speech or difficulty in maintaining balance.

Inspections and Searches

Coeur Alaska's vehicles, lockers, desks, filing cabinets, files, etc. remain the property of Coeur Alaska and will be subject to Coeur Alaska initiated searches at any time and without notice.

Employees and their possessions, including their vehicles located on Coeur Alaska property, are subject to Coeur Alaska initiated searches at any time and without notice if management has reason to suspect that any employee(s) will be in violation of the terms of this policy.

Employee Substance Abuse Tests

In order to assure compliance with Coeur Alaska's prohibition concerning alcohol and drug use and as a condition of continued employment, employees are required to cooperate in drug and/or alcohol substance abuse testing procedures. Any employee who refuses to cooperate in any aspect of the drug and alcohol testing process described in this policy will be terminated.

Urine/blood testing of employees will be conducted in accordance with the following:

A. Periodically, upon the approval of the corporate Administrative Manager Resources and without reason for suspicion of abuse, any or all employees at a particular facility will be tested for drug and alcohol usage without advance notice.
B. Upon reasonable suspicion that drugs or alcohol are being used at a particular facility, department, or work group, any or all employees at the facility, department, or work group will be tested without advance notice.
C. When company officials have a reasonable suspicion that an employee(s) is/are intoxicated or under the influence of drugs and/or alcohol, a test will be conducted immediately without advance notice.

The following are examples of reasonable suspicion, as that phrase is used in this policy:

(1) Reports of drug or alcohol use from police, customers, other employees, or other individuals.
(2) Observation by supervisor that an employee is apparently under the influence or impaired by drugs or alcohol and not fit for duty.
(3) Ongoing work performance problem.
(4) Rule violation that created a dangerous situation.

After testing of an employee for reasons B. and C. stated above, that individual will be suspended without pay until the test results have been received by the Human Resource Department. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results. If the results are positive, the employee will be terminated. Post-accident drug and/or alcohol testing of employees will be conducted in accordance with the following:

A. An employee involved in an accident, injury, or safety violation will be required to submit to a drug and/or alcohol test immediately. An employee shall be tested under the following circumstances:

    1. After any work-related accident resulting in damage exceeding $1,000.
    2. After any work-related injury.
    3. After any work-related safety rule violation.

After testing of an employee for reasons stated above, that individual will be suspended without pay until the test results have been received by the Human Resources Manager. Each injury or accident will be evaluated by the supervisor and the Safety Department. It will be left to their discretion as to whether the employee will be suspended.

If the employee is suspended and test results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension. In the event disciplinary action is taken pursuant to the incident, the pay will be forfeited.

B. All employees who were in the vicinity of a work-related accident, injury, or safety rule violation, and who, in the opinion of the supervisor, will have contributed to such accident, injury, or violation, shall also be required to submit to a drug or alcohol test.
C. An employee testing positive will be terminated.
D. An employee who refuses to cooperate in drug and/or alcohol testing procedures will be terminated.

An employee required to submit to blood or urine specimen for testing shall be informed by a designated Coeur Alaska representative of the reason why he/she is being requested to submit a specimen. An employee who refuses to cooperate in drug and alcohol testing procedures will be terminated.

Tests shall be accomplished through analysis of a blood or urine sample and /or any other testing method recommended by the designated medical clinic. All specimens will be obtained from the employee by an authorized representative designated by Coeur Alaska. A supervisor or designated representative will escort the employee to the authorized Coeur Alaska representative and the employee's cooperation with the collection procedures will be required.

Coeur Alaska will have the specimen identified and tested by a competent laboratory for the presence of drugs and/or alcohol.

Confidentiality

The Human Resources Department will receive all test results. The appropriate department manager will be notified of results strictly on a need-to-know basis.

No laboratory results or test results shall appear in a personnel folder. Information of this nature will be included in a medical file with a marker to appear on the inside cover of the personnel folder to show that this information is contained elsewhere.

Use of Results

If the test results are positive for any substance, Coeur Alaska will notify the employee(s) of the results.

A positive result to a drug or alcohol test will result in termination. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results.

If test is positive, an employee will be provided an opportunity to explain the presence of the identified substance. In the absence of an acceptable explanation, the employee will be terminated immediately.

Pre-Employment Substance Abuse Tests

Each applicant who is given favorable consideration for a position in Coeur Alaska will be subject to Coeur Alaska's drug and alcohol policy.

An applicant who refuses to submit to pre-employment testing when requested, or refuses to sign Coeur Alaska's drug testing policy consent form, will not be employed.

Coeur Alaska will notify the applicant of the results of any test taken that is positive for any substance included in the procedure. In the case of a positive result, Coeur Alaska will provide the applicant with an opportunity to explain the presence of the identified substance prior to taking any action on the application for employment. In the absence of an acceptable explanation, an applicant with a positive test result will not be employed.

Use of Prescription and/or Over-the-Counter Drugs

In the event an employee is under the care of a physician and taking prescribed medication which might impair his or her ability to perform a job, the employee must notify his or her manager in advance. It is at management's discretion whether the employee will continue to perform the normal assigned duties.

When taking a prescribed drug, the employee must provide a statement from his/her doctor advising that the employee's job performance is not materially affected by the drug prescribed. the doctor's statement will also describe what restrictions will be put on the

employee to ensure that the employee does not pose a threat to his/her own safety, the safety of co-workers or the public.

In those circumstances where the use of a prescribed or over-the-counter drug is inconsistent with the safe and efficient performance of duties, an employee will be required to take sick leave, a leave of absence, or other action determined to be appropriate by Coeur Alaska management.

2.1.3 Medical Monitoring Program

All personnel engaged in facility fuel transfer operations, handling of hazardous materials, and spill response duties, will be monitored by the Safety Officer to ensure their ability to safely perform their job assignments based on their general physical condition as determined by the pre-hire physical and periodic assessment by the Safety Officer.

2.1.4 Security Policies and Practices

The Kensington Gold Project is located in a remote area. Warning signs will be posted at points of entry and Kensington Gold Project personnel will inspect the operations to keep unauthorized persons from entering the facility.

It is not expected that vandalism, unauthorized entry or sabotage will be a problem as the Kensington Gold Project is remote, access is limited, and personnel are on-site 24 hours per day, and will conduct inspections of the facility as part of the normal operational routine. A check of the fuel storage and dispensing areas, and oil storage systems, is part of these regular inspections.

The following operational procedures will help ensure facility security.

- Close and lock all valves
- Close and lock all electrical panels
- Close and lock all doors to pump rooms, generator buildings, and other spaces related to the operation of fuel facilities
- Inspect facility product lines, valves and connections on a routine daily basis
- Verify that all yard lighting is functional on a daily basis.

2.1.5 Storage Vessel Requirements

Tank design, fabrication, and erection shall be in accordance with the applicable portions of the following standards:

- API Standard 650
- American Society of Civil Engineers Standards for Tank Construction
- 1991 Uniform Building Code Guidelines on Tank Construction and Foundations
- 1991 National Fire Protection Association Guidelines
- UL specifications for above-ground self-contained oil storage tanks

In addition all vertical welded tanks shall be designed and constructed for compliance with UBC Seismic Zone 3 and Wind Shear Load Category C (100 mph).

2.1.5.1 Corrosion Control and Leak Detection

In accordance with API 651 principles, corrosion protection for the tanks will not be warranted. The tanks will not come into contact with any soils and no pathways of conductivity exist between the tank bottoms and potential sources of corrosion.

All single wall tanks will be located within secondary containment structures and impervious 30-oz/square yard polymer coated polyester liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment structure sidewalls. The floor of each containment structure slopes to a collection ditch at one end of the containment.

Vertical welded steel tanks are mounted within the secondary containment structures on concrete ring wall foundations with oiled sand pads supporting the tank floors. The oiled sand pads are installed on top of impervious liners that are sealed to the inside surface of the ring walls to provide under floor containment. Any tank floor leaks will discharge to the oiled sand pads and then drain to the secondary containment structure via 1" HDPE drainpipes cast into the ring walls.

Horizontal welded steel tanks are mounted within the secondary containment structures on concrete slabs to which the impervious containment liners are sealed.

A release from either vertical or horizontal tanks would be detected visually during daily visual inspections of the secondary containment structures.

2.1.5.2 Overfill Protection

Overfill protection for all tanks will be designed in accordance with API Recommended Practices 2350, Overfill Protection for Petroleum Storage Tanks.

Bulk storage tanks will be equipped with a visual float level gauging system that shows the actual fluid level inside the tanks. The indicators shall be clearly visible and easily read from ground level outside the tank during routine inspections, tank inventory, and fuel transfer operations.

Each bulk tank shall also be equipped with an independent automatic overfill alarm and transfer pump shutdown system, that uses liquid level floats to activate audible alarms and emergency shutdown of internal transfer pumps. A pre-alarm level shall be set at 95% of the working fill height. When fuel level reaches this height a pre-alarm condition shall be initiated during which an audible alarm sounds and an indicator light is energized on the control panel. The pre-alarm light and audible alarm can be reset only by Kensington Gold Project personnel at the control panel. When fuel level reaches working fill height a second float initiates an alarm condition during which a second alarm and light are energized and all facility in-line transfer pumps are shut down. Resetting of this alarm condition shall be possible only after the level in the tank drops below the working fill level.

All double-walled or self-diked tanks shall be equipped with overfill limiter valves set at 95% of tank capacity and shall have locking fill-containment pans fitted to the fill pipes.

2.1.5.3 Secondary Containment

All single wall tanks are located within secondary containment structures and impervious liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment sidewalls. Each secondary containment structure is sized to contain 110% of the capacity of the largest tank retained by the structure.

The floor of each containment structure is sloped to drain toward a collection ditch at one end. Accumulated precipitation will be removed as necessary by site personnel by operating a normally closed and locked drain valve. Only water that is free of any sheen will be discharged from each containment structure. Containment drainage will be discharged to the facility stormwater management system, which is operated in compliance with EPA BMPs.

Truck load-in/load-out facilities are located adjacent to three of the bulk storage areas. Each truck load-in/load-out facility is equipped with a catchment system that drains to an integral containment tank sized to hold the volume of the largest single compartment of the tank truck. The containment tank is visually monitored by Kensington Gold Project personnel during routine operations and manually pumped to the adjacent bulk storage secondary containment structure whenever necessary.

All day tanks located outside of the secondary containment areas will be self-diked steel tanks that provide full secondary containment.

2.2 Potential Discharge Risk Analysis

The following materials are considered to be most at risk for release to the environment:

Petroleum Product	Individual Capacity	Material of Construction	Manufacture Date	Potential Type of Failure	Secondary Containment
diesel, gasoline	6,500 gallons	Stainless steel cylinder in metal box	N/A	rupture, pierce or overturning	lined, bermed laydown area
gasoline, lubrication oils/greases, hydraulic oils	55 gallons	steel drums	N/A	rupture, pierce or overturning	lined, bermed laydown area

Typically, barges 286 feet long by 75 feet wide will be used to import petroleum products to the site. Unloading of materials will be by a roll-on, roll-off forklift transfer system.

2.3 Receiving Environment Risk Analysis

There are two receiving environments that are subject to the highest degree of risk for the potential release of hydrocarbons: Johnson Creek and the intertidal zone at the marine terminal facilities.

Two bridges cross Johnson Creek while transporting petroleum, and other hazardous materials, to the minesite. Accidents and potential discharges here will require rapid response and specialized equipment. To address this issue, portable spill containment equipment will be stored and readily available at these two bridge locations. Rapid response equipment will also be cached at the stormwater collection pond located at the toe of the process area, which would accept any contaminated runoff from accidental discharges at this facility.

Spill response equipment will also be readily available at each marine facility to shorten the response time of discharges to the intertidal zone.

2.4 Response Strategies and Safety Considerations

This section discusses measures for hazardous material, spill prevention, control and countermeasure plans, as currently planned for the Kensington Gold Project. The project is currently undergoing a NEPA analysis (EIS), and final feasibility study. The plan described herein is, therefore, conceptual by necessity. Once the FEIS and Record of Decision are completed, a final plan will be developed for inclusion into the Final Plan of Operations.

Applicable regulations include the Federal Oil Spill Prevention Regulations (40 CFR Part 112) designed to help prevent spills, and US Department of Transportation regulations that govern oil transport and carriers, the Emergency Planning and Right-to-Know Act (EPCRA which requires reporting of ‘reportable quantities’ of hazardous materials, and other applicable requirements. The objectives are:

- Reduce the risk of accidental spills to the environment, and related environmental degradation
- Provide the Kensington Gold Project with the necessary information to properly respond to diesel fuel and chemical spills

- Clearly define line of function responsibilities for a spill event
- Provide a concise response and clean-up program which minimizes environmental impacts

All observers to an accident or spill must first identify the mechanism of failure or accident and the materials involved to ensure that there is no danger by entering the discharge or accident area.

The sequence of events for anyone discovering a spill will be:

1. Determine the origin of the spill and identify the discharge material.

2. Stop the discharge as safely as possible, which includes closing valves, stoping pumps, and transferring fuel out of leaking tanks.

3. Safeguard human life by alerting unnecessary personnel to evacuate, shutting off power in the vicinity or path of a discharge.

4. Attempt for immediate containment if possible, including the use of boom and sorbents, blocking culverts and drains, and excavating trenches to redirect flow (Appendix 5 - Typical Spill Response Containment Procedures)

5. Reporting the spill by contacting one of the four Emergency Response Plan centers at the minesite noting material type and estimated quantity released.

A standard spill response form is presented in the document as Appendix 2 . It outlines the mandatory reporting needs for an accidental spill event. Key reporting requirements are:

- Date, time and physical conditions
- Location
- Occurrence situation
- Appropriate identification (person, vehicle, equipment)

- Nearest dwelling, water body, weather
- Extent of human exposure, injury
- Same for environmental
- Same for wildlife, fisheries
- Materials involved, container types
- Containment procedures, documentation
- Disposal procedures, documentation, chain of custody
- Environmental sampling
- Photo-documentation
- Signature of preparer.

A display of BMPs is presented later in Appendix 5 of this document.

Personnel involved in oil spill response activities at the Kensington Gold Project will comply with all applicable worker health and safety laws and regulations. Federal regulations include Mine Safety and Health Administration standards for mandatory health and safety as codified in 30 CFR for mining activities.

2.5 Final Notification and Reporting Required By Law

The following agencies must be notified if each of their respective thresholds are breached during a release of a hazardous material or petroleum product to water or land:

National Response Center: Sheen on water (releases to land are not reportable to the NRC)
ADEC: Sheen on water or, Releases to land 55 gallons
EPA: Water N/A, Land 1,000 gallons

The contact numbers for these agencies are listed in Appendix 3 in this document. Reporting to these agencies is the sole responsibility of the Environmental Manager at the Kensington Gold Project.

2.6 Transportation Impact Mitigation

2.6.1 Dust Control Measures

The application of water on roadways and exposed stockpiles serves as mitigation for dust control. Enhanced dust control is achieved with the use of surfactants that increase the retention time for applied moisture to the soils.

2.6.2 Soil Erosion Reduction

Remediation for sediment loading includes bank stabilization with revegetation, the use of BMPs described in Appendix 5, and primary treatment with settling ponds prior to water flow introduced into culvert.

2.6.3 Snow Removal and Maintenance

Unplanned snow removal has the potential to introduce additional sediment loading into the waterways unless disposal areas away from direct discharge areas have been planned and prepared in advance. At the Kensington Gold Project, snow cache areas will be designed into the road system to control snowmelt runoff.

2.6.4 Spill Response Equipment Stations

To address the risks identified in Section 2.2 and 2.3, and as remediation for unexpected spills, it is planned that spill response trailers will be placed at strategic locations along the traveled corridor where discharges of hazardous materials could directly enter the Johnson Creek system. Spill response equipment stations will also be located at each marine facility and at the process area siltation pond which accepts stormwater runoff from that area. Those stations will be equipped with significantly more boom for the marine area.

Spill kits will contain the following minimum equipment: Visqueen bags, silt fence and posts, shovels, life jackets, waders, gloves, rope, buckets, floating oil boom and sorbent pads.

Rapid response caches will be secured with a combination style lock with the code set to "1,2,3,4".

2.6.5 Marine Transportation

All of the fuel and supplies required for the construction and operation of the Kensington Gold Project are to be delivered via the Slate Creek Cove marine terminal. Consultation with regulatory agencies, special interest groups, and the public has identified several important considerations for the construction and operation of this facility which Coeur Alaska has formally adopted into the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004).* A key aspect of this plan, with respect to BMPs associated with the risk of fuel spills, is Coeur's commitment to "…build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period."

2.6.6 Cascade Point Marine Terminal Facility

Coeur Alaska is planning on contracting with Goldbelt to provide passenger ferry service from Goldbelt's proposed marine terminal facility located at Cascade Point. The terminal will be under the direct ownership and control of Goldbelt, however, as with all contractors providing services to the Kensington Gold Project, adherence to Coeur Alaska stipulations with respect to environmental protection and controls will be required.

The Cascade Point marine terminal is being designed to preclude the need for diesel fuel storage tanks for refueling the passenger ferries. Instead, an on-call fuel truck will be dispatched from Juneau as required to meet the fueling needs of the dedicated ferries. It is estimated that the refueling exercise will only require an average of one fueling per week. No other vessels will be refueling at the Cascade Point facility.

The fuel truck will tie into an upland fuel header located at edge of the parking lot area. The header will be located within a permanent structure secured by a locked

door on a bermed concrete pad to provide a non-permeable surface for containment of any spills.

A small diameter steel fuel pipeline will run from the header to the approach dock. It will be located above ground and away from any areas with vehicular traffic. The pipe will be mounted to the edge of the approach dock until reaching the gangway. A flexible hose connection will connect the pipe to an identical pipe section mounted on the gangway. Another flexible hose connection will join the gangway pipe to a pipe along a protected edge of the float dock. All flexible hoses will be protected by a flexible steel covering to limit the potential for vandalism.

At approximately mid-dock the fuel pipe connects to a hose reel. The reel is enclosed in a protective housing for security and weather protection purposes. The housing will be secured to a metal pan to capture any possible fuel drippings. At the end of the fuel hose is the nozzle.

<u>Standard Operating Procedures</u>

The actual transfer of fuel will be conducted under a standard operating procedure (SOP). The list of SOP's is as follows:

1. The fuel truck driver will connect the truck hose to the header. The driver will control and visually monitor the fuel transfer process at this location. Extra care will be taken to minimize any fuel leaks at the header connection.

2. The vessel engineer will do the actual fueling of the boat. The engineer will control and visually monitor the fuel hose nozzle during the transfer process. Extra care will be taken to prevent fuel spills at the nozzle location. The engineer will inform the fuel truck driver of the number of gallons to be transferred prior to starting.

3. The marine facility manager will supervise the overall fuel transfer process. It will be the manager's responsibility to ensure that all SOP's are being followed.

4. The truck driver, vessel engineer, and the marine facility manager will be in constant radio contact throughout the fuel transfer process.

Best Management Practices

A properly designed, constructed, and operated fuel transfer process with associated BMPs, should prevent releases of fuel to the environment. The BMPs for fuel transfer at the Cascade Point Marine Terminal are as follows:

1. All persons involved in the fuel transfer operation will be trained to follow the SOP's and the use of the identified BMPs.

2. A detailed spill response plan will be developed for the marine terminal facility (once the facility is constructed) and all personnel will be trained accordingly on the specific features of that facility.

3. Appropriate spill response equipment including various absorbent materials will be placed at the header and hose reel locations. The materials will be within easy reach in case of any spills. All used materials will be properly disposed of and replaced immediately.

4. A drip bucket will be hung below the fuel header connection. The bucket and the concrete pad will be kept in a clean condition.

5. An absorbent pad will be placed against the fuel nozzle while fueling and a drip bucket placed below the vent to catch any possible overflow.

6. The system will be inspected by the facility manager prior to each fuel transfer operation. In addition, the transfer system will be formally inspected and pressure tested on an annual basis. All maintenance and repair needs will be taken care of immediately in order to ensure continued trouble-free operation.

Appendix – 1
Original Emergency Response Form for Photocopying

EMERGENCY RESPONSE FORM – INJURY and SPILLS

First Incident Commander's Name:___________________________ Time:_______________
Second Incident Commander's Name:_________________________ Time:_______________

1. Information to gather from the observer:

Number of persons affected:____

Mechanism and Extent of Injuries:____

Location of Accident:____

Best Access Route:____

Know Hazardous Goods Involved:____

Quantity of Hazardous Goods Spilled (consult the emergency information in Appendix 4 &5 for any precautions or special handling procedures):__________________________________

Site Weather Conditions:____

Observer's Call-back Number:____

2. **Call the Medivac Operator at: (907) 789-1099 if there are reported injuries for their assessment. The Mine Location is: Lat. 58 degrees 46 minutes North, Long. 135 degrees 01 minutes West. Give them YOUR callback number. Dispatch an Coeur Alaska First-Aid Technician to the scene of the accident, if possible.**

3. **Call the Environmental Manager (or the on-call environmental contact) at: (907) 789-1591 to assess the required action for a spill of any size. Dispatch a Coeur Alaska environmental spill response team, if possible.**

   If the environmental contact person cannot be reached, and the spill is deemed to be potentially detrimental to the surface waters of the State, the following agency must be notified: ADEC 907 465 5340 (daytime) 1-800-478-9300 (after hours).

4. **Call the Safety Officer (or the on-call safety contact) at: (907) 789-1591 to assess any required further action.**

   If the Safety Officer cannot be reached and the mechanism of injury is deemed to be potentially dangerous to the other employees (Hazardous Material), the following agency must be notified: Juneau Fire Department/Police Department – call 911.

5. **Notify the Mine Manager at: (907) 789-1591**

Appendix – 2 Initial Spill Report Form

Kensington Gold Project – Initial Spill Report Form

CALL THE COEUR ALASKA ENVIRONMENTAL GROUP CONTACT BEFORE YOU COMPLETE THIS FORM

Incident Information:

Date:________________Time:_________________Observer's Name:__________________

Operator's Name:____

Spill Location:____

Description of
Incident:____
____
____

Quantity Spilled:_____________________Material Spilled:___________________________

Discharged to:_______Land___________Water___________Air (check one)

If water, which waterbody:_________________________________

Source of Material Spilled:__________________________________

Clean-up
method:____
____

Clean-up: Planned:_______Completed:_________(check one)

Contaminated Area:____

Quantity of Soil:____

Actions taken to correct or mitigate the cause of the
release:____
____

Weather Conditions: Dry/Rain/Snow:____

Signature:________________________________Date:________________________

- FAX THIS FORM TO THE ENVIRONMENTAL MANAGER AT: (907) 789-1503 -

Appendix 3 – Contact Information

a. National Response Center/United States Coast Guard

1-800-424-8802

b. Alaska Department of Environmental Conservation

(907) 465-5340 (daytime) 1-800-478-9300 (after hours)

c. Juneau Fire Department/Police Department/LEPC

9-1-1

d. Southeast Alaska Petroleum Resource Organization (SEAPRO)
(only if directed to call by Management official)

1-907-225-7002
1-888-225-7676

e. Division of Homeland Security

1 (800) 478-2337

f. State Emergency Coordination Center (SECC)

1 (888) 462-7100

g. CBJ Fire Department Helicopter: 789-7554

h. Juneau Ranger District (wildfires): 586-8800

i. Medivac: 789-1099

APPENDIX 4

MATERIAL SAFETY DATA SHEETS FOR EACH CHEMICAL ONSITE

(to be completed once products are delivered to site)

APPENDIX 5

TYPICAL SOIL EROSION AND SPILL RESPONSE CONTAINMENT PROCEDURES

SOURCE: USGS 1:250,000 SERIES TOPOGRAPHIC QUADRANGLE, JUNEAU, ALASKA-CANADA, REVISED 1985, NGVD 1929.

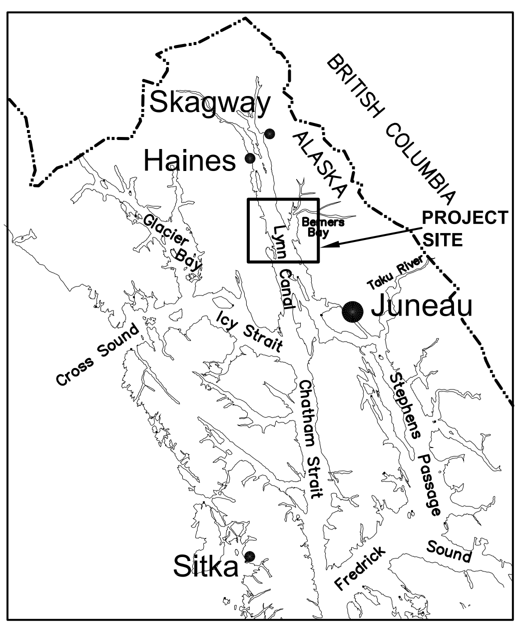


FIGURE 1	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN DRAWN: *JASPER GEOGRAPHICS*

GENERAL FACILITY LOCATION MAP
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

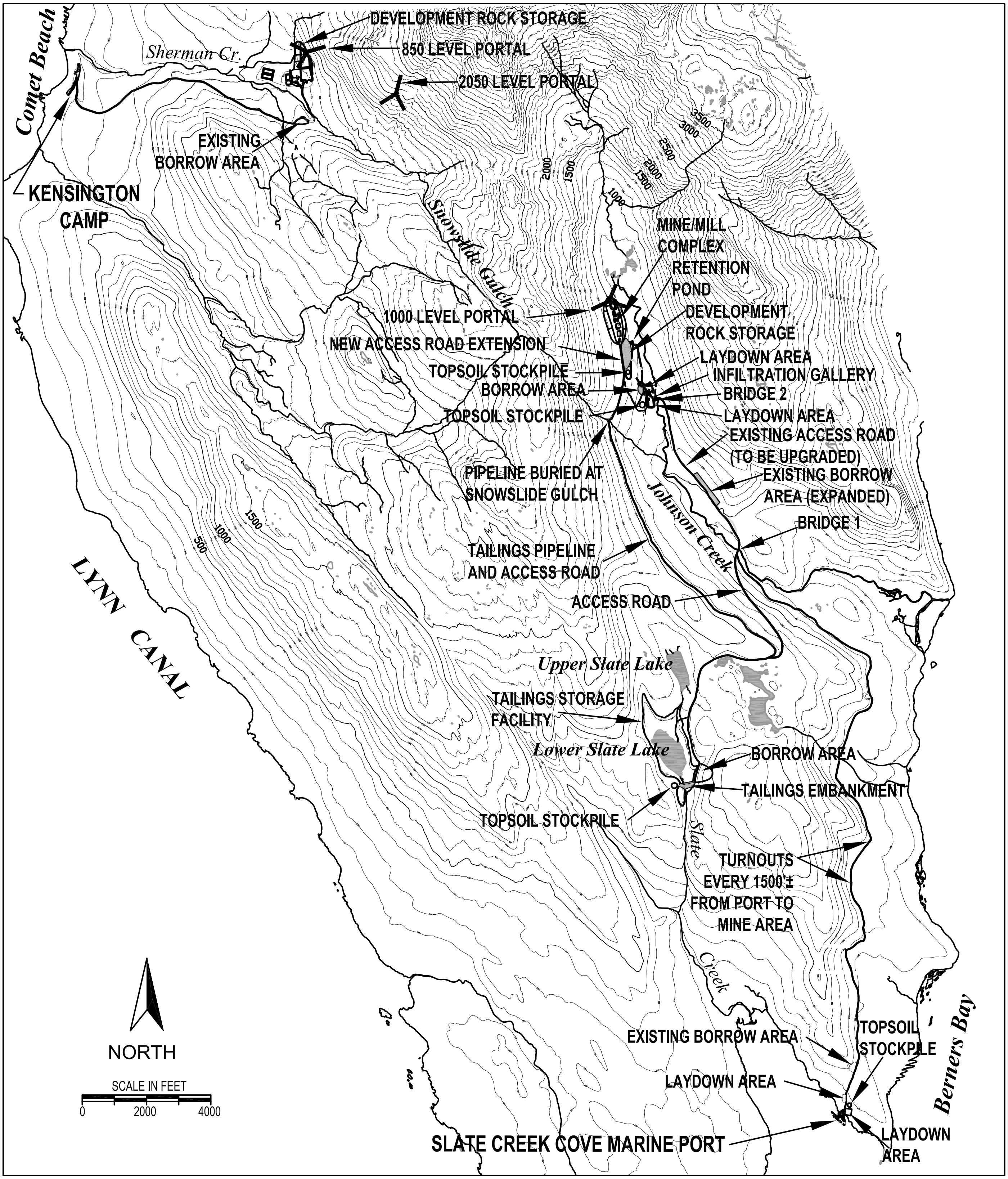
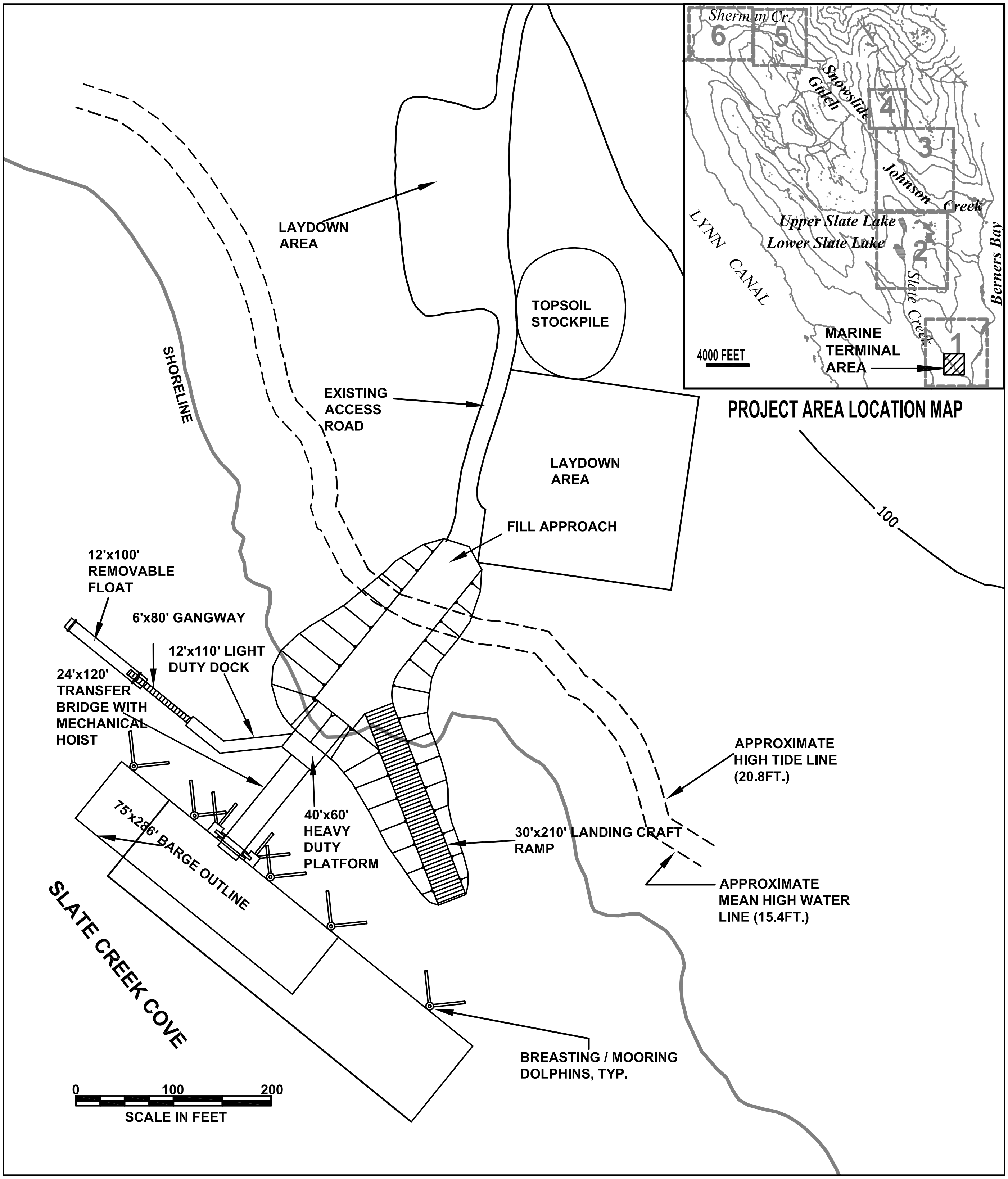


FIGURE 2	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN
	DRAWN: *JASPER GEOGRAPHICS*

LOCATIONS OF FACILITY COMPONENTS
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

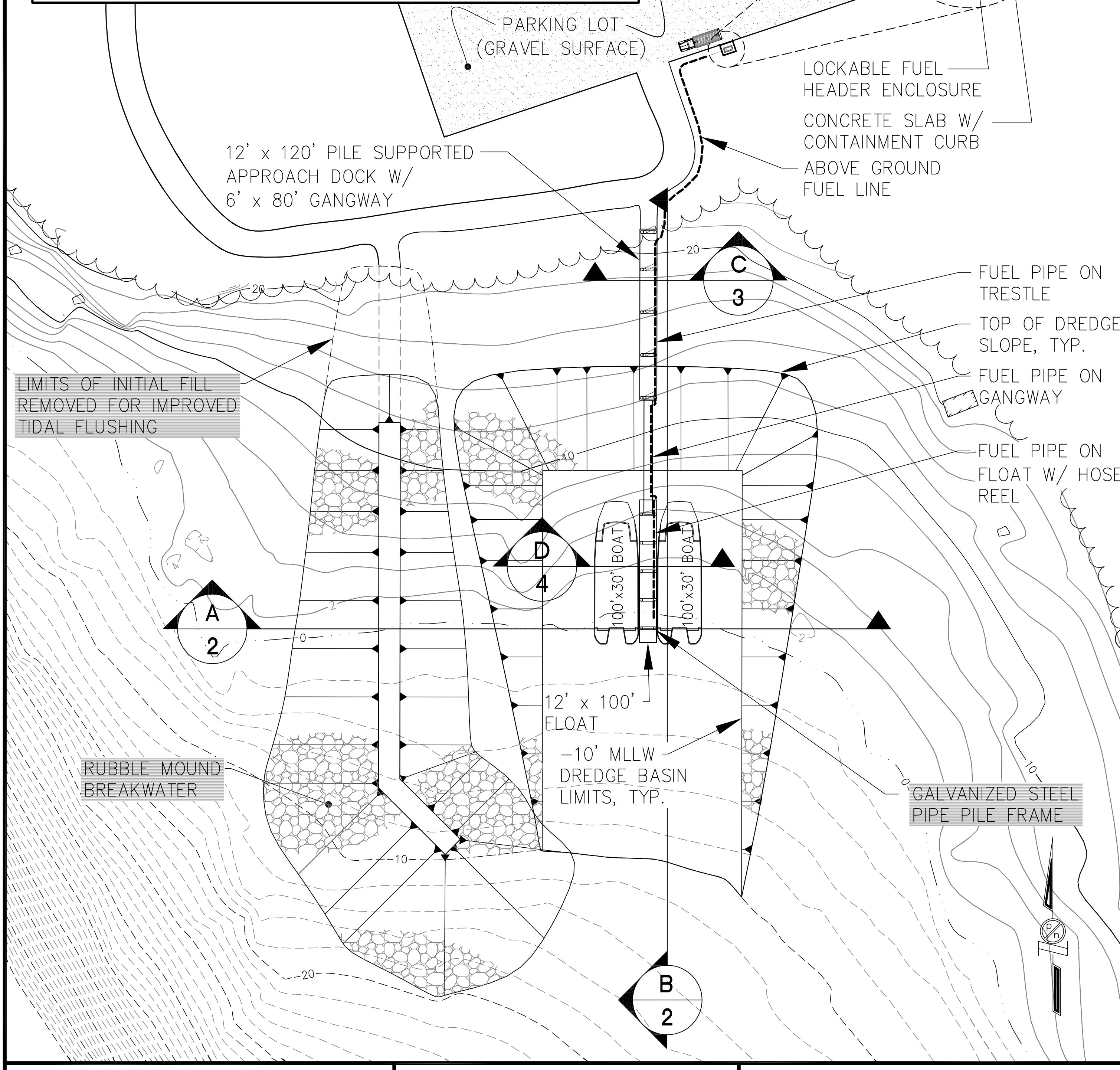


NOTE: BASED ON DESIGN PREPARED BY PERATROVICH, NOTTINGHAM & DRAGE, INC. FOR COEUR ALASKA, INC. 2001

FIGURE 3	DATE: JUNE 2004
COEUR ALASKA	SCALE: AS SHOWN
3031 Clinton Dr. Suite 202, Juneau, AK 99801	DRAWN: *JASPER GEOGRAPHICS*

SLATE CK. COVE MARINE TERMINAL PLAN VIEW
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

RUBBLE MOUND MATERIAL TOTAL	= 33,000 CUBIC YARDS
RUBBLE MOUND MATERIAL BELOW HTL	= 29,000 CUBIC YARDS
RUBBLE MOUND MATERIAL BELOW MHW	= 24,500 CUBIC YARDS
RUBBLE MOUND FOOT PRINT	= 1.3 ACRES
DREDGE BASIN MATERIAL	= 23,000 CUBIC YARDS
DREDGE BASIN FOOT PRINT	= 1.6 ACRES



PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE PLAN

SCALE IN FEET

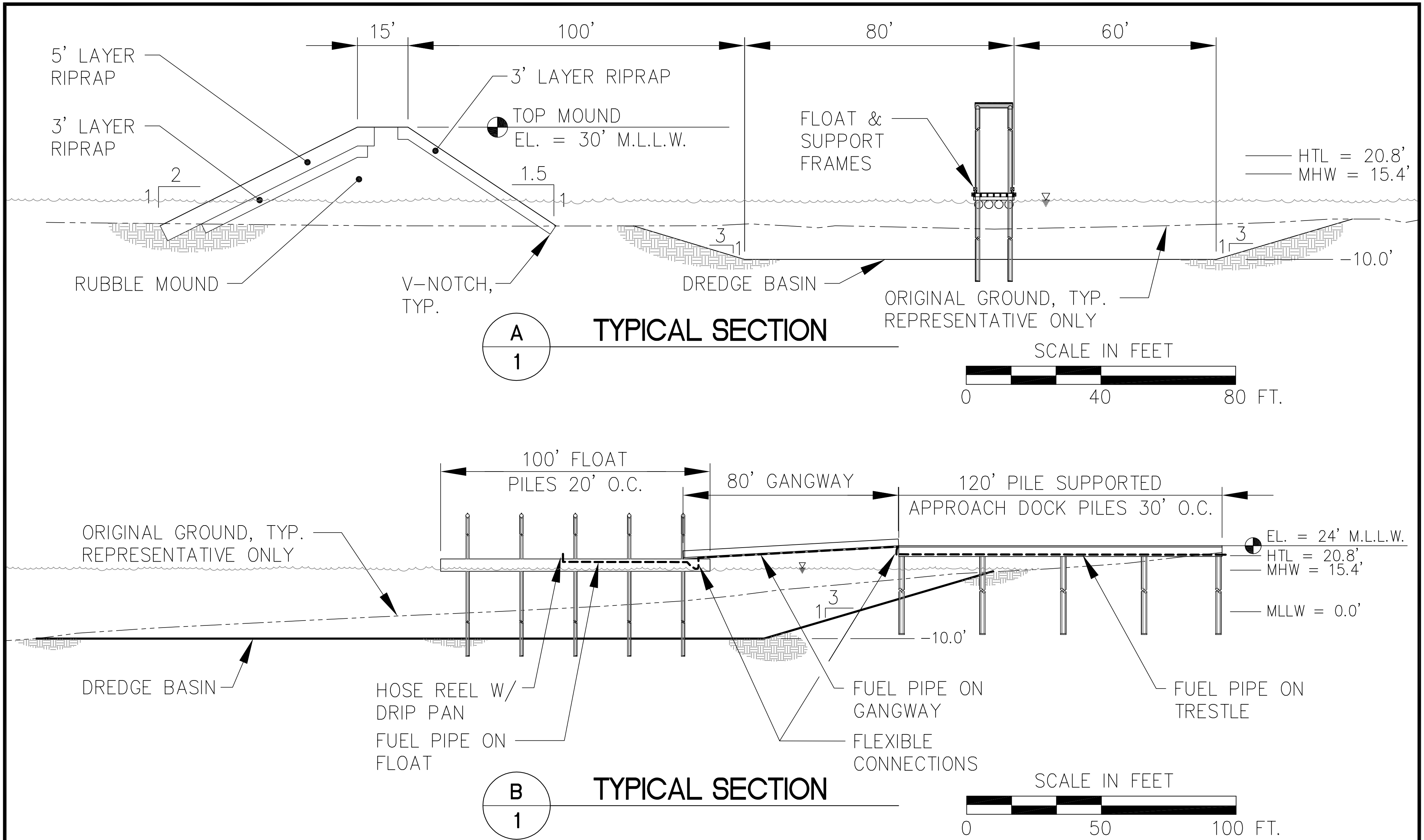
0 100 200 FT.

GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

PN&D PROJECT NO. 032025.01

APRIL 2003 SHEET **1** of **5**



PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE SECTIONS

PN&D PROJECT NO. 032025.01

GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

APRIL 2003

SHEET **2** of **5**

Coeur Alaska Kensington Gold Mine

Berners Bay Transportation Policy and

Mitigation and Best Management Practices Plan

September 2004

COEUR
ALASKA

Coeur Alaska, Inc.
3031 Clinton Dr., Suite 202
Juneau, Alaska 99801

Coeur Alaska Kensington Gold Mine
Berners Bay Transportation Policy and
Mitigation and Best Management Practices Plan

September 2004

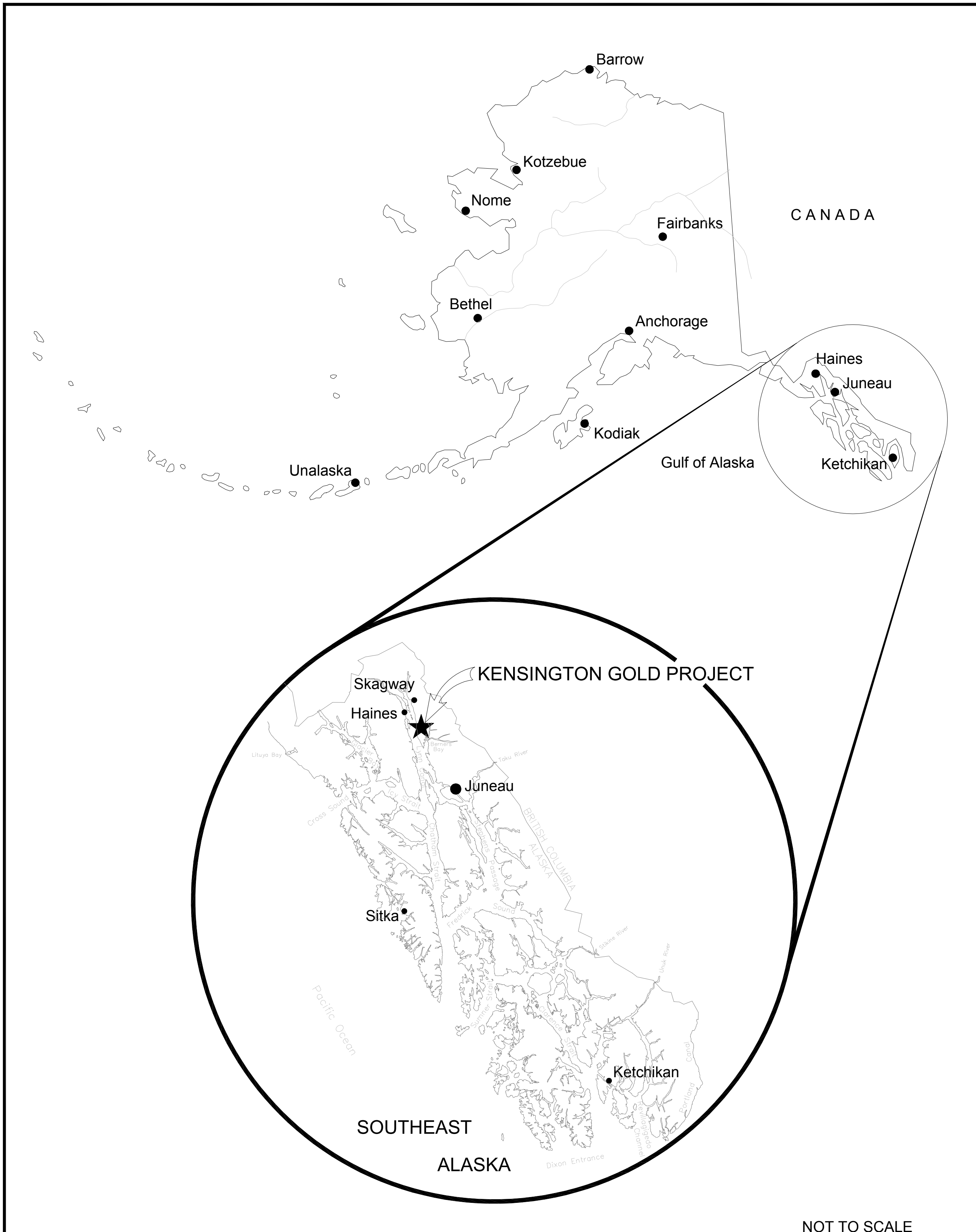
Background

Coeur Alaska, Inc. (Coeur), a wholly-owned subsidiary of Coeur d'Alene Mines Corporation, is proposing to construct and operate a 2000 ton per day (tpd) underground gold mine and processing facility on patented and unpatented mining claims located about 45 miles north-northwest of Juneau, Alaska (Figure 1). The project would be accessible by boat across Berners Bay. Berners Bay has important aquatic resources, marine mammals, and recreation uses.

The Kensington Gold Mine, as currently proposed, would involve the following major operating components:

- 2000 tpd underground mining operation
- Conventional flotation milling process at the existing Jualin Millsite; gold concentrate to be shipped offsite for final processing
- A tailings storage facility located at Lower Slate Lake
- A 6 mile access road from Slate Creek Cove to the millsite and mine
- Daily access across Berners Bay from a dock at Cascade Point to the upgraded Slate Creek Cove landing area and a newly constructed dock

Figure 2 shows a proposed general facilities siting arrangement for the project components. The primary transportation routings (Cascade Point to Slate Creek Cove; Jualin mine access road) are highlighted on the figure. The marine terminal at Cascade Point consists of a breakwater, pedestrian access dock, aluminum gangway, and moveable float. The breakwater has been reconfigured as a "dogleg," to minimize fill intrusion into the intertidal zone. The breakwater is also designed with a breach, to allow shallow water fish passage at most high tides. The breakwater also generally conforms to the shoreline, with limited perpendicular obstruction. As compared to the Echo Cove dock (150,000 yd^3 of dredging), only 70,000 yd^3 of dredging would be required. The Slate Creek Cove terminal consists of an earthen ramp, platform dock, moveable ramp and floating dock. No dredging is required. The proposed construction plan includes specific best management practices (BMP's) to reduce sedimentation, construction prohibition "windows," and seasonal noise constraints. Operational BMP's are described later in this document.

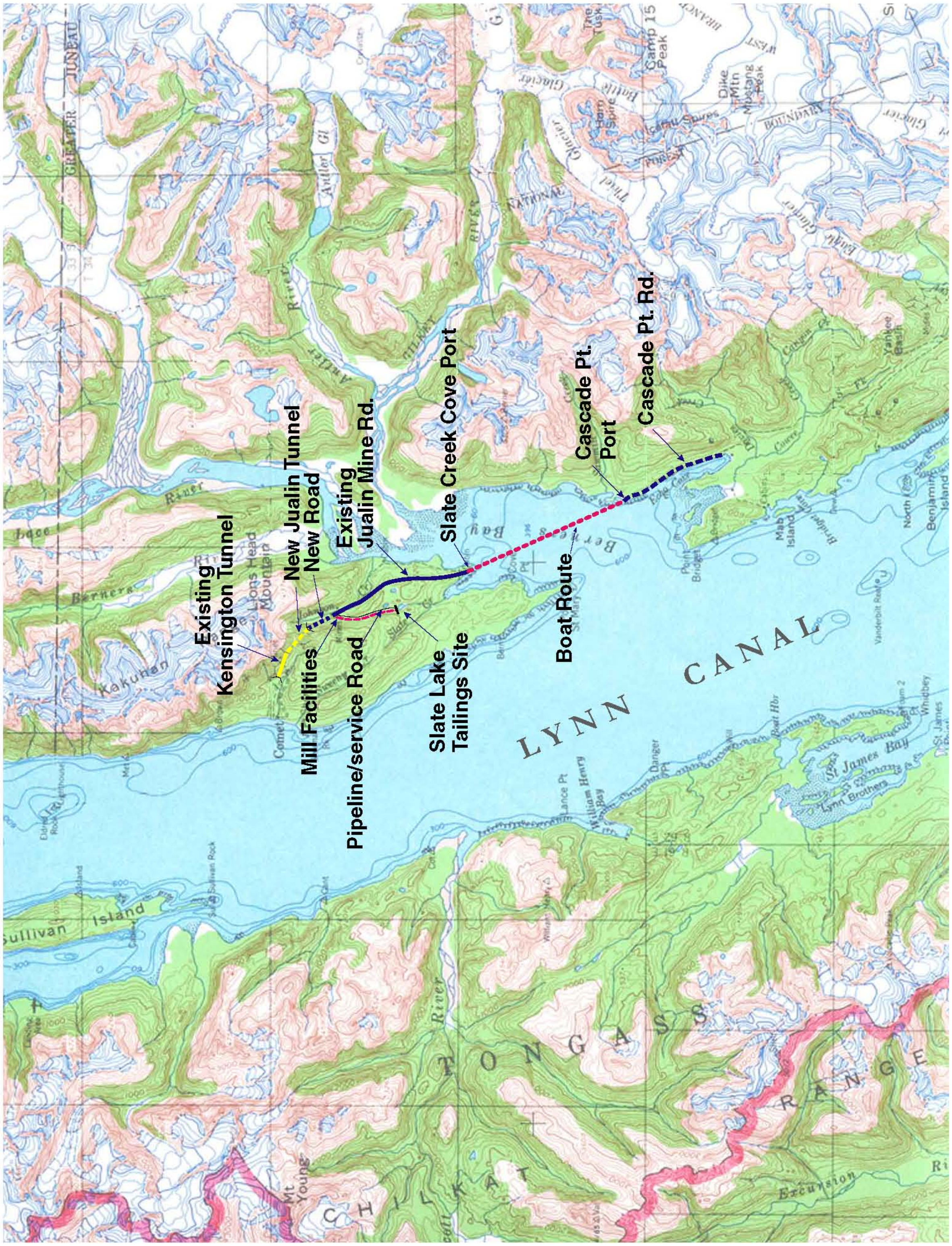


SHEPHERD MILLER
INCORPORATED

FIGURE 1
PROJECT LOCATION MAP

Date:	APRIL 2000
Project:	100619
File:	LOCMAP.dwg

2


Existing Kensington Tunnel
New Jualin Tunnel
New Road
Existing Jualin Mine Rd.
Slate Creek Cove Port
Cascade Pt. Port
Cascade Pt. Rd.
Mill Facilities
Pipeline/service Road
Slate Lake Tailings Site
Boat Route
LYNN CANAL
TONGASS
CHILKAT
RANGE

3

Figure 2

Purpose and Need for Policy

During the environmental impact (NEPA) review process for the Kensington Gold Mine operation, resource agencies and certain publics raised concerns regarding potential impacts of construction and operation of the proposed docks at Cascade Point and Slate Creek Cove on local spawning eulachon and Pacific herring spawning, and Steller sea lion populations. Key concerns are summarized as follows, for the purposes of this plan:

- Eulachon – Returning adult fish are found congregating in Berners Bay near Slate Creek Cove during April and May, before moving into fresh water at the mouth of the Lace, Berners and Antler Rivers. At this time, Steller sea lion abundance also increases. Concern exists over construction and operational activities involving noise and increased dock traffic, and effects on fish spawning and sea lion feeding.

- Pacific herring – Returning fish are known to congregate in the vicinity of the proposed Cascade Point dock during about a 2-3 week period between late April and early May when they spawn. Construction of a breakwater and dock at Cascade Point could result in a loss of permanent habitat; residual hydrocarbons potentially resulting from accidental petroleum spills and/or general marine vessel operations could also adversely affect fish growth and development, and possible spawning.

- Steller sea lion – Excessive noise associated with dock construction and marine vessel operations and traffic could potentially stress sea lion populations, foraging behavior, and reproduction.

Transportation use, such as the daily transport of mine workers and barging of supplies and concentrate, could also impact recreation users. Regular announced schedules, limited trip schedules, and adherence to speed limits and wake control will largely offset these effects.

The effects of the proposed dock facilities and marine traffic associated with the daily commute are difficult to predict. Resource managers indicate they do not have enough information regarding specific habitat factors and potential environmental stressors from development projects such as Kensington. These researchers and managers agree that a combination of Best Management Practices (BMP's) and a monitoring program are necessary to mitigate potential impacts of the proposed project. The BMP's would focus on reducing impacts during construction by prohibiting "in water" work during the critical spawning and incubation period, and controlling sedimentation. BMP's implemented during operations would focus on limiting potential pollution from petroleum hydrocarbons, and optimizing avoidance actions for marine mammals (sea lion) congregating populations in the area, to the extent practicable.

For the purposes of this plan, best management practices are activities, including passive treatment, operating procedures, and avoidance actions, that prevent or reduce the discharge of pollutants, and limit encounters with marine mammals and special fish species. The BMP's included herein are also intended to provide mitigation, consistent with the Clean Water Act, Endangered Species Act, and other applicable federal, state and local laws and regulations. The plan is also intended to be consistent with Coeur's Environmental Policy: "producing and protecting." Key provisions are intended to increase employee awareness of hazards, and thereby improve worker safety and limit pollution liabilities and risks.

Associated monitoring programs would at the same time provide critical information on herring habitat, spawning locations, and water quality. Best Management Practices and monitoring priorities for this Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan can be generally summarized as follows:

Best Management Practices listed in this plan would include (but not be limited to):

- Prohibit in-water construction activities during the period April 15 through June 30
- Silt curtains or other methods to control sediment from being transported off-site into adjacent habitat during construction
- Measures to prevent and control petroleum hydrocarbons from getting into the water during both construction and operations

Monitoring would include:

- Water quality monitoring for petroleum hydrocarbons in Berners Bay
- Map submerged aquatic vegetation between Echo Cove and Cascade Point
- Monitor and document colonization and habitat value of the breakwater
- Monitor and document herring spawning activity and location(s) in Berners Bay

Overview of Coeur's Goals, Policy and Transportation/Mitigation Plan

Coeur has developed environmental management policies, guidelines, and practices included in this document to ensure that environmental impacts are minimized and mitigated during construction and operation of the Kensington Gold Mine, including related transportation facilities and needs. Implementation of these environmental protection measures will occur, as soon as the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD), and related applicable permits are issued by the respective agencies, approving the project. The BMP plan outlined herein will be incorporated into the "Final Plan of Operations for the Kensington Gold Mine," and submitted to the USDA Forest Service for approval, in advance of construction of related facilities on National Forest lands.

The following primary goals are identified for the "Coeur Alaska Kensington Gold Mine Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan":

Goal #1: The overall policy and direction of this plan is comprised of "standard operating procedures" (SOP's), to be followed by Coeur and all its contractors, service providers, and consultants as part of the marine facilities construction and operating plans. These SOP's will be included in all related construction and service contracts.

Goal #2: The primary overriding goal is: "to protect the Berners Bay environment as part of a coordinated and comprehensive transportation and environmental management plan, consistent with the current U.S. Forest Service land use

planning goal of Modified Landscape (ML) with a minerals overlay Land Use Classification, and the stated goals and objectives of the Kensington Berners Bay Consortium. The stated goals of the ML minerals designation are to encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for mineral development.

Goal # 3: Other key objectives of the Coeur Transportation Policy and Mitigation and Best Management Practices Plan are:

- Avoid in-water construction activities during the period of herring spawning and incubation (about April 15 through June 30)
- Avoid incremental water quality impacts to Berners Bay
- Commit to one coordinated marine vessel fueling option involving one fueling location, for transport of mine workers from Cascade Point to Slate Creek Cove
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species through the implementation of a sound fueling plan, and responsible operational BMP program
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove, in order to facilitate fish passage and intertidal flushing at the facilities
- Continue to financially support and participate in a coordinated/cooperative Berners Bay environmental monitoring program initiated by Coeur, ADNR / ADF&G, NMFS / Auke Bay Laboratory, and University of Alaska; the program could also be expanded, as appropriate and agreed upon

Goal # 4: Coeur will work with ADNR to develop effective monitoring and mitigation programs and appropriate environmental thresholds for mitigation, for the Cascade Point and Slate Creek Cove dock sites, as part of the State's Tideland Leases for the two facilities

Goal # 5: Primary Operating Procedures (SOP's) of the Transportation/Mitigation Plan for Berners Bay to be followed by Coeur, its service providers, and consultants are as follows (these will be contractual requirements):

SOP #1: Coeur will identify and operate according to a "designated transportation routing" from Cascade Point to Slate Creek Cove, for the daily marine vessel transport of mine workers

SOP #2: Regular schedules will also be established for weekday and weekend workers' transport (these will minimize the number of daily trips, to the extent practicable)

SOP #3: Routings and schedules will be strictly adhered to, except where unusual environmental or workers' safety considerations dictate an alternative approach

SOP #4: Designated routing and schedules will also be established for barge transport to the Slate Creek Cove dock site

SOP #5: Vessels will operate at low, constant speeds and regular scheduled intervals; vessels will not approach within 100 yards of Steller sea lions, humpback whales, and other sensitive marine mammal species

SOP #6: Marine fueling of Coeur transport vessels will occur only at Cascade Point dock or Auke Bay dock, or other approved U.S. Coast Guard facilities. Kensington marine vessel fueling <u>will not</u> take place at Slate Creek Cove dock, except for emergency environmental situations and/or conditions involving worker safety which dictate such limited use. Other requirements for Cascade Point, based on a separate agreement with Goldbelt are as follows:

- The Cascade Point dock will be used primarily by a single dedicated marine vessel, to transport mine workers to and from the minesite
- No other vessel fueling except the Coeur Kensington marine vessel would be fueled a the Cascade Point facility
- No fuel storage would occur at the site; a fueling truck from Juneau would be used to meet the dedicated vessels needs

SOP #7: The following special considerations will be given by Coeur during the spring eulachon spawning season:

- Coeur will work with the NMFS and USF&W Service to develop a "Steller sea lion awareness training" manual, to be used by Coeur (and other) marine pilots operating vessels in Berners Bay
- Marine vessel encounters with special fish species, marine mammals and important bird species will be recorded and reported, as part of the overall monitoring plan
- Coeur, ADNR/ADFG, and NMFS will annually mutually agree to that year's "eulachon spawning season" to encompass 2-3 weeks, during which a "transportation action strategy" will be implemented by the company as part of an overall traffic plan
- As part of the transportation action strategy, during the designated eulachon spawning season (approximately between April 15 to May 15 window – typically about 2-3 weeks), marine transport vessels for the Kensington Gold Project will be fueled outside of Berners Bay, at a U.S. Coast Guard approved facility
- During the designated eulachon spawning season, Coeur will fund a NMFS "observer" to accompany the designated vessel pilot and take part in determining the best daily routing from Cascade Point to Slate Creek Cove dock, so as to minimize Steller sea lion encounters, and also minimize incidental takings within the context of insuring reasonable access to the Kensington Gold Project minesite
- During this period, Coeur will attempt (to the extent practicable) to reduce the typical daily worker transport schedule from 3-5 trips/day, to not more than 2 or 3 trips/day (except for emergency environmental or safety situations)

- Coeur will build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period
- Coeur will, to the extent practicable, limit concentrate barging during this 2-3 week period (similar to reduced fuel shipments)
- Other chemical and supplies shipments will be curtailed during that period, to the extent practicable, so as to further limit all barging and reduce Steller sea lion encounters
- **Coeur will evaluate the potential practicability and safety considerations related to utilizing a portable, moveable dock which could receive Kensington mine workers at alternative sites within Slate Creek Cove, during the eulachon spawning season. (Note: may not be possible/practicable)**
- During the herring spawning season, Coeur and/or their transportation contractor will adjust regular Cascade Point to Slate Creek Cove routing so as to avoid large congregations of surface spawning forage fish (NMFS observer and Coeur to determine routes)
- Design considerations for the Cascade Point dock facility will consider the slope and composition of fill used in breakwater construction to provide shallower water and large rock outcrops, to the extent practicable
- Coeur will conduct dive surveys of the breakwater and adjacent habitat likely to be impacted by construction and operation of the breakwater, initially on an annual basis following construction for every year during a 5 year period, then at year 10 and year 20 (post-operations)
- During the herring spawning season, Coeur and/or their transportation contractor will limit refueling inside Berners Bay at the Cascade Point to one event per week; the vessel will also be "boomed" during fueling
- Fueling will occur from upland by a fuel truck stationed in a totally contained facility; all related activities will be subject to strict provisions of Coeur's Spill Contingency Plan

<u>Other Standard Operating Procedures (SOP's)</u>

SOP #8: Coeur will implement Stormwater Pollution Prevention Plan (including stormwater management control practices, measures to reduce pollutants in stormwater, SPCC Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) at the two dock sites

SOP #9: Controls for erosion and sedimentation, total containment of petroleum products, oils and grease separation, stormwater diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade

Point and Slate Creek Cove transport facilities, and by boat operations serving the project

SOP #10: Specific BMP's for Marine Vessels and Docks Required by Coeur include the following commitments by Coeur. Coeur or its contractor(s) will:

- Require (contractually) that service providers and users abide by approved BMP's at the two docks
- Provide designated work area(s) for outside boat repairs and maintenance – no maintenance will be permitted outside of these areas
- Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area; upland area(s) are required for these activities
- Perform maintenance over tarps to ease cleanup at these upland maintenance areas
- Provide upland cleanup areas with adequate stormwater management facilities
- Utilize oil and water separators for stormwater collection and treatment at the dock facilities and parking areas
- Inspect stormwater drainage and washing systems regularly at these upload sites
- Develop and implement standard operating procedures BMP's for the management of all solid waste associated with the docks and boat transport facilities, including recycling, compacting, and reuse as appropriate
- Use flyers, pamphlets and newsletters to raise operators and passengers awareness of need to implement BMP's
- Provide and maintain appropriate storage, transfer, containment and disposal facilities for all liquid and solid wastes generated by the mine transportation operations
- Separate containers for disposal and clearly mark those containers for: used antifreeze, oils, greases, solvents and other materials
- Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code (designated storage areas should be covered and the inside area sloped to a dead end sump with total containment provided (all drains to be equipped with positive control valves or devices)
- Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container
- Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors
- Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur; attendance will be mandatory; federal, state and local regulators will be invited to take part in this training program
- An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: 1) Cascade Point dock; 2) Slate Creek Cove dock; and 3) the minesite (supplies are described in the Spill Contingency Plan)
- Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters

- Regular inspection of fuel lines and hoses for chaffing, wear and general deterioration is required (replace with USCG Type A)
- Non-spill vacuum systems for spill proof oil changes or to pump out oily bilge water is required
- Marine vessel engines must be regularly tuned and operating at peak efficiencies
- Waste oil must be removed from the maintenance site by a permitted waste oil transporter
- Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary
- All sewage must be disposed of at approved land-based facilities
- Use of biodegradable treatment chemicals in holding tanks is required
- Use of low phosphate detergents to reduce phosphorous loads to approved treatment systems is required

Additional Construction and Operational SOP Requirements of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan

***SOP #11*:** Coeur will sponsor a "Berners Bay Working Group" to include: NMFS, USFS, USF&WS, ADNR, Coeur, a commercial fisheries organization, commercial crabbers association, and Goldbelt

SOP #12: Coeur will also implement the following construction best management practices (BMP's) at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the two facilities:

- As part of the design criteria, Coeur will limit fill placement in subtidal areas to the extent practicable, to minimize effects on marine fish rearing habitat
- Coeur will use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment
- The design criteria will prohibit the use of creosote or pentachlorophenol treated wood materials in construction that would have contact with the water, in order to avoid toxic effects to juvenile fish
- The design criteria will promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks and gangways) in order to facilitate light penetration for aquatic plants
- Construction contracts will restrict the use of impact hammers to the extent practicable, both from a scheduling, engineering and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity
- The final design will include prudently engineered breach in the Cascade Point breakwater to allow for juvenile fish passage at high tides (this assumes, fish will also congregate behind the breakwater to take advantage of feeding opportunities.
- Coeur will maintain prudent engineering in the dogleg design concept for the Cascade Point breakwater to ensure:
  - reducing the amount of documented kelp that would be directly impacted
  - orienting the end of the breakwater away from habitat to the north that is generally better suited for herring spawning than to the south

- reducing the amount of habitat to the east and south of the breakwater that will have reduced wave energy as a result of the breakwater
- Reduce fill needed for Slate Creek Cove dock facility loading ramp, so as to limit protrusion into Berners Bay, while not jeopardizing loading and offloading worker safety and creating unnecessary environmental risk

SOP #13: Coeur will develop a Spill Response Plan to be implemented at both the Cascade Point and Slate Creek Cove dock facilities, and the minesite, in order to prevent fuel and chemical spills, and minimize their environmental impacts in the event of an accidental spill. The Spill Response Plan will be adopted and implemented as a key component of this mitigation plan. The primary objective of the Spill Contingency Plan will be to:

- Reduce the risk for accidental spills and environmental degradation
- Provide the operating facility with the necessary information to properly respond to a fuel or oil spill or chemical spill event.
- Clearly define line of function responsibilities for a spill situation
- Provide a concise response and clean-up program which minimizes environmental impacts

SOP #14: The effectiveness of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan and related contingency plans and monitoring programs would be evaluated after year one of construction, and year one of operations, and every third-year thereafter in order to facilitate the goals and policies of the program. The findings of the review or "environmental audit," to be conducted by a qualified third-party contractor commissioned by Coeur, would be presented to the "Berners Bay Working Group" and key resource management agencies during the month of February of that year, in order to evaluate programs and recommend modifications an/or realignments to policies, where necessary.

Coeur will commit to these policies, BMP's, mitigation activities, and monitoring programs, to be incorporated into the overall mitigation component of the Final Plan of Operations, to be approved by the U.S. Forest Service. It is understood that approval of this plan by the U.S. Forest Service does not relieve Coeur of its responsibilities to comply with other Federal, State, and Local laws, rules, and regulations.

Appendix E

Best Management Practices and Mitigation Measures

Appendix E: Best Management Practices and Mitigation Measures

The following best management practices (BMPs) and mitigation measures have been identified either as part of permit applications or in the SEIS. The focus of these BMPs and mitigation measures is to reduce the sources and likelihood of a spill into the marine environment, limit the extent of a spill that might occur, and ensure a rapid response in the event of a spill. This appendix includes Coeur's Draft Spill Response and BMP Plan and Coeur's Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan.

Goals and Objectives

- Avoid incremental water quality impacts on Berners Bay.
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species.
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove to facilitate fish passage and intertidal flushing at the facilities.

Standard Operating Procedures

- A Storm Water Pollution Prevention Plan (storm water management control practices, measures to reduce pollutants in storm water, Spill Prevention, Control, and Countermeasures [SPCC] Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) will be implemented at the two dock sites.
- Controls for erosion and sediment, containment, oil and grease separation, storm water diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade Point and Slate Creek Cove transport facilities, and by boat operations serving the project.
- BMPs for boats and docks will include the following**:**
  - ✓ Provide designated work area(s) for outside boat repairs and maintenance. No maintenance would be permitted outside these areas.
  - ✓ Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area (upland area(s) required).
  - ✓ Perform maintenance over tarps to ease cleanup at these upland maintenance areas.
  - ✓ Provide upland cleanup areas with adequate storm water management facilities.
  - ✓ Use oil and water separators for storm water collection and treatment, as appropriate.
  - ✓ Inspect storm water drainage and washing systems regularly at these upload sites.
  - ✓ Require (contractually) that service providers and users abide by approved BMPs at the two docks.
  - ✓ Develop and implement standard operating procedures BMPs for the management of all solid waste associated with the dock and boat transport facilities, including recycling, compacting, and reuse as appropriate.
  - ✓ Use flyers, pamphlets, and newsletters to raise operators' and passengers' awareness of need to implement BMPs.

- ✓ Provide and maintain appropriate storage, transfer, containment, and disposal facilities for all liquid and solid wastes generated by the mine transportation operations.
- ✓ Separate containers for disposal and clearly mark them for used antifreeze, oils, greases, solvents, and other materials.
- ✓ Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code. (Designated storage areas should be covered and the inside area sloped to a dead-end sump with total containment provided; all drains are to be equipped with positive control valves or devices.)
- ✓ Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container.
- ✓ Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors.
- ✓ Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur, and attendance will be mandatory.
- ✓ An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: (1) Cascade Point dock, (2) Slate Creek Cove dock, and (3) the mine site.
- ✓ Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters.
- ✓ Regular inspection of fuel lines and hoses for chaffing, wear, and general deterioration is required (replace with USCG Type A).
- ✓ Non-spill vacuum systems for spillproof oil changes or to pump out oily bilge water are required.
- ✓ Engines must be tuned and operating at peak efficiencies.
- ✓ Waste oil must be removed from the maintenance site by a permitted waste oil transporter.
- ✓ Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary.
- ✓ All sewage must be disposed of at approved land-based facilities.
- ✓ Use of biodegradable treatment chemicals in holding tanks is required.
- ✓ Use of low-phosphate detergents to reduce phosphorus loads to approved treatment systems is required.

Other Construction and Operational Requirements

- The following construction BMPs will be implemented at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the facilities:
  - ✓ Limit fill placement in subtidal areas to the extent practicable to minimize effects on marine fish rearing habitat.
  - ✓ Use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment.

- ✓ Prohibit the use of creosote- or pentachlorophenol-treated wood materials that would have contact with the water in order to avoid toxic effects on juvenile fish.
- ✓ Promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks, and gangways) to facilitate light penetration for aquatic plants.
- ✓ Restrict the use of impact hammers to the extent practicable, from a scheduling, engineering, and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity.
- ✓ Fueling of Coeur marine transport vessels will occur at Slate Creek Cove dock or the Auke Bay transit/maintenance site.
- ✓ Implementation of a strategic spill prevention and response plan at the dock sites and mine site, as described earlier in this document.

Kensington Gold Project

SPILL RESPONSE and BMP PLAN

Including the

EMERGENCY RESPONSE PLAN

(Preliminary Draft)

Prepared by
RTR Resource Management, Inc.

for
Coeur Alaska Inc.

Version 0 – October, 2004

Annual Certification:________________________________Date:_______________
Signature Required

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INTRODUCTION

This document has been prepared for inter-agency review and comment. It is not intended to serve as a replacement document for any one of the four existing plans, listed below, that cover the current configuration of the Kensington Gold Project:

1. Marine Transfer-Related Facility Response Plan (USCG);
2. Spill Prevention, Control, and Countermeasures Plan (USEPA);
3. Emergency Response Action Plan (ADEC); and the
4. Facility Operations Plan (USCG).

These documents have been incorporated into a unified Facility Response Plan as required by 33 CFR 154, Subpart F for marine transportation-related facilities. As dictated, these plans and associated facilities are required to be reviewed by a Registered Professional Engineer and will be updated to include the revised facilities at Kensington once they have been constructed.

The following document has been designed to incorporate all of the considerations for the transportation, handling, and storage of hazardous materials for the optimized Kensington Gold Project as described in the Draft Supplemental Environmental Impact Statement for discussion purposes only. Special planning serves as partial mitigation to minimize the effects associated with handling these materials and responding to accidents or spills in this remote area in a timely manner and this document serves as a mechanism to receive regulatory agency comments and considerations for Standard Operating Procedures adopted for the Kensington Gold Project. Recently Coeur Alaska has distributed the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004),* for comments in the same manner that this document is being distributed.

There are two main sections to this document: the Emergency Response Plan and the Spill Prevention and Response Manual. The Emergency Response Plan appears in Section 1 as it was considered the most time critical section, first to be seen upon opening the document. It is intended that the Emergency Response Form, on the inside front cover of this document is the only piece of paper required to systematically gather and report the required information in the event of an emergency situation. All potential users of this document must be made

aware that in an emergency, only the Emergency Response form needs to be completed initially. The Spill Prevention and Response Manual, Section 2, first lists the industry standard preventative measures required when storing bulk materials at the facility, then identifies the potential risks to the environment, and finally suggests appropriate mitigation for the identified risks.

Section 1 – Emergency Response Plan

The FIRST ACTION in the event of an emergency is to comply with the Emergency Response Form located inside the front cover of this document. Do not read any further, please refer immediately to the Form on the inside cover of this binder.

This section of the plan is to document the systematic approach that will be taken by Coeur Alaska personnel to respond to accidents along the regularly traveled corridor to access the minesite. The response plan is targeted towards personal injury and/or spills as defined in the following section and on the Emergency Response Form located inside the front cover of this document.

These plans must **only** be located at:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk.

There shall **only** be 4 copies of this document in existence and each of the documents must receive the same update information (i.e. be of the same version and date as shown in the footer of each page). Updating this document is the responsibility of the Environmental Manager.

The first person to learn of the accident and refer to the Emergency Response Plan assumes the role of Incident Commander and must comply with the form inside the front cover.

1.1 Emergency Action Form for Accidents and Spills

All employees of Coeur Alaska will be made aware that there is an Emergency Response Form located immediately inside the front cover of this document. The purpose of the Form

is to streamline the gathering and reporting of accurate information to provide to the appropriate response agency(ies) and the appropriate Coeur Alaska staff. Subsequent follow-up reporting, once the emergency situation has been attended to, is the individual responsibility of the environmental and safety managers, as described in Section 1.5.

1.2 Identification and Notification of Spills

A spill is defined as "any discharge of hazardous materials or special waste upon land or into waters of the State of Alaska". This would include accidental spills involving discharge outside of a defined total containment system to the environment.

Per state regulation 18 AAC 75.300 releases of hazardous substances other than oil, or discharges of oil to water, or discharges in excess of 55 gallons of oil outside of a containment area require immediate notification. Releases in excess of 10 gallons, but less that 55 gallons of oil to land require notification in 48 hours.

The policy of Coeur Alaska will be to comply with all ADEC and federal regulations by responding and reporting all of the minor and major spills occurring as a result of Coeur Alaska operations.

1.3 Incident Command System

Once an emergency is discovered, one of the 4 Emergency Response Plan locations will be contacted:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk

Once contact has been established, that person, equipped with the Emergency Response Plan will refer to the Emergency Response Form and assume the role of Incident Commander. The Incident Commander then becomes responsible for completing, or assigning the tasks listed on the Emergency Response Form located in the front cover of this document. The

acceptance and potential transfer of the role of Incident Commander is documented on the Emergency Response Form by signature.

1.4 Product Characteristics

The potentially hazardous materials that will be transported to the Kensington Gold Project site include: lime, cement, diesel, hydraulic fluid, oils and greases, anti-freeze, acids, reagents (PAX, MIBC, surfactant, scale inhibitor), polymers, and flocculants.

Each potential hazardous material has an updated Material Safety Data Sheet located in Appendix 4. These sheets should be consulted in the event of an accident to determine if any special precautions or handling requirements are warranted.

1.5 Standard Reporting Form and Contact Information

The responsibilities of the Incident Commander filling out the Emergency Response Form are defined to immediately attend to any reported incidents of personal injury and spills that could potentially degrade waters of the State.

Follow-up post-emergency reporting is deferred to the appropriate environmental and safety managers with Coeur Alaska. Their responsibilities are to determine the extent of reporting required for the incident and contact the appropriate agencies to comply with required incident reporting. Emergency reporting for releases of hazardous materials other than oil, discharges of oil to water, and discharges greater than 55 gallons of oil outside of secondary containment is required to be submitted to the Alaska Department of Environmental Conservation (Appendix 2 – Spill Report Form) and incidents of personal injury require reporting to MSHA.

Once the Mine Manager has been notified of the incident, all subsequent notices to company personnel and others are the responsibility of the Mine Manager. The Incident Commander does not release any information to the public or media.

Subsequent to any accident, Coeur Alaska personnel will commit to completing and documenting a formal post-accident review to ensure that any changes to the existing

operating and response procedures that are warranted, will be implemented. The Safety Manager will also be included in the debriefing session to evaluate the cause of the accident with the intent to rectify any identified contributing issues.

Coeur Alaska will commit to an annual review of all planning and response documents, to be certified by signature on the front cover of this document.

Section 2 – Spill Prevention and Response Manual

As described in the previous section, Coeur Alaska is committed to providing employees, contractors, and suppliers with the skills and knowledge required to ensure that the maximum effort is afforded to spill prevention and response. The following text describes the specific actions to be taken by Kensington staff.

2.1 Prevention Programs and Training

All employees of the Kensington Gold Project are covered by the regulatory jurisdiction and training requirements of the Mine Safety and Health Administration (MSHA) while engaged in their normal work duties. Training for all employees, contractors, and suppliers working onsite, will include emergency response for accidents and spills as well as spill response containment and clean-up as part of the required MSHA hazard training requirements. All personnel that would be exposed to petroleum or chemical products, or assisting in the clean-up of petroleum or chemical products, will be tasked trained according to the following programs.

2.1.1 Prevention Training Program

All employees using petroleum products stored at the Kensington Gold Project, or involved in maintenance of petroleum storage and dispensing systems, will receive training and instruction in the areas of:

1. Operation and maintenance of equipment necessary to prevent unintended discharges.
2. The location and use of spill containment and cleanup supplies.
3. Applicable pollution control laws, rules, and regulations.
4. Discharge prevention.
5. Changes pertaining to any of the above items.

Employees handling, using, or who are otherwise exposed to petroleum products will also receive training in accordance with applicable MSHA (30 CFR 48, 57) and Occupational

Safety and Health Administration (OSHA), Hazard Communication regulations (29 CFR 1910.1200). This training will address:

1. Hazards
2. Appropriate work practices, procedures, and protective equipment to be used during both normal operations and in the event of a foreseeable emergency.

Employees designated or expected to perform emergency response functions for releases of hazardous substances (including petroleum products) will receive training as required by OSHA (29 CFR 1910.38).

Training will be conducted by supervisory personnel, and/or training program contractors according to the following table.

Table 1 - Kensington Annual Training Schedule

Position	Type of Training				
	Hazwoper	Oil Spill Response	Confined Entry	Incident Command	Wildlife Hazing
Key Managers	24 hour, 8 hr Annual refresher	Annual with drills	For selected personnel	Initial training, Annual refresher	Initial training, Annual update
Facility Response Personnel	As above for all response personnel	As above for all response personnel	For selected Personnel	As above for all response personnel	For selected personnel
Contractors and Suppliers	Required for selected personnel	Initial Training, Annual Refresher	For selected personnel	Initial Training, Annual Refresher	Upon introduction to the project

All personnel who have spill response duties as part of their job function will be trained at the time they first report for work. Employees transferring to new job functions which have oil spill response duties will be trained at the time they assume their new responsibilities.
Any changes or new information concerning discharge prevention and operational and emergency procedures for petroleum storage and dispensing systems will be communicated to all affected employees by either memoranda, routine safety meetings, and/or supplemental

training sessions. Training sessions will be recorded and filed in the safety department's filing system.

2.1.2 Drug and Alcohol Abuse Program

Accidents are often a result of human error due to poor judgment or delayed response caused by the effects of drugs or alcohol. Coeur Alaska's zero tolerance drug and alcohol abuse program is presented below. Contractors and Suppliers will also be required by signed contract to abide by the Program as described below:

Statement of Policy

To ensure a safe and productive work environment at all Coeur Alaska facilities and to safeguard Coeur Alaska employees and property, Coeur Alaska strictly prohibits the use, sale, transfer or possession of alcohol, drugs, or controlled substances or the presence of an illegal drug, illegal drug metabolite, or alcohol in the employee's system, on any Coeur Alaska premises, work sites, or during work time. Excluded are prescribed drugs when used in the manner, combination, and quantity intended unless job performance could be affected. This policy applies to all personnel, including supervision and management. Compliance with this policy is required as a condition of continued employment. Any employee found in violation of this policy will be terminated. Depending on the circumstances, other actions, including notification of appropriate law enforcement agencies, will be taken in response to a violation of the policy.

Purpose

The purpose of this policy is to outline standards and procedures for dealing with employee and drug abuse. Substance abuse has been linked to numerous on-the-job accidents. Employees not only endanger themselves when they are impaired, but also their fellow workers. Providing a safe work place is a strict policy of Coeur Alaska. To avoid the many problems that result from employee substance abuse, Coeur Alaska maintains a zero tolerance drug and alcohol policy.

In order to provide high quality service and a safe and efficient work environment, Coeur Alaska requires its employees to report to work fit to perform their jobs. To ensure this,

Coeur Alaska has established the following policies and procedures dealing with employee drug and alcohol abuse:

Definitions

Alcohol or Alcoholic Beverages: "Alcohol" means beer, wine, and all forms of distilled liquor containing ethyl alcohol. References to the use of, or the possession of alcohol, include the use or possession of any beverage, mixture, or preparation containing ethyl alcohol.

Drug: Any substance (other than alcohol) that has known mind- or function-altering effects on a person, including psychoactive substances, and substances prohibited or controlled by State and Federal controlled substance laws.

Prescribed Drug: Any substance prescribed by a licensed medical practitioner for the individual consuming it.

Under the Influence: Being unable to perform work in a safe and productive manner, being in a physical or mental condition which creates a risk to the safety and well being of the individual, other employees, the public, or Coeur Alaska's property. The symptoms of influence and/or impairment are not confined to those consistent with misbehavior or to obvious impairment of physical or mental ability such as slurred speech or difficulty in maintaining balance.

Inspections and Searches

Coeur Alaska's vehicles, lockers, desks, filing cabinets, files, etc. remain the property of Coeur Alaska and will be subject to Coeur Alaska initiated searches at any time and without notice.

Employees and their possessions, including their vehicles located on Coeur Alaska property, are subject to Coeur Alaska initiated searches at any time and without notice if management has reason to suspect that any employee(s) will be in violation of the terms of this policy.

Employee Substance Abuse Tests
In order to assure compliance with Coeur Alaska's prohibition concerning alcohol and drug use and as a condition of continued employment, employees are required to cooperate in drug and/or alcohol substance abuse testing procedures. Any employee who refuses to cooperate in any aspect of the drug and alcohol testing process described in this policy will be terminated.

Urine/blood testing of employees will be conducted in accordance with the following:

A. Periodically, upon the approval of the corporate Administrative Manager Resources and without reason for suspicion of abuse, any or all employees at a particular facility will be tested for drug and alcohol usage without advance notice.
B. Upon reasonable suspicion that drugs or alcohol are being used at a particular facility, department, or work group, any or all employees at the facility, department, or work group will be tested without advance notice.
C. When company officials have a reasonable suspicion that an employee(s) is/are intoxicated or under the influence of drugs and/or alcohol, a test will be conducted immediately without advance notice.

The following are examples of reasonable suspicion, as that phrase is used in this policy:

(1) Reports of drug or alcohol use from police, customers, other employees, or other individuals.
(2) Observation by supervisor that an employee is apparently under the influence or impaired by drugs or alcohol and not fit for duty.
(3) Ongoing work performance problem.
(4) Rule violation that created a dangerous situation.

After testing of an employee for reasons B. and C. stated above, that individual will be suspended without pay until the test results have been received by the Human Resource Department. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results. If the results are positive, the employee will be terminated.
Post-accident drug and/or alcohol testing of employees will be conducted in accordance with the following:

A. An employee involved in an accident, injury, or safety violation will be required to submit to a drug and/or alcohol test immediately. An employee shall be tested under the following circumstances:

1. After any work-related accident resulting in damage exceeding $1,000.
2. After any work-related injury.
3. After any work-related safety rule violation.

After testing of an employee for reasons stated above, that individual will be suspended without pay until the test results have been received by the Human Resources Manager. Each injury or accident will be evaluated by the supervisor and the Safety Department. It will be left to their discretion as to whether the employee will be suspended.

If the employee is suspended and test results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension. In the event disciplinary action is taken pursuant to the incident, the pay will be forfeited.

B. All employees who were in the vicinity of a work-related accident, injury, or safety rule violation, and who, in the opinion of the supervisor, will have contributed to such accident, injury, or violation, shall also be required to submit to a drug or alcohol test.
C. An employee testing positive will be terminated.
D. An employee who refuses to cooperate in drug and/or alcohol testing procedures will be terminated.

An employee required to submit to blood or urine specimen for testing shall be informed by a designated Coeur Alaska representative of the reason why he/she is being requested to submit a specimen. An employee who refuses to cooperate in drug and alcohol testing procedures will be terminated.

Tests shall be accomplished through analysis of a blood or urine sample and /or any other testing method recommended by the designated medical clinic. All specimens will be obtained from the employee by an authorized representative designated by Coeur Alaska. A supervisor or designated representative will escort the employee to the authorized Coeur Alaska representative and the employee's cooperation with the collection procedures will be required.

Coeur Alaska will have the specimen identified and tested by a competent laboratory for the presence of drugs and/or alcohol.

Confidentiality

The Human Resources Department will receive all test results. The appropriate department manager will be notified of results strictly on a need-to-know basis.

No laboratory results or test results shall appear in a personnel folder. Information of this nature will be included in a medical file with a marker to appear on the inside cover of the personnel folder to show that this information is contained elsewhere.

Use of Results

If the test results are positive for any substance, Coeur Alaska will notify the employee(s) of the results.

A positive result to a drug or alcohol test will result in termination. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results.

If test is positive, an employee will be provided an opportunity to explain the presence of the identified substance. In the absence of an acceptable explanation, the employee will be terminated immediately.

Pre-Employment Substance Abuse Tests

Each applicant who is given favorable consideration for a position in Coeur Alaska will be subject to Coeur Alaska's drug and alcohol policy.

An applicant who refuses to submit to pre-employment testing when requested, or refuses to sign Coeur Alaska's drug testing policy consent form, will not be employed.

Coeur Alaska will notify the applicant of the results of any test taken that is positive for any substance included in the procedure. In the case of a positive result, Coeur Alaska will provide the applicant with an opportunity to explain the presence of the identified substance prior to taking any action on the application for employment. In the absence of an acceptable explanation, an applicant with a positive test result will not be employed.

Use of Prescription and/or Over-the-Counter Drugs

In the event an employee is under the care of a physician and taking prescribed medication which might impair his or her ability to perform a job, the employee must notify his or her manager in advance. It is at management's discretion whether the employee will continue to perform the normal assigned duties.

When taking a prescribed drug, the employee must provide a statement from his/her doctor advising that the employee's job performance is not materially affected by the drug prescribed. the doctor's statement will also describe what restrictions will be put on the

employee to ensure that the employee does not pose a threat to his/her own safety, the safety of co-workers or the public.

In those circumstances where the use of a prescribed or over-the-counter drug is inconsistent with the safe and efficient performance of duties, an employee will be required to take sick leave, a leave of absence, or other action determined to be appropriate by Coeur Alaska management.

2.1.3 Medical Monitoring Program

All personnel engaged in facility fuel transfer operations, handling of hazardous materials, and spill response duties, will be monitored by the Safety Officer to ensure their ability to safely perform their job assignments based on their general physical condition as determined by the pre-hire physical and periodic assessment by the Safety Officer.

2.1.4 Security Policies and Practices

The Kensington Gold Project is located in a remote area. Warning signs will be posted at points of entry and Kensington Gold Project personnel will inspect the operations to keep unauthorized persons from entering the facility.

It is not expected that vandalism, unauthorized entry or sabotage will be a problem as the Kensington Gold Project is remote, access is limited, and personnel are on-site 24 hours per day, and will conduct inspections of the facility as part of the normal operational routine. A check of the fuel storage and dispensing areas, and oil storage systems, is part of these regular inspections.

The following operational procedures will help ensure facility security.

- Close and lock all valves
- Close and lock all electrical panels
- Close and lock all doors to pump rooms, generator buildings, and other spaces related to the operation of fuel facilities
- Inspect facility product lines, valves and connections on a routine daily basis
- Verify that all yard lighting is functional on a daily basis.

2.1.5 Storage Vessel Requirements

Tank design, fabrication, and erection shall be in accordance with the applicable portions of the following standards:

- API Standard 650
- American Society of Civil Engineers Standards for Tank Construction
- 1991 Uniform Building Code Guidelines on Tank Construction and Foundations
- 1991 National Fire Protection Association Guidelines
- UL specifications for above-ground self-contained oil storage tanks

In addition all vertical welded tanks shall be designed and constructed for compliance with UBC Seismic Zone 3 and Wind Shear Load Category C (100 mph).

2.1.5.1 Corrosion Control and Leak Detection

In accordance with API 651 principles, corrosion protection for the tanks will not be warranted. The tanks will not come into contact with any soils and no pathways of conductivity exist between the tank bottoms and potential sources of corrosion.

All single wall tanks will be located within secondary containment structures and impervious 30-oz/square yard polymer coated polyester liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment structure sidewalls. The floor of each containment structure slopes to a collection ditch at one end of the containment.

Vertical welded steel tanks are mounted within the secondary containment structures on concrete ring wall foundations with oiled sand pads supporting the tank floors. The oiled sand pads are installed on top of impervious liners that are sealed to the inside surface of the ring walls to provide under floor containment. Any tank floor leaks will discharge to the oiled sand pads and then drain to the secondary containment structure via 1” HDPE drainpipes cast into the ring walls.

Horizontal welded steel tanks are mounted within the secondary containment structures on concrete slabs to which the impervious containment liners are sealed.

A release from either vertical or horizontal tanks would be detected visually during daily visual inspections of the secondary containment structures.

2.1.5.2 Overfill Protection

Overfill protection for all tanks will be designed in accordance with API Recommended Practices 2350, Overfill Protection for Petroleum Storage Tanks.

Bulk storage tanks will be equipped with a visual float level gauging system that shows the actual fluid level inside the tanks. The indicators shall be clearly visible and easily read from ground level outside the tank during routine inspections, tank inventory, and fuel transfer operations.

Each bulk tank shall also be equipped with an independent automatic overfill alarm and transfer pump shutdown system, that uses liquid level floats to activate audible alarms and emergency shutdown of internal transfer pumps. A pre-alarm level shall be set at 95% of the working fill height. When fuel level reaches this height a pre-alarm condition shall be initiated during which an audible alarm sounds and an indicator light is energized on the control panel. The pre-alarm light and audible alarm can be reset only by Kensington Gold Project personnel at the control panel. When fuel level reaches working fill height a second float initiates an alarm condition during which a second alarm and light are energized and all facility in-line transfer pumps are shut down. Resetting of this alarm condition shall be possible only after the level in the tank drops below the working fill level.

All double-walled or self-diked tanks shall be equipped with overfill limiter valves set at 95% of tank capacity and shall have locking fill-containment pans fitted to the fill pipes.

2.1.5.3 Secondary Containment

All single wall tanks are located within secondary containment structures and impervious liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment sidewalls. Each secondary containment structure is sized to contain 110% of the capacity of the largest tank retained by the structure.

The floor of each containment structure is sloped to drain toward a collection ditch at one end. Accumulated precipitation will be removed as necessary by site personnel by operating a normally closed and locked drain valve. Only water that is free of any sheen will be discharged from each containment structure. Containment drainage will be discharged to the facility stormwater management system, which is operated in compliance with EPA BMPs.

Truck load-in/load-out facilities are located adjacent to three of the bulk storage areas. Each truck load-in/load-out facility is equipped with a catchment system that drains to an integral containment tank sized to hold the volume of the largest single compartment of the tank truck. The containment tank is visually monitored by Kensington Gold Project personnel during routine operations and manually pumped to the adjacent bulk storage secondary containment structure whenever necessary.

All day tanks located outside of the secondary containment areas will be self-diked steel tanks that provide full secondary containment.

2.2 Potential Discharge Risk Analysis

The following materials are considered to be most at risk for release to the environment:

Petroleum Product	Individual Capacity	Material of Construction	Manufacture Date	Potential Type of Failure	Secondary Containment
diesel, gasoline	6,500 gallons	Stainless steel cylinder in metal box	N/A	rupture, pierce or overturning	lined, bermed laydown area
gasoline, lubrication oils/greases, hydraulic oils	55 gallons	steel drums	N/A	rupture, pierce or overturning	lined, bermed laydown area

Typically, barges 286 feet long by 75 feet wide will be used to import petroleum products to the site. Unloading of materials will be by a roll-on, roll-off forklift transfer system.

2.3 Receiving Environment Risk Analysis

There are two receiving environments that are subject to the highest degree of risk for the potential release of hydrocarbons: Johnson Creek and the intertidal zone at the marine terminal facilities.

Two bridges cross Johnson Creek while transporting petroleum, and other hazardous materials, to the minesite. Accidents and potential discharges here will require rapid response and specialized equipment. To address this issue, portable spill containment equipment will be stored and readily available at these two bridge locations. Rapid response equipment will also be cached at the stormwater collection pond located at the toe of the process area, which would accept any contaminated runoff from accidental discharges at this facility.

Spill response equipment will also be readily available at each marine facility to shorten the response time of discharges to the intertidal zone.

2.4 Response Strategies and Safety Considerations

This section discusses measures for hazardous material, spill prevention, control and countermeasure plans, as currently planned for the Kensington Gold Project. The project is currently undergoing a NEPA analysis (EIS), and final feasibility study. The plan described herein is, therefore, conceptual by necessity. Once the FEIS and Record of Decision are completed, a final plan will be developed for inclusion into the Final Plan of Operations.

Applicable regulations include the Federal Oil Spill Prevention Regulations (40 CFR Part 112) designed to help prevent spills, and US Department of Transportation regulations that govern oil transport and carriers, the Emergency Planning and Right-to-Know Act (EPCRA which requires reporting of 'reportable quantities' of hazardous materials, and other applicable requirements. The objectives are:

- Reduce the risk of accidental spills to the environment, and related environmental degradation
- Provide the Kensington Gold Project with the necessary information to properly respond to diesel fuel and chemical spills

- Clearly define line of function responsibilities for a spill event
- Provide a concise response and clean-up program which minimizes environmental impacts

All observers to an accident or spill must first identify the mechanism of failure or accident and the materials involved to ensure that there is no danger by entering the discharge or accident area.

The sequence of events for anyone discovering a spill will be:

1. Determine the origin of the spill and identify the discharge material.

2. Stop the discharge as safely as possible, which includes closing valves, stoping pumps, and transferring fuel out of leaking tanks.

3. Safeguard human life by alerting unnecessary personnel to evacuate, shutting off power in the vicinity or path of a discharge.

4. Attempt for immediate containment if possible, including the use of boom and sorbents, blocking culverts and drains, and excavating trenches to redirect flow (Appendix 5 - Typical Spill Response Containment Procedures)

5. Reporting the spill by contacting one of the four Emergency Response Plan centers at the minesite noting material type and estimated quantity released.

A standard spill response form is presented in the document as Appendix 2 . It outlines the mandatory reporting needs for an accidental spill event. Key reporting requirements are:

- Date, time and physical conditions
- Location
- Occurrence situation
- Appropriate identification (person, vehicle, equipment)

- Nearest dwelling, water body, weather
- Extent of human exposure, injury
- Same for environmental
- Same for wildlife, fisheries
- Materials involved, container types
- Containment procedures, documentation
- Disposal procedures, documentation, chain of custody
- Environmental sampling
- Photo-documentation
- Signature of preparer.

A display of BMPs is presented later in Appendix 5 of this document.

Personnel involved in oil spill response activities at the Kensington Gold Project will comply with all applicable worker health and safety laws and regulations. Federal regulations include Mine Safety and Health Administration standards for mandatory health and safety as codified in 30 CFR for mining activities.

2.5 Final Notification and Reporting Required By Law

The following agencies must be notified if each of their respective thresholds are breached during a release of a hazardous material or petroleum product to water or land:

National Response Center: Sheen on water (releases to land are not reportable to the NRC)
ADEC: Sheen on water or, Releases to land 55 gallons
EPA: Water N/A, Land 1,000 gallons

The contact numbers for these agencies are listed in Appendix 3 in this document. Reporting to these agencies is the sole responsibility of the Environmental Manager at the Kensington Gold Project.

2.6 Transportation Impact Mitigation

2.6.1 Dust Control Measures

The application of water on roadways and exposed stockpiles serves as mitigation for dust control. Enhanced dust control is achieved with the use of surfactants that increase the retention time for applied moisture to the soils.

2.6.2 Soil Erosion Reduction

Remediation for sediment loading includes bank stabilization with revegetation, the use of BMPs described in Appendix 5, and primary treatment with settling ponds prior to water flow introduced into culvert.

2.6.3 Snow Removal and Maintenance

Unplanned snow removal has the potential to introduce additional sediment loading into the waterways unless disposal areas away from direct discharge areas have been planned and prepared in advance. At the Kensington Gold Project, snow cache areas will be designed into the road system to control snowmelt runoff.

2.6.4 Spill Response Equipment Stations

To address the risks identified in Section 2.2 and 2.3, and as remediation for unexpected spills, it is planned that spill response trailers will be placed at strategic locations along the traveled corridor where discharges of hazardous materials could directly enter the Johnson Creek system. Spill response equipment stations will also be located at each marine facility and at the process area siltation pond which accepts stormwater runoff from that area. Those stations will be equipped with significantly more boom for the marine area.

Spill kits will contain the following minimum equipment: Visqueen bags, silt fence and posts, shovels, life jackets, waders, gloves, rope, buckets, floating oil boom and sorbent pads.

Rapid response caches will be secured with a combination style lock with the code set to “1,2,3,4”.

2.6.5 Marine Transportation

All of the fuel and supplies required for the construction and operation of the Kensington Gold Project are to be delivered via the Slate Creek Cove marine terminal. Consultation with regulatory agencies, special interest groups, and the public has identified several important considerations for the construction and operation of this facility which Coeur Alaska has formally adopted into the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004).* A key aspect of this plan, with respect to BMPs associated with the risk of fuel spills, is Coeur’s commitment to “…build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period.”

2.6.6 Cascade Point Marine Terminal Facility

Coeur Alaska is planning on contracting with Goldbelt to provide passenger ferry service from Goldbelt’s proposed marine terminal facility located at Cascade Point. The terminal will be under the direct ownership and control of Goldbelt, however, as with all contractors providing services to the Kensington Gold Project, adherence to Coeur Alaska stipulations with respect to environmental protection and controls will be required.

The Cascade Point marine terminal is being designed to preclude the need for diesel fuel storage tanks for refueling the passenger ferries. Instead, an on-call fuel truck will be dispatched from Juneau as required to meet the fueling needs of the dedicated ferries. It is estimated that the refueling exercise will only require an average of one fueling per week. No other vessels will be refueling at the Cascade Point facility.

The fuel truck will tie into an upland fuel header located at edge of the parking lot area. The header will be located within a permanent structure secured by a locked

door on a bermed concrete pad to provide a non-permeable surface for containment of any spills.

A small diameter steel fuel pipeline will run from the header to the approach dock. It will be located above ground and away from any areas with vehicular traffic. The pipe will be mounted to the edge of the approach dock until reaching the gangway. A flexible hose connection will connect the pipe to an identical pipe section mounted on the gangway. Another flexible hose connection will join the gangway pipe to a pipe along a protected edge of the float dock. All flexible hoses will be protected by a flexible steel covering to limit the potential for vandalism.

At approximately mid-dock the fuel pipe connects to a hose reel. The reel is enclosed in a protective housing for security and weather protection purposes. The housing will be secured to a metal pan to capture any possible fuel drippings. At the end of the fuel hose is the nozzle.

<u>Standard Operating Procedures</u>

The actual transfer of fuel will be conducted under a standard operating procedure (SOP). The list of SOP’s is as follows:

1. The fuel truck driver will connect the truck hose to the header. The driver will control and visually monitor the fuel transfer process at this location. Extra care will be taken to minimize any fuel leaks at the header connection.

2. The vessel engineer will do the actual fueling of the boat. The engineer will control and visually monitor the fuel hose nozzle during the transfer process. Extra care will be taken to prevent fuel spills at the nozzle location. The engineer will inform the fuel truck driver of the number of gallons to be transferred prior to starting.

3. The marine facility manager will supervise the overall fuel transfer process. It will be the manager’s responsibility to ensure that all SOP’s are being followed.

4. The truck driver, vessel engineer, and the marine facility manager will be in constant radio contact throughout the fuel transfer process.

Best Management Practices

A properly designed, constructed, and operated fuel transfer process with associated BMPs, should prevent releases of fuel to the environment. The BMPs for fuel transfer at the Cascade Point Marine Terminal are as follows:

1. All persons involved in the fuel transfer operation will be trained to follow the SOP's and the use of the identified BMPs.

2. A detailed spill response plan will be developed for the marine terminal facility (once the facility is constructed) and all personnel will be trained accordingly on the specific features of that facility.

3. Appropriate spill response equipment including various absorbent materials will be placed at the header and hose reel locations. The materials will be within easy reach in case of any spills. All used materials will be properly disposed of and replaced immediately.

4. A drip bucket will be hung below the fuel header connection. The bucket and the concrete pad will be kept in a clean condition.

5. An absorbent pad will be placed against the fuel nozzle while fueling and a drip bucket placed below the vent to catch any possible overflow.

6. The system will be inspected by the facility manager prior to each fuel transfer operation. In addition, the transfer system will be formally inspected and pressure tested on an annual basis. All maintenance and repair needs will be taken care of immediately in order to ensure continued trouble-free operation.

Appendix – 1
Original Emergency Response Form for Photocopying

EMERGENCY RESPONSE FORM – INJURY and SPILLS

First Incident Commander's Name:___________________________ Time:_______________
Second Incident Commander's Name:_________________________ Time:_______________

1. **Information to gather from the observer:**

Number of persons affected:____

Mechanism and Extent of Injuries:____

Location of Accident:____

Best Access Route:____

Know Hazardous Goods Involved:____

Quantity of Hazardous Goods Spilled (consult the emergency information in Appendix 4 &5 for any precautions or special handling procedures):__________________________________

Site Weather Conditions:____

Observer's Call-back Number:____

2. **Call the Medivac Operator at: (907) 789-1099 if there are reported injuries for their assessment. The Mine Location is: Lat. 58 degrees 46 minutes North, Long. 135 degrees 01 minutes West. Give them YOUR callback number. Dispatch an Coeur Alaska First-Aid Technician to the scene of the accident, if possible.**

3. **Call the Environmental Manager (or the on-call environmental contact) at: (907) 789-1591 to assess the required action for a spill of any size. Dispatch a Coeur Alaska environmental spill response team, if possible.**

   If the environmental contact person cannot be reached, and the spill is deemed to be potentially detrimental to the surface waters of the State, the following agency must be notified: ADEC 907 465 5340 (daytime) 1-800-478-9300 (after hours).

4. **Call the Safety Officer (or the on-call safety contact) at: (907) 789-1591 to assess any required further action.**

   If the Safety Officer cannot be reached and the mechanism of injury is deemed to be potentially dangerous to the other employees (Hazardous Material), the following agency must be notified: Juneau Fire Department/Police Department – call 911.

5. **Notify the Mine Manager at: (907) 789-1591**

Appendix – 2 Initial Spill Report Form

Kensington Gold Project – Initial Spill Report Form

CALL THE COEUR ALASKA ENVIRONMENTAL GROUP CONTACT BEFORE YOU COMPLETE THIS FORM

Incident Information:

Date:________________Time:_________________Observer's Name:__________________

Operator's Name:____

Spill Location:____

Description of
Incident:____
____
____

Quantity Spilled:_____________________Material Spilled:___________________________

Discharged to:_______Land___________Water___________Air (check one)

If water, which waterbody:_________________________________

Source of Material Spilled:__________________________________

Clean-up
method:____
____

Clean-up: Planned:_______Completed:_________(check one)

Contaminated Area:____

Quantity of Soil:____

Actions taken to correct or mitigate the cause of the
release:____
____

Weather Conditions: Dry/Rain/Snow:____

Signature:________________________________Date:________________________

- FAX THIS FORM TO THE ENVIRONMENTAL MANAGER AT: (907) 789-1503 -

Appendix 3 – Contact Information

a. **National Response Center/United States Coast Guard**

1-800-424-8802

b. **Alaska Department of Environmental Conservation**

(907) 465-5340 (daytime) **1-800-478-9300 (after hours)**

c. **Juneau Fire Department/Police Department/LEPC**

9-1-1

d. **Southeast Alaska Petroleum Resource Organization (SEAPRO)**
(only if directed to call by Management official)

1-907-225-7002
1-888-225-7676

e. **Division of Homeland Security**

1 (800) 478-2337

f. **State Emergency Coordination Center (SECC)**

1 (888) 462-7100

g. **CBJ Fire Department Helicopter: 789-7554**

h. **Juneau Ranger District (wildfires): 586-8800**

i. **Medivac: 789-1099**

APPENDIX 4

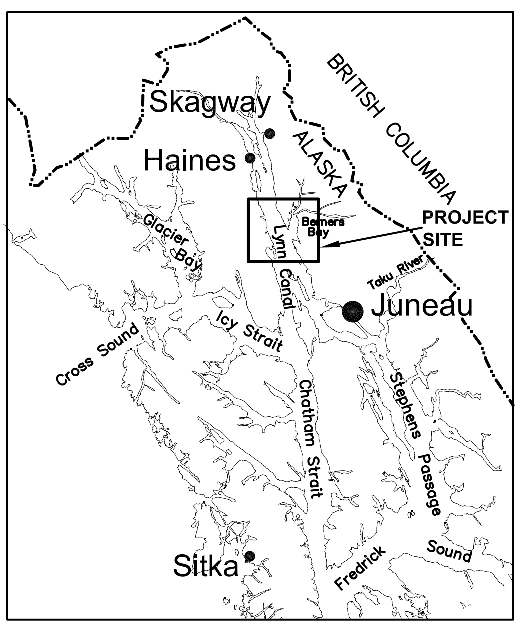
MATERIAL SAFETY DATA SHEETS FOR EACH CHEMICAL ONSITE

(to be completed once products are delivered to site)

APPENDIX 5

TYPICAL SOIL EROSION AND SPILL RESPONSE CONTAINMENT PROCEDURES

SOURCE: USGS 1:250,000 SERIES TOPOGRAPHIC QUADRANGLE, JUNEAU, ALASKA-CANADA, REVISED 1985, NGVD 1929.



NORTH

FIGURE 1	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN DRAWN: *JASPER GEOGRAPHICS*

GENERAL FACILITY LOCATION MAP
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

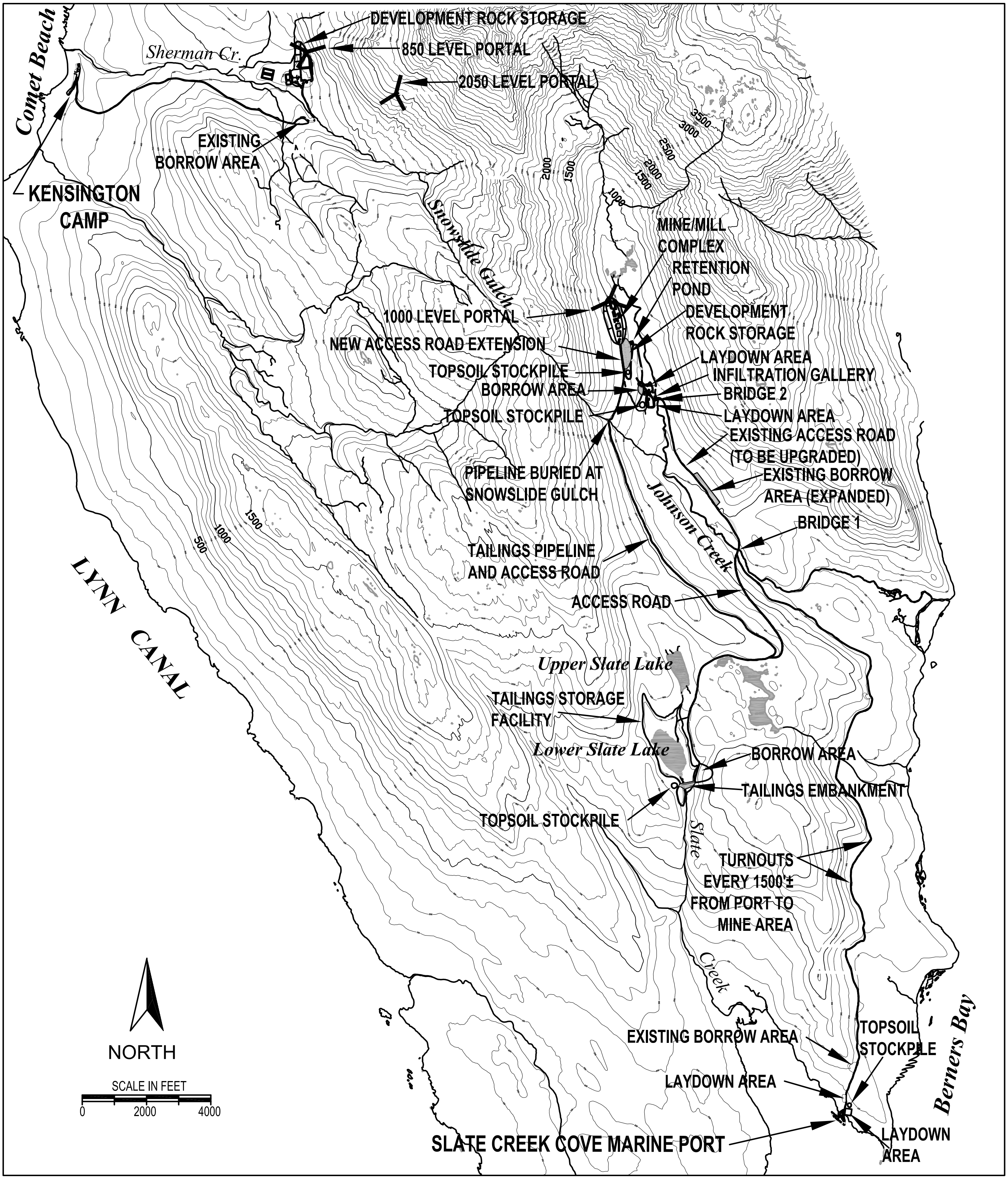
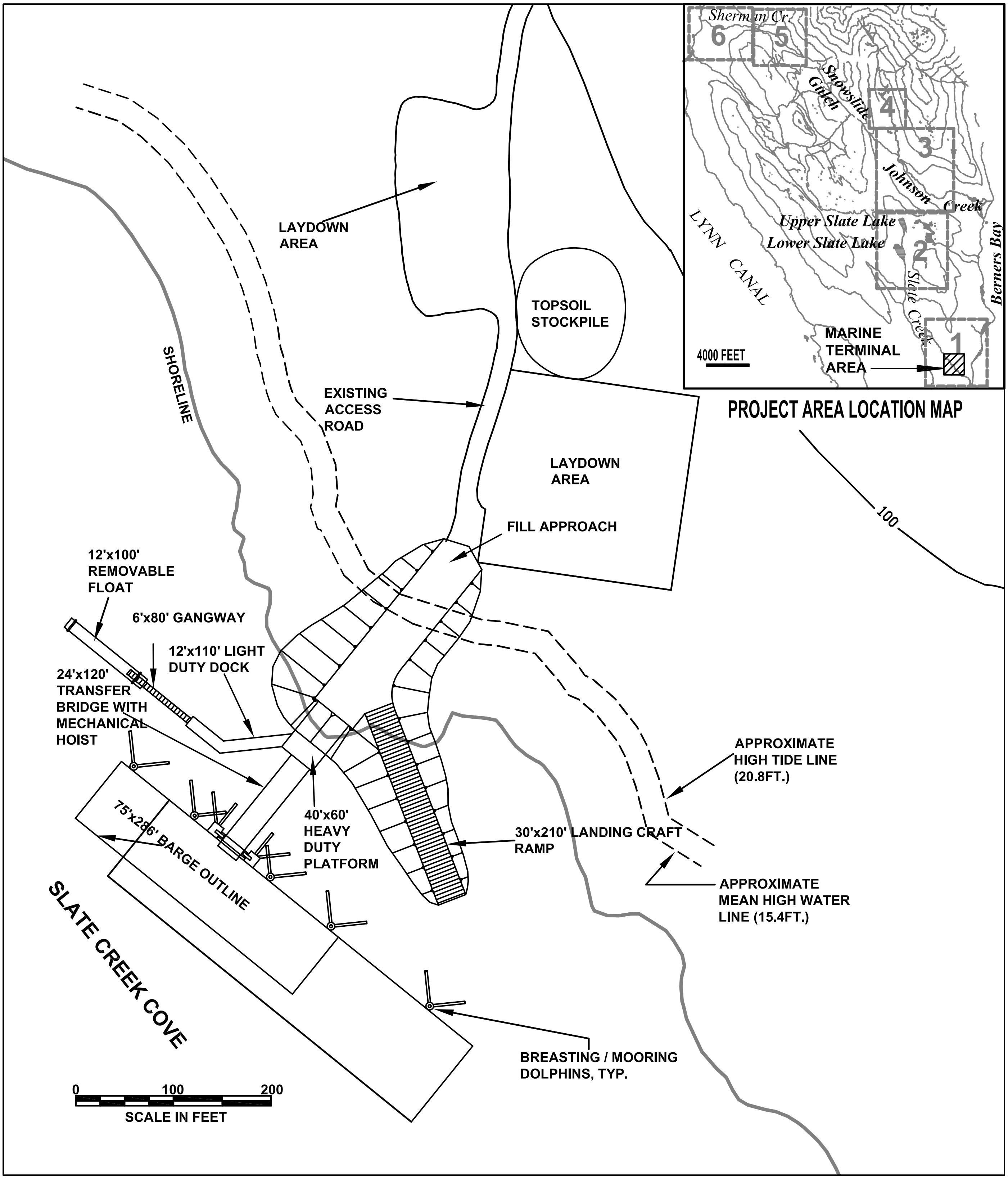


FIGURE 2	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN
	DRAWN: *JASPER GEOGRAPHICS*

LOCATIONS OF FACILITY COMPONENTS
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA



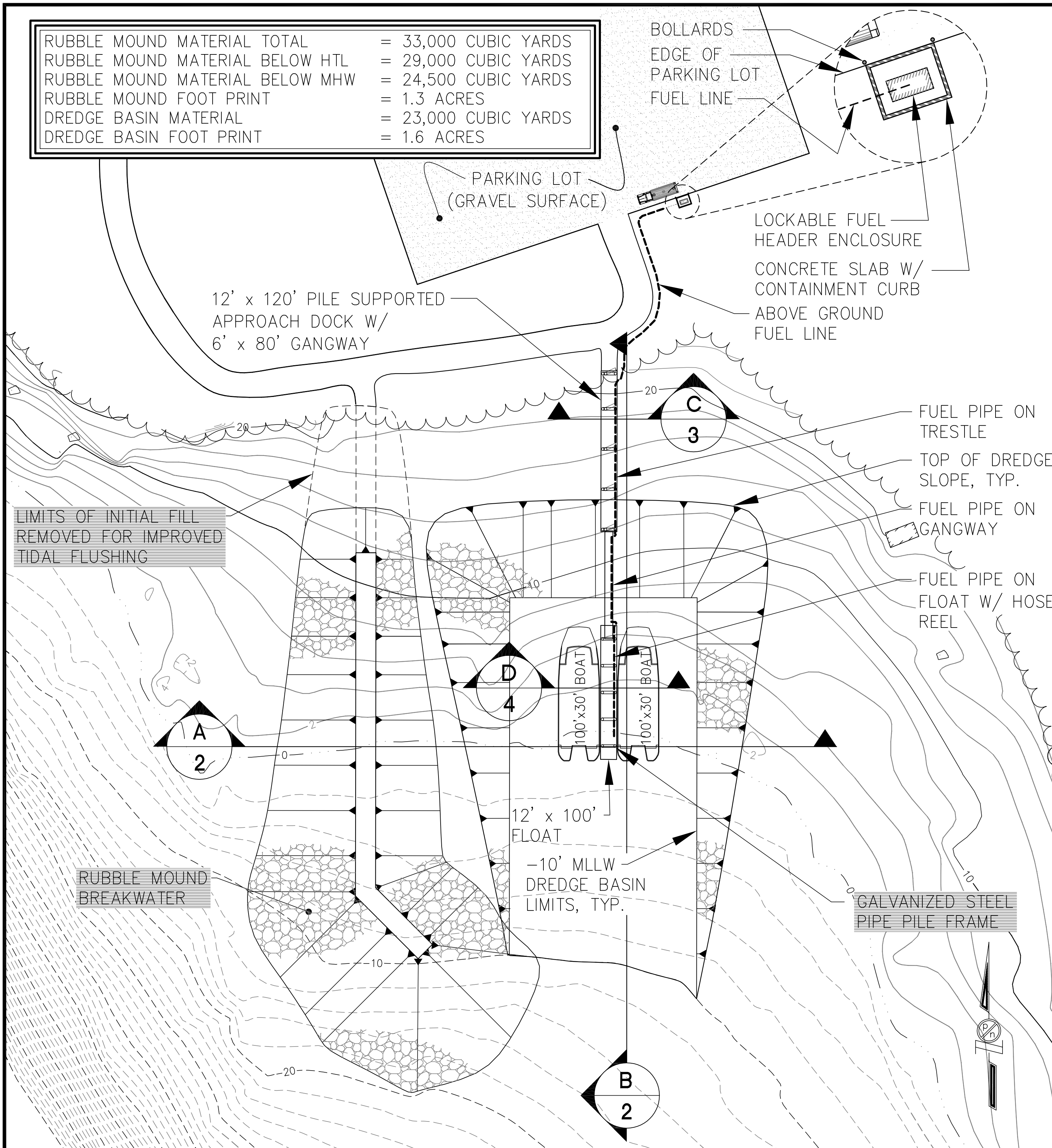
NOTE: BASED ON DESIGN PREPARED BY PERATROVICH, NOTTINGHAM & DRAGE, INC. FOR COEUR ALASKA, INC. 2001

NORTH

FIGURE 3	DATE: JUNE 2004
COEUR ALASKA	SCALE: AS SHOWN
3031 Clinton Dr. Suite 202, Juneau, AK 99801	DRAWN: *JASPER GEOGRAPHICS*

SLATE CK. COVE MARINE TERMINAL PLAN VIEW
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

RUBBLE MOUND MATERIAL TOTAL	= 33,000 CUBIC YARDS
RUBBLE MOUND MATERIAL BELOW HTL	= 29,000 CUBIC YARDS
RUBBLE MOUND MATERIAL BELOW MHW	= 24,500 CUBIC YARDS
RUBBLE MOUND FOOT PRINT	= 1.3 ACRES
DREDGE BASIN MATERIAL	= 23,000 CUBIC YARDS
DREDGE BASIN FOOT PRINT	= 1.6 ACRES



PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE PLAN

SCALE IN FEET

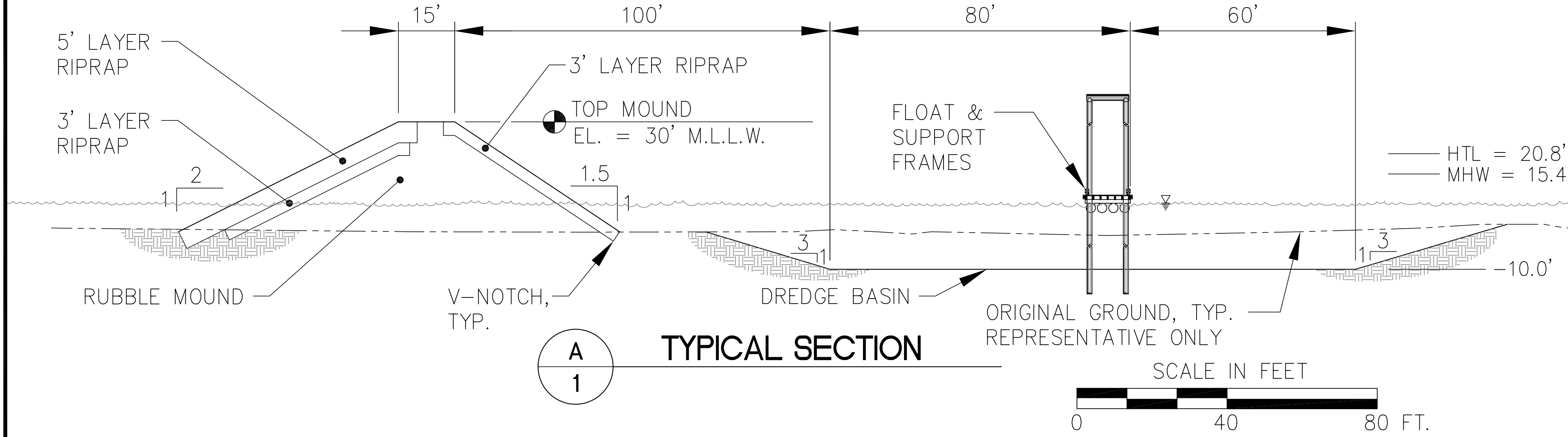
0 100 200 FT.

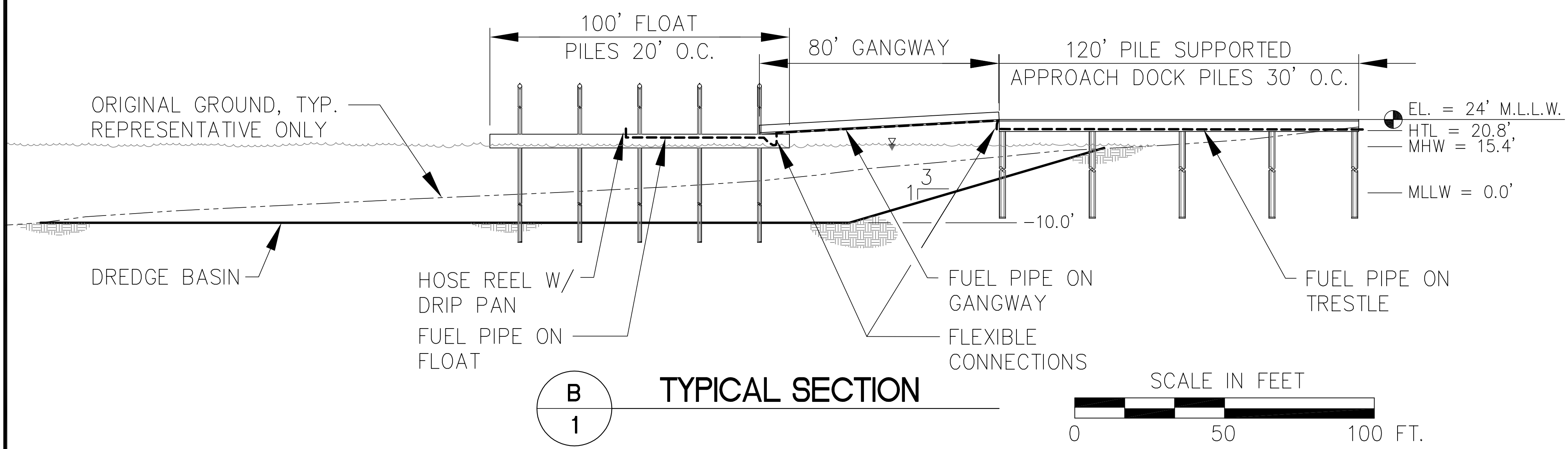
GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

PN&D PROJECT NO. 032025.01

APRIL 2003 SHEET **1** of **5**





PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE SECTIONS

PN&D PROJECT NO. 032025.01

GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

APRIL 2003

SHEET **2** of **5**

Coeur Alaska Kensington Gold Mine

Berners Bay Transportation Policy and

Mitigation and Best Management Practices Plan

September 2004


COEUR
ALASKA

Coeur Alaska, Inc.
3031 Clinton Dr., Suite 202
Juneau, Alaska 99801

Coeur Alaska Kensington Gold Mine
Berners Bay Transportation Policy and
Mitigation and Best Management Practices Plan

September 2004

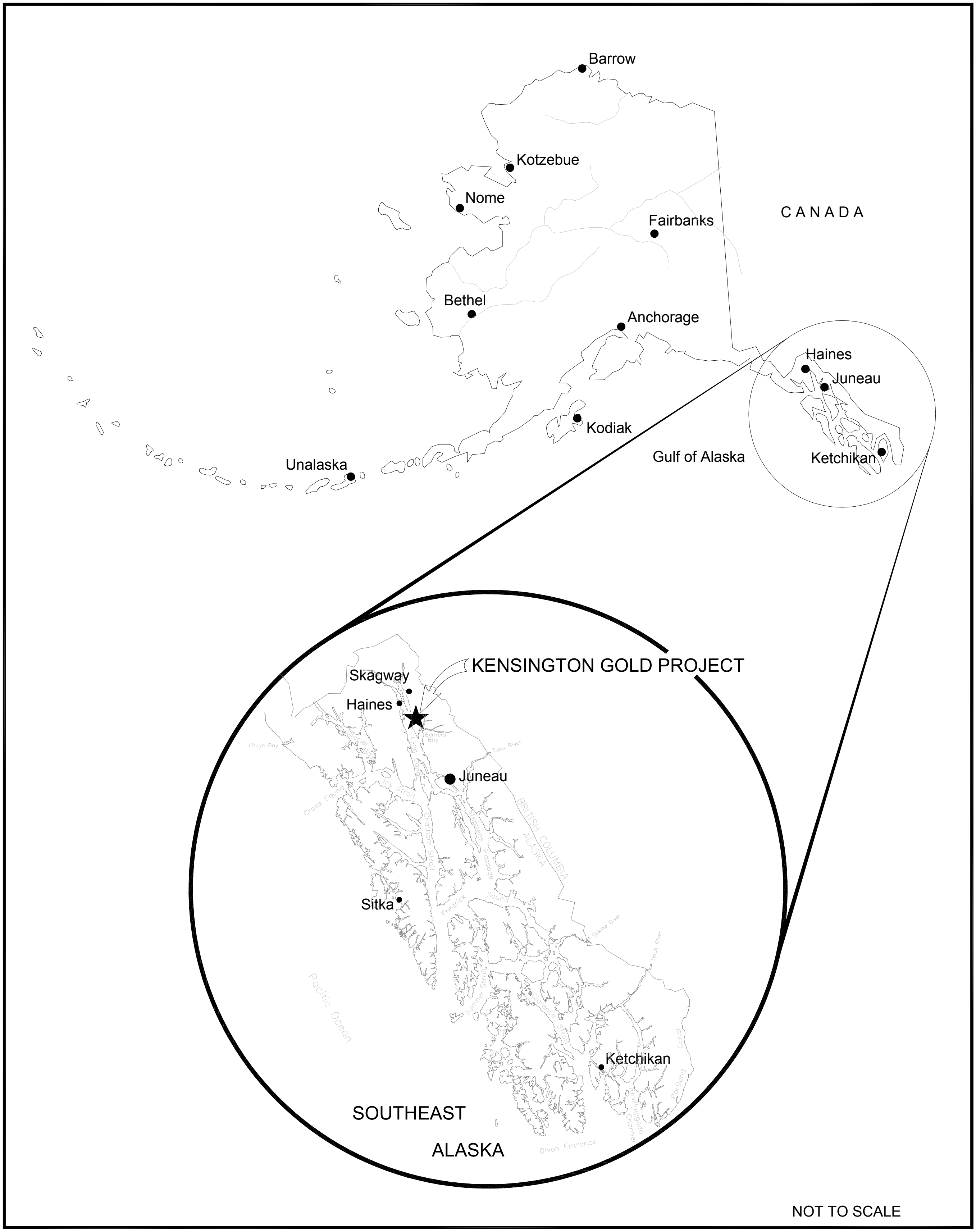
Background

Coeur Alaska, Inc. (Coeur), a wholly-owned subsidiary of Coeur d'Alene Mines Corporation, is proposing to construct and operate a 2000 ton per day (tpd) underground gold mine and processing facility on patented and unpatented mining claims located about 45 miles north-northwest of Juneau, Alaska (Figure 1). The project would be accessible by boat across Berners Bay. Berners Bay has important aquatic resources, marine mammals, and recreation uses.

The Kensington Gold Mine, as currently proposed, would involve the following major operating components:

- 2000 tpd underground mining operation
- Conventional flotation milling process at the existing Jualin Millsite; gold concentrate to be shipped offsite for final processing
- A tailings storage facility located at Lower Slate Lake
- A 6 mile access road from Slate Creek Cove to the millsite and mine
- Daily access across Berners Bay from a dock at Cascade Point to the upgraded Slate Creek Cove landing area and a newly constructed dock

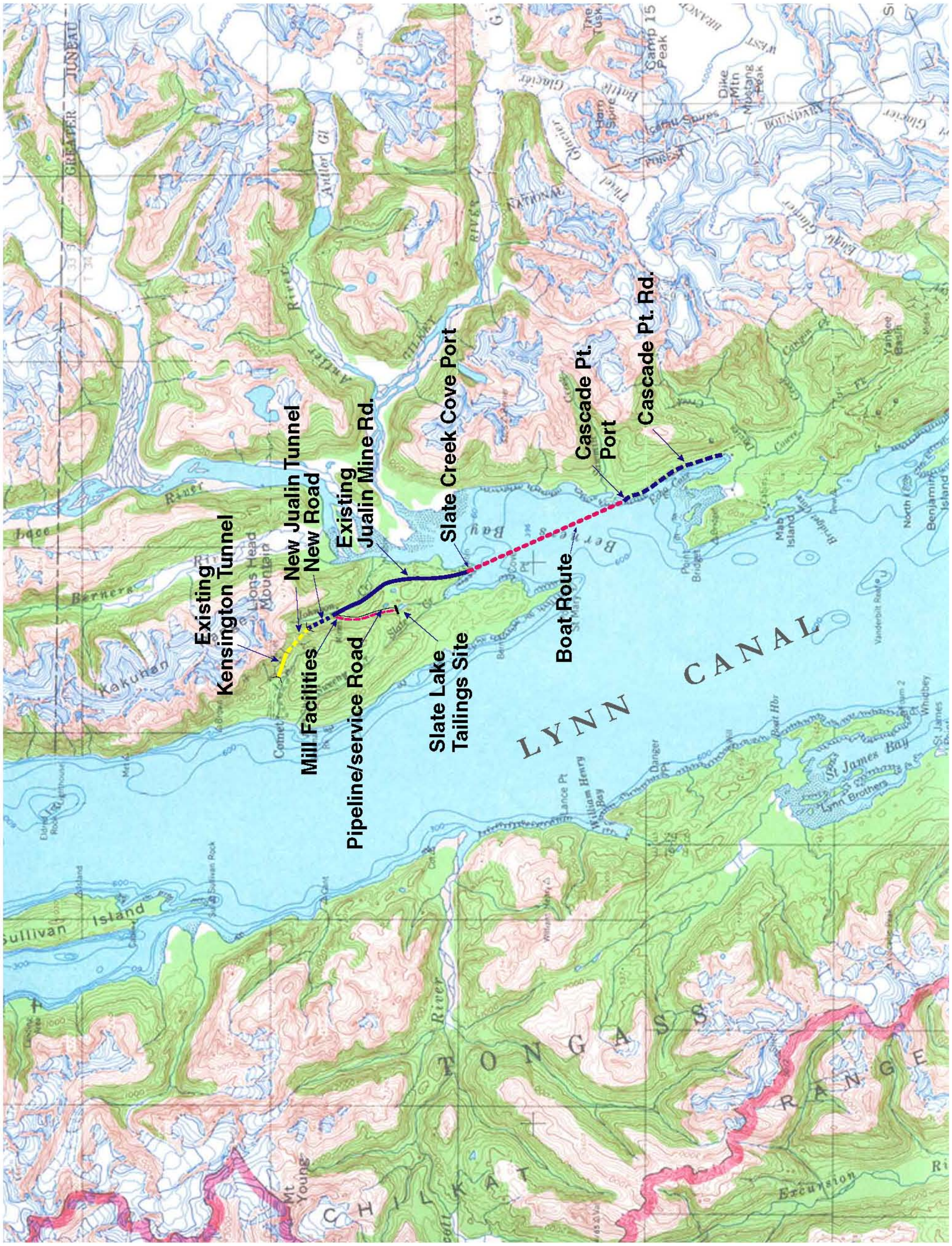
Figure 2 shows a proposed general facilities siting arrangement for the project components. The primary transportation routings (Cascade Point to Slate Creek Cove; Jualin mine access road) are highlighted on the figure. The marine terminal at Cascade Point consists of a breakwater, pedestrian access dock, aluminum gangway, and moveable float. The breakwater has been reconfigured as a "dogleg," to minimize fill intrusion into the intertidal zone. The breakwater is also designed with a breach, to allow shallow water fish passage at most high tides. The breakwater also generally conforms to the shoreline, with limited perpendicular obstruction. As compared to the Echo Cove dock (150,000 yd^3 of dredging), only 70,000 yd^3 of dredging would be required. The Slate Creek Cove terminal consists of an earthen ramp, platform dock, moveable ramp and floating dock. No dredging is required. The proposed construction plan includes specific best management practices (BMP's) to reduce sedimentation, construction prohibition "windows," and seasonal noise constraints. Operational BMP's are described later in this document.



SHEPHERD MILLER INCORPORATED

FIGURE 1
PROJECT LOCATION MAP

Date:	APRIL 2000
Project:	100619
File:	LOCMAP.dwg


Existing Kensington Tunnel
New Jualin Tunnel
New Road
Existing Jualin Mine Rd.
Slate Creek Cove Port
Cascade Pt. Port
Cascade Pt. Rd.
Mill Facilities
Pipeline/service Road
Slate Lake Tailings Site
Boat Route
LYNN CANAL
TONGASS
CHILKAT
RANGE
Sullivan Island
Berners Bay
St James Bay
Lynn Brothers
Benjamin Island
Mt Young
Comet
Kakuhan
Antler Gl
JUNEAU

3

Figure 2

Purpose and Need for Policy

During the environmental impact (NEPA) review process for the Kensington Gold Mine operation, resource agencies and certain publics raised concerns regarding potential impacts of construction and operation of the proposed docks at Cascade Point and Slate Creek Cove on local spawning eulachon and Pacific herring spawning, and Steller sea lion populations. Key concerns are summarized as follows, for the purposes of this plan:

- Eulachon – Returning adult fish are found congregating in Berners Bay near Slate Creek Cove during April and May, before moving into fresh water at the mouth of the Lace, Berners and Antler Rivers. At this time, Steller sea lion abundance also increases. Concern exists over construction and operational activities involving noise and increased dock traffic, and effects on fish spawning and sea lion feeding.

- Pacific herring – Returning fish are known to congregate in the vicinity of the proposed Cascade Point dock during about a 2-3 week period between late April and early May when they spawn. Construction of a breakwater and dock at Cascade Point could result in a loss of permanent habitat; residual hydrocarbons potentially resulting from accidental petroleum spills and/or general marine vessel operations could also adversely affect fish growth and development, and possible spawning.

- Steller sea lion – Excessive noise associated with dock construction and marine vessel operations and traffic could potentially stress sea lion populations, foraging behavior, and reproduction.

Transportation use, such as the daily transport of mine workers and barging of supplies and concentrate, could also impact recreation users. Regular announced schedules, limited trip schedules, and adherence to speed limits and wake control will largely offset these effects.

The effects of the proposed dock facilities and marine traffic associated with the daily commute are difficult to predict. Resource managers indicate they do not have enough information regarding specific habitat factors and potential environmental stressors from development projects such as Kensington. These researchers and managers agree that a combination of Best Management Practices (BMP's) and a monitoring program are necessary to mitigate potential impacts of the proposed project. The BMP's would focus on reducing impacts during construction by prohibiting "in water" work during the critical spawning and incubation period, and controlling sedimentation. BMP's implemented during operations would focus on limiting potential pollution from petroleum hydrocarbons, and optimizing avoidance actions for marine mammals (sea lion) congregating populations in the area, to the extent practicable.

For the purposes of this plan, best management practices are activities, including passive treatment, operating procedures, and avoidance actions, that prevent or reduce the discharge of pollutants, and limit encounters with marine mammals and special fish species. The BMP's included herein are also intended to provide mitigation, consistent with the Clean Water Act, Endangered Species Act, and other applicable federal, state and local laws and regulations. The plan is also intended to be consistent with Coeur's Environmental Policy: "producing and protecting." Key provisions are intended to increase employee awareness of hazards, and thereby improve worker safety and limit pollution liabilities and risks.

Associated monitoring programs would at the same time provide critical information on herring habitat, spawning locations, and water quality. Best Management Practices and monitoring priorities for this Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan can be generally summarized as follows:

Best Management Practices listed in this plan would include (but not be limited to):

- Prohibit in-water construction activities during the period April 15 through June 30
- Silt curtains or other methods to control sediment from being transported off-site into adjacent habitat during construction
- Measures to prevent and control petroleum hydrocarbons from getting into the water during both construction and operations

Monitoring would include:

- Water quality monitoring for petroleum hydrocarbons in Berners Bay
- Map submerged aquatic vegetation between Echo Cove and Cascade Point
- Monitor and document colonization and habitat value of the breakwater
- Monitor and document herring spawning activity and location(s) in Berners Bay

Overview of Coeur's Goals, Policy and Transportation/Mitigation Plan

Coeur has developed environmental management policies, guidelines, and practices included in this document to ensure that environmental impacts are minimized and mitigated during construction and operation of the Kensington Gold Mine, including related transportation facilities and needs. Implementation of these environmental protection measures will occur, as soon as the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD), and related applicable permits are issued by the respective agencies, approving the project. The BMP plan outlined herein will be incorporated into the "Final Plan of Operations for the Kensington Gold Mine," and submitted to the USDA Forest Service for approval, in advance of construction of related facilities on National Forest lands.

The following primary goals are identified for the "Coeur Alaska Kensington Gold Mine Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan":

Goal #1: The overall policy and direction of this plan is comprised of "standard operating procedures" (SOP's), to be followed by Coeur and all its contractors, service providers, and consultants as part of the marine facilities construction and operating plans. These SOP's will be included in all related construction and service contracts.

Goal #2: The primary overriding goal is: "to protect the Berners Bay environment as part of a coordinated and comprehensive transportation and environmental management plan, consistent with the current U.S. Forest Service land use

planning goal of Modified Landscape (ML) with a minerals overlay Land Use Classification, and the stated goals and objectives of the Kensington Berners Bay Consortium. The stated goals of the ML minerals designation are to encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for mineral development.

Goal # 3: Other key objectives of the Coeur Transportation Policy and Mitigation and Best Management Practices Plan are:

- Avoid in-water construction activities during the period of herring spawning and incubation (about April 15 through June 30)
- Avoid incremental water quality impacts to Berners Bay
- Commit to one coordinated marine vessel fueling option involving one fueling location, for transport of mine workers from Cascade Point to Slate Creek Cove
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species through the implementation of a sound fueling plan, and responsible operational BMP program
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove, in order to facilitate fish passage and intertidal flushing at the facilities
- Continue to financially support and participate in a coordinated/cooperative Berners Bay environmental monitoring program initiated by Coeur, ADNR / ADF&G, NMFS / Auke Bay Laboratory, and University of Alaska; the program could also be expanded, as appropriate and agreed upon

Goal # 4: Coeur will work with ADNR to develop effective monitoring and mitigation programs and appropriate environmental thresholds for mitigation, for the Cascade Point and Slate Creek Cove dock sites, as part of the State's Tideland Leases for the two facilities

Goal # 5: Primary Operating Procedures (SOP's) of the Transportation/Mitigation Plan for Berners Bay to be followed by Coeur, its service providers, and consultants are as follows (these will be contractual requirements):

SOP #1: Coeur will identify and operate according to a "designated transportation routing" from Cascade Point to Slate Creek Cove, for the daily marine vessel transport of mine workers

SOP #2: Regular schedules will also be established for weekday and weekend workers' transport (these will minimize the number of daily trips, to the extent practicable)

SOP #3: Routings and schedules will be strictly adhered to, except where unusual environmental or workers' safety considerations dictate an alternative approach

SOP #4: Designated routing and schedules will also be established for barge transport to the Slate Creek Cove dock site

SOP #5: Vessels will operate at low, constant speeds and regular scheduled intervals; vessels will not approach within 100 yards of Steller sea lions, humpback whales, and other sensitive marine mammal species

SOP #6: Marine fueling of Coeur transport vessels will occur only at Cascade Point dock or Auke Bay dock, or other approved U.S. Coast Guard facilities. Kensington marine vessel fueling will not take place at Slate Creek Cove dock, except for emergency environmental situations and/or conditions involving worker safety which dictate such limited use. Other requirements for Cascade Point, based on a separate agreement with Goldbelt are as follows:

- The Cascade Point dock will be used primarily by a single dedicated marine vessel, to transport mine workers to and from the minesite
- No other vessel fueling except the Coeur Kensington marine vessel would be fueled a the Cascade Point facility
- No fuel storage would occur at the site; a fueling truck from Juneau would be used to meet the dedicated vessels needs

SOP #7: The following special considerations will be given by Coeur during the spring eulachon spawning season:

- Coeur will work with the NMFS and USF&W Service to develop a “Steller sea lion awareness training” manual, to be used by Coeur (and other) marine pilots operating vessels in Berners Bay
- Marine vessel encounters with special fish species, marine mammals and important bird species will be recorded and reported, as part of the overall monitoring plan
- Coeur, ADNR/ADFG, and NMFS will annually mutually agree to that year’s “eulachon spawning season” to encompass 2-3 weeks, during which a “transportation action strategy” will be implemented by the company as part of an overall traffic plan
- As part of the transportation action strategy, during the designated eulachon spawning season (approximately between April 15 to May 15 window – typically about 2-3 weeks), marine transport vessels for the Kensington Gold Project will be fueled outside of Berners Bay, at a U.S. Coast Guard approved facility
- During the designated eulachon spawning season, Coeur will fund a NMFS “observer” to accompany the designated vessel pilot and take part in determining the best daily routing from Cascade Point to Slate Creek Cove dock, so as to minimize Steller sea lion encounters, and also minimize incidental takings within the context of insuring reasonable access to the Kensington Gold Project minesite
- During this period, Coeur will attempt (to the extent practicable) to reduce the typical daily worker transport schedule from 3-5 trips/day, to not more than 2 or 3 trips/day (except for emergency environmental or safety situations)

- Coeur will build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period
- Coeur will, to the extent practicable, limit concentrate barging during this 2-3 week period (similar to reduced fuel shipments)
- Other chemical and supplies shipments will be curtailed during that period, to the extent practicable, so as to further limit all barging and reduce Steller sea lion encounters
- **Coeur will evaluate the potential practicability and safety considerations related to utilizing a portable, moveable dock which could receive Kensington mine workers at alternative sites within Slate Creek Cove, during the eulachon spawning season. (Note: may not be possible/practicable)**
- During the herring spawning season, Coeur and/or their transportation contractor will adjust regular Cascade Point to Slate Creek Cove routing so as to avoid large congregations of surface spawning forage fish (NMFS observer and Coeur to determine routes)
- Design considerations for the Cascade Point dock facility will consider the slope and composition of fill used in breakwater construction to provide shallower water and large rock outcrops, to the extent practicable
- Coeur will conduct dive surveys of the breakwater and adjacent habitat likely to be impacted by construction and operation of the breakwater, initially on an annual basis following construction for every year during a 5 year period, then at year 10 and year 20 (post-operations)
- During the herring spawning season, Coeur and/or their transportation contractor will limit refueling inside Berners Bay at the Cascade Point to one event per week; the vessel will also be "boomed" during fueling
- Fueling will occur from upland by a fuel truck stationed in a totally contained facility; all related activities will be subject to strict provisions of Coeur's Spill Contingency Plan

<u>Other Standard Operating Procedures (SOP's)</u>

SOP #8: Coeur will implement Stormwater Pollution Prevention Plan (including stormwater management control practices, measures to reduce pollutants in stormwater, SPCC Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) at the two dock sites

SOP #9: Controls for erosion and sedimentation, total containment of petroleum products, oils and grease separation, stormwater diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade

Point and Slate Creek Cove transport facilities, and by boat operations serving the project

SOP #10: Specific BMP's for Marine Vessels and Docks Required by Coeur include the following commitments by Coeur. Coeur or its contractor(s) will:

- Require (contractually) that service providers and users abide by approved BMP's at the two docks
- Provide designated work area(s) for outside boat repairs and maintenance – no maintenance will be permitted outside of these areas
- Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area; upland area(s) are required for these activities
- Perform maintenance over tarps to ease cleanup at these upland maintenance areas
- Provide upland cleanup areas with adequate stormwater management facilities
- Utilize oil and water separators for stormwater collection and treatment at the dock facilities and parking areas
- Inspect stormwater drainage and washing systems regularly at these upload sites
- Develop and implement standard operating procedures BMP's for the management of all solid waste associated with the docks and boat transport facilities, including recycling, compacting, and reuse as appropriate
- Use flyers, pamphlets and newsletters to raise operators and passengers awareness of need to implement BMP's
- Provide and maintain appropriate storage, transfer, containment and disposal facilities for all liquid and solid wastes generated by the mine transportation operations
- Separate containers for disposal and clearly mark those containers for: used antifreeze, oils, greases, solvents and other materials
- Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code (designated storage areas should be covered and the inside area sloped to a dead end sump with total containment provided (all drains to be equipped with positive control valves or devices)
- Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container
- Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors
- Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur; attendance will be mandatory; federal, state and local regulators will be invited to take part in this training program
- An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: 1) Cascade Point dock; 2) Slate Creek Cove dock; and 3) the minesite (supplies are described in the Spill Contingency Plan)
- Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters

- Regular inspection of fuel lines and hoses for chaffing, wear and general deterioration is required (replace with USCG Type A)
- Non-spill vacuum systems for spill proof oil changes or to pump out oily bilge water is required
- Marine vessel engines must be regularly tuned and operating at peak efficiencies
- Waste oil must be removed from the maintenance site by a permitted waste oil transporter
- Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary
- All sewage must be disposed of at approved land-based facilities
- Use of biodegradable treatment chemicals in holding tanks is required
- Use of low phosphate detergents to reduce phosphorous loads to approved treatment systems is required

Additional Construction and Operational SOP Requirements of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan

***SOP #11*:** Coeur will sponsor a "Berners Bay Working Group" to include: NMFS, USFS, USF&WS, ADNR, Coeur, a commercial fisheries organization, commercial crabbers association, and Goldbelt

SOP #12: Coeur will also implement the following construction best management practices (BMP's) at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the two facilities:

- As part of the design criteria, Coeur will limit fill placement in subtidal areas to the extent practicable, to minimize effects on marine fish rearing habitat
- Coeur will use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment
- The design criteria will prohibit the use of creosote or pentachlorophenol treated wood materials in construction that would have contact with the water, in order to avoid toxic effects to juvenile fish
- The design criteria will promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks and gangways) in order to facilitate light penetration for aquatic plants
- Construction contracts will restrict the use of impact hammers to the extent practicable, both from a scheduling, engineering and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity
- The final design will include prudently engineered breach in the Cascade Point breakwater to allow for juvenile fish passage at high tides (this assumes, fish will also congregate behind the breakwater to take advantage of feeding opportunities.
- Coeur will maintain prudent engineering in the dogleg design concept for the Cascade Point breakwater to ensure:
  - reducing the amount of documented kelp that would be directly impacted
  - orienting the end of the breakwater away from habitat to the north that is generally better suited for herring spawning than to the south

- reducing the amount of habitat to the east and south of the breakwater that will have reduced wave energy as a result of the breakwater
- Reduce fill needed for Slate Creek Cove dock facility loading ramp, so as to limit protrusion into Berners Bay, while not jeopardizing loading and offloading worker safety and creating unnecessary environmental risk

SOP #13: Coeur will develop a Spill Response Plan to be implemented at both the Cascade Point and Slate Creek Cove dock facilities, and the minesite, in order to prevent fuel and chemical spills, and minimize their environmental impacts in the event of an accidental spill. The Spill Response Plan will be adopted and implemented as a key component of this mitigation plan. The primary objective of the Spill Contingency Plan will be to:

- Reduce the risk for accidental spills and environmental degradation
- Provide the operating facility with the necessary information to properly respond to a fuel or oil spill or chemical spill event.
- Clearly define line of function responsibilities for a spill situation
- Provide a concise response and clean-up program which minimizes environmental impacts

SOP #14: The effectiveness of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan and related contingency plans and monitoring programs would be evaluated after year one of construction, and year one of operations, and every third-year thereafter in order to facilitate the goals and policies of the program. The findings of the review or "environmental audit," to be conducted by a qualified third-party contractor commissioned by Coeur, would be presented to the "Berners Bay Working Group" and key resource management agencies during the month of February of that year, in order to evaluate programs and recommend modifications an/or realignments to policies, where necessary.

Coeur will commit to these policies, BMP's, mitigation activities, and monitoring programs, to be incorporated into the overall mitigation component of the Final Plan of Operations, to be approved by the U.S. Forest Service. It is understood that approval of this plan by the U.S. Forest Service does not relieve Coeur of its responsibilities to comply with other Federal, State, and Local laws, rules, and regulations.

Appendix E

Best Management Practices and Mitigation Measures

Appendix E: Best Management Practices and Mitigation Measures

The following best management practices (BMPs) and mitigation measures have been identified either as part of permit applications or in the SEIS. The focus of these BMPs and mitigation measures is to reduce the sources and likelihood of a spill into the marine environment, limit the extent of a spill that might occur, and ensure a rapid response in the event of a spill. This appendix includes Coeur's Draft Spill Response and BMP Plan and Coeur's Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan.

Goals and Objectives

- Avoid incremental water quality impacts on Berners Bay.
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species.
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove to facilitate fish passage and intertidal flushing at the facilities.

Standard Operating Procedures

- A Storm Water Pollution Prevention Plan (storm water management control practices, measures to reduce pollutants in storm water, Spill Prevention, Control, and Countermeasures [SPCC] Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) will be implemented at the two dock sites.
- Controls for erosion and sediment, containment, oil and grease separation, storm water diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade Point and Slate Creek Cove transport facilities, and by boat operations serving the project.
- BMPs for boats and docks will include the following**:**
  - ✓ Provide designated work area(s) for outside boat repairs and maintenance. No maintenance would be permitted outside these areas.
  - ✓ Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area (upland area(s) required).
  - ✓ Perform maintenance over tarps to ease cleanup at these upland maintenance areas.
  - ✓ Provide upland cleanup areas with adequate storm water management facilities.
  - ✓ Use oil and water separators for storm water collection and treatment, as appropriate.
  - ✓ Inspect storm water drainage and washing systems regularly at these upload sites.
  - ✓ Require (contractually) that service providers and users abide by approved BMPs at the two docks.
  - ✓ Develop and implement standard operating procedures BMPs for the management of all solid waste associated with the dock and boat transport facilities, including recycling, compacting, and reuse as appropriate.
  - ✓ Use flyers, pamphlets, and newsletters to raise operators' and passengers' awareness of need to implement BMPs.

- ✓ Provide and maintain appropriate storage, transfer, containment, and disposal facilities for all liquid and solid wastes generated by the mine transportation operations.
- ✓ Separate containers for disposal and clearly mark them for used antifreeze, oils, greases, solvents, and other materials.
- ✓ Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code. (Designated storage areas should be covered and the inside area sloped to a dead-end sump with total containment provided; all drains are to be equipped with positive control valves or devices.)
- ✓ Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container.
- ✓ Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors.
- ✓ Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur, and attendance will be mandatory.
- ✓ An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: (1) Cascade Point dock, (2) Slate Creek Cove dock, and (3) the mine site.
- ✓ Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters.
- ✓ Regular inspection of fuel lines and hoses for chaffing, wear, and general deterioration is required (replace with USCG Type A).
- ✓ Non-spill vacuum systems for spillproof oil changes or to pump out oily bilge water are required.
- ✓ Engines must be tuned and operating at peak efficiencies.
- ✓ Waste oil must be removed from the maintenance site by a permitted waste oil transporter.
- ✓ Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary.
- ✓ All sewage must be disposed of at approved land-based facilities.
- ✓ Use of biodegradable treatment chemicals in holding tanks is required.
- ✓ Use of low-phosphate detergents to reduce phosphorus loads to approved treatment systems is required.

Other Construction and Operational Requirements

- The following construction BMPs will be implemented at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the facilities:
  - ✓ Limit fill placement in subtidal areas to the extent practicable to minimize effects on marine fish rearing habitat.
  - ✓ Use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment.

- ✓ Prohibit the use of creosote- or pentachlorophenol-treated wood materials that would have contact with the water in order to avoid toxic effects on juvenile fish.
- ✓ Promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks, and gangways) to facilitate light penetration for aquatic plants.
- ✓ Restrict the use of impact hammers to the extent practicable, from a scheduling, engineering, and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity.
- ✓ Fueling of Coeur marine transport vessels will occur at Slate Creek Cove dock or the Auke Bay transit/maintenance site.
- ✓ Implementation of a strategic spill prevention and response plan at the dock sites and mine site, as described earlier in this document.

Kensington Gold Project

SPILL RESPONSE and BMP PLAN

Including the

EMERGENCY RESPONSE PLAN

(Preliminary Draft)

Prepared by
RTR Resource Management, Inc.

for
Coeur Alaska Inc.

Version 0 – October, 2004

Annual Certification:________________________________Date:_______________
Signature Required

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INTRODUCTION

This document has been prepared for inter-agency review and comment. It is not intended to serve as a replacement document for any one of the four existing plans, listed below, that cover the current configuration of the Kensington Gold Project:

1. Marine Transfer-Related Facility Response Plan (USCG);
2. Spill Prevention, Control, and Countermeasures Plan (USEPA);
3. Emergency Response Action Plan (ADEC); and the
4. Facility Operations Plan (USCG).

These documents have been incorporated into a unified Facility Response Plan as required by 33 CFR 154, Subpart F for marine transportation-related facilities. As dictated, these plans and associated facilities are required to be reviewed by a Registered Professional Engineer and will be updated to include the revised facilities at Kensington once they have been constructed.

The following document has been designed to incorporate all of the considerations for the transportation, handling, and storage of hazardous materials for the optimized Kensington Gold Project as described in the Draft Supplemental Environmental Impact Statement for discussion purposes only. Special planning serves as partial mitigation to minimize the effects associated with handling these materials and responding to accidents or spills in this remote area in a timely manner and this document serves as a mechanism to receive regulatory agency comments and considerations for Standard Operating Procedures adopted for the Kensington Gold Project. Recently Coeur Alaska has distributed the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004),* for comments in the same manner that this document is being distributed.

There are two main sections to this document: the Emergency Response Plan and the Spill Prevention and Response Manual. The Emergency Response Plan appears in Section 1 as it was considered the most time critical section, first to be seen upon opening the document. It is intended that the Emergency Response Form, on the inside front cover of this document is the only piece of paper required to systematically gather and report the required information in the event of an emergency situation. All potential users of this document must be made

aware that in an emergency, only the Emergency Response form needs to be completed initially. The Spill Prevention and Response Manual, Section 2, first lists the industry standard preventative measures required when storing bulk materials at the facility, then identifies the potential risks to the environment, and finally suggests appropriate mitigation for the identified risks.

Section 1 – Emergency Response Plan

The FIRST ACTION in the event of an emergency is to comply with the Emergency Response Form located inside the front cover of this document. Do not read any further, please refer immediately to the Form on the inside cover of this binder.

This section of the plan is to document the systematic approach that will be taken by Coeur Alaska personnel to respond to accidents along the regularly traveled corridor to access the minesite. The response plan is targeted towards personal injury and/or spills as defined in the following section and on the Emergency Response Form located inside the front cover of this document.

These plans must **only** be located at:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk.

There shall **only** be 4 copies of this document in existence and each of the documents must receive the same update information (i.e. be of the same version and date as shown in the footer of each page). Updating this document is the responsibility of the Environmental Manager.

The first person to learn of the accident and refer to the Emergency Response Plan assumes the role of Incident Commander and must comply with the form inside the front cover.

1.1 Emergency Action Form for Accidents and Spills

All employees of Coeur Alaska will be made aware that there is an Emergency Response Form located immediately inside the front cover of this document. The purpose of the Form

is to streamline the gathering and reporting of accurate information to provide to the appropriate response agency(ies) and the appropriate Coeur Alaska staff. Subsequent follow-up reporting, once the emergency situation has been attended to, is the individual responsibility of the environmental and safety managers, as described in Section 1.5.

1.2 Identification and Notification of Spills

A spill is defined as "any discharge of hazardous materials or special waste upon land or into waters of the State of Alaska". This would include accidental spills involving discharge outside of a defined total containment system to the environment.

Per state regulation 18 AAC 75.300 releases of hazardous substances other than oil, or discharges of oil to water, or discharges in excess of 55 gallons of oil outside of a containment area require immediate notification. Releases in excess of 10 gallons, but less that 55 gallons of oil to land require notification in 48 hours.

The policy of Coeur Alaska will be to comply with all ADEC and federal regulations by responding and reporting all of the minor and major spills occurring as a result of Coeur Alaska operations.

1.3 Incident Command System

Once an emergency is discovered, one of the 4 Emergency Response Plan locations will be contacted:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk

Once contact has been established, that person, equipped with the Emergency Response Plan will refer to the Emergency Response Form and assume the role of Incident Commander. The Incident Commander then becomes responsible for completing, or assigning the tasks listed on the Emergency Response Form located in the front cover of this document. The

acceptance and potential transfer of the role of Incident Commander is documented on the Emergency Response Form by signature.

1.4 Product Characteristics

The potentially hazardous materials that will be transported to the Kensington Gold Project site include: lime, cement, diesel, hydraulic fluid, oils and greases, anti-freeze, acids, reagents (PAX, MIBC, surfactant, scale inhibitor), polymers, and flocculants.

Each potential hazardous material has an updated Material Safety Data Sheet located in Appendix 4. These sheets should be consulted in the event of an accident to determine if any special precautions or handling requirements are warranted.

1.5 Standard Reporting Form and Contact Information

The responsibilities of the Incident Commander filling out the Emergency Response Form are defined to immediately attend to any reported incidents of personal injury and spills that could potentially degrade waters of the State.

Follow-up post-emergency reporting is deferred to the appropriate environmental and safety managers with Coeur Alaska. Their responsibilities are to determine the extent of reporting required for the incident and contact the appropriate agencies to comply with required incident reporting. Emergency reporting for releases of hazardous materials other than oil, discharges of oil to water, and discharges greater than 55 gallons of oil outside of secondary containment is required to be submitted to the Alaska Department of Environmental Conservation (Appendix 2 – Spill Report Form) and incidents of personal injury require reporting to MSHA.

Once the Mine Manager has been notified of the incident, all subsequent notices to company personnel and others are the responsibility of the Mine Manager. The Incident Commander does not release any information to the public or media.

Subsequent to any accident, Coeur Alaska personnel will commit to completing and documenting a formal post-accident review to ensure that any changes to the existing

operating and response procedures that are warranted, will be implemented. The Safety Manager will also be included in the debriefing session to evaluate the cause of the accident with the intent to rectify any identified contributing issues.

Coeur Alaska will commit to an annual review of all planning and response documents, to be certified by signature on the front cover of this document.

Section 2 – Spill Prevention and Response Manual

As described in the previous section, Coeur Alaska is committed to providing employees, contractors, and suppliers with the skills and knowledge required to ensure that the maximum effort is afforded to spill prevention and response. The following text describes the specific actions to be taken by Kensington staff.

2.1 Prevention Programs and Training

All employees of the Kensington Gold Project are covered by the regulatory jurisdiction and training requirements of the Mine Safety and Health Administration (MSHA) while engaged in their normal work duties. Training for all employees, contractors, and suppliers working onsite, will include emergency response for accidents and spills as well as spill response containment and clean-up as part of the required MSHA hazard training requirements. All personnel that would be exposed to petroleum or chemical products, or assisting in the clean-up of petroleum or chemical products, will be tasked trained according to the following programs.

2.1.1 Prevention Training Program

All employees using petroleum products stored at the Kensington Gold Project, or involved in maintenance of petroleum storage and dispensing systems, will receive training and instruction in the areas of:

1. Operation and maintenance of equipment necessary to prevent unintended discharges.
2. The location and use of spill containment and cleanup supplies.
3. Applicable pollution control laws, rules, and regulations.
4. Discharge prevention.
5. Changes pertaining to any of the above items.

Employees handling, using, or who are otherwise exposed to petroleum products will also receive training in accordance with applicable MSHA (30 CFR 48, 57) and Occupational

Safety and Health Administration (OSHA), Hazard Communication regulations (29 CFR 1910.1200). This training will address:

1. Hazards
2. Appropriate work practices, procedures, and protective equipment to be used during both normal operations and in the event of a foreseeable emergency.

Employees designated or expected to perform emergency response functions for releases of hazardous substances (including petroleum products) will receive training as required by OSHA (29 CFR 1910.38).

Training will be conducted by supervisory personnel, and/or training program contractors according to the following table.

Table 1 - Kensington Annual Training Schedule

Position	Type of Training				
	Hazwoper	Oil Spill Response	Confined Entry	Incident Command	Wildlife Hazing
Key Managers	24 hour, 8 hr Annual refresher	Annual with drills	For selected personnel	Initial training, Annual refresher	Initial training, Annual update
Facility Response Personnel	As above for all response personnel	As above for all response personnel	For selected Personnel	As above for all response personnel	For selected personnel
Contractors and Suppliers	Required for selected personnel	Initial Training, Annual Refresher	For selected personnel	Initial Training, Annual Refresher	Upon introduction to the project

All personnel who have spill response duties as part of their job function will be trained at the time they first report for work. Employees transferring to new job functions which have oil spill response duties will be trained at the time they assume their new responsibilities.
Any changes or new information concerning discharge prevention and operational and emergency procedures for petroleum storage and dispensing systems will be communicated to all affected employees by either memoranda, routine safety meetings, and/or supplemental

training sessions. Training sessions will be recorded and filed in the safety department's filing system.

2.1.2 Drug and Alcohol Abuse Program

Accidents are often a result of human error due to poor judgment or delayed response caused by the effects of drugs or alcohol. Coeur Alaska's zero tolerance drug and alcohol abuse program is presented below. Contractors and Suppliers will also be required by signed contract to abide by the Program as described below:

Statement of Policy

To ensure a safe and productive work environment at all Coeur Alaska facilities and to safeguard Coeur Alaska employees and property, Coeur Alaska strictly prohibits the use, sale, transfer or possession of alcohol, drugs, or controlled substances or the presence of an illegal drug, illegal drug metabolite, or alcohol in the employee's system, on any Coeur Alaska premises, work sites, or during work time. Excluded are prescribed drugs when used in the manner, combination, and quantity intended unless job performance could be affected. This policy applies to all personnel, including supervision and management. Compliance with this policy is required as a condition of continued employment. Any employee found in violation of this policy will be terminated. Depending on the circumstances, other actions, including notification of appropriate law enforcement agencies, will be taken in response to a violation of the policy.

Purpose

The purpose of this policy is to outline standards and procedures for dealing with employee and drug abuse. Substance abuse has been linked to numerous on-the-job accidents. Employees not only endanger themselves when they are impaired, but also their fellow workers. Providing a safe work place is a strict policy of Coeur Alaska. To avoid the many problems that result from employee substance abuse, Coeur Alaska maintains a zero tolerance drug and alcohol policy.

In order to provide high quality service and a safe and efficient work environment, Coeur Alaska requires its employees to report to work fit to perform their jobs. To ensure this,

Coeur Alaska has established the following policies and procedures dealing with employee drug and alcohol abuse:

Definitions

Alcohol or Alcoholic Beverages: "Alcohol" means beer, wine, and all forms of distilled liquor containing ethyl alcohol. References to the use of, or the possession of alcohol, include the use or possession of any beverage, mixture, or preparation containing ethyl alcohol.

Drug: Any substance (other than alcohol) that has known mind- or function-altering effects on a person, including psychoactive substances, and substances prohibited or controlled by State and Federal controlled substance laws.

Prescribed Drug: Any substance prescribed by a licensed medical practitioner for the individual consuming it.

Under the Influence: Being unable to perform work in a safe and productive manner, being in a physical or mental condition which creates a risk to the safety and well being of the individual, other employees, the public, or Coeur Alaska's property. The symptoms of influence and/or impairment are not confined to those consistent with misbehavior or to obvious impairment of physical or mental ability such as slurred speech or difficulty in maintaining balance.

Inspections and Searches

Coeur Alaska's vehicles, lockers, desks, filing cabinets, files, etc. remain the property of Coeur Alaska and will be subject to Coeur Alaska initiated searches at any time and without notice.

Employees and their possessions, including their vehicles located on Coeur Alaska property, are subject to Coeur Alaska initiated searches at any time and without notice if management has reason to suspect that any employee(s) will be in violation of the terms of this policy.

Employee Substance Abuse Tests

In order to assure compliance with Coeur Alaska's prohibition concerning alcohol and drug use and as a condition of continued employment, employees are required to cooperate in drug and/or alcohol substance abuse testing procedures. Any employee who refuses to cooperate in any aspect of the drug and alcohol testing process described in this policy will be terminated.

Urine/blood testing of employees will be conducted in accordance with the following:

A. Periodically, upon the approval of the corporate Administrative Manager Resources and without reason for suspicion of abuse, any or all employees at a particular facility will be tested for drug and alcohol usage without advance notice.
B. Upon reasonable suspicion that drugs or alcohol are being used at a particular facility, department, or work group, any or all employees at the facility, department, or work group will be tested without advance notice.
C. When company officials have a reasonable suspicion that an employee(s) is/are intoxicated or under the influence of drugs and/or alcohol, a test will be conducted immediately without advance notice.

The following are examples of reasonable suspicion, as that phrase is used in this policy:

(1) Reports of drug or alcohol use from police, customers, other employees, or other individuals.
(2) Observation by supervisor that an employee is apparently under the influence or impaired by drugs or alcohol and not fit for duty.
(3) Ongoing work performance problem.
(4) Rule violation that created a dangerous situation.

After testing of an employee for reasons B. and C. stated above, that individual will be suspended without pay until the test results have been received by the Human Resource Department. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results. If the results are positive, the employee will be terminated. Post-accident drug and/or alcohol testing of employees will be conducted in accordance with the following:

A. An employee involved in an accident, injury, or safety violation will be required to submit to a drug and/or alcohol test immediately. An employee shall be tested under the following circumstances:

    1. After any work-related accident resulting in damage exceeding $1,000.
    2. After any work-related injury.
    3. After any work-related safety rule violation.

After testing of an employee for reasons stated above, that individual will be suspended without pay until the test results have been received by the Human Resources Manager. Each injury or accident will be evaluated by the supervisor and the Safety Department. It will be left to their discretion as to whether the employee will be suspended.

If the employee is suspended and test results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension. In the event disciplinary action is taken pursuant to the incident, the pay will be forfeited.

B. All employees who were in the vicinity of a work-related accident, injury, or safety rule violation, and who, in the opinion of the supervisor, will have contributed to such accident, injury, or violation, shall also be required to submit to a drug or alcohol test.
C. An employee testing positive will be terminated.
D. An employee who refuses to cooperate in drug and/or alcohol testing procedures will be terminated.

An employee required to submit to blood or urine specimen for testing shall be informed by a designated Coeur Alaska representative of the reason why he/she is being requested to submit a specimen. An employee who refuses to cooperate in drug and alcohol testing procedures will be terminated.

Tests shall be accomplished through analysis of a blood or urine sample and /or any other testing method recommended by the designated medical clinic. All specimens will be obtained from the employee by an authorized representative designated by Coeur Alaska. A supervisor or designated representative will escort the employee to the authorized Coeur Alaska representative and the employee's cooperation with the collection procedures will be required.

Coeur Alaska will have the specimen identified and tested by a competent laboratory for the presence of drugs and/or alcohol.

Confidentiality

The Human Resources Department will receive all test results. The appropriate department manager will be notified of results strictly on a need-to-know basis.

No laboratory results or test results shall appear in a personnel folder. Information of this nature will be included in a medical file with a marker to appear on the inside cover of the personnel folder to show that this information is contained elsewhere.

Use of Results

If the test results are positive for any substance, Coeur Alaska will notify the employee(s) of the results.

A positive result to a drug or alcohol test will result in termination. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results.

If test is positive, an employee will be provided an opportunity to explain the presence of the identified substance. In the absence of an acceptable explanation, the employee will be terminated immediately.

Pre-Employment Substance Abuse Tests

Each applicant who is given favorable consideration for a position in Coeur Alaska will be subject to Coeur Alaska's drug and alcohol policy.

An applicant who refuses to submit to pre-employment testing when requested, or refuses to sign Coeur Alaska's drug testing policy consent form, will not be employed.

Coeur Alaska will notify the applicant of the results of any test taken that is positive for any substance included in the procedure. In the case of a positive result, Coeur Alaska will provide the applicant with an opportunity to explain the presence of the identified substance prior to taking any action on the application for employment. In the absence of an acceptable explanation, an applicant with a positive test result will not be employed.

Use of Prescription and/or Over-the-Counter Drugs

In the event an employee is under the care of a physician and taking prescribed medication which might impair his or her ability to perform a job, the employee must notify his or her manager in advance. It is at management's discretion whether the employee will continue to perform the normal assigned duties.

When taking a prescribed drug, the employee must provide a statement from his/her doctor advising that the employee's job performance is not materially affected by the drug prescribed. the doctor's statement will also describe what restrictions will be put on the

employee to ensure that the employee does not pose a threat to his/her own safety, the safety of co-workers or the public.

In those circumstances where the use of a prescribed or over-the-counter drug is inconsistent with the safe and efficient performance of duties, an employee will be required to take sick leave, a leave of absence, or other action determined to be appropriate by Coeur Alaska management.

2.1.3 Medical Monitoring Program

All personnel engaged in facility fuel transfer operations, handling of hazardous materials, and spill response duties, will be monitored by the Safety Officer to ensure their ability to safely perform their job assignments based on their general physical condition as determined by the pre-hire physical and periodic assessment by the Safety Officer.

2.1.4 Security Policies and Practices

The Kensington Gold Project is located in a remote area. Warning signs will be posted at points of entry and Kensington Gold Project personnel will inspect the operations to keep unauthorized persons from entering the facility.

It is not expected that vandalism, unauthorized entry or sabotage will be a problem as the Kensington Gold Project is remote, access is limited, and personnel are on-site 24 hours per day, and will conduct inspections of the facility as part of the normal operational routine. A check of the fuel storage and dispensing areas, and oil storage systems, is part of these regular inspections.

The following operational procedures will help ensure facility security.

- Close and lock all valves
- Close and lock all electrical panels
- Close and lock all doors to pump rooms, generator buildings, and other spaces related to the operation of fuel facilities
- Inspect facility product lines, valves and connections on a routine daily basis
- Verify that all yard lighting is functional on a daily basis.

2.1.5 Storage Vessel Requirements

Tank design, fabrication, and erection shall be in accordance with the applicable portions of the following standards:

- API Standard 650
- American Society of Civil Engineers Standards for Tank Construction
- 1991 Uniform Building Code Guidelines on Tank Construction and Foundations
- 1991 National Fire Protection Association Guidelines
- UL specifications for above-ground self-contained oil storage tanks

In addition all vertical welded tanks shall be designed and constructed for compliance with UBC Seismic Zone 3 and Wind Shear Load Category C (100 mph).

2.1.5.1 Corrosion Control and Leak Detection

In accordance with API 651 principles, corrosion protection for the tanks will not be warranted. The tanks will not come into contact with any soils and no pathways of conductivity exist between the tank bottoms and potential sources of corrosion.

All single wall tanks will be located within secondary containment structures and impervious 30-oz/square yard polymer coated polyester liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment structure sidewalls. The floor of each containment structure slopes to a collection ditch at one end of the containment.

Vertical welded steel tanks are mounted within the secondary containment structures on concrete ring wall foundations with oiled sand pads supporting the tank floors. The oiled sand pads are installed on top of impervious liners that are sealed to the inside surface of the ring walls to provide under floor containment. Any tank floor leaks will discharge to the oiled sand pads and then drain to the secondary containment structure via 1” HDPE drainpipes cast into the ring walls.

Horizontal welded steel tanks are mounted within the secondary containment structures on concrete slabs to which the impervious containment liners are sealed.

A release from either vertical or horizontal tanks would be detected visually during daily visual inspections of the secondary containment structures.

2.1.5.2 Overfill Protection

Overfill protection for all tanks will be designed in accordance with API Recommended Practices 2350, Overfill Protection for Petroleum Storage Tanks.

Bulk storage tanks will be equipped with a visual float level gauging system that shows the actual fluid level inside the tanks. The indicators shall be clearly visible and easily read from ground level outside the tank during routine inspections, tank inventory, and fuel transfer operations.

Each bulk tank shall also be equipped with an independent automatic overfill alarm and transfer pump shutdown system, that uses liquid level floats to activate audible alarms and emergency shutdown of internal transfer pumps. A pre-alarm level shall be set at 95% of the working fill height. When fuel level reaches this height a pre-alarm condition shall be initiated during which an audible alarm sounds and an indicator light is energized on the control panel. The pre-alarm light and audible alarm can be reset only by Kensington Gold Project personnel at the control panel. When fuel level reaches working fill height a second float initiates an alarm condition during which a second alarm and light are energized and all facility in-line transfer pumps are shut down. Resetting of this alarm condition shall be possible only after the level in the tank drops below the working fill level.

All double-walled or self-diked tanks shall be equipped with overfill limiter valves set at 95% of tank capacity and shall have locking fill-containment pans fitted to the fill pipes.

2.1.5.3 Secondary Containment

All single wall tanks are located within secondary containment structures and impervious liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment sidewalls. Each secondary containment structure is sized to contain 110% of the capacity of the largest tank retained by the structure.

The floor of each containment structure is sloped to drain toward a collection ditch at one end. Accumulated precipitation will be removed as necessary by site personnel by operating a normally closed and locked drain valve. Only water that is free of any sheen will be discharged from each containment structure. Containment drainage will be discharged to the facility stormwater management system, which is operated in compliance with EPA BMPs.

Truck load-in/load-out facilities are located adjacent to three of the bulk storage areas. Each truck load-in/load-out facility is equipped with a catchment system that drains to an integral containment tank sized to hold the volume of the largest single compartment of the tank truck. The containment tank is visually monitored by Kensington Gold Project personnel during routine operations and manually pumped to the adjacent bulk storage secondary containment structure whenever necessary.

All day tanks located outside of the secondary containment areas will be self-diked steel tanks that provide full secondary containment.

2.2 Potential Discharge Risk Analysis

The following materials are considered to be most at risk for release to the environment:

Petroleum Product	Individual Capacity	Material of Construction	Manufacture Date	Potential Type of Failure	Secondary Containment
diesel, gasoline	6,500 gallons	Stainless steel cylinder in metal box	N/A	rupture, pierce or overturning	lined, bermed laydown area
gasoline, lubrication oils/greases, hydraulic oils	55 gallons	steel drums	N/A	rupture, pierce or overturning	lined, bermed laydown area

Typically, barges 286 feet long by 75 feet wide will be used to import petroleum products to the site. Unloading of materials will be by a roll-on, roll-off forklift transfer system.

2.3 Receiving Environment Risk Analysis

There are two receiving environments that are subject to the highest degree of risk for the potential release of hydrocarbons: Johnson Creek and the intertidal zone at the marine terminal facilities.

Two bridges cross Johnson Creek while transporting petroleum, and other hazardous materials, to the minesite. Accidents and potential discharges here will require rapid response and specialized equipment. To address this issue, portable spill containment equipment will be stored and readily available at these two bridge locations. Rapid response equipment will also be cached at the stormwater collection pond located at the toe of the process area, which would accept any contaminated runoff from accidental discharges at this facility.

Spill response equipment will also be readily available at each marine facility to shorten the response time of discharges to the intertidal zone.

2.4 Response Strategies and Safety Considerations

This section discusses measures for hazardous material, spill prevention, control and countermeasure plans, as currently planned for the Kensington Gold Project. The project is currently undergoing a NEPA analysis (EIS), and final feasibility study. The plan described herein is, therefore, conceptual by necessity. Once the FEIS and Record of Decision are completed, a final plan will be developed for inclusion into the Final Plan of Operations.

Applicable regulations include the Federal Oil Spill Prevention Regulations (40 CFR Part 112) designed to help prevent spills, and US Department of Transportation regulations that govern oil transport and carriers, the Emergency Planning and Right-to-Know Act (EPCRA which requires reporting of 'reportable quantities' of hazardous materials, and other applicable requirements. The objectives are:

- Reduce the risk of accidental spills to the environment, and related environmental degradation
- Provide the Kensington Gold Project with the necessary information to properly respond to diesel fuel and chemical spills

- Clearly define line of function responsibilities for a spill event
- Provide a concise response and clean-up program which minimizes environmental impacts

All observers to an accident or spill must first identify the mechanism of failure or accident and the materials involved to ensure that there is no danger by entering the discharge or accident area.

The sequence of events for anyone discovering a spill will be:

1. Determine the origin of the spill and identify the discharge material.

2. Stop the discharge as safely as possible, which includes closing valves, stoping pumps, and transferring fuel out of leaking tanks.

3. Safeguard human life by alerting unnecessary personnel to evacuate, shutting off power in the vicinity or path of a discharge.

4. Attempt for immediate containment if possible, including the use of boom and sorbents, blocking culverts and drains, and excavating trenches to redirect flow (Appendix 5 - Typical Spill Response Containment Procedures)

5. Reporting the spill by contacting one of the four Emergency Response Plan centers at the minesite noting material type and estimated quantity released.

A standard spill response form is presented in the document as Appendix 2 . It outlines the mandatory reporting needs for an accidental spill event. Key reporting requirements are:

- Date, time and physical conditions
- Location
- Occurrence situation
- Appropriate identification (person, vehicle, equipment)

- Nearest dwelling, water body, weather
- Extent of human exposure, injury
- Same for environmental
- Same for wildlife, fisheries
- Materials involved, container types
- Containment procedures, documentation
- Disposal procedures, documentation, chain of custody
- Environmental sampling
- Photo-documentation
- Signature of preparer.

A display of BMPs is presented later in Appendix 5 of this document.

Personnel involved in oil spill response activities at the Kensington Gold Project will comply with all applicable worker health and safety laws and regulations. Federal regulations include Mine Safety and Health Administration standards for mandatory health and safety as codified in 30 CFR for mining activities.

2.5 Final Notification and Reporting Required By Law

The following agencies must be notified if each of their respective thresholds are breached during a release of a hazardous material or petroleum product to water or land:

National Response Center: Sheen on water (releases to land are not reportable to the NRC)
ADEC: Sheen on water or, Releases to land 55 gallons
EPA: Water N/A, Land 1,000 gallons

The contact numbers for these agencies are listed in Appendix 3 in this document. Reporting to these agencies is the sole responsibility of the Environmental Manager at the Kensington Gold Project.

2.6 Transportation Impact Mitigation

2.6.1 Dust Control Measures

The application of water on roadways and exposed stockpiles serves as mitigation for dust control. Enhanced dust control is achieved with the use of surfactants that increase the retention time for applied moisture to the soils.

2.6.2 Soil Erosion Reduction

Remediation for sediment loading includes bank stabilization with revegetation, the use of BMPs described in Appendix 5, and primary treatment with settling ponds prior to water flow introduced into culvert.

2.6.3 Snow Removal and Maintenance

Unplanned snow removal has the potential to introduce additional sediment loading into the waterways unless disposal areas away from direct discharge areas have been planned and prepared in advance. At the Kensington Gold Project, snow cache areas will be designed into the road system to control snowmelt runoff.

2.6.4 Spill Response Equipment Stations

To address the risks identified in Section 2.2 and 2.3, and as remediation for unexpected spills, it is planned that spill response trailers will be placed at strategic locations along the traveled corridor where discharges of hazardous materials could directly enter the Johnson Creek system. Spill response equipment stations will also be located at each marine facility and at the process area siltation pond which accepts stormwater runoff from that area. Those stations will be equipped with significantly more boom for the marine area.

Spill kits will contain the following minimum equipment: Visqueen bags, silt fence and posts, shovels, life jackets, waders, gloves, rope, buckets, floating oil boom and sorbent pads.

Rapid response caches will be secured with a combination style lock with the code set to “1,2,3,4”.

2.6.5 Marine Transportation

All of the fuel and supplies required for the construction and operation of the Kensington Gold Project are to be delivered via the Slate Creek Cove marine terminal. Consultation with regulatory agencies, special interest groups, and the public has identified several important considerations for the construction and operation of this facility which Coeur Alaska has formally adopted into the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004).* A key aspect of this plan, with respect to BMPs associated with the risk of fuel spills, is Coeur’s commitment to “…build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period.”

2.6.6 Cascade Point Marine Terminal Facility

Coeur Alaska is planning on contracting with Goldbelt to provide passenger ferry service from Goldbelt’s proposed marine terminal facility located at Cascade Point. The terminal will be under the direct ownership and control of Goldbelt, however, as with all contractors providing services to the Kensington Gold Project, adherence to Coeur Alaska stipulations with respect to environmental protection and controls will be required.

The Cascade Point marine terminal is being designed to preclude the need for diesel fuel storage tanks for refueling the passenger ferries. Instead, an on-call fuel truck will be dispatched from Juneau as required to meet the fueling needs of the dedicated ferries. It is estimated that the refueling exercise will only require an average of one fueling per week. No other vessels will be refueling at the Cascade Point facility.

The fuel truck will tie into an upland fuel header located at edge of the parking lot area. The header will be located within a permanent structure secured by a locked

door on a bermed concrete pad to provide a non-permeable surface for containment of any spills.

A small diameter steel fuel pipeline will run from the header to the approach dock. It will be located above ground and away from any areas with vehicular traffic. The pipe will be mounted to the edge of the approach dock until reaching the gangway. A flexible hose connection will connect the pipe to an identical pipe section mounted on the gangway. Another flexible hose connection will join the gangway pipe to a pipe along a protected edge of the float dock. All flexible hoses will be protected by a flexible steel covering to limit the potential for vandalism.

At approximately mid-dock the fuel pipe connects to a hose reel. The reel is enclosed in a protective housing for security and weather protection purposes. The housing will be secured to a metal pan to capture any possible fuel drippings. At the end of the fuel hose is the nozzle.

<u>Standard Operating Procedures</u>

The actual transfer of fuel will be conducted under a standard operating procedure (SOP). The list of SOP's is as follows:

1. The fuel truck driver will connect the truck hose to the header. The driver will control and visually monitor the fuel transfer process at this location. Extra care will be taken to minimize any fuel leaks at the header connection.

2. The vessel engineer will do the actual fueling of the boat. The engineer will control and visually monitor the fuel hose nozzle during the transfer process. Extra care will be taken to prevent fuel spills at the nozzle location. The engineer will inform the fuel truck driver of the number of gallons to be transferred prior to starting.

3. The marine facility manager will supervise the overall fuel transfer process. It will be the manager's responsibility to ensure that all SOP's are being followed.

4. The truck driver, vessel engineer, and the marine facility manager will be in constant radio contact throughout the fuel transfer process.

Best Management Practices

A properly designed, constructed, and operated fuel transfer process with associated BMPs, should prevent releases of fuel to the environment. The BMPs for fuel transfer at the Cascade Point Marine Terminal are as follows:

1. All persons involved in the fuel transfer operation will be trained to follow the SOP's and the use of the identified BMPs.

2. A detailed spill response plan will be developed for the marine terminal facility (once the facility is constructed) and all personnel will be trained accordingly on the specific features of that facility.

3. Appropriate spill response equipment including various absorbent materials will be placed at the header and hose reel locations. The materials will be within easy reach in case of any spills. All used materials will be properly disposed of and replaced immediately.

4. A drip bucket will be hung below the fuel header connection. The bucket and the concrete pad will be kept in a clean condition.

5. An absorbent pad will be placed against the fuel nozzle while fueling and a drip bucket placed below the vent to catch any possible overflow.

6. The system will be inspected by the facility manager prior to each fuel transfer operation. In addition, the transfer system will be formally inspected and pressure tested on an annual basis. All maintenance and repair needs will be taken care of immediately in order to ensure continued trouble-free operation.

Appendix – 1
Original Emergency Response Form for Photocopying

EMERGENCY RESPONSE FORM – INJURY and SPILLS

First Incident Commander's Name:___________________________ Time:______________
Second Incident Commander's Name:_________________________ Time:______________

1. Information to gather from the observer:
Number of persons affected:____

Mechanism and Extent of Injuries:____

Location of Accident:____

Best Access Route:____

Know Hazardous Goods Involved:____

Quantity of Hazardous Goods Spilled (consult the emergency information in Appendix 4 &5 for any precautions or special handling procedures):__________________________________

Site Weather Conditions:____

Observer's Call-back Number:____

2. **Call the Medivac Operator at: (907) 789-1099 if there are reported injuries for their assessment. The Mine Location is: Lat. 58 degrees 46 minutes North, Long. 135 degrees 01 minutes West. Give them YOUR callback number. Dispatch an Coeur Alaska First-Aid Technician to the scene of the accident, if possible.**

3. **Call the Environmental Manager (or the on-call environmental contact) at: (907) 789-1591 to assess the required action for a spill of any size. Dispatch a Coeur Alaska environmental spill response team, if possible.**

   If the environmental contact person cannot be reached, and the spill is deemed to be potentially detrimental to the surface waters of the State, the following agency must be notified: ADEC 907 465 5340 (daytime) 1-800-478-9300 (after hours).

4. **Call the Safety Officer (or the on-call safety contact) at: (907) 789-1591 to assess any required further action.**

   If the Safety Officer cannot be reached and the mechanism of injury is deemed to be potentially dangerous to the other employees (Hazardous Material), the following agency must be notified: Juneau Fire Department/Police Department – call 911.

5. **Notify the Mine Manager at: (907) 789-1591**

Appendix – 2 Initial Spill Report Form

Kensington Gold Project – Initial Spill Report Form

CALL THE COEUR ALASKA ENVIRONMENTAL GROUP CONTACT BEFORE YOU COMPLETE THIS FORM

Incident Information:

Date:________________Time:_________________Observer's Name:__________________

Operator's Name:____

Spill Location:____

Description of
Incident:____
____
____

Quantity Spilled:_____________________Material Spilled:___________________________

Discharged to:_______Land___________Water___________Air (check one)

If water, which waterbody:_________________________________

Source of Material Spilled:__________________________________

Clean-up
method:____
____

Clean-up: Planned:_______Completed:_________(check one)

Contaminated Area:____

Quantity of Soil:____

Actions taken to correct or mitigate the cause of the
release:____
____

Weather Conditions: Dry/Rain/Snow:____

Signature:________________________________Date:________________________

- FAX THIS FORM TO THE ENVIRONMENTAL MANAGER AT: (907) 789-1503 -

Appendix 3 – Contact Information

a. National Response Center/United States Coast Guard

1-800-424-8802

b. Alaska Department of Environmental Conservation

(907) 465-5340 (daytime) 1-800-478-9300 (after hours)

c. Juneau Fire Department/Police Department/LEPC

9-1-1

d. Southeast Alaska Petroleum Resource Organization (SEAPRO)
(only if directed to call by Management official)

1-907-225-7002
1-888-225-7676

e. Division of Homeland Security

1 (800) 478-2337

f. State Emergency Coordination Center (SECC)

1 (888) 462-7100

g. CBJ Fire Department Helicopter: 789-7554

h. Juneau Ranger District (<u>wildfires</u>): 586-8800

i. Medivac: 789-1099

APPENDIX 4

MATERIAL SAFETY DATA SHEETS FOR EACH CHEMICAL ONSITE

(to be completed once products are delivered to site)

APPENDIX 5

TYPICAL SOIL EROSION AND SPILL RESPONSE CONTAINMENT PROCEDURES

SOURCE: USGS 1:250,000 SERIES TOPOGRAPHIC QUADRANGLE, JUNEAU, ALASKA-CANADA, REVISED 1985, NGVD 1929.

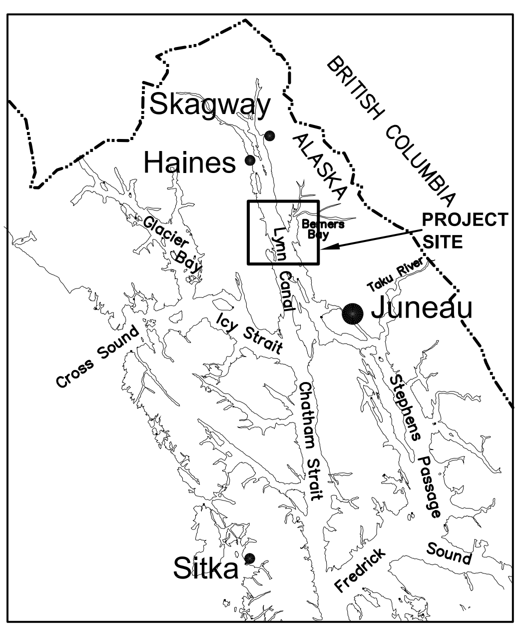


FIGURE 1	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN DRAWN: *JASPER GEOGRAPHICS*

GENERAL FACILITY LOCATION MAP
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

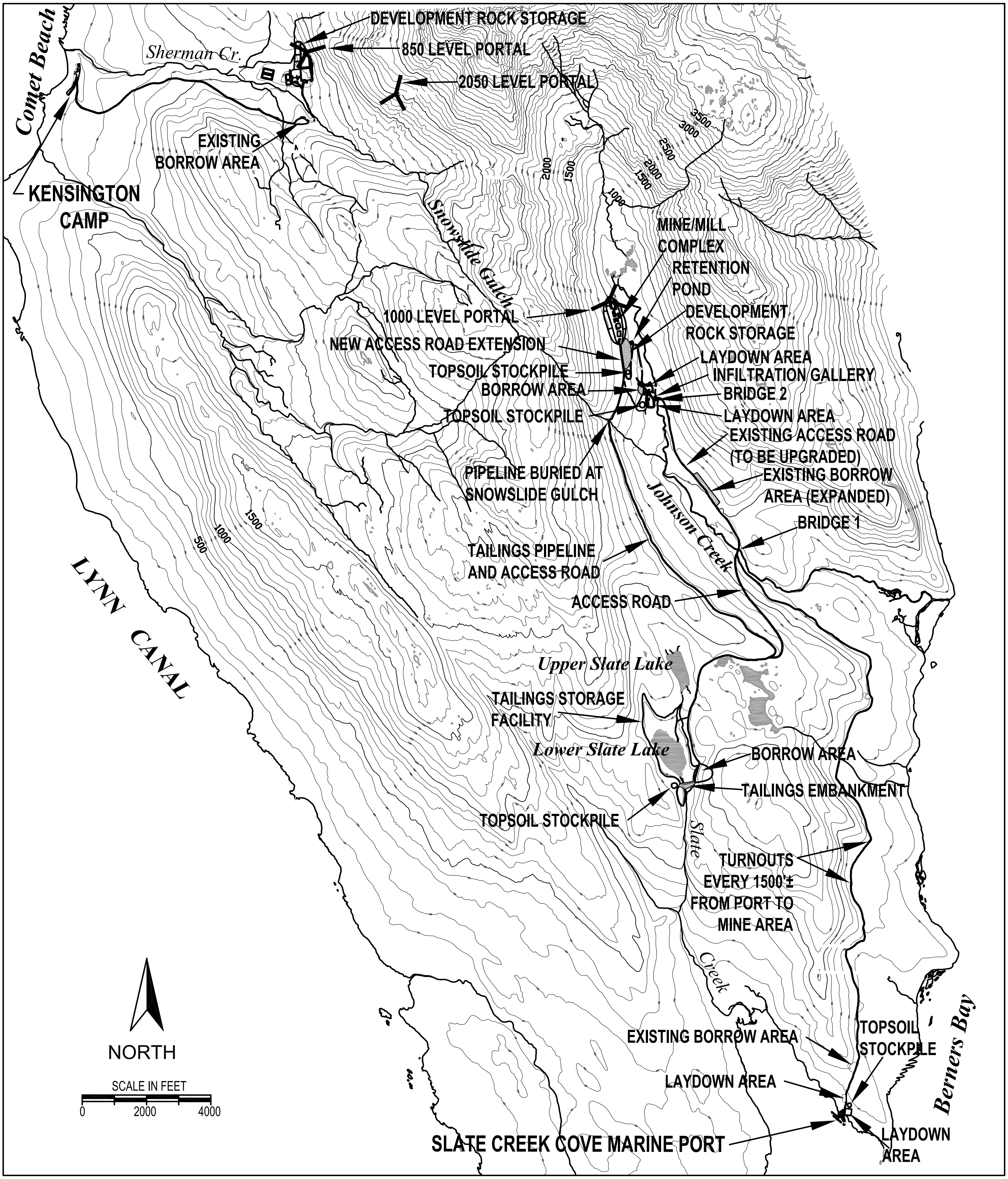
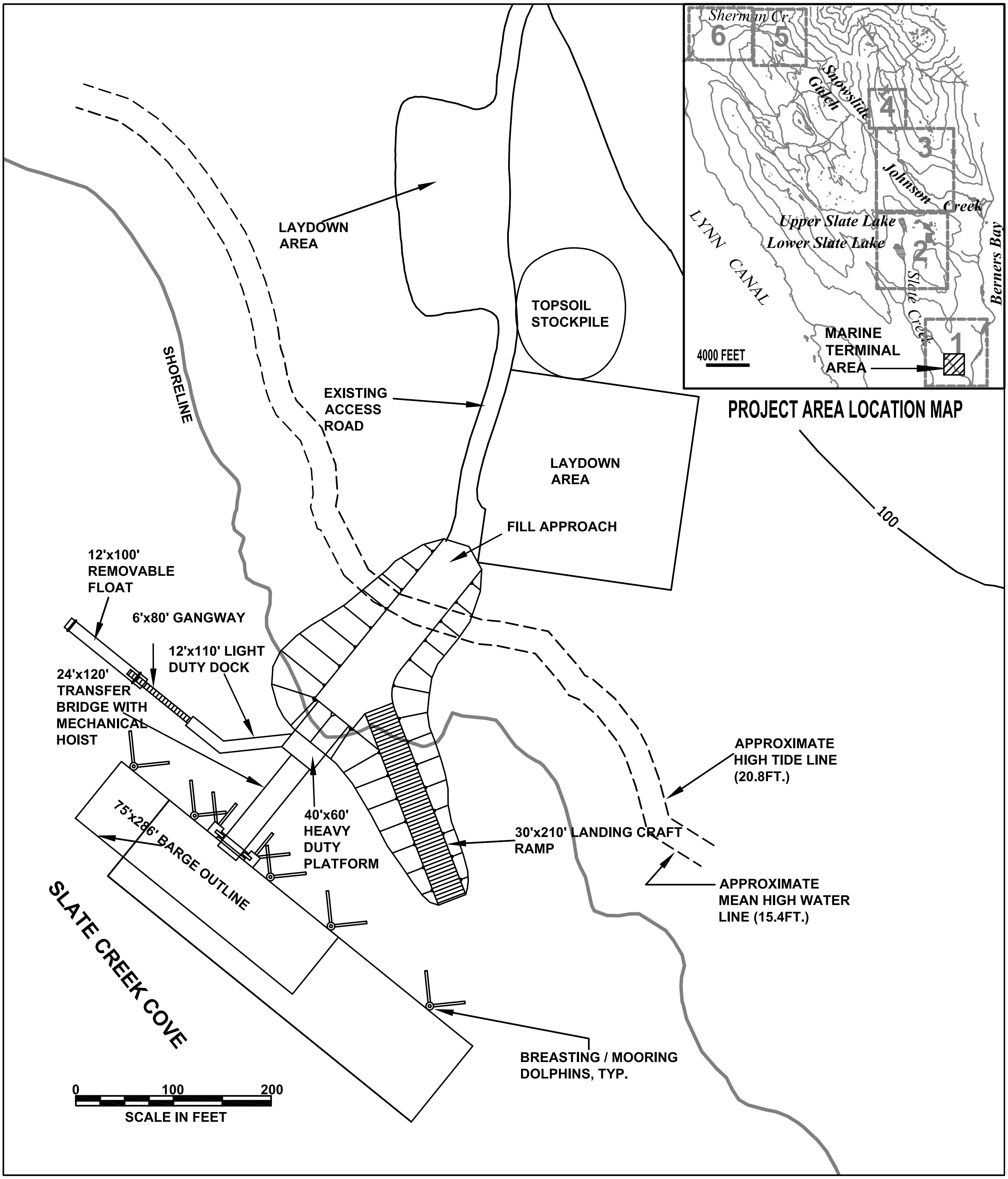


FIGURE 2	DATE: JUNE 2004
COEUR ALASKA 3031 Clinton Dr. Suite 202, Juneau, AK 99801	SCALE: AS SHOWN
	DRAWN: *JASPER GEOGRAPHICS*

LOCATIONS OF FACILITY COMPONENTS
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA

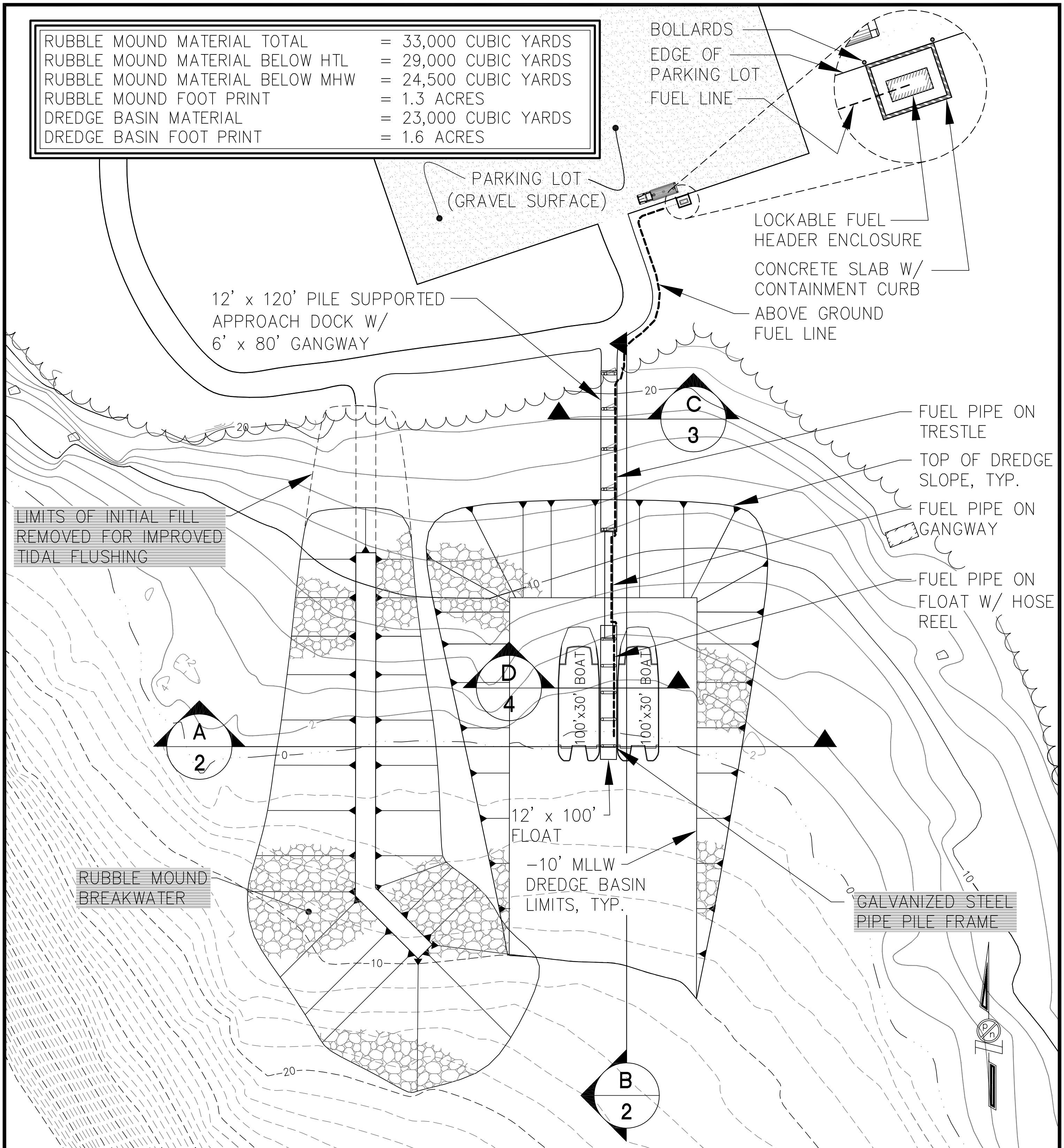


NOTE: BASED ON DESIGN PREPARED BY PERATROVICH, NOTTINGHAM & DRAGE, INC. FOR COEUR ALASKA, INC. 2001

NORTH

FIGURE 3	DATE: JUNE 2004
COEUR ALASKA	SCALE: AS SHOWN
3031 Clinton Dr. Suite 202, Juneau, AK 99801	DRAWN: *JASPER GEOGRAPHICS*

SLATE CK. COVE MARINE TERMINAL PLAN VIEW
KENSINGTON GOLD PROJECT
BERNERS BAY, ALASKA



PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE PLAN

SCALE IN FEET

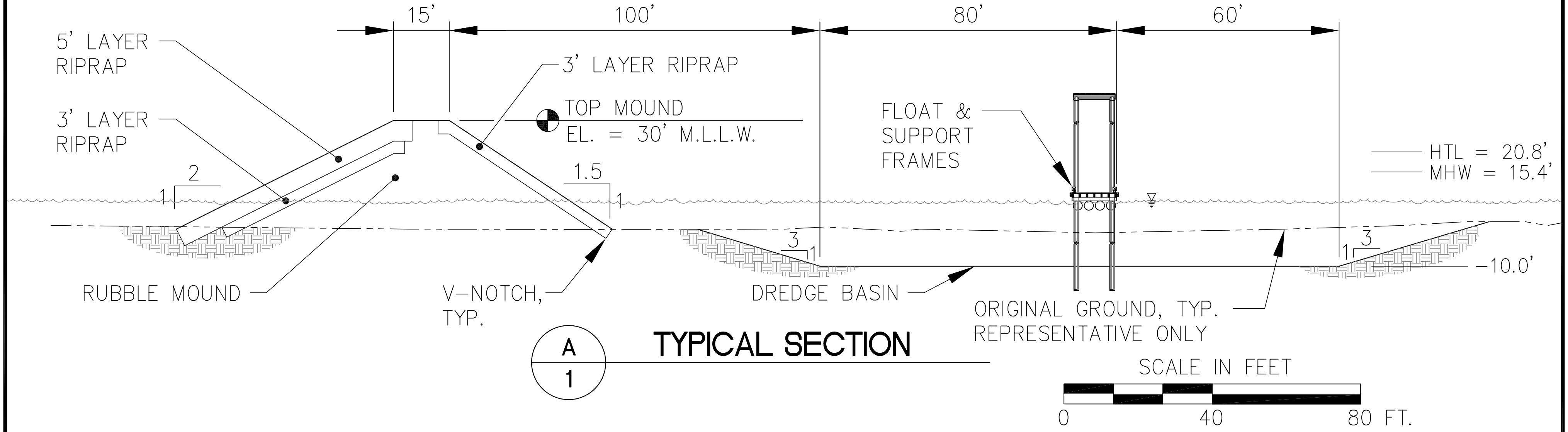
0 100 200 FT.

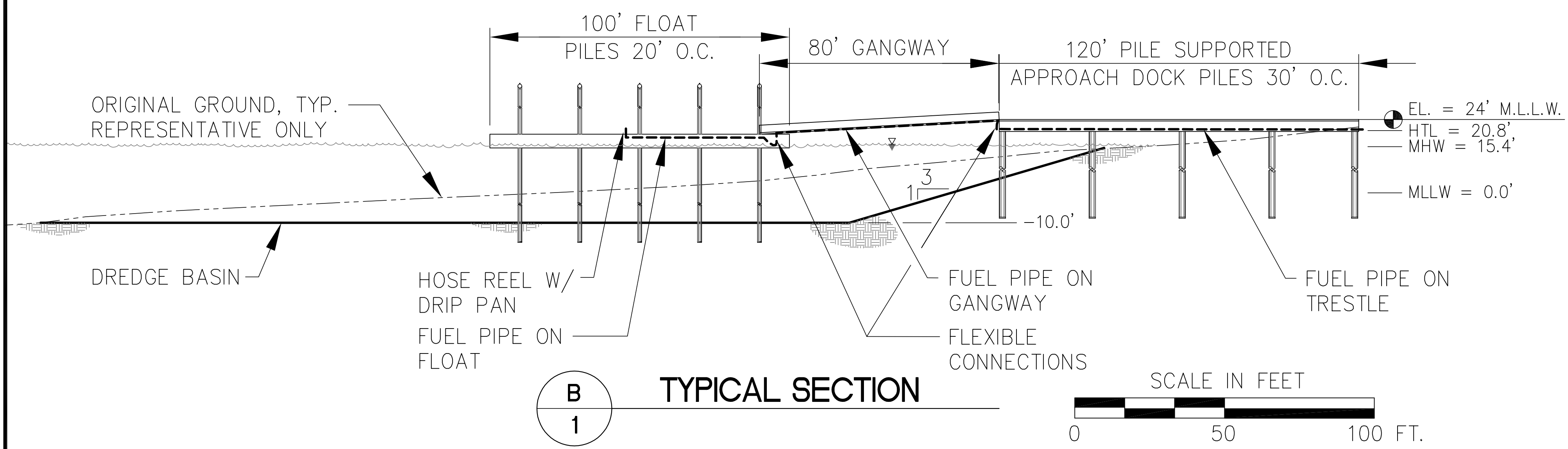
GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

PN&D PROJECT NO. 032025.01

APRIL 2003 SHEET **1** of **5**





PURPOSE:

MARINE FACILITY FOR TOUR OPERATIONS AND MINER'S SHUTTLE.

DATUM:
MLLW = 0.0 FT

HTL = 20.8'
MHW = 15.4'
MLLW = 0.0'

SITE SECTIONS

PN&D PROJECT NO. 032025.01

GOLDBELT, INC.
CASCADE POINT
MARINE FACILITY

IN: BERNERS BAY
NEAR: CASCADE POINT
AT: JUNEAU, ALASKA
BY: GOLDBELT, INC.

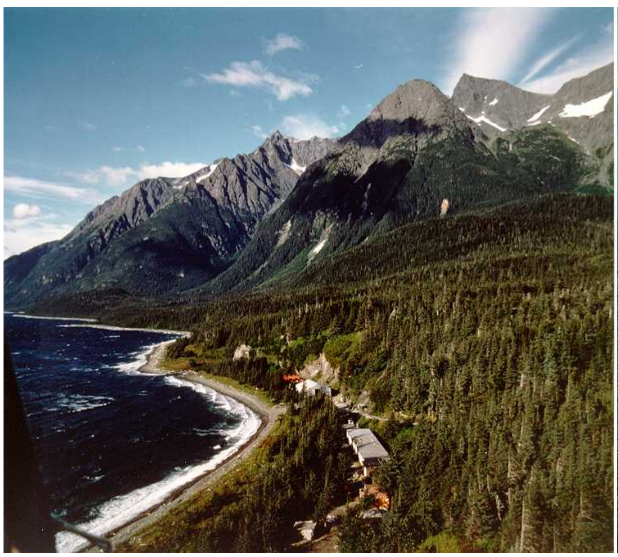
APRIL 2003 SHEET **2** of **5**

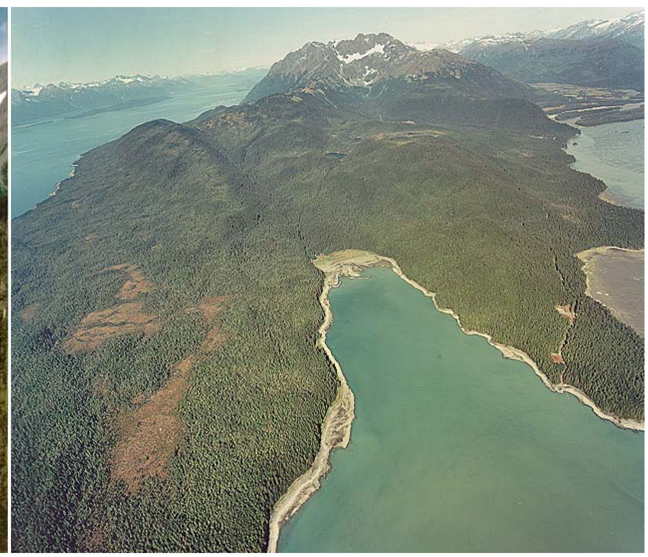
Coeur Alaska Kensington Gold Mine

Berners Bay Transportation Policy and

Mitigation and Best Management Practices Plan

September 2004





Coeur Alaska, Inc.
3031 Clinton Dr., Suite 202
Juneau, Alaska 99801

Coeur Alaska Kensington Gold Mine
Berners Bay Transportation Policy and
Mitigation and Best Management Practices Plan

September 2004

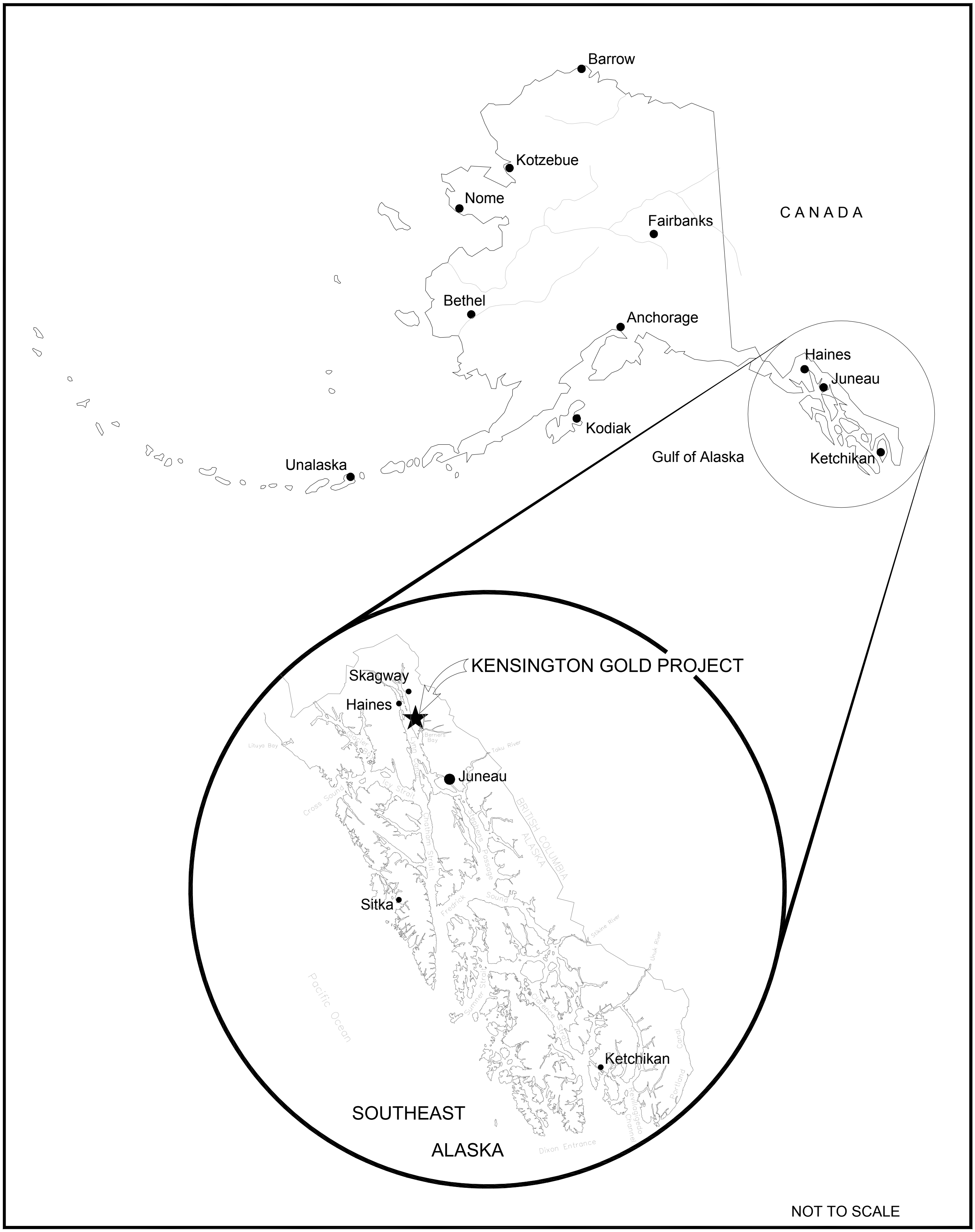
Background

Coeur Alaska, Inc. (Coeur), a wholly-owned subsidiary of Coeur d'Alene Mines Corporation, is proposing to construct and operate a 2000 ton per day (tpd) underground gold mine and processing facility on patented and unpatented mining claims located about 45 miles north-northwest of Juneau, Alaska (Figure 1). The project would be accessible by boat across Berners Bay. Berners Bay has important aquatic resources, marine mammals, and recreation uses.

The Kensington Gold Mine, as currently proposed, would involve the following major operating components:

- 2000 tpd underground mining operation
- Conventional flotation milling process at the existing Jualin Millsite; gold concentrate to be shipped offsite for final processing
- A tailings storage facility located at Lower Slate Lake
- A 6 mile access road from Slate Creek Cove to the millsite and mine
- Daily access across Berners Bay from a dock at Cascade Point to the upgraded Slate Creek Cove landing area and a newly constructed dock

Figure 2 shows a proposed general facilities siting arrangement for the project components. The primary transportation routings (Cascade Point to Slate Creek Cove; Jualin mine access road) are highlighted on the figure. The marine terminal at Cascade Point consists of a breakwater, pedestrian access dock, aluminum gangway, and moveable float. The breakwater has been reconfigured as a "dogleg," to minimize fill intrusion into the intertidal zone. The breakwater is also designed with a breach, to allow shallow water fish passage at most high tides. The breakwater also generally conforms to the shoreline, with limited perpendicular obstruction. As compared to the Echo Cove dock (150,000 yd^3 of dredging), only 70,000 yd^3 of dredging would be required. The Slate Creek Cove terminal consists of an earthen ramp, platform dock, moveable ramp and floating dock. No dredging is required. The proposed construction plan includes specific best management practices (BMP's) to reduce sedimentation, construction prohibition "windows," and seasonal noise constraints. Operational BMP's are described later in this document.

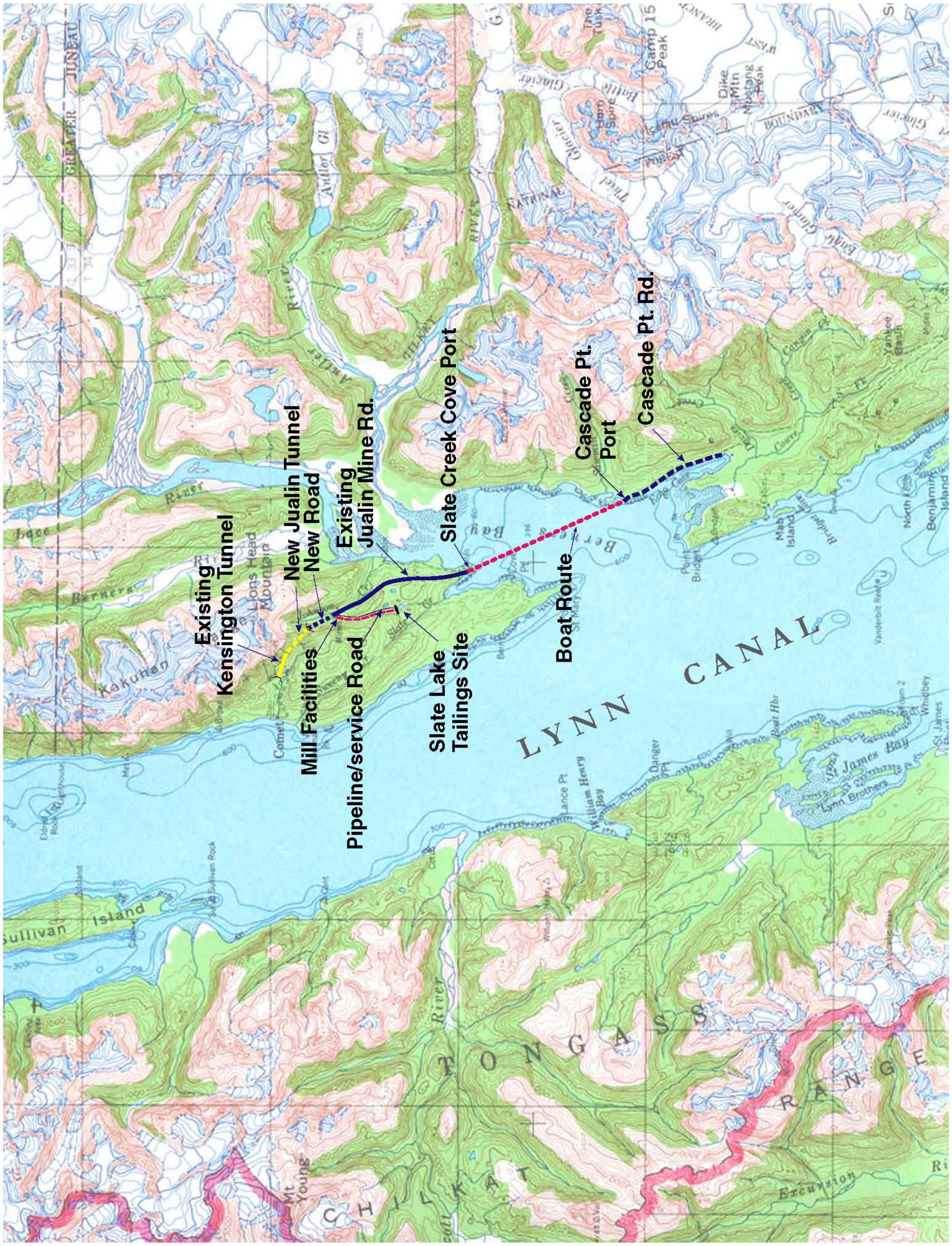


SHEPHERD MILLER
INCORPORATED

FIGURE 1
PROJECT LOCATION MAP

Date:	APRIL 2000
Project:	100619
File:	LOCMAP.dwg

2


Existing Kensington Tunnel
New Jualin Tunnel
New Road
Existing Jualin Mine Rd.
Slate Creek Cove Port
Cascade Pt. Port
Cascade Pt. Rd.
Mill Facilities
Pipeline/service Road
Slate Lake Tailings Site
Boat Route
LYNN CANAL
TONGASS
CHILKAT
RANGE
Sullivan Island
Berners Bay
Lions Head Mountain
Comet
Point Bridget
Mab Island
Benjamin Island
St James Bay
Lynn Brothers
William Henry Bay
Lance Pt
Danger Pt
Mt Young
Antler River
Lace River
Berners River
Kakuhan
Vanderbilt Reef
Camp 15 Peak
Dike Mtn
Mustang Peak

3

Figure 2

Purpose and Need for Policy

During the environmental impact (NEPA) review process for the Kensington Gold Mine operation, resource agencies and certain publics raised concerns regarding potential impacts of construction and operation of the proposed docks at Cascade Point and Slate Creek Cove on local spawning eulachon and Pacific herring spawning, and Steller sea lion populations. Key concerns are summarized as follows, for the purposes of this plan:

- Eulachon – Returning adult fish are found congregating in Berners Bay near Slate Creek Cove during April and May, before moving into fresh water at the mouth of the Lace, Berners and Antler Rivers. At this time, Steller sea lion abundance also increases. Concern exists over construction and operational activities involving noise and increased dock traffic, and effects on fish spawning and sea lion feeding.

- Pacific herring – Returning fish are known to congregate in the vicinity of the proposed Cascade Point dock during about a 2-3 week period between late April and early May when they spawn. Construction of a breakwater and dock at Cascade Point could result in a loss of permanent habitat; residual hydrocarbons potentially resulting from accidental petroleum spills and/or general marine vessel operations could also adversely affect fish growth and development, and possible spawning.

- Steller sea lion – Excessive noise associated with dock construction and marine vessel operations and traffic could potentially stress sea lion populations, foraging behavior, and reproduction.

Transportation use, such as the daily transport of mine workers and barging of supplies and concentrate, could also impact recreation users. Regular announced schedules, limited trip schedules, and adherence to speed limits and wake control will largely offset these effects.

The effects of the proposed dock facilities and marine traffic associated with the daily commute are difficult to predict. Resource managers indicate they do not have enough information regarding specific habitat factors and potential environmental stressors from development projects such as Kensington. These researchers and managers agree that a combination of Best Management Practices (BMP's) and a monitoring program are necessary to mitigate potential impacts of the proposed project. The BMP's would focus on reducing impacts during construction by prohibiting "in water" work during the critical spawning and incubation period, and controlling sedimentation. BMP's implemented during operations would focus on limiting potential pollution from petroleum hydrocarbons, and optimizing avoidance actions for marine mammals (sea lion) congregating populations in the area, to the extent practicable.

For the purposes of this plan, best management practices are activities, including passive treatment, operating procedures, and avoidance actions, that prevent or reduce the discharge of pollutants, and limit encounters with marine mammals and special fish species. The BMP's included herein are also intended to provide mitigation, consistent with the Clean Water Act, Endangered Species Act, and other applicable federal, state and local laws and regulations. The plan is also intended to be consistent with Coeur's Environmental Policy: "producing and protecting." Key provisions are intended to increase employee awareness of hazards, and thereby improve worker safety and limit pollution liabilities and risks.

Associated monitoring programs would at the same time provide critical information on herring habitat, spawning locations, and water quality. Best Management Practices and monitoring priorities for this Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan can be generally summarized as follows:

Best Management Practices listed in this plan would include (but not be limited to):

- Prohibit in-water construction activities during the period April 15 through June 30
- Silt curtains or other methods to control sediment from being transported off-site into adjacent habitat during construction
- Measures to prevent and control petroleum hydrocarbons from getting into the water during both construction and operations

Monitoring would include:

- Water quality monitoring for petroleum hydrocarbons in Berners Bay
- Map submerged aquatic vegetation between Echo Cove and Cascade Point
- Monitor and document colonization and habitat value of the breakwater
- Monitor and document herring spawning activity and location(s) in Berners Bay

Overview of Coeur's Goals, Policy and Transportation/Mitigation Plan

Coeur has developed environmental management policies, guidelines, and practices included in this document to ensure that environmental impacts are minimized and mitigated during construction and operation of the Kensington Gold Mine, including related transportation facilities and needs. Implementation of these environmental protection measures will occur, as soon as the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD), and related applicable permits are issued by the respective agencies, approving the project. The BMP plan outlined herein will be incorporated into the "Final Plan of Operations for the Kensington Gold Mine," and submitted to the USDA Forest Service for approval, in advance of construction of related facilities on National Forest lands.

The following primary goals are identified for the "Coeur Alaska Kensington Gold Mine Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan":

Goal #1: The overall policy and direction of this plan is comprised of "standard operating procedures" (SOP's), to be followed by Coeur and all its contractors, service providers, and consultants as part of the marine facilities construction and operating plans. These SOP's will be included in all related construction and service contracts.

Goal #2: The primary overriding goal is: "to protect the Berners Bay environment as part of a coordinated and comprehensive transportation and environmental management plan, consistent with the current U.S. Forest Service land use

planning goal of Modified Landscape (ML) with a minerals overlay Land Use Classification, and the stated goals and objectives of the Kensington Berners Bay Consortium. The stated goals of the ML minerals designation are to encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for mineral development.

Goal # 3: Other key objectives of the Coeur Transportation Policy and Mitigation and Best Management Practices Plan are:

- Avoid in-water construction activities during the period of herring spawning and incubation (about April 15 through June 30)
- Avoid incremental water quality impacts to Berners Bay
- Commit to one coordinated marine vessel fueling option involving one fueling location, for transport of mine workers from Cascade Point to Slate Creek Cove
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species through the implementation of a sound fueling plan, and responsible operational BMP program
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove, in order to facilitate fish passage and intertidal flushing at the facilities
- Continue to financially support and participate in a coordinated/cooperative Berners Bay environmental monitoring program initiated by Coeur, ADNR / ADF&G, NMFS / Auke Bay Laboratory, and University of Alaska; the program could also be expanded, as appropriate and agreed upon

Goal # 4: Coeur will work with ADNR to develop effective monitoring and mitigation programs and appropriate environmental thresholds for mitigation, for the Cascade Point and Slate Creek Cove dock sites, as part of the State's Tideland Leases for the two facilities

Goal # 5: Primary Operating Procedures (SOP's) of the Transportation/Mitigation Plan for Berners Bay to be followed by Coeur, its service providers, and consultants are as follows (these will be contractual requirements):

SOP #1: Coeur will identify and operate according to a "designated transportation routing" from Cascade Point to Slate Creek Cove, for the daily marine vessel transport of mine workers

SOP #2: Regular schedules will also be established for weekday and weekend workers' transport (these will minimize the number of daily trips, to the extent practicable)

SOP #3: Routings and schedules will be strictly adhered to, except where unusual environmental or workers' safety considerations dictate an alternative approach

SOP #4: Designated routing and schedules will also be established for barge transport to the Slate Creek Cove dock site

SOP #5: Vessels will operate at low, constant speeds and regular scheduled intervals; vessels will not approach within 100 yards of Steller sea lions, humpback whales, and other sensitive marine mammal species

SOP #6: Marine fueling of Coeur transport vessels will occur only at Cascade Point dock or Auke Bay dock, or other approved U.S. Coast Guard facilities. Kensington marine vessel fueling will not take place at Slate Creek Cove dock, except for emergency environmental situations and/or conditions involving worker safety which dictate such limited use. Other requirements for Cascade Point, based on a separate agreement with Goldbelt are as follows:

- The Cascade Point dock will be used primarily by a single dedicated marine vessel, to transport mine workers to and from the minesite
- No other vessel fueling except the Coeur Kensington marine vessel would be fueled a the Cascade Point facility
- No fuel storage would occur at the site; a fueling truck from Juneau would be used to meet the dedicated vessels needs

SOP #7: The following special considerations will be given by Coeur during the spring eulachon spawning season:

- Coeur will work with the NMFS and USF&W Service to develop a "Steller sea lion awareness training" manual, to be used by Coeur (and other) marine pilots operating vessels in Berners Bay
- Marine vessel encounters with special fish species, marine mammals and important bird species will be recorded and reported, as part of the overall monitoring plan
- Coeur, ADNR/ADFG, and NMFS will annually mutually agree to that year's "eulachon spawning season" to encompass 2-3 weeks, during which a "transportation action strategy" will be implemented by the company as part of an overall traffic plan
- As part of the transportation action strategy, during the designated eulachon spawning season (approximately between April 15 to May 15 window – typically about 2-3 weeks), marine transport vessels for the Kensington Gold Project will be fueled outside of Berners Bay, at a U.S. Coast Guard approved facility
- During the designated eulachon spawning season, Coeur will fund a NMFS "observer" to accompany the designated vessel pilot and take part in determining the best daily routing from Cascade Point to Slate Creek Cove dock, so as to minimize Steller sea lion encounters, and also minimize incidental takings within the context of insuring reasonable access to the Kensington Gold Project minesite
- During this period, Coeur will attempt (to the extent practicable) to reduce the typical daily worker transport schedule from 3-5 trips/day, to not more than 2 or 3 trips/day (except for emergency environmental or safety situations)

- Coeur will build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period
- Coeur will, to the extent practicable, limit concentrate barging during this 2-3 week period (similar to reduced fuel shipments)
- Other chemical and supplies shipments will be curtailed during that period, to the extent practicable, so as to further limit all barging and reduce Steller sea lion encounters
- **Coeur will evaluate the potential practicability and safety considerations related to utilizing a portable, moveable dock which could receive Kensington mine workers at alternative sites within Slate Creek Cove, during the eulachon spawning season. (Note: may not be possible/practicable)**
- During the herring spawning season, Coeur and/or their transportation contractor will adjust regular Cascade Point to Slate Creek Cove routing so as to avoid large congregations of surface spawning forage fish (NMFS observer and Coeur to determine routes)
- Design considerations for the Cascade Point dock facility will consider the slope and composition of fill used in breakwater construction to provide shallower water and large rock outcrops, to the extent practicable
- Coeur will conduct dive surveys of the breakwater and adjacent habitat likely to be impacted by construction and operation of the breakwater, initially on an annual basis following construction for every year during a 5 year period, then at year 10 and year 20 (post-operations)
- During the herring spawning season, Coeur and/or their transportation contractor will limit refueling inside Berners Bay at the Cascade Point to one event per week; the vessel will also be "boomed" during fueling
- Fueling will occur from upland by a fuel truck stationed in a totally contained facility; all related activities will be subject to strict provisions of Coeur's Spill Contingency Plan

Other Standard Operating Procedures (SOP's)

SOP #8: Coeur will implement Stormwater Pollution Prevention Plan (including stormwater management control practices, measures to reduce pollutants in stormwater, SPCC Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) at the two dock sites

SOP #9: Controls for erosion and sedimentation, total containment of petroleum products, oils and grease separation, stormwater diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade

Point and Slate Creek Cove transport facilities, and by boat operations serving the project

SOP #10: Specific BMP's for Marine Vessels and Docks Required by Coeur include the following commitments by Coeur. Coeur or its contractor(s) will:

- Require (contractually) that service providers and users abide by approved BMP's at the two docks
- Provide designated work area(s) for outside boat repairs and maintenance – no maintenance will be permitted outside of these areas
- Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area; upland area(s) are required for these activities
- Perform maintenance over tarps to ease cleanup at these upland maintenance areas
- Provide upland cleanup areas with adequate stormwater management facilities
- Utilize oil and water separators for stormwater collection and treatment at the dock facilities and parking areas
- Inspect stormwater drainage and washing systems regularly at these upload sites
- Develop and implement standard operating procedures BMP's for the management of all solid waste associated with the docks and boat transport facilities, including recycling, compacting, and reuse as appropriate
- Use flyers, pamphlets and newsletters to raise operators and passengers awareness of need to implement BMP's
- Provide and maintain appropriate storage, transfer, containment and disposal facilities for all liquid and solid wastes generated by the mine transportation operations
- Separate containers for disposal and clearly mark those containers for: used antifreeze, oils, greases, solvents and other materials
- Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code (designated storage areas should be covered and the inside area sloped to a dead end sump with total containment provided (all drains to be equipped with positive control valves or devices)
- Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container
- Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors
- Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur; attendance will be mandatory; federal, state and local regulators will be invited to take part in this training program
- An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: 1) Cascade Point dock; 2) Slate Creek Cove dock; and 3) the minesite (supplies are described in the Spill Contingency Plan)
- Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters

- Regular inspection of fuel lines and hoses for chaffing, wear and general deterioration is required (replace with USCG Type A)
- Non-spill vacuum systems for spill proof oil changes or to pump out oily bilge water is required
- Marine vessel engines must be regularly tuned and operating at peak efficiencies
- Waste oil must be removed from the maintenance site by a permitted waste oil transporter
- Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary
- All sewage must be disposed of at approved land-based facilities
- Use of biodegradable treatment chemicals in holding tanks is required
- Use of low phosphate detergents to reduce phosphorous loads to approved treatment systems is required

Additional Construction and Operational SOP Requirements of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan

SOP #11**:** Coeur will sponsor a "Berners Bay Working Group" to include: NMFS, USFS, USF&WS, ADNR, Coeur, a commercial fisheries organization, commercial crabbers association, and Goldbelt

SOP #12: Coeur will also implement the following construction best management practices (BMP's) at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the two facilities:

- As part of the design criteria, Coeur will limit fill placement in subtidal areas to the extent practicable, to minimize effects on marine fish rearing habitat
- Coeur will use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment
- The design criteria will prohibit the use of creosote or pentachlorophenol treated wood materials in construction that would have contact with the water, in order to avoid toxic effects to juvenile fish
- The design criteria will promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks and gangways) in order to facilitate light penetration for aquatic plants
- Construction contracts will restrict the use of impact hammers to the extent practicable, both from a scheduling, engineering and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity
- The final design will include prudently engineered breach in the Cascade Point breakwater to allow for juvenile fish passage at high tides (this assumes, fish will also congregate behind the breakwater to take advantage of feeding opportunities.
- Coeur will maintain prudent engineering in the dogleg design concept for the Cascade Point breakwater to ensure:
  - reducing the amount of documented kelp that would be directly impacted
  - orienting the end of the breakwater away from habitat to the north that is generally better suited for herring spawning than to the south

- reducing the amount of habitat to the east and south of the breakwater that will have reduced wave energy as a result of the breakwater

- Reduce fill needed for Slate Creek Cove dock facility loading ramp, so as to limit protrusion into Berners Bay, while not jeopardizing loading and offloading worker safety and creating unnecessary environmental risk

SOP #13: Coeur will develop a Spill Response Plan to be implemented at both the Cascade Point and Slate Creek Cove dock facilities, and the minesite, in order to prevent fuel and chemical spills, and minimize their environmental impacts in the event of an accidental spill. The Spill Response Plan will be adopted and implemented as a key component of this mitigation plan. The primary objective of the Spill Contingency Plan will be to:

- Reduce the risk for accidental spills and environmental degradation
- Provide the operating facility with the necessary information to properly respond to a fuel or oil spill or chemical spill event.
- Clearly define line of function responsibilities for a spill situation
- Provide a concise response and clean-up program which minimizes environmental impacts

SOP #14: The effectiveness of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan and related contingency plans and monitoring programs would be evaluated after year one of construction, and year one of operations, and every third-year thereafter in order to facilitate the goals and policies of the program. The findings of the review or "environmental audit," to be conducted by a qualified third-party contractor commissioned by Coeur, would be presented to the "Berners Bay Working Group" and key resource management agencies during the month of February of that year, in order to evaluate programs and recommend modifications an/or realignments to policies, where necessary.

Coeur will commit to these policies, BMP's, mitigation activities, and monitoring programs, to be incorporated into the overall mitigation component of the Final Plan of Operations, to be approved by the U.S. Forest Service. It is understood that approval of this plan by the U.S. Forest Service does not relieve Coeur of its responsibilities to comply with other Federal, State, and Local laws, rules, and regulations.

Appendix F

Old-Growth Habitat

Appendix F: Old-Growth Habitat

During the development of the 1997 Forest Plan Final Environmental Impact Statement (EIS) (Forest Service, 1997a), a conservation strategy was designed to ensure that implementation of the Forest Plan would provide a reasonable assurance of maintaining viable and well-distributed wildlife populations across the Tongass National Forest for 100 years. As part of this conservation strategy, a forest-wide system of large, medium, and small Old-Growth Habitats (OGHs) was established and a set of standards and guidelines developed to preserve the integrity of the forest's old-growth ecosystem. The habitats have been identified and mapped in the revised Forest Plan.

Three small OGHs are within the Kensington Gold Project area (Figure F-1). Small OGHs require a contiguous landscape of at least 16 percent of the total Value Comparison Unit (VCU) area, and 50 percent of this area must be productive old-growth timber (Forest Service, 1997b). VCUs are distinct geographic areas encompassing one or more large stream systems with boundaries that follow watershed divides. Along with the general criteria of size and productivity, connectivity is also a criterion. The design of each habitat should be based on wildlife concerns specific to the particular area. Criteria commonly used in designing small habitats include important deer winter range, probable goshawk nesting habitat, probable marbled murrelet nesting habitat, large forest blocks, rare plant associations, and landscape linkages.

The Old-Growth Habitat land use designation provides for evaluation and possible adjustment of the location of the habitats based on site-specific information. Where feasible, the boundaries should follow geographic features so that the boundaries can be recognized in the field. The revised Forest Plan Record of Decision committed the Forest Service to work with the Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (USFWS) to review the location, size, and suitability of the OGHs during project-level planning.

The study area includes three VCUs (160, 190, and 200) with a small OGH within each. The Forest Service, ADF&G, and USFWS conducted an interagency review of the existing mapped small OGHs in November 2003. The interagency review team determined that none of the mapped small OGHs in the study area met the requirements for size or the amount of productive old growth established under the Forest Plan. Using the criteria in Appendix K of the Forest Plan (Forest Service 1997b), the interagency team recommended modifications to each of the small OGHs within the project area, which are discussed below for each VCU.

The small OGH in VCU 160 is of greatest concern because it does not meet Forest Plan standards and guidelines (e.g., 16 percent of the VCU). It also contains approximately 5.4 miles of existing road and could be affected under Alternatives B, C, and D. This small OGH covers 802 acres and will need to be modified (i.e., increased in size) by 573 acres to meet Forest Plan standards and guidelines for old-growth habitats (Table F-1).

The small OGHs in VCUs 190 and 200 would not be affected by the proposed project activities under any of the alternatives; however, neither of the two meets the required amount of productive old growth, even though the small OGH in VCU 200 exceeds the size required under the Forest Plan (Table F-1).

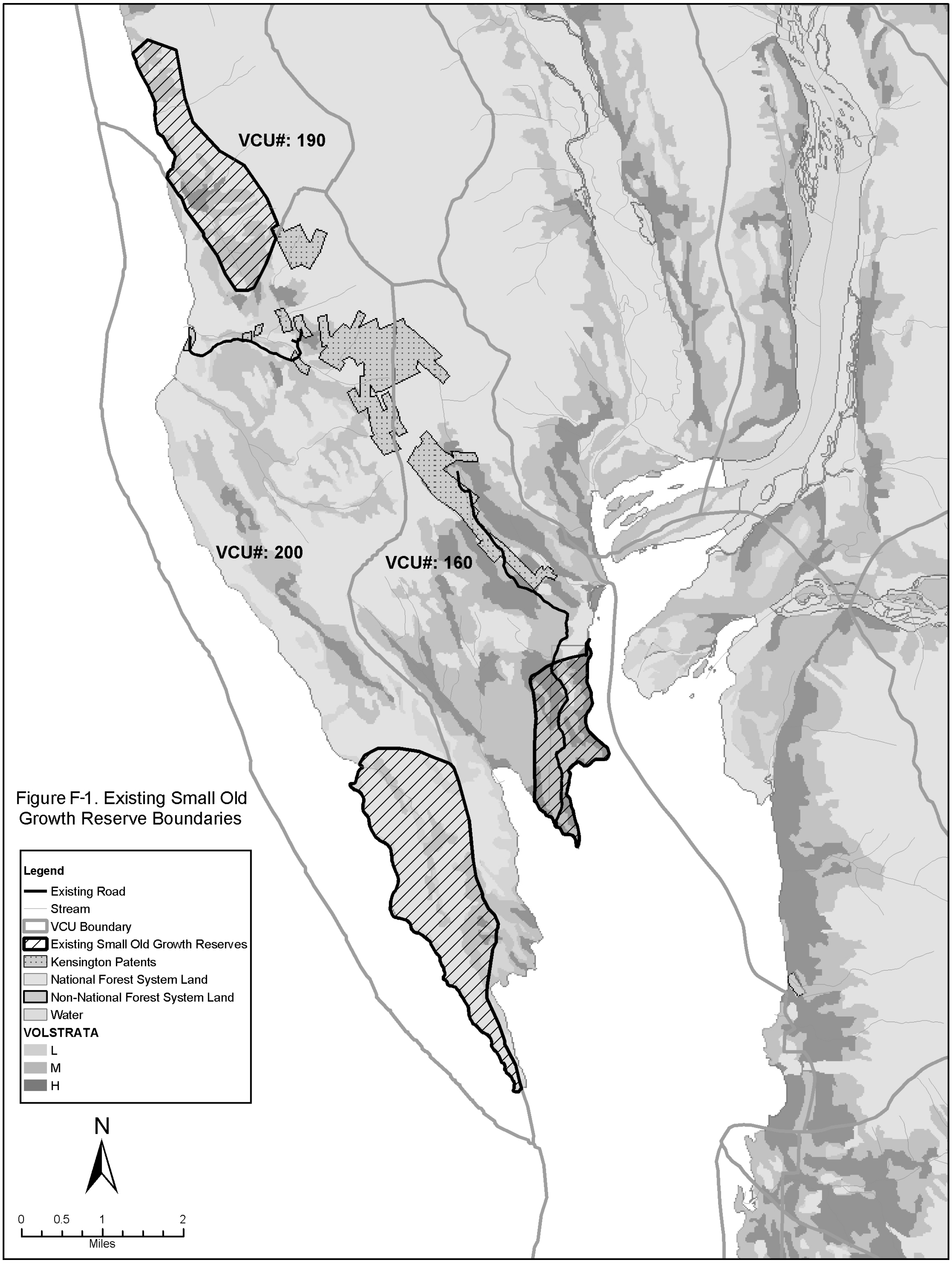


Figure F-1. Existing Small Old Growth Reserve Boundaries

Table F-1. Existing Small Old-Growth Habitat Analysis within the Kensington Mine Project Area, and Recommended Modifications to Each

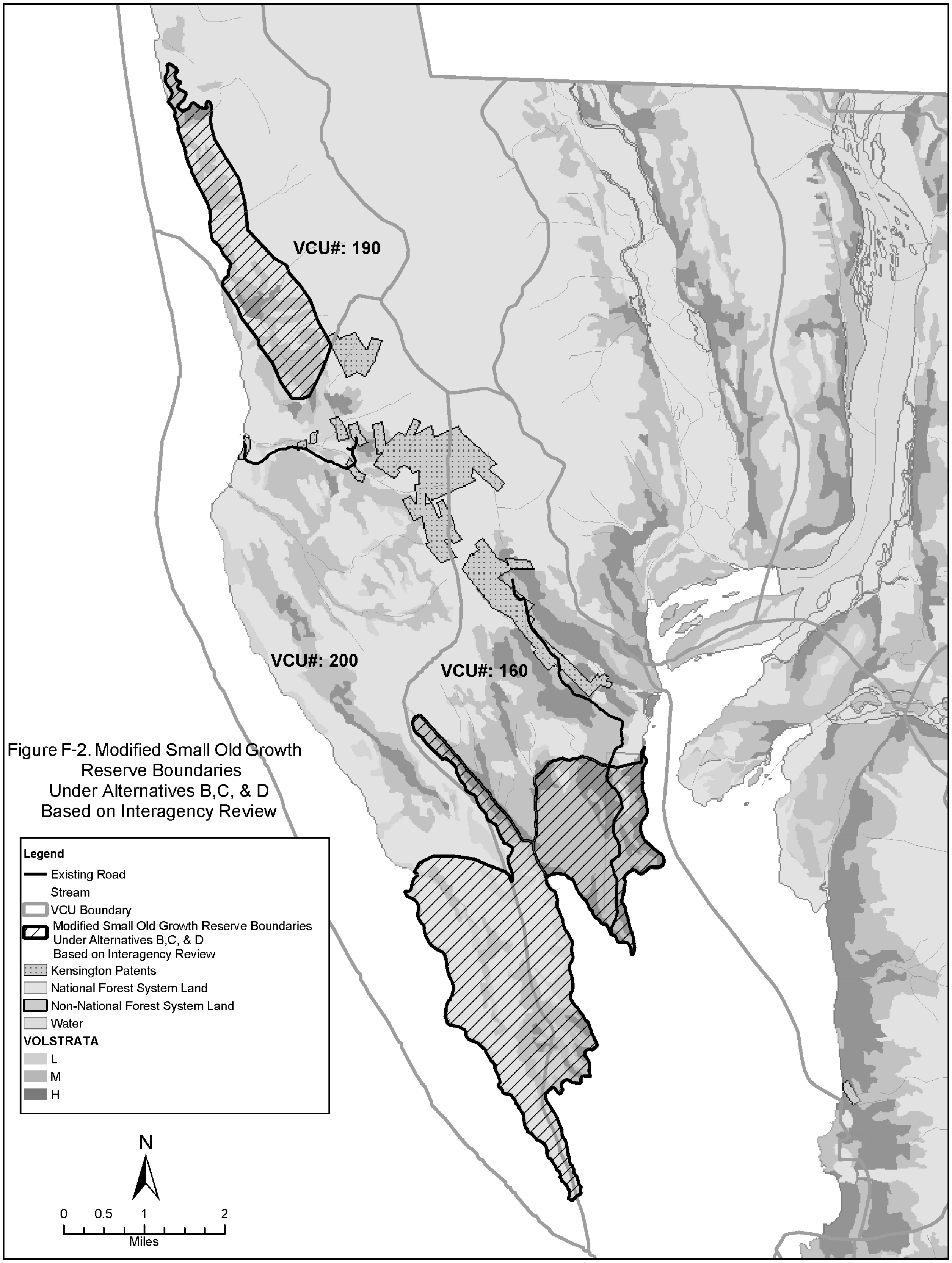
Existing Conditions											
VCU	Acreage of POG Within Each of the Mapped Small OGHs										
	High-Volume POG	Medium-Volume POG	Low-Volume POG	Total POG	Total Land Acres/VCU	Existing Acres	16% of VCU Requirement	Difference in Total Acres Needed	50% POG Required	Existing POG	Difference in POG Acres Needed
160	329	454	0	783	8,593	802	1,375	-573	688	783	+96
190	61	527	27	615	9,005	1,299	1,441	-142	720	615	-106
200	18	353	276	648	10,937	2,098	1,750	+348	875	648	-227
Recommended Modifications											
VCU	Amount of POG Within Each of the Modified Small OGHs by VCU										
	High-Volume POG	Medium-Volume POG	Low-Volume POG	Total POG	Total Land Acres/VCU	Modified Acres	16% of VCU Requirement	Difference in Total Acres Needed	50% POG Required	Existing POG	Difference in POG Acres Needed
160	466	949	2	1,417	8,593	1,454	1,375	+79	688	1,417	+729
190	95	616	27	737	9,005	1,462	1,441	+21	720	737	+17
200	143	704	660	1,507	10,937	2,098	1,750	+348	1,049	1,507	+458

The existing habitat in VCU 190 did not meet the guidelines under the Forest Plan for size and percentage of productive old growth needed. This small OGH was greatly expanded to the north in light of the existing natural fragmentation and limited amounts of productive old growth required to meet Forest Plan requirements (Table F-1).

For VCU 200, there was no logical alternative to obtaining additional acres within this VCU because of the distribution and amount of forested areas in it. The naturally fragmented area limited the interagency review team's options, and additional acres were therefore used in the adjacent VCU 160. Appendix K of the Forest Plan allows for up to 30 percent of an OGH to be mapped in an adjacent VCU if the resulting habitat achieves the objectives of the old-growth habitats. The interagency review team agreed that expanding the small OGH in VCU 200 to include portions of VCU 160 would increase connectivity values, capture important beach and estuary fringe habitats and riparian habitats, and include higher-volume stands. However, approximately 36 percent of the area encompassed by the proposed OGH boundary modification extends into VCU 160. The proposed modifications to the OGH boundaries are presented in Figure F-2.

Direct and Indirect Effects on OGHs

No direct or indirect effects on OGHs are expected other than the positive effect of adjusting the boundaries of the existing small OGHs. Low-elevation passes, beach and estuary fringe, and stream corridors provide natural connections between forested blocks and are important areas for migrating and dispersing wildlife. The boundary modifications for each of the small OGHs would increase connectivity from higher elevations to the beach and estuary fringe habitats and


VCU#: 190
VCU#: 200
VCU#: 160
Figure F-2. Modified Small Old Growth Reserve Boundaries Under Alternatives B,C, & D Based on Interagency Review
Legend
Existing Road
Stream
VCU Boundary
Modified Small Old Growth Reserve Boundaries Under Alternatives B,C, & D Based on Interagency Review
Kensington Patents
National Forest System Land
Non-National Forest System Land
Water
VOLSTRATA
L
M
H
N
0 0.5 1 2
Miles

additional riparian habitat, and would increase the number of intact patches of medium- and high-volume productive old-growth stands. Maintaining forested corridors between OGHs or other non-development land use designations is a key component to maintaining viable wildlife populations on the forest (Forest Service, 1997b).

Within the project area, corridors that link alpine areas to the beach fringe are important given past harvest and mining activities. Landscape features affecting the connectivity of OGH ecosystems are distances between old-growth areas and forest conditions in the areas between the old-growth areas (Forest Service, 1997b).

Cumulative Effects

Reasonably foreseeable future activities include a potential land exchange between the Forest Service and the Sealaska Corporation and Cape Fox Corporation. Sealaska and Cape Fox corporations have initiated a proposal for a land exchange (House Bill H.R. 1889 and Senate Bill S. 1354). These bills would require the Forest Service to exchange lands in the Kensington area.

Approximately 22 percent of the small OGH in VCU 190 and all of the small OGH in VCU 160 are included in the proposed exchange. This exchange would bisect the two small OGHs in VCU 200 and VCU 190. It is unknown what level of potential connectivity would be available northward from Point St. Mary. Neither the existing small OGH in VCU 200 nor its modified boundary (which would extend into VCU 160) would be included in the proposed land exchange, and therefore neither would be affected by the proposed exchange.

References

Forest Service. 1997a. *Tongass Land Management Plan Revision, Final Environmental Impact Statement.* USDA Forest Service, Tongass National Forest, R10-MB-338dd (Record of Decision, Final Environmental Impact Statement—Parts 1 and 2, Map Packet, Appendix—Volumes 1, 2, 3, and 4, and Errata). USDA Forest Service, Alaska Region, Juneau, AK.

Forest Service. 1997b. *Land and Resource Management Plan: Tongass National Forest.* USDA Forest Service, Alaska Region, R10-MB-338dd.

Forest Service. 1998, August 7. Tongass National Forest Land and Resource Management Plan, Implementation Policy Clarification, August 1998. USDA Forest Service, Ketchikan, AK.

Appendix G

Ground Water Quality

G. GROUND WATER QUALITY

GROUND WATER QUALITY AND MONITORING

A program to characterize the existing ground water quality in the project area was established at the Kensington mine site in 1989. Wells were installed throughout the Sherman Creek basin and the Terrace Area basin to sample ground waters. Results of the ground water monitoring program through October 1995 are presented in Montgomery Watson (1996c); data through June 1996 are presented in Montgomery Watson (1996b). Ground water quality data collected from the Terrace Area drainage basin (proposed dry tailings facility [DTF] site) are provided in SRK, 1996e. More detailed discussion of the ground water monitoring program can be found in Montgomery Watson (1996a; 1996c) and in the *Technical Resource Document for Water Resources, Kensington Mine Project* (SAIC, 1997a).

The locations of the ground water monitoring wells installed in the Sherman Creek drainage basin are shown in Figure G-1 and their characteristics are summarized in Table G-1. Most wells were sampled on a monthly or quarterly basis during their period of record, which ranges from 16 months (SH-8) to 7 years (SH-3).

The locations of the ground water monitoring wells installed in the Terrace Area drainage basin are shown on Figure G-2 and their characteristics are summarized in Table G-1. Three additional wells (i.e., MW 96-6A, MW 96-8A, MW 96-9) were completed in the Terrace Area, but water quality data have not been reported for these wells. The wells in the Terrace Area drainage were sampled once during the summer of 1996.

Ground water samples were collected by Kensington Joint Venture staff prior to December 1995 and have been collected by Montgomery Labs personnel since that time. Portable equipment was used to measure pH, turbidity, water temperature, and specific conductance in the field. Samples were filtered in the field through elements with pore diameters of 0.45 mm to prepare them for analysis of dissolved constituents. From 1987 to 1993, field-cleaned, reusable filters were used to process samples; since 1993, single-use, disposable filters have been used. Piezometers were installed in the Sherman Creek drainage boreholes to permit monitoring of ground water levels and quality. Table G-1 borehole depths and sampling intervals. It should be noted that four wells in the Sherman Creek basin (i.e., SH-7, SH-8, SH-10, and SH-11A) were contaminated by grout during installation.

Two laboratories have analyzed samples collected for ground water quality. Intermountain Laboratories (IML) in Sheridan, Wyoming, conducted chemical analyses from 1987 to November 1994. Montgomery Laboratories (ML) in Juneau, Alaska, conducted sample analyses from June 1993 to present. Duplicate ground water samples were not analyzed in the two labs during their period of overlap. However, a program to assess inter-lab consistency, conducted as part of the surface water quality monitoring program, produced reasonably consistent results for the five constituents (i.e., As, Cu, Pb, Hg, and hardness) analyzed by both labs.

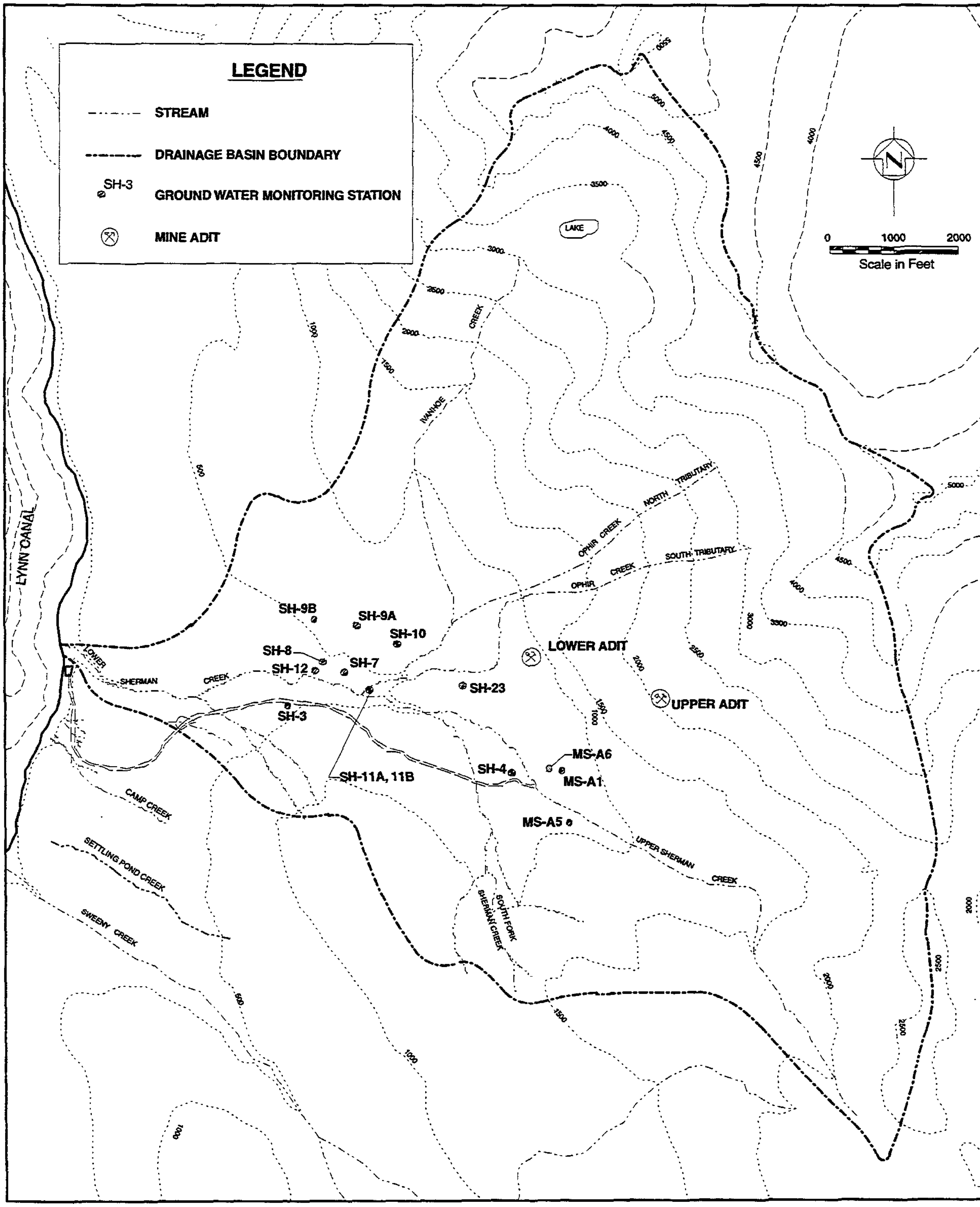


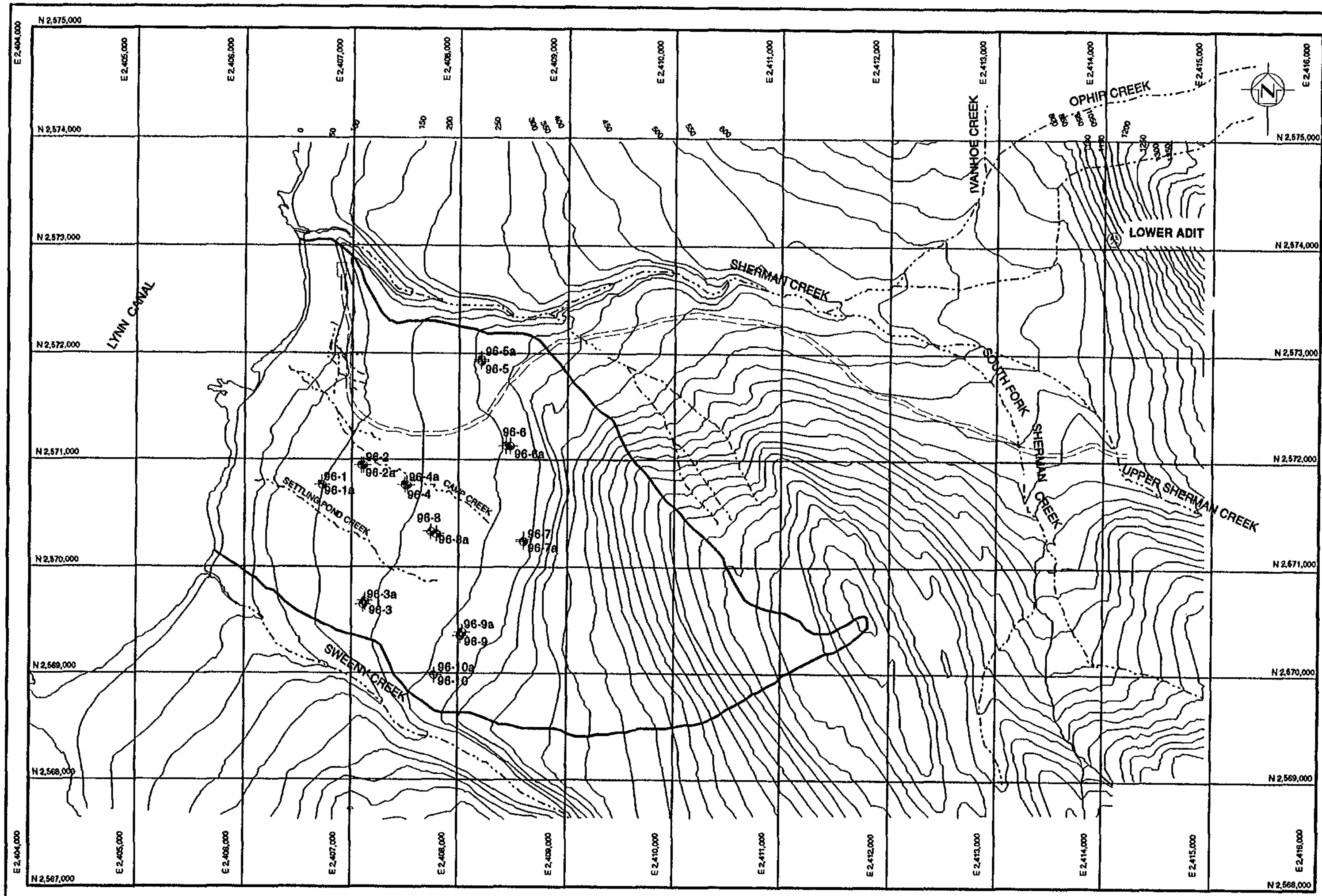
Figure G-1. Ground Water Monitoring Wells in Sherman Creek Drainage Basin (Source: Adapted from Montgomery Watson, 1996a and SRK, 1996d)

Table G-1. Ground Water Quality Monitoring Stations

Well Number	Installation Date	Boring Depth[1]	Perforated Interval[1]	Mean-Static Water Depth[1]	Medium of Perforated Interval
			Sherman Creek Drainage Basin[2]		
SH-3	11/6/88	101.5	60-90	54.0	sandy gravelly clay
SH-4	11/7/88	26.0	9.5-24.5	18.0	gravelly sand
SH-7	10/22/89	78.1	44.2-54.2	38.0	phyllite/meta-siltstone
SH-8	8/16/89	110.4	85-95	39.2	clay; phyllite
SH-9A	9/9/89	31.2	21-31	2.2	clayey sand; silty gravel
SH-9B	11/26/89	178.6	134.5-164.5	36.3	clay; clayey sand
SH-10	9/7/89	102.0	67-87	6.2	silty sand; silty gravel
SH-11A	10/30/89	76.3	39.6-46.6	5.6	phyllite
SH-11B	10/31/89	32.0	19-29	6.9	silty sand
SH-12	10/25/89	55.0	21.5-31.5	2.8	phyllite with clay gouge
SH-23	12/15/89	88.5	43-63	n.r.	clay
MS-A1	11/28/90	32.0	16.5-26.5	16.3	silty sand; clay till
MS-A5	11/20/90	40.0	28-38	2.2	clay till
MS-A6	11/29/90	22.5	12.5-22.5	0.0	diorite
			Terrace Area Drainage Basin[3]		
MW 96-1	6/2/96	65.0	42.7-62.7	13.8	slate/phyllite
MW 96-1A	6/3/96	7.1	1.8-6.8	2.0	clayey sand; slate
MW 96-2	6/4/96	63.8	53.5-63.5	13.6	slate
MW 96-2A	6/3/96	7.1	1.8-6.8	2.6	silty sand; slate
MW 96-3	5/31/96	78.4	66.4-76.4	5.4	slate/phyllite
MW 96-3A	5/31/96	7.0	1.5-6.5	3.6	clayey sand; phyllite
MW 96-4	6/14/96	28.2	22.5-27.5	2.6	slate
MW 96-4A	6/14/96	8.0	1.1-6.0	0.9	peat; silty sand; slate
MW 96-5	6/13/96	44.7	37.0-42.0	11.6	phyllite
MW 96-5A	6/13/96	8.5	3.0-8.0	2.2	slate/phyllite
MW 96-6	6/12/96	15.3	9.8-14.8	2.6	slate
MW 96-7	6/11/96	39.0	22.7-37.7	1.8	slate/phyllite
MW 96-7A	6/10/96	9.6	4.2-9.2	1.7	silty sand/gravel; slate
MW 96-8	6/9/96	33.8	n.r.	n.r.	clayey sand/gravel
MW 96-9A	6/7/96	7.3	2.0-7.0	1.2	silty sand/gravel; slate
MW 96-10	6/6/96	44.1	27.2-42.2	2.3	slate
MW 96-10A	6/5/96	8.5	1.1-6.1	1.3	peat; silty sand

1. Depths given in feet; mean static water table as feet below top of casing.
   n.r. = not reported.
2. Data are from Montgomery Watson, 1996a.
3. Source: SRK, 1996f. Perforated interval is interval of slotted pvc.

Laboratory work was performed in accordance with 40 CFR Part 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants* and EPA *Methods for Chemical Analysis of Water and Wastes*. As a check on analytical accuracy, both labs routinely performed analyses of blanks and synthesized standards of known composition; sample analyses were corrected accordingly as required by EPA quality assurance/quality control procedures. Table G-2 lists the analytical methods and reporting limits of both labs. Note that analytical methods have improved with time, showing a general trend toward lower reporting limits.



LEGEND

- MINE ADIT
- DRAINAGE BASIN BOUNDARY
- STREAM
- 96-1 BOREHOLE/WATER QUALITY MONITORING LOCATION

400 0 400 800

SCALE IN FEET

Figure G-2
Monitoring Points in Terrace Area Drainage Basin
(Source: SRK, 1996c)

214D-52

Table G-2. Laboratory Methods, Reporting Limits, and Reporting Periods

Parameter	Intermountain Laboratories			Montgomery Laboratories		
	Analysis Method	Analysis Period	Reporting Limit	Analysis Method	Analysis Period	Reporting Limit
Aluminum (µg/L)	EPA 200.7	06/88-11/94	100	EPA 202.1	07/93-11/95	500
Arsenic (µg/L)	EPA 206.2	09/87-11/94	5	EPA 200.9	07/93-09/93	5
	---	---	---	EPA 206.2	10/93-10/95	0.5
Barium (µg/L)	EPA 200.7	06/88-11/94	500	EPA 208.1	07/93-10/95	500
Cadmium (µg/L)	EPA 213.2	09/87	0.5	EPA 200.9	07/93-09/94	1
	EPA 213.2	10/87-09/91	2	EPA 213.2	10/94-10/95	0.2
	EPA 213.2	10/91-11-94	0.5	---	---	---
Chromium (µg/L)	EPA 200.7	09/87	1	EPA 218.1	07/93-02/95	50
	EPA 200.7	10/87-06/89	5	EPA 218.1	03/95-10/95	20
	EPA 200.7	10/87-09/91	20	---	---	---
	EPA 200.7	10/91-11/94	10	---	---	---
Copper (µg/L)	EPA 200.7	09/87-06/89	2	EPA 200.9	07/93-09/94	20
	EPA 200.7	06/88-09/91	10	EPA 220.1	10/94-10/95	2
	EPA 200.7	10/91-11/94	5	---	---	---
Iron (µg/L)	EPA 200.7	09/87-11/88	10	EPA 236.1	07/93-02/95	100
	EPA 200.7	12/88-11/94	50	EPA 236.1	02/95-10/95	50
Lead (µg/L)	EPA 239.2	09/87	2	EPA 200.9 &	07/93-10/95	2
	EPA 239.2	10/87-11/88	10	239.2	---	---
	EPA 239.2	12/88-09/91	20	---	---	---
	EPA 239.2	10/91-11/94	1	---	---	---
Manganese (µg/L)	EPA 200.7	07/87-06/89	2	EPA 243.1	07/93-02/95	20
	EPA 200.7	06/88-11/94	20	EPA 243.1	03/95-10/95	15
Mercury (µg/L)	EPA 245.1	09/87-09/91	1	EPA 245.2	07/93-09/94	2
	EPA 245.1	11/91-11/94	0.1	EPA 245.2	10/94-10/95	0.2
Molybdenum (µg/L)	EPA 200.7	12/88-11/94	20	EPA 246.1	07/93-10/95	500
Nickel (µg/L)	EPA 200.7	09/87	2	EPA 200.9	07/93-02/95	20
	EPA 200.7	10/87-11/94	10	EPA 249.2	03/95-10/95	10
Selenium (µg/L)	EPA 270.2	09/87	2	EPA 200.9 &	07/93-10/95	5
	EPA 270.2	10/87-11/94	5	270.2	---	---
Silver (µg/L)	EPA 200.7	09/87	1	EPA 200.9	07/93-09/94	50
	EPA 200.7	10/87-11/87	2	EPA 272.1	10/94-10/95	0.5
	EPA 200.7	12/88-09/91	10	---	---	---
	EPA 200.7	10/91-11/94	0.1	---	---	---
Zinc (µg/L)	EPA 200.7	09/87-06/89	2	EPA 289.1	07/93-02/95	20
	EPA 200.7	06/88-11/94	10	EPA 289.1	03/95-10/95	10
Cyanide, free (µg/L)	EPA 335.3	12/89-10/90	5		No Analysis	
Cyanide, WAD (µg/L)	EPA 335.3	12/89-10/90	5		No Analysis	
Cyanide, total (µg/L)	EPA 335.3	12/89-10/90	5		No Analysis	
Ortho-Phosphate (µg/L)	EPA 365.1	09/87-06/89	5	EPA 365.1	07/93-10/95	50
	EPA 365.1	09/88-11/94	10	---	---	---
Nitrite-Nitrogen (µg/L)	EPA 354.1	09/87-06/89	5	EPA 354.1	07/93-03/94	100
	EPA 354.1	06/88-11/94	10	EPA 300.0	04/94-09/95	200
	---	---	---	EPA 300.0	10/95	100

Table G-2. Laboratory Methods, Reporting Limits, and Reporting Periods (continued)

Parameter	Intermountain Laboratories Analysis Method	Intermountain Laboratories Analysis Period	Intermountain Laboratories Reporting Limit	Montgomery Laboratories Analysis Method	Montgomery Laboratories Analysis Period	Montgomery Laboratories Reporting Limit
Nitrate-Nitrogen (µg/L)	EPA 353.1	09/87-06/89	200	EPA 353.2,3	07/93-03/94	100
	EPA 353.1	06/88-11/94	10	EPA 353.2,3	04/94-09/95	200
	---	---	---	EPA 353.2,3	10/95	100
Nitrite+Nitrate Nitrogen (µg/L)	EPA 353.2	06/88-11/94	10	ML/EPA 353.2	07/93-08/94	300
	---	---	---	EPA 300.0	09/94-09/95	400
	---	---	---	EPA 353.2	10/95	200
Ammonium Nitrogen (µg/L)	EPA 350.1	09/87-01/89	50	ML/EPA 350.1	07/93-09/95	50
	EPA 350.1	06/88-11/93	10	---	---	---
	EPA 350.1	01/94-11/94	50	---	---	---
Boron (mg/L)	EPA 200.7	06/88-11/94	0.01	ML 6010, 200.7	07/93-10/93	0.05
	---	---	---	EPA 212.3	11/93-10/95	0.05
Sodium (mg/L)	SM 325B	12/88-11/94	0.2	EPA 273.1	07/93-10/95	1.0
Potassium (mg/L)	SM 322B	05/89	0.1	EPA 258.1	07/93-10/95	1.0
	SM 322B	09/88-05/94	0.2	---	---	---
Calcium (mg/L)	EPA 215.2	08/88-11/94	1.0	EPA 215.1	07/93-11/93	1.0
	---	---	---	EPA 215.1	12/93-10/95	1.0 to 2.0
Magnesium (mg/L)	SM 318C	09/88-11/94	1.0	EPA 242.1	07/93-10/95	1.0
Fluoride (mg/L)	EPA 340.2	09/88-11/94	0.2	SM 4500-FC	07/93-10/95	0.1
Chloride (mg/L)	EPA 325.3	12/89-11/94	1.0	EPA 325.3	07/93-03/94	1.0
	---	---	---	EPA 300.0	04/94-09/95	2.0
	---	---	---	EPA 300.0	10/95	1.0
Sulfate (mg/L)	EPA 375.3	09/87-11/94	1.0	EPA 300.0	07/93-11/93	2.0
	---	---	---	EPA 300.0	12/93-09/95	4.0
	---	---	---	EPA 300.0	10/95	2.0
Hydroxide (mg/L)	EPA 310.1	10/90-11/94	1.0	EPA 310.1	07/93-10/95	0.001
Carbonate (mg/L)	EPA 310.1	12/88-11/94	1.0	EPA 310.1	07/93-10/95	0.001
Bicarbonate (mg/L)	EPA 310.1	12/88-11/94	1.0	EPA 310.1	07/93-10/95	0.001
Total Alkalinity (mg/L)	EPA 310.1	12/88-11/94	1.0	EPA 310.1	07/93-10/95	2.0
Acidity (mg/L)	EPA 305.1	12/88-11/94	1.0	EPA 305.1	07/93-12/94	2.0
	---	---	---	EPA 305.1	01/95-10/95	10
Hardness (mg/L)	EPA 130.2	12/88-11/94	1.0	ML/SM 2340B	07/93-10/95	1.0
pH (s.u.)	EPA 150.1	09/87-11/94	0.1	EPA 150.1	07/93-10/95	0.001
TDS (mg/L)	EPA 160.1	06/88-11/94	1.0	ML/EPA 160.1	07/93-08/94	10
	---	---	---	ML/EPA 160.1	09/94-10/95	20
Conductivity (µmhos/cm)	EPA 120.1	09/87-11/94	10.0	EPA 120.1	07/93-10/95	4.0
TSS (mg/L)	EPA 160.2	09/88-11/94	1.0	EPA 160.2	07/93-10/95	4.0
Turbidity (NTU)	EPA 180.1	08/88-11/94	0.05	EPA 180.1	07/93-10/95	0.05
Sett. Solids (ml/L)	EPA 160.5	12/88-11/94	0.1	EPA 160.5	07/93-10/95	0.1
SAR (units)	Calculated	12/88-11/94	NA	Calculated	07/93-05/94	0.0000
	---	---	---	Calculated	06/94-10/95	0.0001

The water quality monitoring effort focused primarily on trace metals, which typically occur in concentrations at or near their method detection limits. Nitric and hydrochloric acid digestion of samples was used for analyses of total recoverable metals. Raw analytical data show that dissolved metals concentrations are occasionally reported at levels higher than total metals concentrations. This is particularly true of samples collected during 1993. Montgomery Watson (1996a) discusses this apparent inconsistency, which could result from sample contamination, inappropriate analytical procedures, or overlapping analytical tolerances. While some inconsistent analyses are likely due to overlapping analytical tolerances at concentrations near the method detection limits, the switch from reusable to disposable filters in 1993 corresponded to the near elimination of inconsistent analyses.

Table G-3 summarizes sample analyses conducted through October 1995 for each ground water monitoring station in the Sherman Creek basin. Analytical data were screened and evaluated prior to their inclusion into Table G-3. Duplicate analyses were evaluated using a protocol that gave priority to detected values with the lowest reporting limit. Analyses with inconsistent values between dissolved and total metals were screened using maximum tolerance limits. Thirteen analyses with values outside of their computed tolerance limits were removed from the data base. Seven hundred and eighty-one outlier data points were identified in the Sherman Creek ground water quality data base by computing two standard deviations around the mean value of each constituent. Four of these data points were identified as erroneous and removed from the data base. They included total arsenic analyses of samples collected from stations SH-3 and SH-7 on 9/15/94, which were prepared improperly for analysis; a spurious TDS analysis of a sample collected from station SH-11B on 6/21/94 caused by matrix interference from abnormally high TSS; and a TDS analysis of a sample collected from station SH-11B on 10/9/95 that was contaminated when particles broke through a lab filter. Several values recorded as zero were also eliminated from the data base. These included 25 ground water temperature measurements and zero values recorded for hydroxide, bicarbonate, carbonate and alkalinity at station SH-23 on 2/18/91.

The data presented in Table G-3 were analyzed using a statistical method that utilizes a distribution/substitution technique developed for data with a large number of non-detect values and multiple detection limits. EPA Region 10 and ADEC accepted the method, which was developed by Helsel and Cohn (1988) and Helsel (1990), for implementation on the Kensington Mine Project. The technique assumes a log-normal distribution of analytical values to compute percentile distributions.

Table G-4 presents ground water analyses of samples collected from the Terrace Area drainage basin. The summarized values include analyses of a single sample collected from each of the 17 monitoring wells shown in Table G-1. These data were not analyzed using the robust statistical methods applied to the Sherman Creek drainage data. Instead, non-detected values were included in the statistical computations by using a value of one-half of the method detection limit (MDL); for constituents with variable detection limits (e.g., total Al), a value of one-half of the lowest detection limit (e.g., 0.25 for total Al) was used. Because the data in Tables G-3 and G-4 received different statistical treatment, readers should exercise caution when comparing summarized data from the Sherman Creek and Terrace Area drainages.

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage

Station		Depth to Water (feet)	Field pH (units)	Field Cond (µmhos/cm)	Field Turb (NTU)	Water Temp (°C)
Station SH-3	Mean	54	--	238	NA	5.1
	Min	50.6	7.28	125	*33*	0
8/89-pres.	Max	56.13	8.54	293	*72*	7.6
m/q	Detects	21	21	21	2	19
	Non-detects	0	0	0	0	0
Station SH-4	Mean	18	--	65	NA	5.6
	Min	14.93	5.13	20	*96*	0
11/89-pres.	Max	20.21	7.35	195	*96*	11.7
m/q	Detects	20	19	20	1	17
	Non-detects	0	0	0	0	0
Station SH-7	Mean	38	--	6,190	NA	5.8
	Min	30.95	8.5	1,590	NA	3.1
11/89-9/94	Max	40.88	12.93	8,980	NA	8.5
irr.	Detects	5	5	5	0	5
	Non-detects	0	0	0	0	0
Station SH-8	Mean	39	--	4,221	NA	5.6
	Min	26.51	8.5	468	NA	3
3/90-6/91	Max	49.54	12.96	8,720	NA	12
m	Detects	12	12	12	0	10
	Non-detects	0	0	0	0	0
Station SH-9A	Mean	2.2	--	174	NA	6.3
	Min	0.1	6.26	105	*6.6*	3.4
11/89-9/94	Max	4.54	8.25	310	*80*	9.2
m/q	Detects	8	15	16	2	14
	Non-detects	0	0	0	0	0
Station SH-9B	Mean	NA	--	214	NA	6.5
	Min	*36.3*	7.27	10	*0.55*	3.7
4/90-9/94	Max	*36.3*	8.65	269	*46*	8.5
m/q	Detects	1	19	19	2	17
	Non-detects	0	0	0	0	0
Station SH-10	Mean	NA	--	398	NA	6.4
	Min	*6.2*	8.5	130	*28*	4
11/89-9/94	Max	*6.2*	11.77	613	*28*	10.8
m/q	Detects	1	14	14	1	12
	Non-detects	0	0	0	0	0
Station SH-11A	Mean	5.6	--	373	NA	5.3
	Min	2.55	8.5	163	*5.6*	2.2
11/89-pres.	Max	41.9	11.59	628	*46*	14.6
m/q	Detects	22	22	22	2	20
	Non-detects	0	0	0	0	0
Station SH-11B	Mean	6.9	--	341	NA	5.2
	Min	5.65	8.31	157	*0.93*	2.1
11/89-pres.	Max	7.93	9.59	418	*55*	12
m/q	Detects	19	20	20	2	19
	Non-detects	0	0	0	0	0
Station SH-12	Mean	2.8	--	270	NA	5.4
	Min	1.9	8.04	175	*4.7*	2.3
11/89-9/94	Max	3.56	9.59	326	22	11
m/q	Detects	20	20	20	2	18
	Non-detects	0	0	0	0	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Depth to Water (feet)	Field pH (units)	Field Cond (μmhos/cm)	Field Turb (NTU)	Water Temp (°C)
Station SH-23	Mean	NA	--	307	NA	5.7
	Min	NA	8.03	169	*0.28*	2.4
2/90-9/94	Max	NA	9.15	394	*3.3*	12
m/q	Detects	0	21	21	2	18
	Non-detects	0	0	0	0	0
Station MS-A1	Mean	16	--	94	NA	5.2
	Min	13.46	5.37	23	*22*	2.2
4/91-3/94	Max	18.35	7.61	233	*22*	8.4
m/q	Detects	13	13	13	1	12
	Non-detects	0	0	0	0	0
Station MS-A5	Mean	2.2	--	196	NA	5.6
	Min	0.28	7.43	73	*0.1*	2.1
3/91-pres.	Max	6.5	8.69	279	*0.1*	8.5
m/q	Detects	10	10	10	1	9
	Non-detects	0	0	0	0	0
Station MS-A6	Mean	NA	--	229	NA	4.8
	Min	NA	7	110	*3.2*	0
1/91-pres.	Max	NA	8.07	301	*17*	6.5
m/q	Detects	0	14	14	2	13
	Non-detects	0	0	0	0	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Al (µg/L) Tot.	Al (µg/L) Diss.	As (µg/L) Tot.	As (µg/L) Diss.	Ba (µg/L) Tot.	Ba (µg/L) Diss.	Cd (µg/L) Tot.	Cd (µg/L) Diss.	Cr (µg/L) Tot.	Cr (µg/L) Diss.
Station SH-3	**Mean**	6,785	NA	10	4.2	162	NA	0.64	NA	14	NA
	Min	300	*<100*	5	3	500	*<500*	0.22	*<0.2*	10	*<10*
8/89-pres.	**Max**	59,000	*<500*	36	19	1,200	*<500*	2	*<2*	150	*<50*
m/q	**Detects**	36	3	24	9	4	0	12	0	10	0
	Non-detects	1	35	13	29	33	38	25	38	27	38
Station SH-4	**Mean**	104,990	28	323	NA	538	NA	11	NA	183	NA
	Min	1,500	100	13	*<1*	500	*<500*	0.7	*<0.5*	20	*<10*
11/89-pres.	**Max**	1,490,000	200	2,900	*7*	7,400	*<500*	300	*15*	2,480	*<50*
m/q	**Detects**	30	3	29	1	10	0	11	1	21	0
	Non-detects	1	28	2	30	21	31	20	30	10	31
Station SH-7	**Mean**	7,091	492	NA	NA	398	NA	NA	NA	31	26
	Min	500	200	*<5*	*<5*	700	*<500*	*<0.5*	*<0.5*	10	40
11/89-9/94	**Max**	36,000	1,000	8	*32*	1,300	*1,200*	*32*	*<2*	100	90
irr.	**Detects**	11	8	1	0	3	2	2	0	6	3
	Non-detects	1	4	10	11	9	10	10	12	6	9
Station SH-8	**Mean**	759	492	NA	NA	NA	NA	NA	NA	NA	NA
	Min	400	300	*<5*	*<5*	*<500*	*<500*	*<2*	*<2*	*<20*	*<20*
3/90-6/91	**Max**	1,800	700	*<5*	*<5*	*<500*	*<500*	*<2*	*<2*	*<20*	*<20*
m	**Detects**	16	15	0	0	0	0	0	0	0	0
	Non-detects	0	1	16	16	16	16	16	16	16	16
Station SH-9A	**Mean**	5,563	61	6.4	3.7	NA	NA	NA	NA	21	NA
	Min	100	100	*5*	3.3	*<500*	*<500*	*<0.5*	*<0.5*	20	*<10*
11/89-9/94	**Max**	43,000	700	18	8	*500*	*<500*	*<2*	*<2*	180	*<50*
m/q	**Detects**	25	6	14	5	1	0	1	0	8	0
	Non-detects	2	21	13	22	26	27	26	27	19	27
Station SH-9B	**Mean**	936	NA	16	10	NA	NA	0.52	NA	NA	NA
	Min	100	*<100*	7	6	*<500*	*<500*	0.7	*<0.5*	*<10*	*<10*
4/90-9/94	**Max**	7,900	*<500*	52	24	*<500*	*<500*	1.4	*<2*	*<50*	*<50*
m/q	**Detects**	17	5	27	23	0	0	3	1	1	1
	Non-detects	11	23	1	5	28	28	25	27	27	27
Station SH-10	**Mean**	421	105	6.6	5.2	NA	NA	NA	NA	NA	NA
	Min	100	100	5	4.4	*<500*	*<500*	*<0.5*	*<0.5*	*<10*	*<10*
11/89-9/94	**Max**	1,400	300	10.5	10.5	*<500*	*<500*	*<2*	*<2*	*<50*	*<50*
m/q	**Detects**	20	11	15	10	0	0	0	0	0	0
	Non-detects	2	11	7	12	22	22	22	22	22	22
Station SH-11A	**Mean**	315	89	5.2	NA	NA	NA	NA	NA	NA	NA
	Min	100	100	0.51	*<0.5*	*<500*	*<500*	*<0.2*	*<0.2*	*<10*	*<10*
11/89-pres.	**Max**	2,200	200	15	*<5*	*<500*	*<500*	*4*	*<2*	*<50*	*<50*
m/q	**Detects**	29	15	5	1	0	0	3	0	1	1
	Non-detects	9	23	33	37	38	38	35	38	37	37
Station SH-11B	**Mean**	77,300	1,023	57	30	1,557	NA	1.4	NA	180	NA
	Min	500	100	0.98	13	500	*<500*	0.6	*<0.2*	40	*<10*
11/89-pres.	**Max**	585,000	13,900	360	304	7,000	*1,000*	9	*<2*	1,400	*<50*
m/q	**Detects**	35	22	35	34	24	1	12	1	24	2
	Non-detects	2	15	2	3	13	36	25	36	13	35
Station SH-12	**Mean**	782	31	7.3	4.8	NA	NA	0.47	NA	NA	NA
	Min	100	100	5	4	*<500*	*<500*	0.6	*<0.5*	*<10*	*<10*
11/89-9/94	**Max**	5,300	400	15	13	*770*	*<500*	4	*<2*	*<50*	*<50*
m/q	**Detects**	20	4	21	15	2	0	4	0	0	0
	Non-detects	11	28	10	17	29	32	27	32	31	32

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Al (µg/L) Tot.	Al (µg/L) Diss.	As (µg/L) Tot.	As (µg/L) Diss.	Ba (µg/L) Tot.	Ba (µg/L) Diss.	Cd (µg/L) Tot.	Cd (µg/L) Diss.	Cr (µg/L) Tot.	Cr (µg/L) Diss.
Station SH-23	**Mean**	161	NA	9.7	8.0	NA	NA	NA	NA	NA	NA
	Min	200	*<100*	5	5	*<500*	*<500*	*<0.5*	*<0.5*	*<10*	*<10*
2/90-9/94	**Max**	800	*<500*	14	13	*<500*	*<500*	<2	<2	*<50*	*<50*
m/q	**Detects**	8	0	28	26	0	0	2	1	0	0
	Non-detects	24	32	4	6	32	32	30	31	32	32
Station MS-A1	**Mean**	175,580	NA	269	NA	842	NA	2.9	NA	432	NA
	Min	48,000	*<100*	9	*<5*	500	*<500*	1	*<0.5*	90	*<10*
4/91-3/94	**Max**	462,000	*1,400*	550	*<5*	2,600	*<500*	20	<2	1,230	*<20*
m/q	**Detects**	18	1	18	0	15	0	14	0	18	1
	Non-detects	1	18	1	19	4	19	5	19	1	18
Station MS-A5	**Mean**	72,517	NA	218	68	808	NA	9.7	NA	155	NA
	Min	700	*<100*	31	26	600	*<500*	0.31	*<0.2*	10	*<10*
3/91-pres.	**Max**	770,000	*12,000*	1,700	134	7,000	*1,500*	94	*2.6*	1,700	*<50*
m/q	**Detects**	18	2	17	17	6	1	9	2	6	2
	Non-detects	1	17	1	1	13	18	10	17	13	17
Station MS-A6	**Mean**	75	NA	6.2	5.2	NA	NA	NA	NA	NA	NA
	Min	100	*<100*	5	4.8	*<500*	*<500*	*<0.2*	*<0.2*	*<10*	*<10*
1/91-pres.	**Max**	600	*<500*	11	7	*<500*	*<500*	<2	<2	*<50*	*<50*
m/q	**Detects**	6	2	20	11	0	0	0	0	0	0
	Non-detects	20	24	6	15	26	26	26	26	26	26

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Cu (µg/L) Tot.	Cu (µg/L) Diss.	Fe (µg/L) Tot.	Fe (µg/L) Diss.	Pb (µg/L) Tot.	Pb (µg/L) Diss.	Mn (µg/L) Tot.	Mn (µg/L) Diss.	Hg (µg/L) Tot.	Hg (µg/L) Diss.
Station SH-3	**Mean**	82	3.5	17,128	30	17	NA	591	52	NA	NA
	Min	10	8	280	50	4	<1	50	20	<0.05	<0.05
8/89-pres.	**Max**	880	20.5	160,000	220	250	<20	4,500	75	<1	<1
m/q	**Detects**	31	4	36	6	18	2	36	36	0	0
	Non-detects	6	34	1	31	19	35	1	2	37	38
Station SH-4	**Mean**	1,244	NA	195,690	NA	37	NA	6,898	53	0.18	NA
	Min	10	<5	2,230	<50	14	<1	20	20	0.2	<0.05
11/89-pres.	**Max**	16,200	<20	2,890,000	160	280	<20	81,300	240	1.3	<1
m/q	**Detects**	30	1	30	2	18	1	31	26	4	0
	Non-detects	1	30	1	29	13	30	0	5	27	31
Station SH-7	**Mean**	44	8.3	9,802	NA	31	1.5	205	NA	NA	NA
	Min	8	5	50	<50	7	1	20	<20	<0.1	<0.1
11/89-9/94	**Max**	150	16	70,000	320	190	3	1,300	31	<1	<1
irr.	**Detects**	10	7	11	2	7	3	7	1	0	0
	Non-detects	2	5	1	10	5	9	5	11	12	12
Station SH-8	**Mean**	7.0	NA	551	NA	NA	NA	8.3	NA	NA	NA
	Min	10	<10	120	<50	<20	<20	20	<20	<1	<1
3/90-6/91	**Max**	20	10	2,950	80	<20	<20	70	<20	<1	<1
m	**Detects**	5	1	14	1	0	0	3	0	1	0
	Non-detects	11	15	2	15	16	16	13	16	15	16
Station SH-9A	**Mean**	127	5.1	11,129	679	9.6	0.91	757	461	NA	NA
	Min	5	6	460	60	2	1	120	30	<0.1	<0.1
11/89-9/94	**Max**	580	22	74,100	1,540	52	2	1,980	710	<1	<1
m/q	**Detects**	24	6	27	23	9	4	27	26	0	0
	Non-detects	3	21	0	4	17	22	0	1	27	27
Station SH-9B	**Mean**	21	5.0	1,979	112	5.8	1.1	174	134	NA	NA
	Min	9	8	50	230	1	1	70	30	<0.05	<0.05
4/90-9/94	**Max**	110	15	17,000	1,250	11.5	3	690	690	<1	<1
m/q	**Detects**	14	4	25	4	10	5	27	27	0	0
	Non-detects	14	24	3	24	18	23	1	1	28	28
Station SH-10	**Mean**	8.9	NA	699	22	8.0	NA	24	NA	NA	NA
	Min	7	<5	55	50	5	<1	20	<20	<0.1	<0.1
11/89-9/94	**Max**	25	<20	3,500	140	14	<20	120	110	<1	<1
m/q	**Detects**	7	2	19	3	5	2	10	2	0	0
	Non-detects	15	20	3	19	17	20	12	20	22	22
Station SH-11A	**Mean**	9.4	3.1	519	50	5.7	NA	15	NA	NA	NA
	Min	2.2	5	50	80	1	<1	20	<15	<0.05	<0.05
11/89-pres.	**Max**	40	20	3,800	110	67	<20	150	<20	<1	<1
m/q	**Detects**	19	5	37	4	15	3	7	0	0	0
	Non-detects	18	32	1	34	22	34	31	38	38	38
Station SH-11B	**Mean**	521	22	138,790	2,202	37	5	3,402	101	NA	NA
	Min	6	5	710	62	1	1	20	20	<0.05	<0.05
11/89-pres.	**Max**	2,900	613	990,000	37,200	250	125	21,000	1,960	<1	<1
m/q	**Detects**	34	7	36	25	23	5	35	14	3	0
	Non-detects	3	30	1	12	14	32	2	23	34	37
Station SH-12	**Mean**	9.0	NA	982	29	7.1	1.1	62	33	NA	NA
	Min	5	<5	70	50	1	1	20	20	<0.05	<0.05
11/89-9/94	**Max**	30	<20	8,200	310	38	2	280	70	<1	<1
m/q	**Detects**	13	2	30	6	12	6	31	24	0	0
	Non-detects	18	30	1	26	19	26	0	8	31	32

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Cu (µg/L)		Fe (µg/L)		Pb (µg/L)		Mn (µg/L)		Hg (µg/L)	
		Tot.	Diss.	Tot.	Diss.	Tot.	Diss.	Tot.	Diss.	Tot.	Diss.
Station SH-23	**Mean**	7.5	5.1	624	NA	1.5	NA	34	25	NA	NA
	Min	7	10	50	*<50*	1	*<1*	20	20	*<0.05*	*<0.05*
2/90-9/94	**Max**	32	20	1,440	*<100*	9	*<20*	60	40	*<1*	*<1*
m/q	**Detects**	9	4	21	0	7	1	29	29	0	0
	Non-detects	23	28	11	32	24	30	3	3	32	32
Station MS-A1	**Mean**	2,358	3.7	331,690	NA	291	1.1	6,646	176	0.23	NA
	Min	1,020	7	62,800	*<50*	157	1	180	20	0.2	*<0.05*
4/91-3/94	**Max**	5,160	20	890,000	*2,600*	660	6	15,100	1,350	0.6	*<1*
m/q	**Detects**	18	3	18	2	15	4	19	13	5	1
	Non-detects	1	16	1	17	4	15	0	6	14	18
Station MS-A5	**Mean**	482	NA	126,970	1,852	77	4.8	3,474	281	0.17	NA
	Min	10	<2	150	50	5.4	1	20	20	0.2	*<0.05*
3/91-pres.	**Max**	3,700	*150*	1,405,000	34,700	690	87	32,000	4,870	1.51	*<1*
m/q	**Detects**	17	2	18	5	12	3	19	15	3	0
	Non-detects	2	17	1	14	7	16	0	4	16	19
Station MS-A6	**Mean**	7.0	3.6	518	172	0.8	NA	198	184	NA	NA
	Min	5	6	280	110	1	*<1*	170	20	*0.09*	*0.09*
1/91-pres.	**Max**	30	10	1,390	370	3	*<20*	220	220	*<1*	*<1*
m/q	**Detects**	9	3	25	13	5	1	26	25	1	1
	Non-detects	17	23	1	13	21	25	0	1	25	25

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

		Mo (µg/L)		Ni (µg/L)		Se (µg/L)		Ag (µg/L)	
Station		Tot.	Diss.	Tot.	Diss.	Tot.	Diss.	Tot.	Diss.
Station SH-3	Mean	NA	NA	14	NA	NA	NA	0.14	NA
	Min	*<20*	*<20*	10	*<10*	*<5*	*<5*	0.1	*<0.1*
8/89-pres.	Max	*<500*	*<500*	110	*<20*	*6*	*8*	0.6	*<50*
m/q	Detects	0	0	11	2	1	2	7	0
	Non-detects	37	38	26	36	36	36	30	38
Station SH-4	Mean	14	NA	167	NA	NA	NA	0.92	NA
	Min	20	*<20*	10	*<10*	*<5*	*<5*	0.3	*<0.1*
11/89-pres.	Max	120	*<500*	2,480	*<20*	*<5*	*<5*	11	*<50*
m/q	Detects	5	0	27	2	0	0	8	0
	Non-detects	26	31	4	29	31	31	23	31
Station SH-7	Mean	NA	NA	23	NA	NA	NA	NA	NA
	Min	*<20*	*<20*	10	*<10*	*<5*	*<5*	*<0.1*	*<0.1*
11/89-9/94	Max	*<500*	*<500*	80	*<20*	*<5*	*<5*	*<50*	*<50*
irr.	Detects	2	2	6	0	0	0	0	0
	Non-detects	10	10	6	12	12	12	12	12
Station SH-8	Mean	30	30	7.7	NA	NA	NA	NA	NA
	Min	20	30	10	*<10*	*<5*	*<5*	*<10*	*<10*
3/90-6/91	Max	40	40	20	*<10*	*<5*	*<5*	10	*<10*
m	Detects	14	12	6	0	0	0	1	0
	Non-detects	2	4	10	16	16	16	15	16
Station SH-9A	Mean	5.7	5.4	12	NA	NA	NA	0.14	NA
	Min	20	20	10	*<10*	*<5*	*<5*	0.1	*<0.1*
11/89-9/94	Max	80	60	90	*<20*	*<5*	*<5*	0.4	*<50*
m/q	Detects	3	3	11	0	0	0	4	1
	Non-detects	24	24	16	27	27	27	23	26
Station SH-9B	Mean	NA	NA	NA	NA	NA	NA	0.13	NA
	Min	*<20*	*<20*	*<10*	*<10*	*<5*	*<5*	0.1	*<0.1*
4/90-9/94	Max	*<500*	*<500*	*24*	*<20*	*6.5*	*6*	0.8	*<50*
m/q	Detects	0	0	2	2	1	1	3	1
	Non-detects	28	28	26	26	27	27	25	27
Station SH-10	Mean	NA	NA	NA	NA	NA	NA	NA	NA
	Min	*<20*	*<20*	*<10*	*<10*	*<5*	*<5*	*<0.1*	*<0.1*
11/89-9/94	Max	*<500*	*<500*	*<20*	*<20*	*<5*	*<5*	*<50*	*<50*
m/q	Detects	1	1	1	0	0	0	2	0
	Non-detects	21	21	21	22	22	22	20	22
Station SH-11A	Mean	NA	NA	4.8	NA	NA	NA	0.07	NA
	Min	*<20*	*<20*	10	*<10*	*<5*	*<5*	0.1	*<0.1*
11/89-pres.	Max	*<500*	*<500*	100	*<20*	*<5*	*<5*	0.2	*<50*
	Detects	1	2	6	3	0	0	4	1
m/q	Non-detects	37	36	32	35	38	38	34	37
Station SH-11B	Mean	53	NA	161	4.7	NA	NA	8.5	NA
	Min	20	*<20*	10	10	*<5*	*<5*	0.1	*<0.1*
11/89-pres.	Max	1,200	*500*	1,100	60	*<50*	*<5*	300	*<50*
m/q	Detects	9	3	29	5	1	0	8	3
	Non-detects	28	34	8	32	36	37	29	34
Station SH-12	Mean	7.9	NA	NA	NA	NA	NA	0.16	NA
	Min	20	*<20*	*<10*	*<10*	*<5*	*<5*	0.1	*<0.1*
11/89-9/94	Max	40	*<500*	*<20*	*<20*	*<5*	*<5*	1	*<50*
m/q	Detects	4	2	5	2	0	0	5	1
	Non-detects	27	30	26	30	31	32	26	31

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Mo (µg/L) Tot.	Mo (µg/L) Diss.	Ni (µg/L) Tot.	Ni (µg/L) Diss.	Se (µg/L) Tot.	Se (µg/L) Diss.	Ag (µg/L) Tot.	Ag (µg/L) Diss.
Station SH-23	**Mean**	NA	NA	NA	NA	NA	NA	0.84	NA
	Min	*<20*	*<20*	*<10*	*<10*	*<5*	*<5*	0.1	*<0.1*
2/90-9/94	**Max**	*<500*	*<500*	*<20*	*<20*	*<5*	*<5*	10	*<50*
m/q	**Detects**	0	0	1	2	0	0	8	1
	Non-detects	32	32	31	30	32	32	24	31
Station MS-A1	**Mean**	45	NA	309	NA	NA	NA	30	NA
	Min	20	*<20*	70	*<10*	*<5*	*<5*	0.6	*<0.1*
4/91-3/94	**Max**	280	*<20*	820	*10*	*9*	*9*	503	*<10*
m/q	**Detects**	9	0	18	1	2	1	10	2
	Non-detects	10	19	1	18	17	18	9	17
Station MS-A5	**Mean**	19	NA	146	NA	NA	NA	1.7	NA
	Min	20	*<20*	10	*<10*	*<5*	*<5*	0.2	*<0.1*
3/91-pres.	**Max**	200	*<500*	1,600	*60*	*<50*	*<5*	16.4	*<50*
m/q	**Detects**	3	1	9	1	0	0	5	2
	Non-detects	16	18	10	18	19	19	14	17
Station MS-A6	**Mean**	NA	NA	NA	NA	NA	NA	0.06	NA
	Min	*<20*	*<20*	*<10*	*<10*	*<5*	*<5*	0.1	*<0.1*
1/91-pres.	**Max**	*<500*	*<500*	*<20*	*<20*	*<5*	*<5*	0.2	*<50*
m/q	**Detects**	1	0	1	1	0	0	3	1
	Non-detects	25	26	25	25	26	26	23	25

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Zn (µg/L) Tot.	Zn (µg/L) Diss.	CN (free) (µg/L)	CN (WAD) (µg/L)	CN (total) (µg/L)	PO_4-P (µg/L)	NO_2-N (µg/L)
Station SH-3	Mean	248	6.4	NA	NA	NA	36	NA
	Min	30	10	<5	<5	<5	10	<10
8/89-pres.	Max	1,700	140	<5	<5	7	440	<200
m/q	Detects	36	5	0	0	1	21	1
	Non-detects	1	32	10	10	9	17	37
Station SH-4	Mean	502	8.6	9.5	32	9.5	19	14
	Min	20	10	10	7	11	10	10
11/89-pres.	Max	6,320	60	35	40	116	130	400
m/q	Detects	29	11	3	6	8	20	4
	Non-detects	2	20	7	4	2	11	27
Station SH-7	Mean	172	8.9	NA	NA	NA	68	NA
	Min	30	10	<5	<5	<5	10	<10
11/89-9/94	Max	810	50	<5	<5	7	730	<100
irr.	Detects	11	4	0	0	1	4	0
	Non-detects	1	8	8	8	7	9	13
Station SH-8	Mean	18	NA	NA	NA	NA	5.7	NA
	Min	10	<10	<5	<5	<5	10	<10
3/90-6/91	Max	50	10	<5	8	14	20	<10
m	Detects	12	3	0	1	2	4	0
	Non-detects	4	13	9	8	7	12	16
Station SH-9A	Mean	47	NA	NA	NA	NA	45	14
	Min	10	<10	<5	<5	<5	10	10
11/89-9/94	Max	230	<20	<5	<5	9	630	210
m/q	Detects	24	10	0	0	2	18	3
	Non-detects	3	17	9	9	7	9	24
Station SH-9B	Mean	29	6.0	NA	NA	NA	16	NA
	Min	10	10	<5	<5	<5	10	<10
4/90-9/94	Max	260	20	<5	<5	<5	160	<100
m/q	Detects	19	6	0	0	0	15	0
	Non-detects	9	22	7	7	7	13	28
Station SH-10	Mean	28	NA	NA	NA	NA	13	NA
	Min	10	<10	<5	<5	<5	10	<10
11/89-9/94	Max	92	<20	<5	<5	<5	90	<100
m/q	Detects	17	2	0	0	0	11	1
	Non-detects	5	20	9	9	9	11	21
Station SH-11A	Mean	22	5.4	NA	NA	NA	23	65
	Min	10	10	<5	<5	<5	10	70
11/89-pres.	Max	150	14	<5	<5	<5	450	240
m/q	Detects	28	4	0	0	0	15	9
	Non-detects	9	33	11	11	11	23	29
Station SH-11B	Mean	464	27	NA	NA	NA	665	5
	Min	10	10	<5	<5	<5	10	10
11/89-pres.	Max	2,700	800	<5	5	9	21,000	30
m/q	Detects	35	7	0	1	1	27	5
	Non-detects	1	29	10	9	9	10	32
Station SH-12	Mean	29	4.7	N/A	N/A	N/A	18	NA
	Min	10	10	<5	<5	<5	10	<10
11/89-9/94	Max	260	50	<5	7	18	80	340
m/q	Detects	18	5	0	1	2	17	3
	Non-detects	13	27	10	9	8	15	29

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Zn (µg/L) Tot.	Diss.	CN (free) (µg/L)	CN (WAD) (µg/L)	CN (total) (µg/L)	PO_4-P (µg/L)	NO_2-N (µg/L)
Station SH-23	Mean	13	5.7	NA	NA	NA	11	NA
	Min	10	10	*<5*	*<5*	*<5*	10	*<10*
2/90-9/94	Max	70	80	*<5*	*<5*	*<5*	80	*280*
m/q	Detects	14	5	0	0	0	15	2
	Non-detects	18	27	9	9	9	17	30
Station MS-A1	Mean	677	NA	NA	NA	NA	69	10
	Min	10	*<10*	NA	NA	NA	10	10
4/91-3/94	Max	1,840	*10*	NA	NA	NA	440	40
m/q	Detects	19	6	0	0	0	18	6
	Non-detects	0	13	0	0	0	1	13
Station MS-A5	Mean	533	NA	NA	NA	NA	76	17
	Min	10	*<10*	NA	NA	NA	10	10
3/91-pres.	Max	4,000	*150*	NA	NA	NA	370	280
m/q	Detects	18	2	0	0	0	15	3
	Non-detects	1	17	0	0	0	4	16
Station MS-A6	Mean	11	8.1	NA	NA	NA	10	NA
	Min	10	10	NA	NA	NA	10	*<10*
1/91-pres.	Max	40	22	NA	NA	NA	40	*<200*
m/q	Detects	11	5	0	0	0	8	0
	Non-detects	15	21	0	0	0	18	26

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		NO_3-N (µg/L)	NO_3+NO_2-N (µg/L)	NH_4-N (µg/L)	pH (s.u.)	TDS (mg/L)	Cond (µmhos/cm)	TSS (mg/L)
Station SH-3	Mean	174	194	74	--	165	283	395
	Min	10	10	10	7.4	123	252	13
8/89-pres.	Max	3,550	3,550	530	8.3	200	342	2,600
m/q	Detects	23	24	26	38	38	38	38
	Non-detects	15	13	8	0	0	0	0
Station SH-4	Mean	593	32	76	--	42	65	5,303
	Min	40	40	10	5.7	18	29	358
11/89-pres.	Max	5,220	5,220	440	6.8	76	171	49,500
m/q	Detects	28	28	18	31	31	31	31
	Non-detects	3	3	13	0	0	0	0
Station SH-7	Mean	574	577	350	--	983	4,304	827
	Min	20	20	120	8.6	332	395	18
11/89-9/94	Max	2,960	3,000	910	12.6	2,142	9,500	3,760
irr.	Detects	8	8	12	13	13	13	12
	Non-detects	5	5	1	0	0	0	0
Station SH-8	Mean	208	208	233	--	758	3,287	38
	Min	30	30	30	11.5	564	1,250	4
3/90-6/91	Max	1,020	1,020	510	12.4	1,132	5,630	210
m	Detects	13	13	16	16	16	16	16
	Non-detects	3	3	0	0	0	0	0
Station SH-9A	Mean	94	107	128	--	101	182	411
	Min	10	20	10	6.7	100	127	3
11/89-9/94	Max	1,320	1,320	930	9.2	186	263	3,072
m/q	Detects	8	8	20	27	27	27	27
	Non-detects	19	19	7	0	0	0	0
Station SH-9B	Mean	48	48	71	--	140	233	42
	Min	10	10	10	6.6	52	55.5	1
4/90-9/94	Max	850	850	280	8.3	172	304	300
m/q	Detects	7	7	19	28	28	28	27
	Non-detects	21	21	9	0	0	0	1
Station SH-10	Mean	32	32	318	--	146	331	24
	Min	20	20	30	8.6	110	159	1
11/89-9/94	Max	360	360	910	11.2	322	700	105
m/q	Detects	6	6	19	22	22	22	22
	Non-detects	16	16	3	0	0	0	0
Station SH-11A	Mean	94	111	160	--	240	497	24
	Min	10	10	10	9.1	0	294	2.5
11/89-pres.	Max	870	870	360	12.2	1,086	3,700	194
m/q	Detects	19	20	30	38	37	38	34
	Non-detects	19	18	4	0	0	0	4
Station SH-11B	Mean	86	91	486	--	395	406	2,388
	Min	10	10	60	8	192	302	3
11/89-pres.	Max	780	780	10,000	12	1,900	995	20,680
m/q	Detects	19	20	30	37	35	37	37
	Non-detects	18	17	3	0	0	0	0
Station SH-12	Mean	215	229	208	--	185	299	37
	Min	10	10	10	7.9	144	263	1
11/89-9/94	Max	2,500	2,500	470	9.9	265	344	290
m/q	Detects	22	23	31	32	32	32	32
	Non-detects	10	9	1	0	0	0	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		NO_3-N (µg/L)	NO_3+NO_2-N (µg/L)	NH_4-N (µg/L)	pH (s.u.)	TDS (mg/L)	Cond (µmhos/cm)	TSS (mg/L)
Station SH-23	**Mean**	67	77	184	--	201	339	8
	Min	10	10	30	7.9	0	295	1
2/90-9/94	**Max**	800	800	670	8.7	244	411	50
m/q	**Detects**	15	15	30	32	31	32	23
	Non-detects	17	17	2	0	0	0	9
Station MS-A1	**Mean**	212	219	149	--	81	119	19,603
	Min	10	10	10	6.2	52	60	108
4/91-3/94	**Max**	2,160	2,180	780	8	156	268	152,000
m/q	**Detects**	13	13	16	19	19	19	19
	Non-detects	6	6	3	0	0	0	0
Station MS-A5	**Mean**	158	183	166	--	172	257	5,765
	Min	10	10	10	7.6	121	208	23
3/91-pres.	**Max**	870	870	950	8.4	252	305	63,700
m/q	**Detects**	12	12	14	19	19	19	19
	Non-detects	7	7	4	0	0	0	0
Station MS-A6	**Mean**	121	122	63	--	169	282	3.8
	Min	10	10	10	7.5	133	200	1
1/91-pres.	**Max**	1,560	1,560	200	8.1	190	317	17
m/q	**Detects**	9	9	15	26	26	26	17
	Non-detects	17	17	7	0	0	0	9

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Turbidity (NTU)	Sett. Solids (ml/L)	SAR (units)	B (mg/L)	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	F (mg/L)	Cl (mg/L)
Station SH-3	Mean	217	0.69	0.30	0.07	8.1	2.1	38	11	0.09	7.0
	Min	4.2	0.1	0.12	0.01	2.9	1.5	22.6	5.7	0.05	4.7
8/89-pres.	Max	1,800	7.6	0.44	0.17	11	5.78	63.3	52.9	0.16	9.95
m/q	Detects	38	25	38	30	38	37	38	38	36	38
	Non-detects	0	12	0	8	0	1	0	0	2	0
Station SH-4	Mean	2,122	8.7	0.27	0.06	2.8	0.85	6.1	2.5	0.07	2.5
	Min	120	0.5	0.1	0.01	1	0.2	1.47	0.1	0.04	1.2
11/89-pres.	Max	14,100	43	0.52	0.15	4.7	5.69	19	26	0.18	4.9
m/q	Detects	31	30	31	26	31	31	31	31	29	31
	Non-detects	0	0	0	5	0	0	0	0	2	0
Station SH-7	Mean	250	4.5	1.4	0.10	68	14	297	66	0.79	12
	Min	8.6	0.3	0.63	0.02	36	0.5	2.63	0.6	0.08	8.8
11/89-9/94	Max	1,400	9	4.16	0.65	119	68	939	302	3	19
irr.	Detects	13	9	13	9	13	13	13	13	13	13
	Non-detects	0	2	0	4	0	0	0	0	0	0
Station SH-8	Mean	24	NA	0.56	0.05	36	6.9	282	22	0.39	7.3
	Min	3.5	*<0.1*	0.345	0.01	21.5	5.6	25	1.1	0.21	5.5
3/90-6/91	Max	125	*12*	0.75	0.085	43	9	470	118	0.64	10
m	Detects	16	2	16	14	16	16	16	16	16	16
	Non-detects	0	13	0	2	0	0	0	0	0	0
Station SH-9A	Mean	179	0.08	0.48	0.07	9.1	1.7	21	4.9	0.08	6.9
	Min	1	0.1	0.2	0.01	4	0.4	2.4	0.5	0.03	3.8
11/89-9/94	Max	900	0.6	2.44	0.26	42	8.4	33	16	0.4	18
m/q	Detects	27	10	27	25	27	26	27	27	26	27
	Non-detects	0	17	0	2	0	1	0	0	1	0
Station SH-9B	Mean	30	NA	0.45	0.09	10	1.3	26	7.2	0.14	7.8
	Min	0.5	*<0.1*	0.23	0.01	2.5	0.2	6	2.05	0.02	5.1
4/90-9/94	Max	310	*<1*	0.58	0.2	13	2.5	36	20	1.46	11.95
m/q	Detects	28	4	28	27	28	28	28	28	26	28
	Non-detects	0	23	0	1	0	0	0	0	2	0
Station SH-10	Mean	13	0.15	1.1	0.08	20	2.1	24	3.2	0.24	7.0
	Min	1	0.2	0.63	0.01	16	0.5	7.11	0.2	0.16	4.7
11/89-9/94	Max	40	1.7	1.73	0.18	24	3.7	94	12	0.89	9.2
m/q	Detects	22	5	22	19	22	22	22	22	22	22
	Non-detects	0	16	0	3	0	0	0	0	0	0
Station SH-11A	Mean	14	0.06	7.9	0.41	73	2.8	15	1.8	2.6	10
	Min	0	0.2	1.17	0.04	58	0.3	1.1	0.1	0.61	7.3
11/89-pres.	Max	100	0.7	13.1	0.56	85	20	389	7.9	5	13
m/q	Detects	37	4	38	36	38	38	38	38	38	38
	Non-detects	0	33	0	2	0	0	0	0	0	0
Station SH-11B	Mean	3,864	0.60	4.8	0.52	79	13	24	13	2.8	10
	Min	2	0.1	1.15	0.05	58	1.6	2.2	0.6	1.09	6.7
11/89-pres.	Max	37,500	19	8.7	0.86	94.5	59	199	95.6	5.17	23
m/q	Detects	37	8	37	34	37	37	37	36	37	37
	Non-detects	0	28	0	3	0	0	0	1	0	0
Station SH-12	Mean	17	NA	2.4	0.41	42	1.5	16	5.3	0.90	6.8
	Min	0.4	*<0.1*	1.57	0.31	31	0.7	2.1	1.7	0.62	4
11/89-9/94	Max	145	*0.3*	4.6	0.55	66	3.1	24	15	1.75	9.6
m/q	Detects	32	2	32	31	32	32	32	32	32	32
	Non-detects	0	29	0	1	0	0	0	0	0	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		Turbidity (NTU)	Sett. Solids (ml/L)	SAR (units)	B (mg/L)	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	F (mg/L)	Cl (mg/L)
Station SH-23	Mean	3.5	NA	3.0	0.22	50	2.3	12	6.4	0.29	5.2
	Min	0	*<0.1*	2.38	0.03	44	1.7	5.61	2.88	0.21	2.8
2/90-9/94	Max	24	*0.4*	4.32	0.32	54	3.3	20	9.8	0.56	14
m/q	Detects	31	2	32	30	32	32	32	32	31	31
	Non-detects	0	29	0	2	0	0	0	0	1	1
Station MS-A1	Mean	13,688	44	0.31	0.06	4.7	0.84	14	3.4	0.05	3.7
	Min	270	1	0.23	0.01	3	0.3	1.7	1.5	0.02	1.7
4/91-3/94	Max	138,000	510	0.54	0.14	6.9	2.3	39	10	0.11	5.3
m/q	Detects	19	19	19	18	19	18	19	18	19	19
	Non-detects	0	0	0	1	0	1	0	1	0	0
Station MS-A5	Mean	2,812	1.2	1.1	0.11	24	2.5	28	12	0.13	4.3
	Min	7.5	0.1	0.448	0.02	21	1	0.93	0.63	0.1	2.2
3/91-pres.	Max	22,000	12	1.27	0.55	26	8.56	142	59.3	0.18	11
m/q	Detects	19	8	19	17	19	19	19	19	17	19
	Non-detects	0	11	0	1	0	0	0	0	2	0
Station MS-A6	Mean	4.1	NA	0.16	0.07	4.5	0.44	49	5.4	0.05	4.1
	Min	1.3	*<0.1*	0.13	0.01	3.5	0.2	6.45	0.6	0.02	2.1
1/91-pres.	Max	9.5	*· 0.1*	0.2	0.16	5.3	0.9	64.2	31	0.07	8.3
m/q	Detects	26	1	26	21	26	20	26	26	20	26
	Non-detects	0	25	0	5	0	6	0	0	6	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		SO_4 (mg/L)	OH (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L as HCO_3)	Tot Alk (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)
Station SH-3	**Mean**	6.9	0.01	1.1	167	140	NA	143
	Min	3.9	0	0	65	117	*<1*	107
8/89-pres.	**Max**	18	0.017	1.9	290	234	*<10*	303
m/q	**Detects**	38	6	6	38	38	0	38
	Non-detects	0	0	0	0	0	38	0
Station SH-4	**Mean**	9.2	NA	NA	15	13	NA	25
	Min	4.1	*0*	*0*	7	6	*<1*	10
11/89-pres.	**Max**	20	*0.001*	*0.002*	51	42	*27.6*	122
m/q	**Detects**	31	1	2	31	31	2	31
	Non-detects	0	1	0	0	0	29	0
Station SH-7	**Mean**	17	382	51	NA	1,222	NA	1,014
	Min	0.6	0	4.68	*0*	150	*<1*	69
11/89-9/94	**Max**	49	897	167	*290*	2,841	<2	2,518
irr.	**Detects**	13	12	13	2	13	0	13
	Non-detects	0	0	0	0	0	13	0
Station SH-8	**Mean**	15	281	26	NA	857	NA	794
	Min	3.2	0	0	*0*	605	*<1*	545
3/90-6/91	**Max**	66	423	80	*816*	1,298	*<1*	1,292
m	**Detects**	16	15	15	1	16	0	16
	Non-detects	0	0	0	0	0	16	0
Station SH-9A	**Mean**	0.11	NA	NA	101	84	NA	74
	Min	0.5	*0*	*0*	88	73	*<1*	46
11/89-9/94	**Max**	24	*0.269*	*10*	148	121	<2	106
m/q	**Detects**	25	2	2	27	27	0	27
	Non-detects	2	0	0	0	0	27	0
Station SH-9B	**Mean**	20	NA	NA	107	88	NA	95
	Min	0.7	*0*	*0*	15	12	*<1*	23
4/90-9/94	**Max**	30	*0.017*	*0.72*	116	96	<2	111
m/q	**Detects**	28	2	2	28	28	0	28
	Non-detects	0	0	0	0	0	28	0
Station SH-10	**Mean**	35	19	12	55	75	NA	73
	Min	27	0	0	0	34	*<1*	34
11/89-9/94	**Max**	41	82	33	77	298	<2	283
m/q	**Detects**	22	18	20	6	22	0	22
	Non-detects	0	0	0	0	0	22	0
Station SH-11A	**Mean**	28	46	50	78	165	NA	45
	Min	24	0	0	0	120	*<1*	6
11/89-pres.	**Max**	35	375	80	169	1,198	*<10*	998
m/q	**Detects**	37	12	36	32	38	0	38
	Non-detects	1	0	0	0	0	38	0
Station SH-11B	**Mean**	45	28	9.2	240	209	NA	114
	Min	22	0	0	85	125	*<1*	8
11/89-pres.	**Max**	98	170	39	670	560	*<10*	940
m/q	**Detects**	37	6	28	35	37	0	37
	Non-detects	0	0	2	1	0	37	0
Station SH-12	**Mean**	28	NA	9.7	133	115	NA	61
	Min	20	*0*	0	4	77	*<1*	20
11/89-9/94	**Max**	44	*0.135*	44	148	121	<2	77
m/q	**Detects**	32	2	11	32	32	0	32
	Non-detects	0	0	0	0	0	32	0

Table G-3. Summary of Ground Water Data from the Sherman Creek Drainage (cont'd)

Station		SO_4 (mg/L)	OH (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L as HCO_3)	Tot Alk (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Hardness (mg/L as $CaCO_3$)
Station SH-23	**Mean**	53	NA	2.5	128	107	NA	56
	Min	25	*0*	0	115	97	*<1*	26
2/90-9/94	**Max**	78	*0.054*	10	141	117	*<2*	81
m/q	**Detects**	31	2	13	31	31	0	32
	Non-detects	1	0	1	0	0	32	0
Station MS-A1	**Mean**	9.8	NA	NA	57	47	NA	48
	Min	3.6	*0*	*0*	23	19	*<1*	21
4/91-3/94	**Max**	49	*0*	*0*	144	118	*<1*	122
m/q	**Detects**	19	0	0	19	19	0	19
	Non-detects	0	0	0	0	0	19	0
Station MS-A5	**Mean**	42	0.03	6.2	181	148	NA	123
	Min	37	0	0	98	80	*<1*	74
3/91-pres.	**Max**	50	0.043	9.89	960	790	*<10*	598
m/q	**Detects**	19	3	3	19	19	0	19
	Non-detects	0	0	0	0	0	19	0
Station MS-A6	**Mean**	13	0.01	0.57	161	132	NA	143
	Min	9.7	0	0	134	110	*<1*	120
1/91-pres.	**Max**	14	0.014	0.83	171	140	*<10*	173
m/q	**Detects**	26	6	6	26	26	0	26
	Non-detects	0	0	0	0	0	26	0

Notes: Dates give period of sample collection; sampling frequency given below; m = monthly; q = quarterly; irr. = irregular.

- Minimum and maximum detected values are shown for sets with sufficient data for robust statistical analysis.
- Italics indicate overall minimum and maximum values (considering non-detects) for sets with insufficient data for robust statistical analysis.
- NA – "No Data Available for Analysis" indicates no analyses were conducted for constituent.
- Source: Montgomery Watson, 1996a.

Table G-4. Summary of Ground Water Data from the Terrace Area Drainage Basin

Parameter[1]	MDL	unit	Mean[2]	Std. Dev.[2]	Median[2]	Low	High	n>MDL[3]
Al-dissolved	0.5	mg/L	<0.5	--	--	--	--	0
Al-total	0.5-1.0	mg/L	29	50	1.6	<0.5	160	11
As-dissolved	0.0005	mg/L	0.005	0.003	0.006	<0.0005	0.013	16
As-total	0.0005-0.001	mg/L	0.025	0.027	0.013	0.0015	0.091	17
Ba-dissolved	0.5	mg/L	<0.5	--	<0.5	<0.5	0.75	1
Ba-total	0.5	mg/L	0.39	0.27	<0.5	<0.5	1.1	4
Cd-dissolved	0.0002	mg/L	<0.0002	--	<0.0002	<0.0002	8.2	1
Cd-total	0.0002	mg/L	0.0007	0.0011	0.0003	<0.0002	0.0038	9
Cr-dissolved	0.02	mg/L	<0.02	--	--	--	--	0
Cr-total	0.02	mg/L	0.01	0.10	<0.02	<0.02	0.29	6
Cu-dissolved	0.002	mg/L	0.003	0.007	<0.002	<0.002	0.028	3
Cu-total	0.002-0.008	mg/L	0.1360	0.2700	0.0220	<0.002	1.1	13
Fe-dissolved	0.05-1.0	mg/L	1.2	1.5	0.28	<0.05	5.2	14
Fe-total	0.05	mg/L	39.7	75.2	3.7	0.26	240	17
Pb-dissolved	0.002	mg/L	<0.002	--	<0.002	<0.002	0.0035	1
Pb-total	0.002	mg/L	0.032	0.048	0.005	<0.002	0.13	13
Mg-total	1-2	mg/L	8.82	6.31	7.00	1.99	27.6	17
Mn-dissolved	0.015	mg/L	0.48	0.38	0.46	0.023	1.6	17
Mn-total	0.015	mg/L	1.4	1.7	0.78	0.045	6.2	17
Hg-dissolved	0.2	µg/L	<0.2	--	--	--	--	0
Hg-total	0.2	µg/L	0.18	0.15	<0.2	<0.2	0.5	4
Mo-dissolved	0.5	mg/L	<0.5	--	--	--	--	0
Mo-total	0.5	mg/L	<0.5	--	--	--	--	0
Ni-dissolved	0.01	mg/L	<0.01	--	--	--	--	0
Ni-total	0.01	mg/L	0.06	0.09	<0.01	<0.01	0.29	6
Se-dissolved	0.005	mg/L	<0.005	--	--	--	--	0
Se-total	0.005	mg/L	<0.005	--	--	--	--	0
Ag-dissolved	0.0005	mg/L	<0.0005	--	--	--	--	0
Ag-total	0.0005	mg/L	0.0007	0.0010	<0.0005	<0.0005	0.0042	5
Zn-dissolved	0.01	mg/L	0.028	0.032	0.018	<0.01	0.14	14
Zn-total	0.01	mg/L	0.19	0.24	0.070	0.011	0.81	17

1. Dissolved and total metal concentrations; dissolved Mg not reported.
2. Mean, standard deviation and median computed using values of one-half method detection limit (MDL) for non-detects.
3. Number of analyses greater than the MDL; total analyses = 17.

Source: SRK, 1996e

Table G-4. Summary of Ground Water Data from the Terrace Area Drainage Basin (continued)

Parameter	MDL	unit	Mean[1]	Std. Dev.[1]	Median[1]	Low	High	n>MDL[2]
Boron	0.05	mg/L	0.12	0.08	0.11	<0.05	0.3	14
Calcium	1-20	mg/L	54.3	35.3	48.0	17.6	174	17
Potassium	1	mg/L	4.35	4.69	3.57	<1	21.4	15
Sodium	1.0-5.0	mg/L	26.0	13.7	23.1	10.1	62.5	17
Cation Sum	0.001	meq/L	4.74	2.45	4.28	2.13	13.5	17
Chloride	1-10	mg/L	23.7	13.0	20.8	8.52	50.9	17
Fluoride	0.1	mg/L	0.07	0.05	<0.1	<0.1	0.22	3
Carbonate	0.001	mg/L	0.734	0.808	0.409	0.001	2.52	17
Bicarbonate-calc.	0.001	mg/L	189	130	183	24.2	598	17
Nitrite-N	0.1-0.2	mg/L	<0.2	--	--	--	--	0
Nitrate-N	0.1-0.2	mg/L	0.136	--	<0.1	<0.1	0.704	2
NO_2+NO_2	0.2	mg/L	0.168	--	<0.2	<0.2	0.704	2
Hydroxide	0.001	mg/L	0.009	0.010	0.003	<0.001	0.027	14
Orthophosphate	0.05	mg/L	1.1	2.0	<0.05	<0.05	6.4	8
Sulfate	2-20	mg/L	9.2	12.7	4.59	<2	51.4	11
Anion Sum	0.001	meq/L	4.0	2.3	3.7	1.4	11.5	17
Anion/Cation	0.001	percent	10.5	11.2	7.05	1.68	46.2	17
pH-lab	0.001	units	--	--	7.3	5.8	8.2	17
Acidity	10	mg/L	14.3	--	<10	<10	90	2
Alkalinity	2	mg/L	155	106	150	19.8	490	17
Conductivity	4	umhos/com	370	131	375	145	625	17
Hardness-calc.[3]	1	mg/L	172	107	149	66	548	17
Hardness-titr.[3]	10	mg/L	146	82	140	30	390	17
SAR	0.0001	units	0.995	0.800	0.830	0.319	3.81	17
Settleable Solids	0.1	mg/L	2	3	1	<0.1	9	11
TDS	20	mg/L	229	79	220	120	430	17
TSS	4	mg/L	1799	4188	110	7	17000	17
Turbidity	0.05	NTU	780	1418	70	4.4	4800	17

1. Mean, standard deviation, and median computed using values of one-half MDL for non-detects.
2. Number of analyses greater than the MDL; total analyses = 17.
3. Hardness in $CaCO_3$ equivalent.

Source: SRK, 1996e.

Appendix H

Migratory Birds: Birds of Conservation Concern and Priority Species

Appendix H: Migratory Birds: Birds of Conservation Concern and Priority Species

Executive Order 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*) provides for the conservation of migratory birds and their habitats and requires the evaluation of the effects of federal actions on migratory birds, with an emphasis on species of concern. Federal agencies are required to support the conservation and intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

Neotropical migratory birds are far-ranging species that require a diversity of habitat for foraging, breeding, and wintering. Patterns of population declines are generally detected at larger observational scales than those traditionally used to manage lands. Therefore, the effects on bird populations cannot be addressed solely at the project level. An individual project area is generally too small or restrictive to effectively detect population changes or to significantly affect habitats for migratory species and regional biological diversity. It is possible to implement positive conservation actions at the project level; however, the actions will be relatively minor over the entire range of the species. By assessing habitat at a larger geographic scale, effects on overall biodiversity can be better incorporated into the planning process (Finch and Stangel, 1992).

Over 100 species of birds migrate from the lower 48 states and Central and South America to nesting, breeding, and rearing grounds in Alaska. Most of the birds fly to the interior or northern Alaska and only pass through Southeast Alaska on their way to the breeding grounds. Seventeen “Important Bird Areas” have been identified in Alaska, including Glacier Bay National Park and Misty Fjords National Monument in Southeast Alaska. Berners Bay supports large concentrations of birds, particularly in spring during the eulachon run; however, there are no designated Important Bird Areas within the project area. Species that breed and nest in Southeast Alaska are likely to use habitats in the Kensington/Berners Bay area, as identified in Table H-1.

The term “Birds of Conservation Concern” is a U.S. Fish and Wildlife Service designation (USFWS, 2002). Such birds are called “Priority Species” in the *Landbird Conservation Plan for Alaska Biogeographic Regions* (Boreal Partners in Flight Working Group, 1999). Executive Order 13186 directs federal agencies to take conservation actions for birds and consider effects in the National Environmental Policy Act (NEPA) process. The list of species was derived from the Bird Conservation Region (BCR 5—North Pacific Rainforest) and the *Landbird Conservation Plan for Alaska Biogeographic Regions*.

Four alternatives have been considered in the Kensington Gold Project Final Supplemental Environmental Impact Statement, each of which could have some effect on migratory birds. The following discussion presents an assessment of the potential direct, indirect, and cumulative impacts on these birds.

Direct and Indirect Effects

There will be some direct effects on nesting birds under all the alternatives. Migratory bird habitats will also be affected to some degree regardless of the alternative selected. Alternative C

Table H-1 Birds of Conservation Concern and Priority Species Likely to Occur (or Known to Occur) Within the Vicinity of the Kensington Mine Project Area

				Habitats[3]												
Common Name	**Scientific Name**	**Occurrence[1]**	**Abundance[2]**	**Shrub Thickets**	**Hemlock/Sitka Spruce/Cedar forest**	**Muskeg**	**Mixed Deciduous/ spruce woodlands**	**Marsh**	**Lacustrine waters**	**Fluviatile waters**	**Cliffs bluffs and screes**	**Moraines alluvia and barrier islands**	**Beaches and tidal flats**	**Rocky Shores and reefs**	**Inshore waters**	**Offshore waters**
blue grouse	*Dendragapus obscurus*	B, W	common	x	xx*		xx*									
western screech-owl	*Otus kennicottii*	B, W	uncommon		xx#											
black swift	*Cypseloides niger*	B	rare								x+					
Vaux's swift	*Chaetura vauxi*	M, B*	uncommon		x#											
rufous hummingbird	*Selasphorus rufus*	M, B	common	x	xx*		x									
red-breasted sapsucker	*Sphyrapicus ruber*	B	abundant		xx*	x	x									
olive-sided flycatcher	*Contopus cooperi*	B	uncommon	x	x		xx*									
western wood-pewee	*Contopus sordidulus*	B	uncommon	x	x		xx*									
Hammond's flycatcher	*Empidonax hammondii*	B	uncommon		x		x+									
Pacific-slope flycatcher	*Empidonax difficilis*	B	common		xx*		xx*									
Steller's jay	*Cyanocitta stelleri*	B, W	abundant	x	xx*		x						x			
northwestern crow	*Corvus caurinus*	B, W	abundant		xx*		x	x			x	xx	xx	xx	x	
chestnut-backed chickadee	*Poecile rufescens*	B, W	abundant	x	xx*											
American dipper	*Cinclus mexicanus*	B	fairly common						x	xx	xx*	x				
golden-crowned kinglet	*Regulus satrapa*	B, W	common	x	xx#		xx+									
varied thrush	*Ixoreus naevius*	M, B, W	abundant	xx*	xx*	x	xx*	x			x	x	x	x		
Townsend's warbler	*Dendroica townsendi*	B	common	x	xx*		xx*									
blackpoll warbler	*Dendroica striata*	M	rare[2]	x	xx+											
MacGillivray's warbler	*Oporornis tolmiei*	B	uncommon	xx*	x		x									
golden-crowned sparrow	*Zonotrichia atricapilla*	M, B	fairly common	xx#	x	x	x	x								
northern shrike	*Lanius excubitor*	W	uncommon	xx	x		xx	xx								
gray-cheeked thrush	*Catharus minimus*	B	rare	x	x		xx*									
yellow-billed loon	*Gavia adamsii*	W	uncommon												x	x
black-footed albatross	*Phoebastria nigripes*	B, M	common												x	xx
northern goshawk	*Accipiter gentilis laingi*	B, W	uncommon	x	xx*		xx*	x					x			
peregrine falcon	*Falco peregrinus pealei*	B, W, M	uncommon					x			xx*	x		x	x	
black oystercatcher	*Haematopus bachmani*	B, W	uncommon								xx*	x	x	xx*		
whimbrel	*Numenius phaeopus*	M	rare					x				x	xx	x		
long-billed curlew	*Numenius americanus*		accidental													
marbled godwit	*Limosa fedoa beringiae*	M	rare										x			
black turnstone	*Arenaria melanocephala*	W, M	fairly common									x	x	xx		
surfbird	*Aphriza virgata*	W, M	uncommon										x	xx		
red knot	*Calidris canutus*	M	rare										xx	x		
rock sandpiper	*Calidris ptilocnemis*	W	uncommon										x	xx		
short-billed dowitcher	*Limnodromus griseus*	B, M	locally common					xx*				x	xx	x		
Caspian tern	*Sterna caspia*		casual												x	
Arctic tern	*Sterna paradisaea*	B	fairly common			x		xx*	x	x	xx*	xx*	xx	xx	xx	xx
Aleutian tern	*Sterna aleutica*	B	rare					xx+				x	x		xx	x
marbled murrelet	*Brachyramphus marmoratus*	B, W	common		xx*										xx	xx
Kittlitz's murrelet	*Brachyramphus brevirostris*	B, W	common								x#	x*			xx	xx

1/ B = breeding W = winter M = migration * = no record, but thought to breed.
2/ 1 = migration only.
3/ Primary pref. = xx; secondary pref. = x; minor habitat pref's not indicated; * = breeding, # = probable breeding, + = possible breeding
Abundance and habitats adapted from Isleib and Kessel, 1973.

would remove the most productive old-growth (149 acres), followed by Alternative D (142 acres), Alternative B (141 acres), and Alternative A (135 acres). Total acres of wildlife habitat disturbed ranges from 192 acres under Alternative B to 267 acres under Alternative A. Table H-2 provides a brief description of the potential project-related impacts on each of the habitats.

Table H-2. Habitats Occurring Within Southeast Alaska and Potential Project-related Impacts

Habitat	Habitat Impacts	Disturbance Effects
Tundra	None	N/A
Shrub thickets	Removal of habitat	Potential nest destruction and abandonment during construction activities. Loss of nesting habitat until reclamation success.
Hemlock/Sitka spruce/cedar forest	Removal of habitat	Potential nest destruction and abandonment during construction activities. Loss of nesting habitat until forests regenerate. Potential loss of effectiveness of interior habitat.
Muskeg	Removal of habitat	Potential nest destruction and abandonment during construction activities. Loss of nesting habitat until reclamation success.
Mixed deciduous/spruce woodlands	None present	N/A
Marsh	None present	N/A
Lacustrine waters	Loss of all/most biological activity in Lower Slate Lake during operations	Potential displacement from nesting and feeding habitat during operation of the TSF.
Fluviatile waters	Limited because of 100-yard buffer along riparian corridors	Potential displacement from nesting and feeding habitat in immediate vicinity of the two stream crossings.
Cliffs, bluffs, and screes	None	N/A
Moraines, alluvia, and barrier islands	None present	N/A
Beaches and tidal flats	Project-related noises may reach tidal flats in Slate Creek Cove and the head of Berners Bay	Potential displacement from feeding areas in response to crew shuttle operation and material transfer operations at Slate Creek Cove, particularly during the eulachon and herring runs in the spring and salmon runs in summer.
Rocky shores and reefs	Marine terminals at Cascade Point and Slate Creek Cove would affect a small amount (4.5 acres) of rocky shore habitat	Potential nest destruction and abandonment during construction activities. Potential displacement from feeding from crew shuttle operation and material transfer activities at Slate Creek Cove, particularly during the eulachon and herring runs in the spring and salmon runs in summer.
Inshore waters	None	Displacement from feeding areas in response to crew shuttle and barge operations, particularly during the eulachon and herring runs in the spring and salmon runs in summer.
Offshore waters	None	N/A

The primary effect on birds would be nest destruction or abandonment if the activities occur in suitable nesting habitat during the breeding/nesting period. The magnitude of the effects will vary depending on the alternative selected and the season in which disturbance would occur. Nesting in Southeast Alaska generally begins in May. By September the young birds have fledged, and they would not be directly affected by any of the proposed activities (Gwen Baluss, Tongass National Forest, Juneau Ranger District, personal communication).

Indirect effects would be associated with fragmentation and patch size reduction of suitable habitat. For species such as northern goshawk, marbled murrelet, and Townsend's warbler, habitat removal would affect forest fragmentation by potentially reducing the effectiveness of interior habitat and increasing the potential for nest-site predation from avian predators that are associated with forest edges and fragmented landscapes. Other species might be more associated with forest edge, riparian, or more open habitats, and therefore effects from habitat removal would likely be negligible.

Cumulative Effects

The Kensington Gold Project, when combined with other projects occurring in the Berners Bay area, would produce additional impacts on some wildlife populations. However, the distribution of the disturbances would not likely result in significant impacts on any species or population.

As discussed in Section 4.21.11 (Wetlands), approximately 200 acres of wetlands would be affected in the Berners Bay watershed if all projects were to be implemented with the maximum effects on wetlands. Impacts on wetlands would affect migratory bird species that nest or forage in wetland habitats. Because these impacts would be distributed across a number of wetland types regionally, they would not result in significant loss in diversity or function (e.g., wildlife habitat) in the Berners Bay watershed.

Additional impacts associated with the projects described above would be related to road construction, which has the potential to affect migratory bird species through habitat fragmentation (especially old growth-dependent species or forest interior species) and access-related disturbance.

Literature Cited

Boreal Partners in Flight Working Group. 1999. *Landbird Conservation Plan for Alaska Biogeographic Regions*. Version 1.0. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK.

Marsten, B.H., M.F. Wilson, and S.M. Gende. 2002. *Predator Aggregations During Eulachon* (Thaleichthys pacificus) *Spawning Runs*. Alaska Department of Fish and Game, Wildlife Conservation, Juneau, AK.

Forest Service. 1997. *Land and Resource Management Plan*. Alaska Region R10-MB-338dd. USDA Forest Service. Tongass National Forest. Pp. 3-23, 3-24.

USFWS (U.S. Fish and Wildlife Service). 2002. *Birds of Conservation Concern 2002*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA.

Appendix I

CBJ Notices of Decision

PLANNING COMMISSION
NOTICE OF DECISION
Date: September 13, 2004

File No.: MIN2004-00003

Coeur Alaska
3032 Vintage Blvd, Suite 101
Juneau, AK 99801

Application For:	An Allowable use permit for gold mine development and production within the Rural Mining District at Berners Bay.
Legal Description:	Berners Bay area
Parcel Code No.:	3-M00-0-BB0-004-0
Hearing Date:	August 31, 2004

The Planning Commission, at its regular public meeting, adopted the analysis and findings listed in the attached memorandum dated and approved the Allowable use permit for gold mine development and production within the Rural Mining District at Berners Bay to be conducted as described in the project description and project drawing submitted with the application and with the following conditions:

Traffic

1. Speed limit signs that are provided by, or are comparable to, Alaska Department of Transportation speed limit signs, shall be posted in readily visible locations at the tidewater and mill site ends of the haul road.
2. Coeur shall state in the approved Plan of Operations that passengers and freight vessels must reduce speed and/or alter course to lessen the wake effect on other boat traffic in the bay, particularly non-motorized vessels.
3. Unless weather, safety procedure, emergencies, or Federal Aviation Administration requirements dictate otherwise, the mine operator shall operate helicopters at elevations and along the flight path that follows, in order to minimize noise levels on residential areas and recreational users of Berners Bay.
   - The minimum flight elevation shall be 1,000 feet above ground level. The highest practicable elevation shall be maintained, preferably at least 2,000 feet above mean sea level.
   - The flight path shall be: from the Juneau Airport, head west while immediately climbing to FAA-directed or highest practicable altitude, cross the Mendenhall River, turn north to Montana Creek and proceed northwest following the creek drainage, on past Windfall Lake toward the mouth of Cowee Creek, north across Berners Bay, and then along the coastline of Lynn Canal to Comet Beach.

Parking and Circulation

4. The applicant shall develop and operate a bus commute for mine workers for the life of the project. This requirement may be waived only upon modification of this permit. A fully-operational bus commute system, which includes both a bus commute and park-an-ride as described in conditions 5 and 6 below, must be in place before any Occupancy Permit is issued to the applicant or the Allowable Use Permit will be revoked.
5. The park-and-ride facility must be located between Mile 6 and Mile 12 of Glacier Highway, and must be designed and sized to support daily bus transportation to and from Cascade Point for all mining shifts and all mine workers per shift. The park-and-ride facility must provide enough parking spaces for two shifts of workers, or 100 vehicles.
6. The bus commute shall consist of round-trip bus transportation from a park-and-ride facility to the Cascade Point Terminal and back. The busses shall be operated daily, 365 days per year, and shall be operated so as to provide transportation to and from each work shift. The busses shall have sufficient capacity to transport all hourly mineworkers scheduled for each work shift.
7. The applicant shall institute a company policy that its employees utilize the bus commute on a daily basis.

Exterior Lighting

8. Lighting at the marine terminals shall be used only during loading and off-loading of workers and materials, or when the terminals are otherwise in use, and applicant shall use an appropriate low-intensity lighting system to implement this condition.
9. Lighting must, to the extent that safety is not compromised, be directed downward, and remain within the perimeter of the site.
10. Lighting must be of a type that provides for adequate illumination without unnecessary glare. The applicant shall install a low-level lighting system, subject to Department approval, that provides for onsite safety while minimizing or eliminating offsite glare.
11. Lighting required by the Coast Guard as Aids to Navigation is exempt from these recommendations.

Signs

12. Speed limit signs and other signs managing traffic on the haul road shall comply with appropriate Alaska Department of Transportation standards for highway signage.
13. Signage at the park-and-ride facility must comply with standards in CBJ 49.45.

Safety

No recommendations

Noise

14. Company policy shall forbid the use of "jake" brakes, or compression braking, on trucks transiting the haul road to Slate Creek Cove, except under emergency circumstances.

15. Only rubber-tired machinery may be used to load and offload freight at the Slate Creek Cove marine terminal. Track machinery may be used for on and off-loading only when rubber-tired machinery is incapable of handling the loads.

(See the Traffic section for a condition on helicopter flights.)

Dust

16. The speed limit on the haul road shall be posted at 20 miles-per-hour to minimize the amount of airborne dust.
18. The applicant shall abate visible airborne dust as necessary to protect the visual quality of the project area.

Visual Screening

18. Retain the values of the Modified Landscape VQO in the materials and colors used in construction of the Slate Creek Cove marine terminal.
19. Minimize tree clearing at the mine and mill complex and along the haul road. Maintain as large a buffer or standing timber as possible between the haul road, mill and processing area at Berners Bay.
20. Use earth tone colors and finishes on the exterior of the mill and processing buildings.

Surface Subsidence

21. The company must maintain a 150-foot crown pillar to assure stability and prevent surface subsidence.
22. The employment of mining techniques that modify the 150-foot crown pillar must be pre-approved in the Plan of Operations and be shown to have no increased potential for contributing to surface subsidence.

Avalanches and Landslides

23. The tailings pipeline must be buried for the entire mapped area of the Snowslide Gulch avalanche path. Burial must be at a depth and length that will assure the integrity of the pipeline to withstand a 100-year avalanche event.
24. If the tailings access road remains open for use during the November to May avalanche season, the applicant shall be required to prepare a Snow Safety Plan that includes, at a minimum, the following:
    a. avalanche search and rescue training for on-site employees;
    b. travel protocol on the tailings access road;
    c. placement of probes, beacons and shovels in all vehicles crossing Snowslide Gulch;
    d. radio checks for all travel across Snowslide Gulch;
    e. a system for daily and/or weekly avalanche forecasting;
    f. designation of an on-site avalanche expert;
    g. other practices and procedures that assure worker safety and rapid response to avalanche events.

    The plan shall be prepared by an organization such as the Southeast Alaska Avalanche Center or another comparable qualified organization.

25. If the tailings access road remains closed for use during the avalanche season, then the applicant shall be required to incorporate avalanche awareness training into the required 40 hour Mine Safety and Health Administrative (MSHA) training class that is given to every new miner hired for the project. The applicant is required to consult with the Southeast Alaska Avalanche Center, or a comparable qualified organization, in developing avalanche awareness training. Specific attention shall be given to the avalanche hazard posed at Snowslide Gulch.
26. Snow removal equipment must be staged on the mill side of the tailings pond access road, and must be in a ready-to-operate condition in the event the tailings pipeline is damaged. This equipment must be available to clear the access road of avalanche debris just as quickly as it is declared safe to do so in consultation with a qualified individual or organization such as the Southeast Alaska Avalanche Center. This consultation shall occur immediately following an avalanche event.
27. If the tailings access road is available for use during the avalanche season, signage must be placed warning all drivers of avalanche danger on the road. The road must be closed during periods of high avalanche risk as determined by mine officials in consultation with the Southeast Alaska Avalanche Center or comparably qualified organization or individual. This consultation shall occur on a daily basis during the November–May avalanche season.
28. A snow shed shall be constructed over the Kensington portal to shed snow away from the portal and prevent the portal from being covered by snow and impeding escape from the mine.

Erosion

29. Coeur shall identify methods in the approved Plan of Operations for the employment of best management practices that allows for quick action to be taken where erosion is imminent or under way.
30. Provide worker training in the employment of best management practices, including both techniques (how MBPs are employed) and protocols (when and where MBPs are employed).
31. Reclaim disturbed areas on steep slopes and avoid disturbing steep slopes during inclement weather.
32. Construct all storm water diversion ditches to accommodate a 100-year, 24-hour precipitation event.

JCMP Conditions

33. Preserved and pressure-treated wood shall not be used in the water, or have contact with the water, in the construction of the Slate Creek Cove marine terminal.
34. Fill in wetlands shall be avoided and minimized to the greatest extent practicable.
35. The best management practices enumerated in CBJ §49.70.1080 (b) (7) (A) (B) (C) (D) (F) and (G) are incorporated as MBPs for the project. These are:

    - There shall be no work in the stream bed or that would adversely impact the stream during egg incubation or out-migration of salmon smelts;
    - Filtration curtains shall be used to protect streams from turbidity due to adjacent soil disturbance activities;
    - Existing wetlands vegetation shall be stripped in mats and repositioned over regraded soils;

- The amount of fill shall be restricted to the minimum amount necessary to achieve stated purposes;
- All discharge material shall be free from toxic pollutants in toxic amounts as defined by state law, and;
- Erosion at the construction site shall be controlled through re-vegetation and other appropriate means. Exposed soils shall be re-vegetated within one year.

Wetlands Review Board Conditions

36. Marine construction shall not occur in Slate Creek Cove during the spring concentration of forage fish.
37. A strong monitoring and reporting program shall be instituted for water quality assessment in the Slate Lakes Basin and in Slate Creek Cove, with an emphasis on the fish population.
38. Species in Slate Creek Cove shall be monitored for vessel impacts. Measures shall be taken to reduce impacts to marine species, including reduction of vessel speed, vessel routing and timing of vessel arrivals and departures. Coeur should incorporate provisions for marine mammal protection in the approved Plan of Operations or through an agreement with the National Marine Fisheries Service.
39. Coeur shall sponsor a Berners Bay working group to coordinate activities and promote good communication among the operator, the agencies and the public.

Attachments: August 24, 2004 memorandum from Peter Freer, Community Development to the CBJ Planning Commission regarding MIN2004-00003.

This Notice of Decision constitutes a final decision of the CBJ Planning Commission. Appeals must be brought to the CBJ Assembly in accordance with CBJ §01.50.030. Appeals must be filed by 4:30 P.M. on the day twenty days from the date the decision is filed with the City Clerk, pursuant to CBJ §01.50.030 (c). Any action by the applicant in reliance on the decision of the Planning Commission shall be at the risk that the decision may be reversed on appeal (CBJ Sec. 49.20.120).

Effective Date: The permit is effective upon approval by the Commission
August 31, 2004

Expiration Date: The permit will expire 18 months after the effective date, or February 28, 2006, if no Building Permit has been issued and substantial construction progress has not been made in accordance with the plans for which the development permit was authorized. Application for permit extension must by submitted thirty days prior to the expiration date.

Project Planner: [signature]
Peter Freer, Planning Supervisor

[signature]
Johan Dybdahl, Chairman
Planning Commission

Filed With Deputy City Clerk

[signature]
Sept. 15, 2004

cc: Plan Review

NOTE: The Americans with Disabilities Act (ADA) is a federal civil rights law that may affect this development project. ADA regulations have access requirements above and beyond CBJ - adopted regulations. Owners and designers are responsible for compliance with ADA. Contact an ADA - trained architect or other ADA trained personnel with questions about the ADA: Department of Justice (202) 272-5434, or fax (202) 272-5447, NW Disability Business Technical Center 1 (800) 949-4232, or fax (360) 438-3208.

Appendix J

Biological Assessment/Biological Evaluation

Biological Assessment/Biological Evaluation Threatened, Endangered, and Forest Service Sensitive Listed Wildlife Species

Kensington Gold Project Supplemental Environmental Impact Statement

Juneau Ranger District
Tongass National Forest, Alaska

November 15, 2004

Prepared by

Tetra Tech, Inc.

Under contract to the USDA Forest Service

CONTENTS

FIGURES

TABLES

Acronyms and Abbreviations

µPa	micro Pascal unit
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
BA/BE	Biological Assessment/Biological Evaluation
CFR	Code of Federal Regulations
Coeur	Coeur Alaska, Inc.
dB	decibel
dbh	diameter breast height
DTF	dry tailings facility
EPA	U.S. Environmental Protection Agency
ES	eastern stock of Steller sea lion
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEIS	Final Environmental Impact Statement
Goldbelt	Goldbelt Incorporated
LPG	liquefied petroleum gas
LUD	Land Use Developments
Master Plan	Echo Cove Master Plan
MCP	minimum convex polygons
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OGH	Old-growth Habitat Reserves
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SPCC	spill prevention, control, and containment
T&E	threatened and endangered

TLRMP	Tongass Land and Resource Management Plan
TSF	Tailings Storage Facility
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA Forest Service	Forest Service
USFWS	U.S. Fish and Wildlife Service
WS	western stock of Steller sea lion

1. INTRODUCTION

This Biological Assessment/Biological Evaluation (BA/BE) has been prepared to address potential impacts of proposed changes identified in the latest plan of operation for the Kensington Gold Project in Juneau, Alaska, on threatened, endangered, and Forest Service sensitive listed species, and is further prepared in association with the 2004 Supplemental Environmental Impact Statement (SEIS) studying the impact of these changes on the general environment.

The National Forest Management Act of 1976, 16 United States Code (USC) 1604, requires the USDA Forest Service (Forest Service) to “provide for the diversity of plant and animal communities based on the suitability and capability of the land area in order to meet overall multiple-use objectives….” The Act also directs the Forest Service to manage habitats in order to maintain viable populations of existing native and desired non-native vertebrate species in a planning area (36 Code of Federal Regulations [CFR] 219.19).

The objectives of a BA/BE are : 1) to ensure that Forest Service actions do not contribute to the loss of viability of any native or desired non-native plant or contribute to animal species or trends toward federal listing of any species, 2) to ensure that actions of federal agencies do not jeopardize or adversely modify critical habitat of federally listed species, and 3) to provide a process and standard by which to ensure that threatened, endangered, and Forest Service sensitive listed species receive full consideration in the decision making process.

Forest Service policies implementing the National Environmental Policy Act (NEPA) outline direction for the Forest Service to review all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, and sensitive species. The biological evaluation process is the means of conducting the review and documenting the findings (FSM 2672.4).

The effects analysis for threatened and endangered (T&E) species (the biological assessment portion of the BA/BE) is required to address the direct and indirect effects of the action on T&E species and their critical habitat (50 CFR 402.02). This documentation complies with Section 7 of the Endangered Species Act (ESA), which requires all federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), to ensure that their actions are not likely to jeopardize the continued existence of T&E species or adversely modify their habitat.

An additional analysis of potential direct, indirect, and cumulative effects is required for Forest Service designated sensitive species and their habitats (FSM 2672.42; the biological evaluation portion of the BA/BE). Species that have been designated by the Forest Service as Sensitive are listed in the 1997 Tongass Land and Resource Management Plan (TLRMP).

The proposed change most relevant to the listed species of concern is the construction and operation of two crew shuttle marine terminals, associated crew shuttle operation, and barge traffic proposed under Alternatives B, C, and D in the 2004 SEIS. Crew shuttle and barge traffic between marine terminal locations at Slate Creek Cove on the west side of Berners Bay, and either Cascade Point (Alternatives B and D) or Echo Cove (Alternative C) on the east side of the bay could result in potential increased impacts to, primarily, marine mammals. Issues such as the potential for oil spills, noise disturbance, vessel/marine mammal collisions, effects on spawning herring, and measures to mitigate these impacts, are addressed in this BA/BE.

2. PROJECT HISTORY, DESCRIPTION, AND LOCATION

2.1 PROJECT AREA

The Kensington Gold Project involves a permitted underground gold mine located approximately 45 miles northwest of Juneau, Alaska (Figure 2-1). Figure 2-2 illustrates the specific location of the project area, including Comet Beach and Berners Bay. Coeur Alaska, Inc. (Coeur), the mine operator, currently maintains a wastewater treatment plant, including settling ponds, located near the 850-foot portal near the historic Kensington Mine site. The settling ponds treat mine drainage and are permitted to discharge to Sherman Creek under a National Pollutant Discharge Elimination System (NPDES) permit. A waste rock pile resulting from exploration activities is located in the same vicinity. A small personnel camp at Comet Beach houses workers conducting maintenance activities at the site. The camp currently uses a septic system, but also maintains a small sewage treatment plant with a permit to discharge to Lynn Canal.

2.2 PROJECT CHANGES AND RESULTING PUBLICATIONS

The mine received all permits required to begin construction and operations following publication of the 1997 *Kensington Gold Project Final Supplemental Environmental Impact Statement* (Forest Service 1997a) and issuance of the Record of Decision (ROD). However, Coeur has not yet constructed the mine. Improved efficiency and the potential to reduce the extent of disturbance of the approved project were factors that motivated Coeur to submit a revised Plan of Operations to the Tongass National Forest. This revised Plan of Operations forms the basis for a new (2004) SEIS. This BA/BE is being prepared in association with the 2004 SEIS as required under NEPA.

The 2004 SEIS represents the third iteration of the Kensington Gold Project to undergo a review under NEPA. The first EIS, *Kensington Gold Project Final Environmental Impact Statement*, was completed in 1992 (1992 FEIS) (Forest Service 1992). The Kensington Venture, a joint venture between Coeur and Echo Bay Exploration Inc., initially proposed to develop the Kensington Gold Project. Their proposal, submitted to the Forest Service in 1990, described mining the Kensington deposits by using underground recovery techniques, processing the ore on-site using flotation and cyanidation circuits, and disposing 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 (LPG) to fuel on-site generators. Supply deliveries and gold shipments off the site would have been accomplished from a marine terminal developed at Comet Beach in Lynn Canal. However, the Kensington Venture did not obtain all of the permits necessary to build the mine and, in 1995, Coeur became the sole stakeholder in the property.

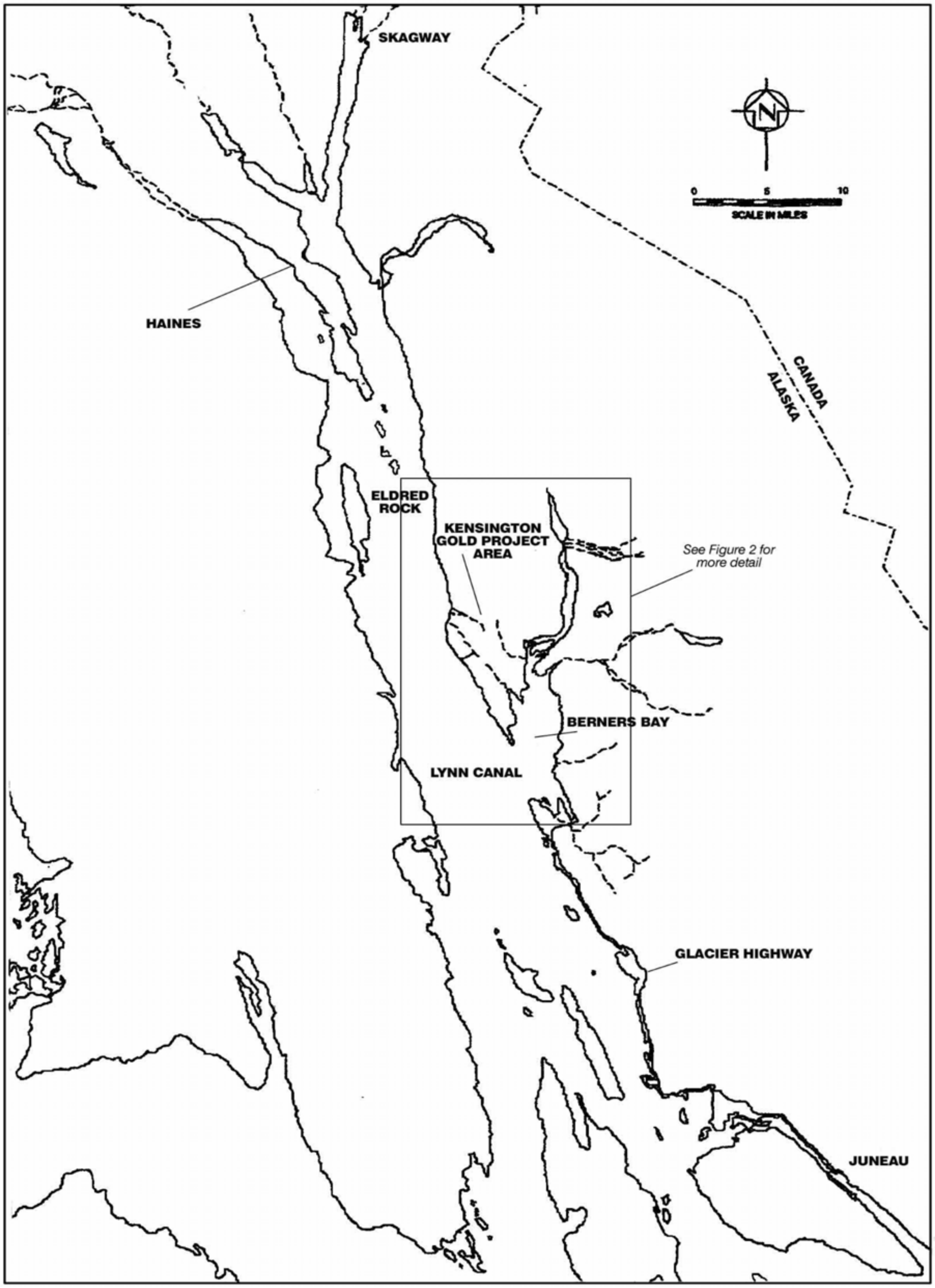


Figure 2-1. General Project Area (approximately 45 miles northwest of Juneau)

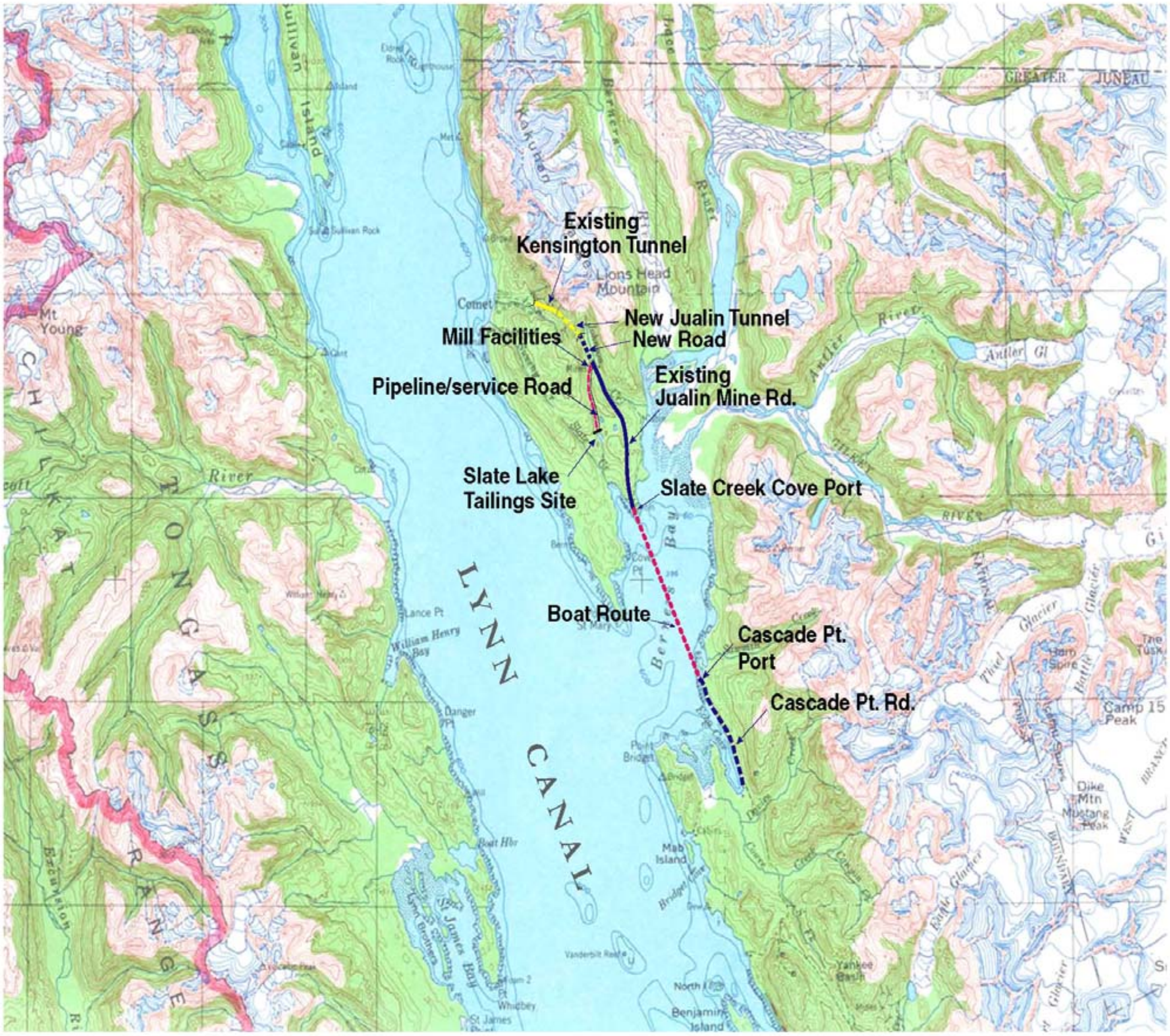


Figure 2-2. Specific location of the project area, including Comet Beach, Echo Cove, Slate Creek Cove, and Berners Bay

Coeur then submitted a revised plan of operations to the Forest Service in September 1995 (Coeur 1995). The 1995 Plan of Operations included the same mining and tailings disposal scenario but proposed enhanced treatment of the tailings wastewater and discharge to Sherman Creek instead of Lynn Canal. The proposal also included backfilling the cyanidation tailings and changing the fuel source from LPG to diesel. In June 1996, Coeur revised the Amended Plan of Operations it had submitted in 1995 in response to issues raised during scoping and at meetings with state and federal agencies. The revised plan was analyzed in the *Kensington Gold Project Final Supplemental Environmental Impact Statement* (1997 SEIS) and approved in a ROD signed in August 1997 (Forest Service 1997a), in which Alternative D was chosen. Although Coeur has not yet constructed the mine, Alternative D, the currently permitted project, consists of site access from Comet Beach, helicopter transport of employees, wastewater discharge to Sherman Creek, and construction of a dry tailings facility (DTF) for tailings disposal.

The Forest Service completed an EIS for the Cascade Point Access Road and issued a ROD in March 1998 (USDA Forest Service 1998a). The EIS and the ROD addressed access to Goldbelt's property across Forest Service lands but did not include an impact analysis for construction of a dock. Following Goldbelt's submittal of a Clean Water Act (CWA) Section 404 permit application for the facility in 1999, the U.S. Army Corps of Engineers (USACE) evaluated the potential effects of a dock at the site. The USACE denied the permit at the time, citing a lack of demonstrable need for the facility, as well as a number of environmental concerns.

To improve efficiency and reduce the extent of environmental disturbance from the approved project, Coeur submitted another Amended Plan of Operations for the Kensington Gold Project in November 2001 (Coeur 2001) to the Forest Service. The 2001 Amended Plan proposed a number of changes to the approved plan, such as the location of the milling facilities, tailings disposal, and site access, and a different means of employee transportation. The operation would also mine a smaller portion of the ore body than that proposed under previous iterations. The 2001 Amended Plan also proposed to use a dock to be constructed at Cascade Point on property owned by Goldbelt Incorporated (Goldbelt), an Alaska Native corporation.

The Forest Service directed the preparation of the 2004 SEIS by a third-party contractor, Tetra Tech, Inc., with cooperating agency support from the U.S. Environmental Protection Agency (EPA), USACE, and the Alaska Department of Natural Resources (ADNR) (under Title 40, CFR Section 1501.6). The SEIS objective was to evaluate the operator's proposed changes to the approved Plan of Operations for the mine, including construction of a dock facility at Cascade Point. The SEIS was intended to supplement the 1997 SEIS and 1992 FEIS. Information from the previous documents was incorporated into the latest document to the extent practicable in order to minimize cross-referencing to previous analyses.

2.3 OBJECTIVES OF THIS BA/BE

According to requirements defined under Chapter V, Council on Environmental Quality (40 CFR Part 1500), this BA/BE analyzes and discloses the direct, indirect, and cumulative impacts associated with the proposed changes to the approved Plan of Operations.

Alternatives B, C, and D in the 2004 SEIS propose the construction of two crew shuttle dock facilities to transport mine personnel across Berners Bay, either from a dock facility at Cascade Point or Echo Cove on the east side of Berners Bay to Slate Creek Cove on the west side of Berners Bay. Alternatives A and A1 do not propose the construction of dock facilities within Berners Bay. This BA/BE deals primarily with the potential effects of dock construction and operations, including increased human activity, to marine mammals that use Berners Bay for foraging and resting. Additional detail on the alternatives analyzed in this document can be found in the 2004 SEIS.

3. THREATENED, ENDANGERED, AND PROPOSED LISTED SPECIES

In compliance with the Tongass Land and Resource Management Plan (TLRMP) (Forest Service 1997b, and c) and ESA, species that are listed as threatened or endangered by USFWS and NMFS have been identified for the Tongass National Forest (Table 3-1).

Five wildlife species and one plant species, under the jurisdiction of USFWS, are found (or were once found) in Alaska and include the Kittlitz's murrelet (*Brachyramphus brevirostris*), short-tailed albatross (*Phoebastria albatrus*), Eskimo curlew (*Numenius borealis*), spectacled eider (*Somateria fischeri*), Alaska breeding population of Steller's eider (*Polysticta stelleri*), and Aleutian shield fern (*Polystichum aleuticum*). Except for the Kittlitz's murrelet, which is a candidate for listing under ESA, none of these species is found in southeast Alaska (Ed Grossman, USFWS, July 14, 2004, ref. #04-06V), and will not be discussed further in this BA/BE. Additionally, a number of marine T&E species fall under the jurisdiction of NMFS. These species are at least occasionally, or historically have been, found in southeast Alaska. They include the leatherback sea turtle (*Dermochelys coriacea*), Steller sea lion (*Eumetopias jubatus*), fin whale (*Balaenoptera physalus*), northern right whale (*Eubalaena japonica*), blue whale (*B. musculus*), and humpback whale (*Megaptera novaeangliae*). Furthermore, six chinook salmon (*Onchorynchus tshawytscha*), four steelhead trout (*O. mykiss*), and one sockeye salmon (*O. nerka*) are known to inhabit the marine waters of southeast Alaska seasonally, and are currently listed under ESA (Table 3-1). However, of all these species, only the Steller sea lion and humpback whale are known to occur near Berners Bay, while listed salmon and steelhead trout species may occur there. These are the only T&E listed species addressed further in this assessment.

3.1 AFFECTED ENVIRONMENT

The majority of the mine expansion proposed under the latest plan of operation would occur underground and disturb less forestland than the original proposals described in the earlier plans of operation. Under the proposed action alternative in the 2004 SEIS, construction of two dock facilities and crew shuttle service for mine personnel and barge traffic for materials would occur. Potential impacts from dock construction and crew shuttle operation on marine mammals are a primary concern and are addressed in this BA/BE. Additional information addressing concerns for other marine fish and wildlife species, including eulachon, marine birds, and other marine mammals is provided in the 2004 SEIS.

Table 3-1. Threatened and Endangered Species Listed as occurring on the Tongass National Forest from FWS and NMFS

Common Name	Scientific Name	ESA Status	Occurrence in Coastal Marine Waters Surrounding the Tongass National Forest
Humpback whale	*Megaptera novaeangliae*	Endangered	Common
Steller sea lion	*Eumetopias jubatus*	Threatened [1/]	Common
Chinook salmon— Upper Columbia River–spring-run	*Onchorhynchus tshawytscha*	Endangered	Occur in marine waters on the outside coast to the west of the Tongass National Forest. Not known to inhabit the coastal marine waters of the Tongass National Forest. May feed on fish that are dependent on the waters of the Tongass National Forest at some stage of their lives (see Section 3.3).
Chinook salmon—Puget Sound	*Onchorhynchus tshawytscha*	Threatened	"
Chinook salmon—Lower Columbia River	*Onchorhynchus tshawytscha*	Threatened	"
Chinook salmon—Upper Willamette River	*Onchorhynchus tshawytscha*	Threatened	"
Chinook salmon—Snake River–spring/summer	*Onchorhynchus tshawytscha*	Threatened	"
Chinook salmon—Snake River–fall run	*Onchorhynchus tshawytscha*	Threatened	"
Sockeye salmon—Snake River	Onchorhynchus nerka	Endangered	"
Steelhead Trout—Upper Columbia River	*Onchorhynchus mykiss*	Endangered	"
Steelhead Trout—Middle Columbia River	*Onchorhynchus mykiss*	Threatened	"
Steelhead Trout—Lower Columbia River	*Onchorhynchus mykiss*	Threatened	"
Steelhead Trout-—Snake River Basin	*Onchorhynchus mykiss*	Threatened	"
Kittlitz's murrelet	*Brachyramphus brevirostris*	Candidate	Locally common

1/ The eastern stock of the Steller sea lion is listed as threatened, and the western stock is listed as endangered.

3.2 MARINE MAMMALS

The humpback whale (*Megaptera novaeangliae*), Steller sea lion (*Eumetopias jubatus*), and harbor seals (*Phoca vitulina*) are three species of marine mammals that commonly occur in Berners Bay, and have been observed foraging in greater numbers during the eulachon (*Thaleichthys pacificus*) run that typically occurs from mid-April to early May (Marston et al. 2002, Sigler et al. 2003, USFWS 2003, Womble 2003). Two listed marine mammal species found within Berners Bay include the Steller sea lion and humpback whale. The humpback whale is listed as endangered, and the Steller sea lion is listed as a threatened species in the project area. Harbor seals can be found year-round in Berners Bay, but they are by far most prevalent during the April-May eulachon-spawning period when several hundred concentrate at the head of the bay (USFWS 2003). Their numbers may remain relatively high through summer. Counts conducted by the Alaska Department of Fish and Game (ADF&G) and NMFS in August 2002 documented mean counts of 70 and 349 harbor seals at haul-outs near the mouths of the Antler and Lace rivers, respectively. Harbor seals are discussed more fully in the 2004 SEIS.

Other marine mammals known to inhabit Berners Bay, at least occasionally, include killer whales (*Orcinus orca*), harbor porpoises (*Phocoena phocoena*), and Dall's porpoises (*Phocoenoides dalli*) (USFWS 2003). The presence of transient killer whales may coincide with concentrations of pinnipeds associate with the April-May spawning of eulachon, although they may occur within the Bay at any time. Harbor porpoise probably occur year-round. Other marine mammals infrequently or possibly occurring in Lynn Canal include the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), minke whale (*B. acutorostrata*), gray whale (*Eschrichtius robustus*), northern elephant seal (*Mirounga angustirostris*), and sea otter (*Enhydra lutris*) (Mizroch et al. 1998). The two listed species, humpback whale and Steller sea lion, are addressed below.

3.2.1 Humpback Whale

Humpback whales are found in coastal areas or near oceanic islands and appear to occur primarily in nearshore waters, especially the highly productive fjords of southeast Alaska and Prince William Sound (Calkins 1986). Humpback whales have been protected since 1965 and are currently listed as endangered under the ESA. In the North Pacific, most remaining humpbacks reside in United States territorial waters. They range from California to the Chukchi Sea, Hawaii, and the Mariana Islands (NMFS 1991). During the summer, humpback whales in the North Pacific migrate and feed over the continental shelf and along the coasts of the Pacific Rim, from Point Conception, California, north to the Gulf of Alaska, Prince William Sound, and Kodiak Island. Humpback whales spend the winter in three separate wintering grounds: the coastal waters along Baja California and the mainland of Mexico, the main islands of Hawaii, and the islands south of Japan (NMFS 1991).

Humpback whales were commercially hunted extensively from the late 1800s through the first part of the 20th century. Worldwide, their current population of approximately 10,000 is only 8 percent of the historical population size. The pre-1905 population of humpback whales in the North Pacific of an estimated 15,000 was, by 1966, reduced to approximately 1,200 individuals. There are signs of recovery, however, with a recent estimate of 3,700 in the Central North Pacific (Hawaii wintering stock) alone (NMFS 2002a). The greatest threats to humpback whales today are entanglements in fishing gear, ship strikes, and coastal habitat pollution.

Most humpback whales inhabit temperate and tropical waters in winter. Humpback whales in the North Pacific are seasonal migrants that feed on zooplankton and small fishes in the cooler northern coastal waters during the summer. Humpback whales have separate populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas. The humpback whales that feed in southeast Alaska during the summer migrate to Hawaii in the winter and are referred to as the Central North Pacific stock (NMFS 2002a).

Humpbacks remain in the Gulf of Alaska through the summer and fall and begin their migration south in November, although they have been observed in Lynn Canal during each month of the year. Peak numbers of whales are usually found in nearshore waters during late August and September, but substantial numbers may remain until early winter. The Forest Service (1997c) estimates that 300 to 500 humpback whales inhabit southeast Alaska during the summer and fall. The most recent estimate by Straley et al. (2002) indicated that the annual abundance of humpback whales in southeast Alaska is nearly 1,000 animals.

The local distribution of humpbacks in southeast Alaska is correlated with the density and seasonal availability of prey species, particularly herring; euphausiids (small crustaceans); and, within Berners Bay, eulachon. Other prey includes Pacific sand lance (*Ammodytes hexapterus*), capelin (*Mallotus villosus*), Atka mackerel (*Pleurogrammus monopteryguis*), walleye pollock (*Theragra chalcogramma*), and haddock (*Melanogrammus aeglefinus*) (Bryant et al. 1981, Krieger and Wing 1984). Adults consume up to 3,000 pounds per day, although they likely feed only during the six to nine months of the year when they are in their feeding grounds. They fast and live off their fat layer for the winter period while in their breeding grounds.

Humpback whales are regularly sighted in the Inside Passage and coastal waters of the southeast Alaska panhandle from Yakutat Bay south to Queen Charlotte Sound and have been documented foraging in Berners Bay (Forest Service 1997c, Appendix J; and Marston et al. 2002). Up to three humpback whales were documented foraging in Yakutat Bay during boat surveys in 2000 (USFWS 2003), and a maximum of five humpback whales have been observed feeding in Berners Bay during the eulachon run (Womble 2003).

Because humpback whales inhabit shallow coastal areas, they are increasingly exposed to human activity. NMFS completed a recovery plan for the humpback whale and identified six known or potential categories of human impacts to these species: hunting, entrapment and entanglement in fishing gear, collisions with ships, acoustic disturbance, habitat degradation, and competition for resources with humans. Although NMFS has not designated critical habitat for this species, specific regulations prohibit anyone from approaching within 100 yards of a humpback whale (NMFS 2001a), and apply within 200 nautical miles of Alaska to reduce human impacts. (see Section 6.1, Mitigation Measures for additional information.)

Direct and Indirect Effects

Noise from Construction and Operation

Potential risks to humpback whales associated with this project include noise disturbance from dock construction, operations, and vessel traffic. Excessive noise can place humpback whale populations at risk by displacing animals from optimal feeding areas, inducing undue stress (leading to autoimmune diseases), masking communication, causing hearing injury or loss, and in some cases leading to mortality (Richardson et al. 1995). Consequently, noise can reduce the fitness of individuals and populations. The potential impact of cruise ship noises on local humpback whale populations in nearby Glacier Bay continues to be a subject of research and concern. What is clear from the Glacier Bay research is that humpback whales often move away from approaching vessels and may respond to vessel noises with aerial or vocal threats (Baker et al. 1982, 1983; Baker and Herman 1989). Presumably, vessel noise is a stress factor for humpback whales, but the significance of its impact on population distribution and health remains controversial (Richardson et al. 1995). Reactions of humpback whales to helicopters in Hawaii (Atkins and Swartz 1989) have led to prohibiting aircraft from approaching within 1,000 feet of these whales (NMFS 1987). In Alaska, as stated earlier, vessels cannot approach to within 100 yards of humpback whales, as described in the regulations by NMFS. The regulations "prohibit anyone, with exceptions, from approaching by any means, including by interception, within 100 yards of any humpback whale within 200 nautical miles of Alaska, or within inland waters of the state" (NMFS 2001a).

Watkins' (1986) impression from 25 years of research was that over time, Cape Cod humpback whales changed their responses to whale-watching boats and other vessels from strongly negative to strongly positive reactions. Nevertheless, the continuing research on the interaction between humpback whales and cruise ships in Glacier Bay has yet to definitely show that humpback whales inhabiting southeast Alaska inland waters are able to habituate to vessel noises. Noise generated by dock construction activities could affect humpback whales and other cetaceans during the construction period. Numerous studies have shown whales avoid underwater sounds starting at 110 to 120 decibels (dB) re 1 μ Pa. (All decibel levels in this section refer to sound pressure levels equal to 1 μ Pa [micro Pascal unit].) Blackwell and Greene (2001) measured construction noise at Seal Island in the Beaufort Sea (British Petroleum's Northstar operation), and found that noise caused by pile driving, generators, and heavy equipment varied and reached its highest level 1,450 feet from the island. Overall, broadband levels of underwater sound from activities on or around Northstar ranged from 112 to 139 dB, at a range of 0.25 nautical miles, and from 92 to 121 dB at 1 nautical mile. Underwater noise was at least 11 dB above ambient levels (98-dB dB re 1 μ Pa) at a range of 5 nautical miles. If the noises associated with construction of the proposed crew shuttle docks were similar to those that occurred at Northstar, humpback whales could be expected to avoid areas within at least 1 nautical mile of construction.

The construction activities proposed at Echo Cove (e.g., Alternative C) should not result in impacts on humpback whales because of the embayment location. However, proposed construction activities at Slate Creek Cove Alternatives B, C, and D) or Cascade Point (Alternatives B and D) might impact humpback whales that enter Berners Bay in April and May to feed on eulachon, herring, and other forage fish. If construction activities were to be conducted during the April-May time frame, noise and construction disturbance at either Slate Creek Cove or Cascade Point would likely contribute to the effects on individual foraging humpback whales; however, permit conditions for Slate Creek Cove and/or Cascade Point would exclude construction during the eulachon run and herring spawning, and would include other measures to minimize construction impacts on humpback whales and other marine mammals (see Section 6 and Appendices A to D).

Operations would include three to five daily round trips by the crew shuttle boat between Echo Cove or Cascade Point and Slate Creek Cove, plus four barges per week docking in Slate Creek Cove. Although humpback whales may be present in Berners Bay at any time during the year, it is assumed that the greatest potential for impact to humpback whales (e.g., potential collisions, noise from boat traffic) would occur during the April-May eulachon-spawning run when potentially more individuals may be foraging in Berners Bay. Alternatives B, C, and D include crew shuttle traffic across Berners Bay, either from Cascade Point or Echo Cove on the east side of Berners Bay to Slate Creek Cove on the west side of the Bay, and could disturb humpback whale foraging.

Loud underwater noise (>125 dB) from high-speed (18-20 knot) ferries (e.g., crew shuttle boats) could disturb marine mammals. Because the proposed operation of a crew shuttle boat in Berners Bay could generate noises above 130 dB, behavioral responses of exposed whales are expected. Erbe (2002) concluded that long-term exposure (8 hours per day) to source levels exceeding 145 dB might induce permanent hearing loss in killer whales. Transit time of the crew shuttle would be less than 20 minutes, and therefore, no temporary or permanent hearing loss impacts are expected.

During research at Glacier Bay, LGL (2003) considered the acoustical zone surrounding a moving vessel where 130 dB is exceeded as “ensonified.” The range of ensonification is dependent on a number of factors, including size and speed of the vessel(s), and the attenuation properties of the underwater landscape. There is little information available on the acoustic signatures of small, high-speed ferries, and no information on the crew shuttle boat proposed for this project. Based on studies by Erbe (2003), small vessels traveling at about 20 knots have generated sound levels of 125 dB or greater extending out about 1.2 miles, while cruise ships traveling at the same speed produce noises exceeding 125 decibels out to 6.2 miles. Noise levels from the crew shuttle would likely fall somewhere in between. The size of Berners Bay is estimated at about 26 square miles, and an ensonification zone extending out 1 mile from the shuttle would result in about 17 percent of the bay being ensonified at any given point during the crew shuttle run, and about half the bay over the entire run. An ensonification zone of 2 miles would include one-half of the bay at any given point, and the entire bay would receive sound levels exceeding 125 dB at some point during the transit. A 3-mile ensonification zone would ensonify the entire bay at all points during the run. Mitigation measures to reduce the crew shuttle boat speed to 12 or 13 knots would be implemented during the eulachon run and herring spawning periods. Although no noise signatures were available for a vessel similar to the crew shuttle traveling at these slower speeds; underwater noise would be reduced during the time that greater numbers of humpback whales may be present, as well as lower crew shuttle speeds would reduce the likelihood of potential vessel strikes. Year-round speed limits of 13 knots have been proposed for cruise vessels in Glacier Bay to protect whales from noise disturbance (NPS 2003).

While cetaceans in general show avoidance behavior to sounds starting around 110 dB, more intense sounds can cause physiological damage. Noise can also mask biologically important signals such as vocalizations by other animals. Lien et al. (1993) studied reactions of humpback whales in response to explosions and drilling off Newfoundland. Their data revealed only small changes in residency, movements, and general behavior. However, two humpback whales trapped in fishing gear after the explosions were found to have severely damaged ear structures similar to blast injury in humans. While the whales showed no dramatic behavioral reaction to these harmful sounds, Lien et al. (1993) cautioned that whales' visible short-term reactions to loud sounds may not be a valid measure of the degree of impact of the sound on them. The above finding has implications for any underwater blasting that might occur as part of marine terminal construction. During the marine terminal construction window, blasting activities would not occur when humpback whales are within 1,000 feet, as determined by on-site monitoring by a NMFS-approved marine mammal biologist (see Section 6.1).

Potential Vessel Strikes

Potential collisions with whales and other marine mammals during crew shuttle and barge operations in Berners Bay are possible; however, mitigation measures have been proposed, including reducing the speed of the crew shuttle boat. Direct pursuit of whales by boats and frequent changes in boat speed and direction appear to elicit avoidance behaviors more often than other types of boat activity. However, whales may readily habituate to constant speeds and familiar noise (Forest Service 1997c).

Jensen and Silber (2003) reported the results of large whale ship strikes from records dating from 1975 through 2002. The database containing 292 records at the time of publication indicated that humpback whales (44 records) were second only to fin whales (75 records) in the number of reported large vessel strikes. Approximately 16 percent of all reported whale collisions are documented along the U.S. west coast, with the majority (41 percent) of all reported whale/ship collisions occurring on the U.S. east coast (Jensen and Silber 2003). Collisions between ships and whales are associated with a wide variety of vessel types, with all vessel classes represented in the database. For North Atlantic and Southern right whales, NOAA Fisheries has proposed that vessels 65 feet in length size overall would apply the operational measures in the proposed ship strike strategy to reduce ship/whale strikes. However, it appears that relatively large and fast-moving vessels are most often involved in whale strikes.

Reports of collisions between large ships and whales in southeastern Alaska are rare. One humpback whale was killed by a cruise ship in Stephens Passage in 1999. More recently, Doherty and Gabriele (2001) examined a dead female humpback whale approximately 1 mile west of Point Gustavus in the Glacier Bay/Icy Strait area in July 2001.

The barges that would be used to haul supplies to the mine and transport concentrate from the mine on a regular basis are not likely to affect whale distribution in Berners Bay because these vessels operate at low, constant speeds and at regular intervals (three or four times per week). The crew shuttle and barge operations would both comply with NMFS regulations governing the approach to humpback whales (NMFS 2001a). Adherence to these regulations should minimize disturbance to humpback whales. Additional protection measures that limit disturbance to marine mammals and other marine wildlife are discussed in Section 6. Mitigation measures to reduce the crew shuttle boat speed to 12 or 13 knots would be implemented during the eulachon and herring spawning periods. Crew shuttle boat and barge/tug vessel specifications are provided in Appendix F for reference.

Hydrocarbon Impacts

An oil spill (even infrequent leakage of small amounts of petroleum) at sea adds an element of risk to the environment of a whale. Fresh crude oil or volatile distillates release toxic vapors that can damage sensitive tissues; certain cetaceans may ingest harmful materials via contaminated prey or during breathing or floating near the water surface. In spite of numerous observations of cetaceans in spills, none of these effects has been detected, or at least recorded with any certainty (Geraci 1990).

Crude oil would not be transferred under this project, and additional detail regarding diesel fuels and its effects on marine mammals are presented in Section 3.2.2, Steller sea lion. Infrequent leakage of hydrocarbons from normal crew shuttle and tug/barge operations could be expected to occur either at the marine terminals or en route between them. However, considering the likely low levels of hydrocarbons that would result from minor leakage during normal crew shuttle and tug/barge operations, adverse effects on humpback whales or other marine mammals using Berners Bay are not expected to occur. Protection measures are discussed in Section 6 and Appendices A to D.

Increased Human Activity in the Berners Bay Area

Increased human activity in the form of daily crew shuttle and regular barge traffic has the potential to affect whale distribution and movement within Berners Bay and Slate Creek Cove, either through displacement or physical harm resulting from whale/vessel collisions, especially during spring and early summer when humpback whales may congregate in the area. Boat use would primarily consist of crew shuttle and barge transport of personnel, supplies, and construction materials, and in addition to ongoing recreational use of Berners Bay, activities could result in an increase in harassment or vessel strikes to marine mammals, in particular, humpback whales.

Echo Cove currently serves as the recreational access point for Berners Bay because the existing road ends there. The streams and rivers that drain into Berners Bay produce fish that support both sport and commercial fisheries in southeast Alaska. At present, there is no road access to Cascade Point; however, boat access is provided at Echo Cove, approximately 3 miles south of Cascade Point. Access up the major river drainages does occur via airboats. It is unknown whether increased use of recreational airboats would occur due to project activities, but it is unlikely to affect humpback whales foraging within Berners Bay.

Potential indirect impacts from construction of a marine terminal at Cascade Point, and it's associated disturbance, to the Lynn Canal Pacific herring stock, is of concern because herring, in addition to eulachon, is also a seasonally important prey item for humpback whales. Herring spawning overlaps the eulachon runs within the Berners Bay, and up to five humpbacks have been documented during the April-May time period (USFWS 2003). In addition to the proposed mitigation measures to minimize impacts to marine mammals, specific mitigations to reduce or eliminate potential impacts to Pacific herring, an important forage fish for humpback whales have been added and are discussed in Section 6.1 and Appendix E.

Appendix E provides a summary of what is known about the Lynn Canal Pacific herring stock, and Section 6.1 includes mitigation measures that are currently being considered to be included in ADNR's Tideland's Lease for the Cascade Point Dock facility to protect herring stock. Specific mitigation measures include prohibiting in-water marine terminal construction from March 15 through June 30, no vessel operations from the Cascade Point terminal from the time pre-spawning aggregations are observed around the dock facility until spawning has been completed (typically two weeks), and no fueling at Cascade Point from the time pre-spawning aggregations of herring are observed around the dock facility in Berners Bay until the eggs have hatched (typically four to five weeks).

Determination

Based on the analysis above, which takes into account current protection measures required by the Marine Mammal Protection Act (MMPA), ESA, TLRMP standards and guidelines, and mitigation measures proposed here (see Section 6.1 and Appendices A to D), the project is **not likely to adversely affect** humpback whales. As shown in the analysis, effects from hydrocarbons are discountable because large fuel spills are not likely to occur in Berners Bay. Other potential significant effects, such as noise from construction or vessel operation, vessel strikes, increased human activity, and indirect effects to herring have been reduced or eliminated so that the impacts cannot be meaningfully measured, detected, or evaluated.

3.2.2 Steller Sea Lion

The Steller sea lion is widely distributed over the continental shelf and throughout the coastal waters of the Gulf of Alaska (Calkins 1986). The world population of Steller sea lions is distributed around the North Pacific from northern Japan through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea off the coast of Alaska, and south to the Channel Islands, California (NMML 2003).

The Steller sea lion was originally listed as a threatened species under the ESA in 1990. Protected status was deemed necessary because of a large decline in Steller sea lion numbers throughout their range and particularly in Alaska. Populations are estimated to have declined between the 1950s and 1990 by 78 percent (NMFS 1992). In certain parts of Alaska, declines of greater than 80 percent have occurred since 1985. Population modeling has suggested decreased juvenile survival is likely the reason behind the decline. Critical habitat for Steller sea lions was designated in 1993 (NMFS 1993). In 1997 NMFS classified the Steller sea lion as two distinct population segments, the eastern stock (ES) and western stock (WS), and re-evaluated their status. Steller sea lions occurring west of 144°W longitude (WS) were reclassified as endangered. The stock differentiation is based primarily on differences in mitochondrial DNA, but also on population trends in the two regions. The eastern Pacific population (ES), listed as threatened, includes the Berners Bay population, and the population levels for this group are increasing even though the stock is designated as “depleted” under the MMPA. As a result, this stock is classified as a strategic stock. Although the stock size has increased in recent years, the status of this stock relative to its optimum sustainable population size is still unknown.

Unlike the observed decline in the WS Steller sea lion, there has not been a concomitant decline in the ES. The ES has been increasing in the northern portion of its range (southeast Alaska and British Columbia); however, the stock has been declining in the southern end of its range (Oregon, Washington, and California) where habitat concerns include reduced prey availability, contaminants, and disease (Sydeman and Allen 1997).

The total estimated population of the ES Steller sea lion in southeast Alaska based on 1998 numbers is 15,196 (10,939 non-pups plus 4,257 pups); if it is conservatively assumed that the pup count is relatively stable, the total count for 2,000 would be 16,674 (12,417 non-pups plus 4,257 pups) (NMFS 2003b, NMFS 2002b). The number of pups produced in the ES has nearly doubled since 1978, with an annual rate of increase of 5.9 percent during 1979 to 1998, although the rate of increase between 1989 and 1997 was only 1.7 percent (Calkins et al. 1999). Sease and Gudmundson (2002) estimated a 1.8 percent annual increase in non-pup sea lions between 1991 and 2002. In the southeast Alaska portion of the ES, non-pup counts on trend sites have increased 29.3 percent since 1990 (Sease et al. 2001). The estimated abundance of the ES population of Steller sea lions region-wide (southeast Alaska, Washington, Oregon, California, and British Columbia) is 31,028 animals (NMFS 2002b). Calkins et al. (1999) suggested that there are probably more sea lions at present than at any time in recorded history.

There is some limited interchange between the WS and ES populations. Raum-Suryan et al. (2002, 2004) conducted branding and satellite transmitter studies between 1975 and 2001, and found that a few juveniles from the WS move to the ES region. Raum-Suryan (2002) noted that during 21 years of study, a total of 8,596 Steller sea lion pups were branded. There was little interchange between stocks between 1979 and 1987 with 23 resightings (0.4 percent of 5,746 resightings) of the WS at three different locations within the ES region, including areas near Juneau. No adult Steller sea lions were observed breeding in the opposite stock, although adults of breeding age did move between stocks (Raum-Suryan et al. 2002). Resightings of branded Steller sea lions showed wide dispersal from natal rookeries, particularly of juvenile animals, occasionally traveling over 1,500 km to other rookeries and haul-outs and crossing stock boundaries; yet, individuals returned to breed at either their natal rookery or a non-natal rookery within their respective stock (Raum-Suryan et al. 2002). More recent research on the movement between the WS and ES Steller sea lions used satellite transmitters to track distribution and movement patterns of pup and juvenile Steller sea lions from both stocks. Overall, 90 percent of round trip movements from haul-out sites were less than 15 km, indicating that pup and juveniles did not travel far nor spend long periods of time at sea when using a particular haul-out site (including rookery sites), which is critical to the developing juvenile (Raum-Suryan et al. 2004). Similar to brand-resighting studies (Raum-Suryan et al. 2002), movement of individuals between the WS and ES Steller sea lion populations were documented in very low numbers, and only by males (Raum-Suryan et al. 2004). Although no information exists that documents foraging by Steller sea lions from the WS population within Berners Bay, data provided by NMFS indicates that resightings of WS Steller sea lions has been documented at Benjamin Island. Therefore, the potential presence of some members of the WS population foraging in Berners Bay cannot be completely ruled out. However, given the extremely low number of WS sightings in Southeast Alaska, and the lack of documented evidence of the presence of any WS individuals in Berners Bay proper, there is no basis to suggest that WS Steller sea lions could interact with project activities. Therefore, the WS Steller sea lion population is not addressed further in this assessment.

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods. Prey varies geographically and seasonally. Some of the more important prey species in Alaska are walleye pollock, Atka mackerel, Pacific herring (*Clupea harengus*) (see Appendix E for additional information on the Lynn Canal herring stock), capelin, Pacific sand lance, Pacific cod (*Gadus macrocephalus*), salmon (*Oncorhynchus* spp.), and, locally, eulachon. Eulachon is an important prey species in early spring (NMFS 1992, Marston et al. 2002).

The abundance of Steller sea lions in Berners Bay increases during the early spring, timed with the eulachon run. Each spring, eulachon spawn in Berners Bay in the lower reaches of the Antler, Berners, and Lace rivers (Marston et al. 2002). These runs are considered an "ecological cornerstone" for regional coastal ecosystems. Since 1996 several studies on eulachon and Steller sea lion interactions have been conducted in

Berners Bay. A recent (2002) study documented the first annual arrival of sea lions to Berners Bay on April 8 with a peak count of 949 occurring on April 18 (Sigler et al. 2003). Sea lions were detected in the Antler River from April 22 to May 1. Peak Steller sea lion/harbor seal combined counts of 419 in 1995 and 250 in 1996 occurred in Berners Bay the first week in May (Marston et al. 2002). Both sea lion and eulachon abundance are typically low in early April, peak in mid to late April, and then decrease to near zero by early May (Sigler et al. 2003).

Adult Steller sea lions congregate at rookeries for breeding and pupping. Rookeries are generally located on relatively remote islands, often in exposed areas that are not easily accessed by humans or mammalian predators. These rookeries, as well as haul-outs, have been officially designated as critical habitat in southeast Alaska (NMFS 2001b). NMFS' definition of critical habitat for southeast Alaska includes a "terrestrial zone, aquatic zone, and an air zone, that extend 3,000 feet landward, seaward, and above, respectively, for each major rookery and major haul-out in southeast Alaska." To date, 3 major rookeries and 11 major haul-outs have been identified in southeast Alaska (Table 3-2). The closest sea lion rookery to the project area is White Sisters, approximately 75 air miles southwest of the project area on the outer coast, off Baranof Island. However, Graves Rock, a minor haul-out site, also about 75 air miles from the project area, was recently documented to support pupping and is now considered a new rookery (Calkins et al. 1999).

There is a major sea lion haul-out at Benjamin Island, 14 miles south of Berners Bay, and it is occupied seasonally, primarily from September to April. Sea lion abundance decreases at Benjamin Island as the numbers increase in Berners Bay.

In addition to Benjamin Island, there are two other documented Steller sea lion haul-outs in Lynn Canal: Gran Point and Met Point. During the eulachon run in April and May, Berners Bay is likely to be an important foraging area for sea lions from all three

Table 3-2. Major Steller Sea Lion Rookery and Haul-out Habitats in Southeast Alaska

Name	Rookery	Haul-out
Forester Island	X	
Hazy Island	X	
White Sisters	X	
Benjamin Island		X
Biali Rock	X	X
Biorka Rock		X
Cape Addington		X
Cape Cross		X
Cape Ommaney		X
Coronation Island		X
Gran Point		X
Lull Point		X
Sunset Island		X
Timbered Island		X

Source: 50 CFR 226.202, pages 183, 200-203

haul-out sites (Womble 2004). Although there is no specific documentation in the existing literature, it is obvious that the eulachon run in Berners Bay is important to Steller sea lions and other marine wildlife during certain times of the year.

Cooperative feeding behavior by sea lions has been documented in Berners Bay. Gende et al. (2001) reported several observations of 75 to 300 Steller sea lions foraging cooperatively on schools of eulachon in late April or early May 1996 through 1999. Sigler et al. (2003) also noted cooperative foraging along the western shore of Berners Bay in April 2002. When not foraging, sea lions have been observed forming large “rafts” of 10 to 80 sleeping or resting individuals in the middle of the bay (Gende et al. 2001). Steller sea lions have also been observed hauling out just south of Slate Creek Cove during late April (Womble 2004).

Most of the sea lions observed during peak counts in Berners Bay were either adult or juvenile sea lions (Sigler et al. 2003); however, most sea lions observed at the Benjamin Island haul-out at the same time were 10- to 11- month-old pups, and some were still likely dependent upon their mothers’ milk for nutrition (Womble 2003).

Direct and Indirect Effects

Noise from Construction and Operation

Steller sea lions in the area would be susceptible to disturbances in the water from dock construction noise, subsequent boat traffic, and proximity to people. If construction activities were to be conducted during the April-May time frame, noise and construction disturbance, particularly in Slate Creek Cove, would likely contribute to the effects on Steller sea lions. During that time of year, sea lions congregate on the western side of

Berners Bay between Point St. Mary and the mouth of the Berners River to gorge on the eulachon run that gathers in the same area. The sea lions exhibit cooperative foraging behavior as large groups chase the eulachon into Slate Creek Cove during feeding. When not feeding, the sea lions often rest in the area in large rafts of animals and have been documented to haul out along the shoreline just south of Slate Creek Cove. Access to these spring-spawning runs of forage fish prior to the breeding season may be critical to breeding success (Marston et al. 2002) and is important to pregnant and nursing females.

A USFWS (2003) preliminary report noted that data collected during surveys conducted each May during 2000 and 2002 indicate that marine mammal use along the north shore of Slate Creek Cove is comparatively lower than elsewhere in the cove. As stated earlier, both sea lion and eulachon abundance are typically low in early April, peak in mid- to late-April, and then decrease to near zero by early-May (Sigler et al. 2003). Regardless, no in-water marine terminal construction would occur between March 15 and June 30, and therefore impacts from noise and associated marine terminal construction disturbance is mitigated (see Mitigation Measures in Section 6.1 and Appendices A to D).

Crew shuttle operations, like other vessel traffic, have the potential to affect marine mammals. However, swimming Steller sea lions and harbor seals generally tolerate close approaches by vessels and are often attracted to vessels, especially fishing vessels (Richardson et al. 1995). It is likely that they would tolerate the slow, constant engine speeds associated with crew shuttles (Hoover 1988).

Operations would include three to five daily round trips by the crew shuttle boat between Echo Cove or Cascade Point and Slate Creek Cove, plus up to four barges per week docking in Slate Creek Cove. The greatest potential for impact on marine mammals would come from boat traffic during the April-May eulachon spawning run. Under Alternatives B, C, and D, boat traffic on the west side of Berners Bay, especially in the area of Slate Creek Cove, might disturb Steller sea lions foraging, rafting, or hauled out south of Slate Creek Cove during this time. Mitigation measures to reduce impacts during the above time period include: crew shuttle round trips would be reduced from three to five trips per day to two to three trips per day, barge traffic would be eliminated or curtailed during the two to three week period in April-May when large numbers of Steller sea lions are present in the Bay, and crew shuttle speeds would be reduced to 12 to 13 knots during this time (see Mitigation Measures in Section 6.1 and Appendices A to D for additional detail).

In addition to boat traffic, both Steller sea lions and harbor seals, while hauled out, react to low-flying aircraft by entering the water or sometimes by stampeding into the water (Calkins 1979). Helicopter use for crew transport (Alternatives A and A1) has the potential to affect Steller sea lions that temporarily haul out within Berners Bay during the eulachon run period. In Glacier Bay, Hoover (1988) found that harbor seals generally reacted strongly to aircraft flying at an altitude of less than 200 feet. Calkins

(1979) had found similar responses by Steller sea lions. However, both species generally vacate haul-out sites when approached too closely (Bowles and Stewart 1980, Calambokidis et al. 1983).

Pinnipeds as a group are known to startle at noises. Porter (1997) observed Steller sea lions in southeast Alaska being startled and fleeing for various reasons, such as helicopter overflights, bird flybys, and the presence of humans. Sea lions fleeing haul-outs have fairly predictable behaviors once they gain safety. They mill about with their heads up in a heightened state of watchfulness until they sense it is safe to return, often within 2 hours (Porter 1997). If Steller sea lions were to abandon the area during this critical feeding time, it could have a negative effect on the population. The crew shuttle and barge operations would, however, have to comply with NMFS guidelines for approaching marine mammals. Adherence to these guidelines should minimize disturbance to Steller sea lions. Additional protection measures that limit disturbance to marine mammals and other marine wildlife are discussed in Section 6.1 and Appendices A to D.

Potential Vessel Strikes

Potential collisions with Steller sea lions and other marine mammals during crew shuttle and barge operations in Berners Bay are possible; however, mitigation measures have been proposed (see Section 6.1), including reducing the speed of the crew shuttle boat. The barges that would be used to haul supplies to, and concentrate from, the mine would also operate at low, constant speeds and at regular intervals (three or four times per week). Both barges and crew shuttles, to the extent practicable, would be prohibited from approaching within 100 yards of marine mammals. Steller sea lions are very mobile and alert animals. It is very unlikely that they would be susceptible to strikes from vessels, especially slow-moving crew shuttles and barges. Crew shuttle boat and barge/tug vessel specifications are provided in Appendix F for reference.

Hydrocarbon Impacts

The fate of petroleum hydrocarbons after a spill is based on spreading, evaporation, emulsification, dispersion, dissolution, reaction, and sedimentation. Biodegradation can occur from between 1 day to several months depending upon environmental conditions (Irwin et al. 1998). Marine fish, the primary prey of sea lions, take up petroleum hydrocarbons from water and food; however, within a few days after exposure, aromatic hydrocarbons are oxygenated to polar metabolites and excreted. For this reason, most fish do not accumulate and retain high concentrations of petroleum hydrocarbons, even in heavily oil-contaminated environments and are therefore not likely to transfer them to predators (Neff 1990).

Marine carnivores generally are inefficient assimilators of petroleum compounds in food. Because primary prey species are able to release hydrocarbons from their tissues (Neff and Anderson 1981), biomagnification does not occur. There is no direct correlation between a marine mammal's trophic level and the concentration of residues that it might consume. For example, top carnivores, such as polar bears and killer whales that feed on large pelagic fish and seals, are less likely to be exposed to petroleum in their food than are species such as baleen whales and walrus that feed on zooplankton and benthic invertebrates (Neff 1990).

Steller sea lions could come into physical contact with oil because this species spends considerable time at the surface swimming, breathing, feeding, or resting. Oil that comes ashore is likely to foul Steller sea lions and other pinnipeds that require such areas for haul-outs or nursery areas (Neff 1990). Oil fouling has been implicated in the deaths of pinnipeds; however, large-scale mortality has never been observed, even after some of the more catastrophic spills (St. Aubin 1990). Incidental ingestion during feeding, exposure to vapor concentrations that might be expected under natural conditions at sea, and limited surface fouling with relatively fresh oil do not appear to cause significant distress (St. Aubin 1990).

Accidental discharge of oil from the proposed project would consist of light hydrocarbons (diesel) that result from leakage or rupture from engines, equipment, or spillage or leakage during diesel fueling. Diesel is a light and highly evaporative petroleum product. Diesel disperses relatively rapidly after spillage to form a thin sheen on water. Over 90 percent of the diesel in a small spill incident into the marine environment either evaporates or naturally disperses into the water column in time frames of a few hours to a few days (NOAA/Hazardous Materials Response and Assessment Division 2003). Any residual fractions would be expected to continue to weather through processes of dissolution, biodegradation, and photo-oxidation. Potential impacts would be short-lived and confined to the water column only. Infrequent leakage of hydrocarbons from normal crew shuttle and tug/barge use could be expected to occur either at the marine terminals or en route between them. However, considering the likely low levels of hydrocarbons that would result from minor leakage during normal crew shuttle and tug/barge operations, adverse effects on Steller sea lions in Berners Bay are not expected to occur.

Increased Human Activity in the Berners Bay Area

Mining support is the only use currently identified for the proposed marine terminal facilities. Increased human activity in the form of daily crew shuttle and regular barge traffic has the potential to affect sea lion distribution and foraging activities within Berners Bay and Slate Creek Cove, either through possible displacement or the low likelihood of physical harm resulting from vessel collisions, especially during the eulachon runs in April-May when Steller sea lions congregate in the area. By adhering to the mitigation measures outlined in Section 6.1, disturbance to various Steller sea lion temporary haul-outs, cooperative foraging, and rafting sea lions during the period of the eulachon run (e.g., along the western shore of the Bay and south of Slate Creek Cove) should be minimized.

Potential indirect impacts from construction of a marine terminal at Cascade Point, and it's associated disturbance, to the Lynn Canal Pacific herring stock, is of concern because herring, in addition to eulachon, is also a seasonally important prey item for Steller sea lions. Herring spawning overlaps the eulachon runs within Berners Bay, and Steller sea lions feed on this stock, particularly during the April-May time period when densities of herring is at its highest, and sea lions are abundantly present. In addition to the proposed mitigation measures to minimize impacts to marine mammals, specific mitigations to reduce or eliminate potential impacts to Pacific herring have been developed and are discussed in Section 6.1 and Appendix E.

Appendix E provides a summary of what is known about the Lynn Canal Pacific herring stock. Specific mitigation measures currently being considered to be required by the State's Tidelands Lease include: in-water marine terminal construction prohibited from March 15 through June 30, no vessel operations from the Cascade Point terminal from the time pre-spawning aggregations are observed around the dock facility until spawning has been completed (typically two weeks), and no fueling at Cascade Point would occur from the time pre-spawning aggregations of herring are observed around the dock facility until the eggs have hatched (typically four to five weeks).

Determination

Based on the analysis above, which takes into account current protection measures required by the Marine Mammal Protection Act (MMPA), ESA, TLRMP standards and guidelines, and mitigation measures proposed here (see Section 6.1 and Appendices A to D), the project is **not likely to adversely affect** Steller sea lions. As shown in the analysis, effects from hydrocarbons are discountable because large fuel spills are not likely to occur in Berners Bay. Other potential significant effects, such as noise from construction or vessel operation, vessel strikes, increased human activity, and indirect effects to herring have been reduced or eliminated so that the impacts cannot be meaningfully measured, detected, or evaluated.

3.3 LISTED SALMONIDS

Most of the listed fish (salmonids) in Table 3-1 are highly unlikely to be present in the potential impact area because their migration routes and rearing areas are far from Berners Bay (Busby et al. 1996, Myers et al. 1998, McNeil and Himsworth 1980). However, some representative chinook salmon hatchery stocks are occasionally known to be present in the Ketchikan area of southeast Alaska based on tag recoveries in local sport fishery. For example, of 1,200 chinook tags recovered from the sport fishery in the Ketchikan region between 1993 and 2003, 62 originated in Columbia River system hatcheries, and 2 were from Puget Sound (overall, about 5 percent of all tags collected) (ADF&G 2003). While tags from hatchery fish are not absolute indicators of wild fish marine abundance and distribution, they are often used as surrogates for wild stock distribution. Because the corresponding listed wild stocks are fewer in number, they would also be less prevalent than hatchery stocks from these systems.

Listed salmon stocks most likely to be present in the region (at least in the Ketchikan area) are those containing ocean-type chinook (i.e., those that typically enter the saltwater as 0-age fish). The ocean-type chinook salmon tend to migrate along the coast, while stream-type (i.e., rear in freshwater more than 1 year before entering the ocean) chinook salmon are found far from the coast in the central North Pacific (Myers et al. 1998). Listed stocks containing ocean-type life-cycle characteristics include Snake River fall chinook, some of the Lower Columbia River chinook salmon, and some Puget Sound chinook salmon. A few of the stream-type tagged hatchery fish have also appeared in the Ketchikan area, however, suggesting the occasional presence of other listed chinook salmon stocks. The distribution of other listed salmonids relative to the Berners Bay region, over 200 miles north of Ketchikan, is less clear, but they are likely less abundant. Steelhead trout and sockeye salmon typically are more common in the ocean environment away from nearshore regions after they enter marine waters than are some of the chinook stocks noted.

The rivers of origin for the listed fish stocks are very far from Berners Bay. For this reason, their numbers in the Bay would be minimal. Additionally, any of these fish found in the Berners Bay area would be transient as they move in their ocean migration.

3.3.1 Direct and Indirect Effects

While there are some hazards to fish resources in the region from construction and operations of the proposed activities (see the 2004 SEIS), these hazards are unlikely to adversely affect any of the listed salmonid stocks. The lack of adverse effects is primarily due to the following:

- The extremely low abundance of any of the listed stocks in the region
- The likely distribution away from nearshore areas where potential impacts would be highest from proposed project activities
- The transitory nature of their presence within this region

3.3.2 Determination

Based on the extremely low possibility of listed species encountering any adverse activities in the project area, and actions being taken during construction and operations to minimize or mitigate potential adverse effects to marine resources, the proposed actions will have ***no effect*** on any listed salmonids in Table 3-1.

3.4 CANDIDATE SPECIES FOR LISTING

3.4.1 Kittlitz's Murrelet

On May 9, 2001, the Secretary of the Interior was petitioned to list the Kittlitz's murrelet (*Brachyramphus brevirostris*) as endangered with concurrent designation of critical habitat under the ESA. Petitioners cited dramatic reductions in population size over the past decade and declining habitat quality as reasons for the requested listing. The species was officially designated a candidate species (warranted, but precluded) on May 4, 2004.

Kittlitz's murrelet is closely associated with glacial habitats along the Alaska mainland coast. Breeding sites are usually chosen in the vicinity of glaciers and cirques in high-elevation alpine areas, with little or no vegetative cover (Van Vliet 1993). When present, vegetation is primarily composed of lichens and mosses (Day et al. 1983). The species nests a short distance below the peak or ridge on coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains, generally near glaciers 0.2 to 47 miles inland (Day et al. 1983). The remote and solitary nesting habits lead to extreme difficulty in finding nests. Non-breeding or off-duty breeders spend the summer in inshore areas, especially along glaciated coasts.

The Kittlitz's murrelet is one of the rarest seabirds in North America. The only American population occurs in Alaskan waters from Point Lay south to northern southeast Alaska. The largest breeding populations are believed to be in Glacier Bay National Park and Preserve, Prince William Sound, Kenai Fjords, and Malaspina Forelands (Kendall and Agler 1998). According to the petition, the southern boundary of the breeding range is LeConte Bay on the Tongass National Forest.

Latest worldwide population estimates range from 9,000 to 25,000 birds. The best information available from the USFWS indicates that Prince William Sound populations have declined by 84 percent since 1984, Kenai Fjords area by 83 percent since 1976, Malaspina Forelands by 38 percent and perhaps as much as 75 percent between 1992 and 2002, and Glacier Bay by 60 percent between 1990 and 1999. The USFWS believes that glacial retreat and oceanic regime shifts are the major factors causing decline of the species (69 FR 86: 24875–24904). Other related factors include increased adult and juvenile mortality and low recruitment. Human-caused mortality includes gillnet fisheries and oil spills like that from the Exxon Valdez or smaller tourism and fishing boats. Increased disturbance from helicopter tours and cruise ships in the three main breeding grounds might also be a factor.

Direct and Indirect Effects

Unlike the marbled murrelet, Kittlitz's murrelet is sometimes referred to as the "glacier murrelet," foraging almost exclusively at the face of tidewater glaciers or near the outflow of glacier streams, and nesting in alpine areas in bare patches among the ice and snow. McBride Glacier is the closest tidewater glacier to the project area, and is located approximately 50 miles west in Glacier Bay National Park. No nesting or foraging habitat would be disturbed under any of the alternatives and no Kittlitz's murrelet have been documented foraging within Berners Bay.

Determination

The proposed project will have ***no effect*** on Kittlitz's murrelet.

4. FOREST SERVICE SENSITIVE LISTED WILDLIFE AND FISH SPECIES

Sensitive listed species are those wildlife, fish, and plant species identified by a Regional Forester for which population viability is a concern as evidenced by a significant current or predicted downward trend in population numbers, density, or habitat capability that would reduce a species' existing distribution (FSM 2670.5). As part of the NEPA process, Forest Service activities will be reviewed (i.e., biological evaluation) to determine their potential effect on sensitive species, and impacts to these species will be minimized or avoided (FSM 2670.32). Viable populations and habitat of these species will be maintained and distributed throughout their geographic range on National Forest System Lands (FSM 2670.22).

4.1 AFFECTED ENVIRONMENT

Region 10 has identified four sensitive animal and three sensitive fish species that are found on the Tongass National Forest (Forest Service 1997b). Sensitive animal species include the northern goshawk (*Accipiter gentilis laingi*), osprey (*Pandion haliaetus*), Peale's peregrine falcon (*Falco peregrinus pealei*), and trumpeter swan (*Cygnus buccinator*). Sensitive fish species include island king salmon (*O. tshawytscha*) that occur only on Admiralty Island, Fish Creek chum salmon (*O. keta*) that occur only in Fish Creek near Hyder, and northern pike (*Esox lucius*) that occur only in the Yakutat Forelands. Only the northern goshawk, trumpeter swan, osprey, and Peale's peregrine falcon will be addressed in detail, since none of the sensitive fish species occurs in the project area. Habitat information for these species was obtained from the TLRMP Final EIS (Forest Service 1997c), other literature and files, area maps, and people familiar with the project area.

4.1.1 Northern Goshawk

The Queen Charlotte northern goshawk is a species of concern and a Forest Service-listed sensitive species. Concern exists over the viability of the goshawk population in southeast Alaska because of reductions in the amount of this species' preferred habitat—mature and old-growth forests—as a result of timber harvesting (Forest Service 1997c). In 1994 USFWS received a petition to list the Queen Charlotte northern goshawk under ESA. USFWS decided not to list the goshawk at that time, and again in 1997. Conservation measures for this species, such as the standards and guidelines in the TLRMP, could eliminate the need for additional protection and possible listing.

The goshawk is a wide-ranging forest raptor that occupies old-growth forest habitat in southeast Alaska. Suitable nest site habitat consists of large trees with a dense canopy and generally an open under-story averaging 12 to 37 acres in size (Flatten et al. 2001). Titus et al. (1994) documented that fifteen (83 percent) of the 18 nests found in southeast Alaska during the study period were located in productive old growth with the remaining

3 nests (17 percent) located in mature second-growth (>90 years) stands. Productive old-growth forest is an important component of goshawk habitat use patterns. Radio-marked goshawks consistently select this forest habitat type, relative to availability, with 68 percent of all relocations occurring in productive old growth forest. Most other habitat types (such as alpine, subalpine, peatland [muskeg], and clearcuts) were used infrequently or avoided by goshawks.

Landscape factors, such as slope and elevation, along with beach, riparian, and estuary areas, are important to goshawk habitat suitability. Goshawks appear to prefer elevations lower than 800 feet and slopes less than 35 percent (Iverson et al. 1996). Riparian zones ranked as the most important landscape component used by radio-collared goshawks (Iverson et al. 1996). Radio-tracking results also indicated that goshawks make extensive use of areas within 1,000 feet of beaches and estuaries (Titus et al. 1994). Beach, estuary, and riparian habitats generally support greater prey diversity and net prey productivity, both of which are important to goshawk habitat quality (USDA Forest Service 1997a). Potential goshawk nesting habitat is defined as high-volume old growth on slopes less than 60 percent and below 1,000 feet in elevation (USDA Forest Service 1998a).

In an effort to evaluate the status, population, and habitat ecology of the northern goshawk on the Tongass National Forest, ADF&G and the Forest Service conducted a goshawk study from 1991 to 1999 (Flatten et al. 2001). Sixty-one nesting areas in southeast Alaska were documented as a result of this study. There are 15 documented goshawk nests on the Juneau Ranger District. Eleven of the 15 nests are located on private or state-owned lands adjacent to NFS lands.

Foraging areas comprise the largest majority of a goshawk breeding home range. Foraging habitat is characterized by forested stands with more diverse age classes and structural characteristics (e.g., snags, woody debris) than nesting areas. Breeding season home range size depends primarily on the quality of foraging habitat and prey availability. In southeast Alaska, prey remains identified in goshawk breeding areas included Steller's jays (*Cyanocetti stelleri*), grouse (*Dendragapus* spp.), varied thrushes (*Izoreus naevius*), red squirrels (*Tamiasciurus hudsonicus*), and various woodpecker species (Iverson et al. 1996). The median size adult goshawk home range during the breeding season in southeast Alaska, using 100 percent minimum convex polygons (MCP) from radio telemetry locations during 1992-1999 survey seasons, was 10,631 acres (female) and 10,517 acres (male) (Flatten et al. 2001).

Potential habitat for goshawks (i.e., old-growth forest) can be found throughout the Johnson and Slate Creek drainages, and an active goshawk nest was previously documented on National Forest System lands approximately 2 miles from the Jualin Mine site (ABR 2000). In addition to this nest site, other known goshawk nesting areas have been documented in the vicinity of the project area on state-owned land near Echo Cove, and in the Lace River drainage (Titus et al. 1994, Forest Service project records).

Approximately 1,914 acres of high-volume productive old growth occur within the project area. Removal of suitable goshawk habitat would occur under Alternatives B, C, or D, ranging from approximately 58 to 60 acres. No areas identified as volume class 6 (course canopy structure) would be removed under any of the aforementioned alternatives.

A goshawk survey was conducted in June 2004. No goshawks responded to taped broadcast calls in the vicinity of the nest tree previously documented in 2000. The nest tree location was approached after broadcast calls from the road were conducted with no response and field personnel found that the nest tree was likely downed by wind. Additional calls were conducted nearby with no response. Based on the 2004 survey effort, no active nest is present and the nesting area is not occupied, and therefore, TLRMP standards and guidelines (see below) do not apply. However, mitigation measures include conducting early season goshawk surveys prior to road construction or reconstruction and use, and for a minimum of two years after operations begin to document any nesting in the vicinity of the access road and in other suitable habitat in the vicinity of the mining operations. If a new nest was located, TLRMP standards and guidelines would apply.

Under Forest Service standards and guidelines (Forest Service 1997b), protection of at least 100 acres of productive old-growth forest centered around a known or probable nest site, (typically high-volume old-growth with greater than 60 percent canopy closure and open understory), and seasonal restrictions would apply to any nest located within 600 feet of a continuous source of noise between 15 March and 15 August.

Determination

Based on current absence of goshawks and protection measures required by TLRMP standards and guidelines if goshawks are found in the future, the project ***may impact individuals, but is not likely to cause a trend to federal listing or a loss of viability*** for the northern goshawk.

4.1.2 Osprey

Ospreys are specialized raptors that are not commonly observed in southeast Alaska. Sixteen osprey nesting areas have been documented on the Tongass National Forest, 15 in the Stikine River area and one in the Ketchikan area. Osprey nests in southeast Alaska usually occur in broken-top spruce trees or western hemlock snags. The mean diameter breast height (dbh) of nest trees in the Stikine River area was 38.6 inches (ranging from 15.7 to 54 inches), and the mean height was 105 feet (ranging from 49 to 177 feet). Nests were located within the beach fringe and averaged 0.7 mile (ranging from 0.25 to 1.4 miles) from the closest salt water. Their diet consists mainly of fish; therefore, they are usually found near lakes, streams, beaver ponds, coastal beaches, or large estuaries (Forest Service 1997c).

Although osprey frequently adapt to human activities, disturbances that keep adults from their nests during incubation in May or June may increase the mortality rate of eggs or nestlings. The osprey is adversely affected by stream or waterway alterations that reduce fish populations or visibility in areas traditionally used as feeding areas (VanDaele 1994). Potential nesting habitat for this species will be maintained under the TLRMP estuary and beach fringe standards and guidelines, which require maintaining a 1,000-foot-wide beach fringe of mostly unmodified forest to provide important habitats for wildlife (Forest Service 1997b).

Although osprey nesting and foraging habitat is available near the project area, especially along the major rivers draining into Berners Bay, no ospreys have been recorded near the project area.

Determination

Because no known nesting by ospreys occurs in the Jualin/Kensington region, mine-related impacts on this species' population would not be likely to occur. Therefore, the proposed project will have ***no impacts*** on osprey.

4.1.3 Peale's Peregrine Falcon

Peale's peregrine falcons are known to migrate through southeast Alaska in spring and fall, but are more commonly found in interior Alaska (Forest Service 1992). The Peale's peregrine falcon subspecies is not listed as endangered or threatened, but it is covered by a provision of the "similarity of appearance" which broadens the scope of protection for all peregrine falcons. Peale's peregrine falcons nest on cliffs from 65 to 900 feet in height along the outer coast of the Gulf of Alaska. Nest distribution in southeast Alaska is closely associated with large seabird colonies located on the outer coasts or nearby islands (Forest Service 1997b). Rock outcrops in the project area are more common in areas above the tree line, which do not provide suitable nesting habitat. Forest Service standards and guidelines call for the protection and maintenance of habitats for peregrine falcons.

Determination

Because no nesting (rock outcrops overlooking water) occurs in the project area, the proposed project will have ***no impacts*** on the Peale's peregrine falcon or their prey species.

4.1.4 Trumpeter Swan

Trumpeter swans breed in Alaska and winter along the Pacific Coast from the Alaska Peninsula to the mouth of the Columbia River. Trumpeter swans nest in the Interior and Gulf Coast regions of Alaska and winter primarily in coastal southeast Alaska, British Columbia, and south to the Columbia River in Washington State (Bellrose 1976). The largest nesting population of swans on the Tongass National Forest occurs on the Yakutat Forelands (Conant et al. 2001).

Swans pass through southern-southeast Alaska in the spring and fall during migration to and from their breeding grounds. Swans that over-winter here usually move to large lakes and estuaries once the weather turns cold. They arrive in mid-October as they are migrating south, and their numbers increase as migration continues. Preferred winter habitat is open-water lakes and large freshwater streams, especially near intertidal flats (Conant et al. 2001). Wintering swans have been located in three areas on Admiralty Island, Mitchell Bay (30 swans), Hood Bay (4 swans), and Gambier Bay (6 swans) (Conant et al. 2001).

Swans typically leave for their breeding area by mid-April. USFWS has been monitoring nesting and wintering swans since 1965. The summering population of swans in southeast Alaska continues to increase. Nesting swans have been documented along the Berners, Antler, and Lace rivers, which feed into Berners Bay. However, no known nesting by trumpeter swans occurs in the Jualin/Kensington region.

Impacts of implementing the proposed action alternative (i.e., Alternative B) or Alternatives C or D on trumpeter swans would likely be associated with human activity (barge traffic, crew shuttle traffic, noise from mine operations) during the fall, winter, and spring months when migrating or over-wintering birds may be present in Berners Bay. In addition, the inundation of approximately 33 acres of upland area adjacent to Lower Slate Lake would reduce trumpeter swan foraging habitat, though additional habitat would likely be created along the edges of the “new” shoreline.

Impacts from crew shuttle and barge traffic to swans wintering near the mouths of Antler, Lace, and Berners rivers should not occur due to distance. Indirect impacts to breeding trumpeter swans from increased access due to the construction of a dock at Cascade Point and associated roads may increase the likelihood of disturbance during the breeding season if recreational airboat use increases up the rivers.

Determination

Because no known nesting by trumpeter swans occurs in the Jualin/Kensington region, mine-related impacts on this species’ population would not be likely to occur. The proposed project will have ***no impacts*** on trumpeter swans that nest along the Berners, Antler, and Lace river drainages. No swans have been documented specifically using Berners Bay, therefore ***no impacts*** to wintering swans are anticipated. Monitoring will take place during the winter months. If monitoring documents swans wintering in the area, potential disturbance to swans would be evaluated and mitigated by restricting or reducing crew shuttle and tug/barge traffic.

4.1.5 Forest Service Sensitive Listed Fish Species

The TLRMP identified three sensitive listed fish species that occur on the Forest: Fish Creek chum salmon, island king salmon, and northern pike.

Northern pike are found only on the Yakutat Forelands, and Fish Creek chum salmon occurs only near Hyder, south of the project area. The island king salmon occurs naturally on islands, including runs in King Salmon and Wheeler creeks located on Admiralty Island south of the project area. King Salmon Creek is located in Seymour Canal on the east side of Admiralty Island. Wheeler Creek flows into Chatham Strait on the northwest side of Admiralty Island.

Determination

The proposed project will have ***no impacts*** on any of the aforementioned sensitive listed fish species or their habitat.

5. CUMULATIVE EFFECTS

5.1 CUMULATIVE EFFECTS

NEPA defines *cumulative effects* as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions." This section discusses the cumulative effects on marine and terrestrial wildlife species that are associated with the Kensington Gold Project. Other projects under consideration in this analysis are Goldbelt's proposed development at Echo Cove, the Cascade Point Access Road, and the Juneau Access Road, and these are discussed below in more detail.

5.1.1 Echo Cove Development (Goldbelt)

Goldbelt, Inc., an Alaska Native corporation, owns approximately 1,400 acres along the east and west shores of Echo Cove. The proposed action includes the construction and use of a dock at Cascade Point to transfer workers to the mine site. This aspect is addressed in detail in the full analysis section of this document. The remaining aspects of Goldbelt's Echo Cove development are analyzed here in terms of cumulative effects. The Forest Service has taken this approach because construction of the dock is a specific proposal, while the other aspects of the development are considered to be in the conceptual or planning stages.

Goldbelt released the *Echo Cove Master Plan* (Master Plan) in March 1996, which is a document that described the development proposed for its Echo Cove property. The Master Plan calls for development of approximately 10 percent of the Echo Cove lands. The initial phase is described as construction of a staging area and log transfer facility at Cascade Point; however, Goldbelt logged the area using a helicopter and a barge to remove the logs from the site. No other plans exist for additional logging. Subsequent phases of the Master Plan are still in the planning stages, but they could include a convenience store/gas station, power generation station, and water and sewage treatment facilities. Goldbelt identified the following goals for the development of a dock at Echo Cove:

- High-speed ferry service to Haines or Skagway
- Increased tourism opportunities, including operations with new excursion ships
- Support of the Lynn Canal fishing industry

Boats used for tourism would be of similar size to the crew shuttle used to transport workers to Slate Creek Cove. The fisheries dock would allow fishermen working in Lynn Canal a place to unload fish for shipment to processing plants or shipping terminals in Juneau. Goldbelt also includes a provision for mine housing and other personnel support for the Jualin Mine as some of the goals for development.

5.1.2 Cascade Point Access Road

The Forest Service completed an FEIS for the Cascade Point Access Road in March 1998. The Forest Supervisor selected Alternative B, with modifications in the ROD. This alternative authorized the issuance of a road easement to Goldbelt for construction of the 2.5-mile access road across National Forest lands for the purpose of developing the area. The road would be gated to restrict public access during construction and until one of the planned public facilities was constructed on private land at Cascade Point. The modifications included signage identifying points where land ownership changed from public to private; public vehicular use of the road upon completion of initial dock development when, in the opinion of the Forest Service in collaboration with Goldbelt, development activities do not create hazards to public safety; construction of a turnout with parking on National Forest System land where public land extends to the beach; and on-site monitoring of cultural resources by an archaeologist during construction of the road.

5.1.3 Juneau Access Road

The Alaska Department of Transportation and Public Facilities (ADOT&PF), in cooperation with the Federal Highway Administration, is developing a Supplemental Draft EIS to assess the potential impacts associated with improving access to Juneau. Three alternatives could affect the project area—Alternatives 2, 2A, and 2B. Alternatives 2 and 2A involve a “hard link” along east Lynn Canal between the end of the existing Glacier Highway to the Katzehin River. From the Katzehin River, one alternative would continue with a road to Skagway, while the other would involve a ferry terminal.

Under these alternatives, the road would be constructed around Berners Bay. The initial proposal included a causeway across the head of Berners Bay, although the new proposal would include crossings of the Antler/Gilkey and Berners rivers in forested wetlands and uplands upstream of where the causeway would have crossed. Alternative 2B would extend the Glacier Highway to Sawmill Creek. Marine terminals would be built at Sawmill Creek and on the west shore of Slate Creek Cove to support a ferry connection between the two points. The northern end of the road would begin on the west shore of Slate Creek Cove and continue north to Skagway. ADOT&PF has indicated that it would consider using a dock at Cascade Point as a ferry terminal rather than constructing a separate facility at Sawmill Creek, if it appeared likely that the facility would be constructed. For the purposes of this analysis, it is assumed the facility at Cascade Point would be built and ADOT&PF would use Cascade Point as the southern ferry terminal. The analysis also assumes mine employees would access the mine via the road rather than the crew shuttle boat if the road were completed during the operating life of the mine.

5.1.4 Extension of Mining Operations

The 1997 SEIS evaluated the expansion of mining activities into the Jualin deposit under the cumulative effects analysis and assumed it could add an additional 4 to 5 years to the proposed operation. No information is available to indicate additional exploration activities have been conducted on the Jualin deposit, although development of facilities associated with the Jualin Mine have been incorporated into Alternative B. This discussion of cumulative impacts uses the same assumption but focuses on additional mining activities extending the life span rather than expanding the output of the proposed operation. Either type of activity would require additional permitting and NEPA review.

Under Alternative B, backfilling 40 percent of the tailings is an operational requirement, resulting in approximately 4.5 million tons being deposited in the DTF and 3 million tons being backfilled. This discussion, for the purposes of cumulative effects, assumes that the operator could mine enough ore to generate a total of 20 million tons of tailings as proposed under Alternative A. This would result in the generation of an additional 12.5 million tons of tailings beyond those covered in this 2004 SEIS. The assumption is that all these tailings would be deposited in the TSF, creating a need for storage of a total of 17 million tons. This would represent a worst-case scenario in terms of tailings storage. It is likely that a portion of the tailings would continue to be backfilled into the mine.

Expanding the storage capacity of the TSF to accommodate an additional 12.5 million tons of tailings would require a significant enlargement of the dam. Rough calculations indicate that the final height of the dam would need to be approximately 175 feet, almost double its height under Alternatives B, C, and D. The construction methods, stability, and design criteria would have to be thoroughly investigated to determine the actual height, size, and construction requirements. Assuming the same depth of water covering the tailings (9 to 20 feet), the ultimate size of the lake would be approximately 150 acres and would envelop both Lower and Upper Slate lakes.

5.1.5 Cape Fox/Sealaska Land Exchange

Congress is considering legislation that would enact a land exchange between the Forest Service and Cape Fox, Inc., and the Forest Service and Sealaska, Inc. In October 2004, the bill was voted down, however, it is unclear whether this legislation will be amended and further considered in the future. Cape Fox is an Alaska Native Village Corporation, and Sealaska is an Alaska Native Regional Corporation. The exchange with Cape Fox would convey the surface rights to approximately 2,700 acres of land in the Johnson and Slate creek drainages, which is in the same area where activities are proposed for the Kensington Gold Project. In return, the Forest Service would receive lands owned by Cape Fox determined to be of equal value and identified after the legislation is enacted. The exchange would also convey surface and subsurface rights to approximately 9,300 acres of land in the Johnson, Sherman, and Sweeny creek drainages to Sealaska, as well as the subsurface rights under the land conveyed to Cape Fox. The Forest Service would receive Sealaska lands of equal value identified after the legislation is enacted. It should be noted that the land exchange is being considered by Congress and is not a Forest Service action, nor is it subject to review under NEPA.

If the land exchange is enacted, the lands surrounding the Kensington Gold Project would come under the ownership of Cape Fox and Sealaska. Coeur and other owners of patented claims would retain their ownership. The use of the lands conveyed to Cape Fox and Sealaska would be subject to the same regulatory framework that governs any other private lands in Alaska. Coeur has an agreement with Cape Fox and Sealaska that would allow Coeur to continue the permitting process for the Kensington Gold Project and operate the mine either as currently permitted or as proposed under the amended plan of operations. The result of the exchange would be that the Forest Service would cease to be involved from a land management standpoint. The operation would still be required to obtain permits from ADNR, EPA, and USACE. Statutory requirements under NEPA, as enforced by EPA and USACE, would still have to be satisfied; however, one of these agencies would assume the role of lead agency. Reclamation standards would be established under the terms of the ADNR, EPA, and USACE permitting requirements, but they would also reflect the desires of the landowners—in this case, Cape Fox and Sealaska.

Although the lands would become private and could be used for timber harvest or the development of recreation or housing, these actions are not considered reasonably foreseeable in terms of cumulative effects. No further proposals exist for the land other than to allow the Kensington Gold Project to continue with the permitting process. Therefore, the discussion of cumulative effects related to the land exchange is limited to the potential impacts from a change in regulatory requirements, primarily affecting reclamation.

5.2 AQUATIC RESOURCES IMPACTS

The Kensington Gold Project would not affect marine resources as a part of mining operations, except for the dredging necessary to construct the marine terminal, periodic dredging to keep the channel to Echo Cove open (Alternative C), and the increase in barge and crew shuttle traffic associated with the project. There would be a potential for impacts on marine resources during the life of the project as a result of an increased risk of fuel spills due to the increase in barge and crew shuttle traffic. The potential for accidental spills is very low. An extension of the project life would extend the duration of effects, but it would not increase the magnitude of effects.

The construction of the landing facilities at Echo Cove could increase boat traffic in Berners Bay. A change in traffic volume and patterns could force a shift in fishing locations for a small number of shrimp and crab pot fishermen. An increase in boat traffic beyond what is already associated with the Cascade Point development could cause seasonal disturbance to marine mammals, particularly Steller sea lions, which forage seasonally in the area, and thus contribute to cumulative effects on marine mammals. Any contribution to cumulative effects on marine resources from the Cascade Point Access Road would be minimal.

The Juneau Access Road could include crossings of streams draining into Berners Bay. The potential for impacts would occur mostly during construction with possible increased sediment loads at stream crossings. However, any contribution to cumulative impacts on marine resources from Alternatives 2 and 2A of the Juneau Access Road project would be minimal. Alternative 2B includes marine terminals with associated ferry traffic. This alternative could increase the cumulative effects discussed above by further increasing the potential risk of accidental spills. However, the potential water quality impacts on both the freshwater and marine environments from contaminants in Juneau Access Road runoff (e.g., oils, salts, other toxics) were predicted to be negligible (URS 2004a). As stated above, an increase in boat traffic beyond what is already associated with Cascade Point development could cause seasonal disturbance to foraging, marine mammals in the area and thus contribute to cumulative effects on marine mammals.

5.3 TERRESTRIAL WILDLIFE IMPACTS

The Kensington Gold Project, when combined with other projects occurring or potentially occurring in the Berners Bay area, would produce additional impacts on wildlife and their habitat. However, it is not likely to add a significant amount of impacts because of the distribution and proximity of the disturbance.

Reasonable and foreseeable impacts on wildlife and their habitat would likely occur as a result of partial or full development of Goldbelt’s Master Plan at Echo Cove and the associated construction of the Cascade Point Access Road. The extent of total acres of wildlife habitat potentially disturbed is unknown. However, based on available modeling information, further reductions in the assumed carrying capacity for brown bear, black bear, American marten, and mountain goats would occur, ranging from less than 6 percent for mountain goats to 55 percent for marten, if full development took place (Forest Service 1998b). The aforementioned habitat reductions include loss of beach fringe, which provides important travel corridors for many wildlife species.

The Juneau Access Improvements Supplemental Draft EIS project area partially overlaps this project area and would add cumulatively to impacts on wildlife and their habitats in the Berners Bay area. Construction of Alternative 2 of the Juneau Access Road, consisting of a road around Berners Bay, would result in the permanent loss of approximately 413 acres of terrestrial habitat, of which almost all is within the beach or estuary fringe and contains 364 acres of productive old-growth forest (URS 2004). For species that use productive old-growth forest for some or all of their life requisites (e.g., American marten, marbled murrelet, northern goshawk, woodpeckers), the greatest loss of productive old-growth forest associated with the Kensington Mine Project ranges from approximately 140 acres under Alternative B and D to 150 acres under Alternative

C. Other habitats, such as wetlands, would eventually be restored to their previous condition during reclamation.

Direct impacts of the Juneau Access Improvements Project on both terrestrial and marine wildlife species include direct habitat loss, fragmentation, and disturbance from construction, maintenance, and vehicle traffic associated with the road, construction of marine terminals, and ferry traffic. Marine mammals could be affected primarily by construction and traffic disturbance around Berners Bay and where the road is adjacent to the beach. Marine birds would be affected by disturbance during the nesting season and loss of habitat. Terrestrial mammals would be affected by loss of habitat, habitat fragmentation, and mortality from vehicle collisions. The moose population could be impacted under Alternative 2 due to increased access for hunters and vehicle caused mortality. Terrestrial birds would be affected by loss of habitat, nest disturbance, and edge effects, although marine birds would experience less disturbance with the elimination of the crew shuttle boat.

The proposed Cape Fox/Sealaska land exchange could affect wildlife and their habitat. Although there are no current proposals, future development at the site, depending on its extent and nature, could affect wildlife habitat and connectivity between the three small Old Growth land use designations (LUDs) in the Kensington Gold Project area. If this proposal is implemented, there is Tongass Plan Implementation Team clarification that addresses land exchanges involving Old-growth LUDs. The exchange could also affect areas with other limited development land use designations to the north and east of the project area.

The impacts associated with the projects described above would be additive to those predicted from the Kensington Gold Project and would encompass a much larger area. However, seasonal restrictions on barge and crew shuttle boat traffic, expansion of the existing small OGHs under the action alternatives to increase habitat protection and connectivity between the beach fringe and higher elevation areas, and other mitigation associated with the Kensington Gold Project would limit the extent of the additive cumulative impacts within the Berners Bay watershed.

6. MITIGATION MEASURES

If any previously undiscovered endangered, threatened, or sensitive listed species are encountered at any point in time prior to or during the implementation of this project, the District Biologist and/or Forest Biologist would be consulted and appropriate measures would be implemented.

Should construction of both dock facilities occur outside of the April-May timeframe, it is not expected to have any adverse impacts on humpback whales or Steller sea lions. Although both humpback whales and sea lions can be found in the Bay all year, large foraging concentrations coincide with the eulachon runs and herring spawning. Additional mitigation measures to reduce or eliminate potential adverse effects are listed below.

6.1 PROPOSED MITIGATION MEASURES FOR THE HUMPBACK WHALE, STELLER SEA LION, OTHER MARINE MAMMALS, AND PACIFIC HERRING

- Limit marine terminal construction activities (Alternatives B, C, and D) to avoid in-water work during critical times of the year (e.g., eulachon run, herring spawning) to avoid disturbance to Steller sea lions, humpback whales, and other marine mammals that forage heavily in Berners Bay during April-May. No in-water dock construction activities would occur between March 15 and June 30.
- During the marine terminal construction window, in-water activities such as pile driving and dredging would not occur when humpback whales or Steller sea lions are within 1,000 feet, as determined from on-site monitoring by a NMFS-approved marine mammal biologist.
- Develop a traffic plan (see Appendix A for Coeur's initial draft Berners Bay Transportation and Mitigation and Management Practices Plan). The traffic plan will minimize potential adverse effects in the following ways:
  - Coeur will identify and operate according to a "designated transportation routing," for the daily marine vessel transport of mine workers
  - Regular schedules will be established for weekday and weekend workers' transport (these will minimize the number of daily trips to the extent practicable)
  - Designated routing and schedules will be established for barge transport to the Slate Creek Cove dock site
  - Vessels will operate at low, constant speeds (i.e., less than 12 to 13 knots) and regularly scheduled intervals during the eulachon run/herring spawning time period, typically mid-April through early-May
- Vessels will not approach within 100 yards of humpback whales at all times. Vessels will also not approach within 100 yards of Steller sea lions and other

sensitive marine mammal species, to the maximum extent practicable. Coeur will work with ADNR and NMFS to establish specific approach measures to be used where avoidance is not feasible.

- Coeur will fund a NMFS "observer" to accompany the designated vessel pilot and take part in determining the best daily routing from the dock facilities, to minimize Steller sea lion encounters and also minimize incidental takings within the context of insuring reasonable access to the Kensington Gold Project mine site.
- Kensington marine vessel fueling will not take place at the Slate Creek Cove dock, except for emergency environmental situations and/or conditions involving worker safety that dictate such limited use.
- Coeur will work with NMFS and USFWS to develop a "Steller sea lion awareness training" manual to be used by Coeur (and other) marine pilots operating vessels in Berners Bay.
- *Mitigation Measures Specific to Alternatives B and D (Cascade Point):*
  - Marine fueling of Coeur transport vessels will occur only at the Cascade Point dock, Auke Bay dock, or other approved U.S. Coast Guard facilities.
  - The Cascade Point dock will be used primarily by a single dedicated marine vessel to transport mine workers to and from the mine site.
  - No other vessel fueling, except the Coeur Kensington marine vessel, would be fueled at the Cascade Point facility.
  - No fuel storage would occur at the site; a fueling truck from Juneau would be used to meet the dedicated vessel's needs.
  - Vessel operations from the Cascade Point terminal would be prohibited from the time pre-spawning aggregations of herring are observed around the dock facility until spawning has been completed (typically two weeks). Coeur would be required to limit disturbance from vessel noise, lights, and other sources that may discourage herring from utilizing spawning habitat in the vicinity of Cascade Point. ADF&G would determine the occurrence and timing of herring spawning.*
  - Fueling of vessels at Cascade Point marine terminal would be prohibited from the time pre-spawning aggregations of herring are observed around the dock facility until herring eggs have hatched (typically four to five weeks). During this period, fueling would occur outside of Berners Bay at a U.S. Coast Guard approved facility such as Auke Bay. ADF&G would determine the occurrence and timing of herring spawning.*

  *These are mitigation measures that are currently being considered for inclusion in the final State Tidelands Lease for the Cascade Point dock facility.
- During eulachon spawning period, Coeur will reduce the typical daily worker transport schedule from 3 to 5 trips per day to no more than 2 or 3 trips/day (except for emergency environmental or safety situations)

- Coeur will build up onsite fuel inventories in advance of the eulachon and herring spawning period to a level that would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon and herring spawning period
- Coeur will limit concentrate barging during the 2 to 3 week eulachon spawning period (similar to reduced fuel shipments)
- Other chemical and supplies shipments will be curtailed during that period, to the extent practicable, to further limit all barging and reduce Steller sea lion encounters
- Coeur will prepare a spill prevention, control, and containment (SPCC) plan for approval by Forest Service, CBJ, ADNR, and USACE personnel (see Appendices B and C). In addition to the Standard Operating Procedures outlined above and in Appendix A, the SPCC plan lists the industry standard preventative measures required when transporting, storing, or using bulk materials at the mine site. The SPCC Plan also identifies the potential risks and appropriate mitigation measures. These include stationing spill response trailers at each marine facility, the process area, and strategic locations along the traveled corridor where unexpected discharge of hazardous materials could directly enter the Johnson Creek system.
- Coeur will ensure that construction equipment has noise control devices (e.g., mufflers) no less effective than those provided on the original equipment. Additional noise reduction measures include speed limits, not allowing compression braking on haul roads beginning at the Slate Creek marine facility to the mining site, controlling helicopter flight altitudes, and implementing flight path requirements (see Appendix D).
- Coeur will meet with NMFS, ADNR, and ADF&G personnel to review the mitigation measures and monitoring plans a minimum of once per year, or as needed, to review monitoring information and address the effectiveness of mitigation measures.

6.2 SUMMARY

Overall, Coeur will adhere to the MMPA, ESA, and Forest Service Standards and Guidelines, NMFS regulations for approaching whales, and will following the Alaska Marine Mammal Viewing Guidelines around other marine mammals such as harbor seals, sea lions, dolphins, and porpoise. This includes maintaining a minimum approach distance of 100 yards and traveling at a slow constant speed.

7. SUMMARY OF DETERMINATION OF EFFECT

Based on the analysis contained in this document and current protection measures required by the MMPA, ESA, and TLRMP standards and guidelines, as well as proposed mitigation measures (see Section 6 and attached appendices), the project is **not likely to adversely affect** humpback whales or Steller sea lions. As shown in the analysis, effects from hydrocarbons are discountable because large fuel spills are not likely to occur in Berners Bay. Other potential significant effects, such as noise from construction or vessel operation, vessel strikes, increased human activity, and indirect effects to herring have been reduced or eliminated so that the impacts cannot be meaningfully measured, detected, or evaluated. In addition, based on no goshawks currently being observed and protection measures required by TLRMP standards and guidelines if goshawks are found in the future, the project ***may impact individuals, but is not likely to cause a trend to federal listing or a loss of viability*** for the northern goshawk. These determinations are based on the following:

- Minor changes to important habitat elements will occur under the proposed action alternatives.
- Timing of construction activities will not occur when large concentrations of marine mammals are present in Berners Bay.
- Additional goshawk surveys will occur before any mining activities take place.
- Marine mammal mitigation and monitoring will be part of the construction activities and initial crew shuttle operations plan.

In addition to the above, the proposed project will have **no effect** on the Kittlitz's murrelet, and the following listed fish species: Upper Columbia River spring-run chinook salmon, Snake River sockeye salmon, Upper Columbia River steelhead trout, Lower Columbia River chinook salmon, Puget Sound chinook salmon, Upper Willamette River chinook salmon, Snake River fall-run chinook salmon, Snake River spring/summer-run chinook salmon, Snake River basin steelhead trout, Lower Columbia River steelhead trout, and Middle Columbia River steelhead trout. This determination is based on the premise that these species occur in marine waters on the outside coast, to the west of the Tongass National Forest. They are not known to inhabit the coastal marine waters of the Tongass National Forest. They may, however, feed on fish that are dependent on the waters of the Tongass National Forest at some stage of their lives.

Based on the above information, the proposed project will have **no impact** on the following Forest Service sensitive listed wildlife and fish species: trumpeter swan, osprey, Peale's peregrine falcon, Fish Creek chum salmon, island king salmon, and northern pike. This determination is based on: no documented occurrence near the project area and no habitat present near the project area.

If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, then activities causing impacts would be suspended and the Section 7 Consultation process would be reinitiated.

8. LITERATURE CITED

ABR, Inc. 2000. Bald eagle and northern goshawk nesting surveys, Jualin Mine Project, Alaska. Prepared for Coeur Alaska, Inc., by R.J. Ritchie and J. Shook, ABR, Inc.—Environmental Research and Services. Final Report.

ADF&G (Alaska Department of Fish and Game). 2003. Coded Wire Tag Lab. Available online: http://tagotoweb.adfg.state.ak.us/CWT/reports/sesport_form.asp.

Atkins, N., and S.L. Swartz (eds.). 1989. Proceedings of the workshop to review and evaluate whale watching programs and management needs/November 14-16 1988, Monterey, CA. Cent. Mar. Conserv., Washington, DC. 53 pp.

Baker, C.S., and L.M. Herman. 1989. Behavioral responses of summering humpback whales to vessel traffic: Experimental and opportunistic observations. NPS-NR-TRS-89-01. Rep. from Kewalo Basin Mar. Mamm. Lab., Univ. Hawaii, Honolulu, HI, for U.S. Natl. Park Serv., Anchorage, AK. 50 pp. NTIS PB90-198409.

Baker, C.S., L.M. Herman, B.G. Bays, and G.B. Bauer. 1983. The impact of vessel traffic on the behavior of humpback whales in Southeast Alaska: 1982 season. Rep. From Kewalo Basin Mar. Mamm. Lab., Honolulu, HI, for U.S. Natl. Mar. Mamm. Lab., Seattle, WA. 30 pp.

Baker, C.S., L.M. Herman, B.G. Bays and W.F. Stifel. 1982. The impact of vessel traffic on the behavior of humpback whales in Southeast Alaska. Rep. from Kewalo Basin Mar. Mamm. Lab., Honolulu, HI for U.S. Natl. Mar. Fish. Serv., Seattle, WA. 78 p.

Bellrose, F.C. 1976. Ducks, Geese & Swans of North America. Second edition. Stackpole Books, Harrisburg, Pennsylvania, USA.

Blackwell, S.B., and C.R. Greene, Jr. 2001. Sound measurements, 2000 break-up and open water seasons. In: Monitoring of industrial sounds, seals, and whale calls during construction of BP's Northstar oil development, Alaskan Beaufort Sea, 2000. LGL and Greene Ridge Sciences Inc. April 2001.

Bowles, A.E., and B.S. Stewart. 1980. Disturbances to the Pinnipeds and Birds of San Miguel Island, 1979-1980. Technical Report submitted by Hubbs-Sea World Research Institute and San Diego State University to U.S. Air Force. 246 pgs.

Bryant, P.J., G. Nichols, T.B. Bryant, and K. Miller. 1981. Krill availability and the distribution of humpback whales in Southeast Alaska. Journal of Mammalogy 62: 427-430.

Busby, P.J. et al. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA Tech. Memo. NMFS-NWFSC-27. U.S. Dept. Commer., NOAA. 261 pp.

Calambokidis, J., G.H. Steiger, and L.E. Healey. 1983. Behavior of harbor seals and their reaction to vessels in Glacier Bay, Alaska. In Abstract of the Fifth Biennial Conference on the Biology of Marine Mammals, Boston, MA, November 1983. Page 6.

Calkins, D.G., D.C. McAllister, G.W. Pendleton, and K.W. Pitcher. 1999. Steller sea lion status and trend in Southeast Alaska. Marine Mammal Science 15:462-467.

Calkins, D.G. 1986. Marine Mammals. *In:* D.W. Hood and S.T. Zimmerman (eds.), pp. 527-560. The Gulf of Alaska Physical Environment and Biological Resources. Mineral Management Service Publication number OCS Study: MMS 86-0095, U.S. Government Printing Office, Washington, DC.

Calkins, D.G. 1979 [publ. 1983]. Marine Mammals of Lower Cook Inlet and the Potential for Impact from Outer Continental Shelf Oil and Gas Exploration, Development, and Transport. Environ. Assess. Alaskan Cont. Shelf, Final Rep. Princ. Invest., NOAA, Juneau, AK 20:171-263. 650 pp. NTIS PB85-201226.

Coeur (Coeur Alaska, Inc). 1995. Kensington Gold Project, Description of Project Changes.

Coeur. 2001. Amended Plan of Operations for the Kensington Gold Project.

Conant, Bruce, J.I. Hodges, D.J. Groves, and J.G. King. 2001. Alaska Trumpeter Swan Status Report 2000 [abstract]. Waterfowl Management, USFWS. Juneau, Alaska. 260 pp. March 2001.

Day, R.H., K.L. Oakley and D.R. Barnard. 1983. Nest sites and eggs of Kittlitz's and marbled murrelets. Condor 85(3):265-273.

Doherty, J.L., and C.M. Gabriele. 2001. Population characteristics of humpback whales in Glacier Bay and adjacent waters: 2001. Glacier Bay National Park and Preserve. Gustavus, AK. 28 pp.

Erbe, C. 2002. Underwater Noise of Whale-Watching Boats and Potential Effects on Killer Whales (*Orcinus orca*), Based on an Acoustic Impact Model. Marine Mammal Science 18(2): 394-418.

Erbe, C. 2003. Assessment of Bioacoustic Impact of Ships on Humpback Whales in Glacier Bay, Alaska. Prepared for Glacier Bay National Park and Preserve, Gustavus, Alaska. May 2003. 38 pp.

Flatten, C., K. Titus, and R. Lowell. 2001. Northern goshawk monitoring, population ecology and diet on the Tongass National Forest. Grant SE-4-2-6. Alaska Department of Fish and Game, Douglas, Alaska. 33 pp.

Forest Service (USDA Forest Service). 1992. Kensington Gold Project Final Environmental Impact Statement and Record of Decision. USDA Forest Service, Tongass National Forest. Alaska Region, Juneau, Alaska.

Forest Service. 1997a. Kensington Gold Project Final Supplemental Environmental Impact Statement and Record of Decision. USDA Forest Service, Tongass National Forest. Alaska Region, Juneau, Alaska.

Forest Service. 1997b. Tongass National Forest Land and Resource Management Plan. Alaska Region R10-MB-338dd. pp. 4-88 to 4-93 and 4-112 to 4-122.

Forest Service. 1997c. Tongass Land Management Plan Revision, Final Environmental Impact Statement. USDA Forest Service, Tongass National Forest, R10-MB-338dd (Record of Decision, Final Environmental Impact Statement—Part 1 and Part 2, Map Packet, Appendix—Volume 1, Volume 2, Volume 3, Volume 4, and Errata). Alaska Region, Juneau, Alaska.

Forest Service. 1998a. Cascade Point Access Road, Final Environmental Impact Statement. R10-MB-36B. USDA Forest Service, Tongass National Forest, Sitka, AK.

Forest Service. 1998b. Tongass National Forest land and resource management plan implementation policy clarification. Alaska Region, Tongass National Forest, pp. A-3 to A-4.

Forest Service. 2004. Kensington Gold Project. Draft *Supplemental Environmental Impact Statement*. USDA Forest Service, Tongass National Forest. January 23, 2004.

Gende, S.M., J.N. Womble, M.F. Willson, and B.H. Marston. 2001. Cooperative foraging by Steller sea lions (*Eumetopias jubatus*). Can. Field-Nat. 115: 355-356.

Geraci, J.R. 1990. Physiologic and Toxic Effects on Cetaceans, in: J.R. Geraci and D.J. St. Aubin, eds, Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc. San Diego, CA. 282 p. Pg. 191.

Hoover, A.A. 1988. Harbor seal *Phoca vitulina*. P. 125-157 In: J.W. Lentfer (ed.), Selected marine mammals of Alaska/Species accounts with research and management recommendations. U.S. Mar. Mamm. Comm., Washington, DC. 275 p. NTIS PB88-178462.

Irwin, R.J., M. VanMouwerik, L. Stevens, M.D. Seese, and W. Basham. 1998. Environmental Contaminants Encyclopedia. National Park Service, Water Resources Division, Fort Collins, Colorado. Available online: Nature Net portion of the Park Service Home Page [http://www.nps.gov].

Iverson, C.G., G.D. Hayward, K. Titus, E. DeGayner, R.E. Lowell, D.C. Crocker-Bedford, P.F. Schempf, and J. Lindell. 1996. Conservation Assessment for the Northern Goshawk in Southeast Alaska. Gen. Tech. Rep. PNW-GTR-387, November 1996, Pacific Northwest Research Station, Portland, Oregon. USDA, Forest Service. 101 pp.

Jensen, A.S., and G.K. Silber. 2003. Large Whale Ship Strike Database. U.S. Dept. of Commerce, NOAA Technical Memorandum. NMFS-OPR-, January 2004. 37 pp. Available online: http://www.nmfs.noaa.gov/pr/overview/publicat.html.

Kastak, D., R. J. Schusterman, B.L. Southall, and C.J. Reichmuth. 1999. Underwater temporary shift induced by octave-band noise in three species of pinniped. J. Acoust. Soc. Am. 106(2): 1142-1148.

Kendall, S.J., and B.A. Agler. 1998. Distribution and abundance of Kittlitz's murrelets in southcentral and southeastern Alaska. Colonial Waterbirds 21(1):53-60.

Krieger, K. and B.L. Wing. 1984. Hydroacoustic Surveys and Identification of Humpback Whales Forage in Glacier Bay, Stephens Passage, and Frederick Sound, Southeastern Alaska, Summer 1983. Technical Memorandum NMGS/NWC-66. National Oceanic and Atmospheric Administration.

LGL Alaska Research Associates, Inc. 2003. Memorandum to Louise Flynn from Michael T. Williams. Re: Acoustic Appendix C. Dated October 31, 2002. Unpublished literature research and analysis for the Glacier Bay National Park and Preserve Vessel Quotas and Operating Requirements Draft EIS. Anchorage, AK.

Lien, J., Todd S., Stevick, P., Marques, F. and Ketten, D. 1993. The reaction of humpback whales to explosives; Orientation, movements and behavior. 126th Meeting of the Acoustical Society of America. Journal of the Acoustical Society of America 94: 1849.

Marston, Brian H., Mary F. Willson, Scott M. Gende. 2002. Predator aggregations during eulachon (*Thaleichthys pacificus*) spawning runs. Alaska Department of Fish and Game, Wildlife Conservation. Juneau, Alaska. 8 pp.

McNeil, W.J. and D.C. Himsworth (eds). 1980. Salmonid ecosystems of the North Pacific. Oregon State University Press and Oregon State University Sea Grant College Program, Corvallis, OR. 331 pp.

Mizroch, S.A., L. Shaw, K. Laidre and K. Brix 1998. Seasonal Distribution of Marine Mammals Based on Observations from the Alaska State Ferries. Draft report. Natl. Mar. Mamm. Lab., Seattle, WA. 18 pp.

Myers, J.M. et al. 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. NOAA Tech. Memo. NMFS-NWFSC-35. U.S. Dept. Commer., NOAA. 443 pp.

NMFS (National Marine Fisheries Service). 1987. Endangered fish and wildlife; approaching humpback whales in Hawaiian waters. Fed. Regist. 52(225, 23 Nov.): 44912-44915 [50 CFR Part 222].

NMFS. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 p. Website www.fakr.noaa.gov/protected resources/whales/default/htm.

NMFS. 1992. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 92 pp.

National Marine Fisheries Service. 1993. Designated critical habitat for the Steller sea lion (*Eumetopias jubatus*) for Alaska rookeries, haulouts, and associated areas. 50 CFR 226.202, August 27, 1993.

NMFS. 2001a. 50 CFR Part 224 Regulations Governing the Approach to Humpback Whales in Alaska (*Megaptera novaeangliae*). Fed. Reg./Vol. 66, No. 105, May 31, 2001. Pgs: 29502-29509. Available online at http://www.fakr.noaa.gov/protectedresources/.htm.

NMFS. 2001b. 50 CFR. Part 226.202 Designating critical habitat for Steller sea lions. Steller sea lion (*Eumetopias jubatus*). Available Online: http://www.fakr.noaa.gov/protectedresources/stellers/habitat.htm.

NMFS. 2002a. Stock Assessment Reports (SARS) by Species/Stock for the humpback whale. Report 2002, revised October 30, 2001. Available online: http://www.nmfs.noaa.gov/prot_res/ PR2/Stock_Assessment_Program/individual_sars.html.

NMFS. 2002b. Stock Assessment Reports (SARS) by Species/Stock for the Steller sea lion. Report 2002, revised September 29, 2001. Available online: http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/individual_sars.html.

NMFS. 2003b. Draft Marine Mammal Stock Assessment Reports (SARS) by Species/Stock. Draft Reports 2003, revised June 2003. R. P. Angliss and K. L. Lodge, editors. National Marine Mammal Laboratory, Alaska Fisheries Science Center. Seattle, WA. Available online: http://www.nmfs.noaa.gov/pr/readingrm/draft_2003_sars/AK_draft_SARs_2003.pdf.

National Marine Mammal Laboratory (NMML). 2003. Steller sea lion research. [online] http://nmml.afsc.noaa.gov.

NPS (National Park Service). 2003. Final Environmental Impact Statement., Vessel Quotas and Operating Requirements. Glacier Bay National Park and Preserve, Alaska; USDI National Park Service.

Neff, J.M. 1990. Composition and fate of petroleum and spill-treating agents in the marine environment. In: J.R. Geraci and D.J. St. Aubin, eds, Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc. San Diego, CA. 282 pp.

Neff, J.M and J.W. Anderson. 1981. In: J.R. Geraci and D.J. St. Aubin, eds, Sea Mammals and Oil: confronting the risks. 1990. Page 25. Academic Press, Inc. San Diego, CA. 282 pp.

NOAA/Hazardous Materials Response and Assessment Division. 2003. Fact Sheet: Small Diesel Spills (500-5000 gallons). NOAA Scientific Support Team. Seattle, WA. 2 pp.

Porter, B. 1997. Winter ecology of Steller sea lions (*Eumetopias jubatus*) in Alaska. Master of Science thesis, Department of zoology, University of British Columbia, Victoria, BC.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine mammals and noise. Acad. Press, San Diego, CA. 576 pp.

Raum-Suryan, K.L., M.J. Rehberg, G.W. Pendleton, K. Pitcher, and T.S. Gelatt. 2004. Development of dispersal, movement patterns, and haul-out use by pup and juvenile Steller sea lions (*Eumetopias jubatus*) in Alaska. Marine Mammal Science, 20, No. 4: 823-850.

Raum-Suryan, K.L., K. Pitcher, D. Calkins, and J. Sease. 2002. Dispersal, rookery fidelity, and metapopulation structure of Steller sea lions (*Eumetopias jubatus*) in an increasing and a decreasing population in Alaska. Marine Mammal Science, 18(30): 746-764.

St. Aubin, D. J. 1990. Physiologic and Toxic Effects on Pinnipeds. In: J.R. Geraci and D.J. St. Aubin, eds, Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc. San Diego, CA. Page 123. 282 pp.

Sease, J.L., C.J. Gudmundson. 2002. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) from the western stock in Alaska, June and July 2001 and 2002. U.S. Dep. Commerce, NOAA Technical Memorandum NMFS-AFSC-131. 45 pp.

Sease, J.L., W.P. Taylor, T.R. Loughlin, and K.W. Pitcher. 2001. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1999 and 2000. NOAA Technical Memorandum NMFS-AFSC-122. 52 p.

Sigler, M.F., J.J. Vollenweider, and J.N. Womble. 2003. Availability to Steller sea lions (*Eumetopias jubatus*) of a seasonal prey resource: a pre-spawning aggregation of eulachon (*Thaleichtyys pacificus*). NMFS, Alaska Fisheries Science Center, Auke Bay Laboratory. Final Report J17515. 36 pp.

Straley, J.M., T.J. Quinn, and C.M. Gabriele. 2002. Estimate of the abundance of humpback whales in southeastern Alaska 1994-2000. Report to NMFS, NMML, Grant No. G00000756, SFOS02-223, Seattle, WA. October 2001. 22 pp.

Sydeman, W. J., and S. G. Allen. 1997. Trends and oceanographic correlates of pinniped populations in the Gulf of the Farallones, California. U.S. Dep. Commer., Southwest Fish. Sci. Cent., Admin. Rep. LJ-97-02C, 28 pp.

Titus, K., C.J. Flatten, and R.E. Lowell. 1994. Federal aid annual research performance report. Northern goshawk ecology and habitat relationships on the Tongass National Forest (Goshawk nest sites, nest sites, food habits, morphology, home range, and habitat data). Final Annual Project Report for Tongass National Forest, Alaska Region, Juneau, AK. May 1994. Alaska Department of Fish and Game, Division of Wildlife Conservation, Southeast Regional Office. 137 pp.

URS (URS Corporation). 2004. Wildlife Technical Report for the Juneau Access Improvements Supplemental Draft EIS. State Project no. 71100. Federal Project no. STP-000S (131). Alaska Department of Transportation and Public Facilities, Juneau, AK. March 2004.

USFWS (U.S. Fish and Wildlife Service). 2003. Wildlife and Human Use of the Shoreline and Near-shore waters of Berners Bay, Southeast Alaska. A preliminary report prepared by the Juneau Fish and Wildlife Field Office and the Juneau Waterfowl Investigations Office, USFWS, Juneau, AK. 25 pp.

USFWS. 2003. Larry Rickard's (USDA Forest Service) phone conversation with Steve Brockman, USFWS, requesting information on threatened, endangered or proposed species on the Tongass National Forest. Ref. #03-06V.

VanDaele, L. 1994. Osprey in Alaska. Alaska Department of Fish and Game. Notebook Series. Juneau, Alaska. Available online: http://www.adfg.state.ak.us/pubs/notebook/bird/osprey.php.

Van Vliet, G. 1993. Status concerns for the "Global" population of Kittlitz's Murrelet: Is the "Glacier Murrelet" receding? Pacific Seabird Group Bulletin 20(1):15-16.

Watkins, W.A. 1986. Whale reactions to human activities in Cape Cod water. Mar. Mamm. Sci. 2(4):251-262.

Womble, J. 2003, May 8. Conversation among Jamie Womble (University of Alaska Southeast), Gene Weglinski (Tetra Tech), and Mike Kelly (University of Alaska Anchorage Environment and Natural Resources Institute).

Appendix A

Coeur Alaska Kensington Gold Project: Berners Bay Transportation Policy Mitigation Measures, and Best Management Practices Plan

Coeur Alaska Kensington Gold Mine

Berners Bay Transportation Policy and

Mitigation and Best Management Practices Plan

September 2004

Coeur Alaska, Inc.
3031 Clinton Dr., Suite 202
Juneau, Alaska 99801

Coeur Alaska Kensington Gold Mine
Berners Bay Transportation Policy and
Mitigation and Best Management Practices Plan

September 2004

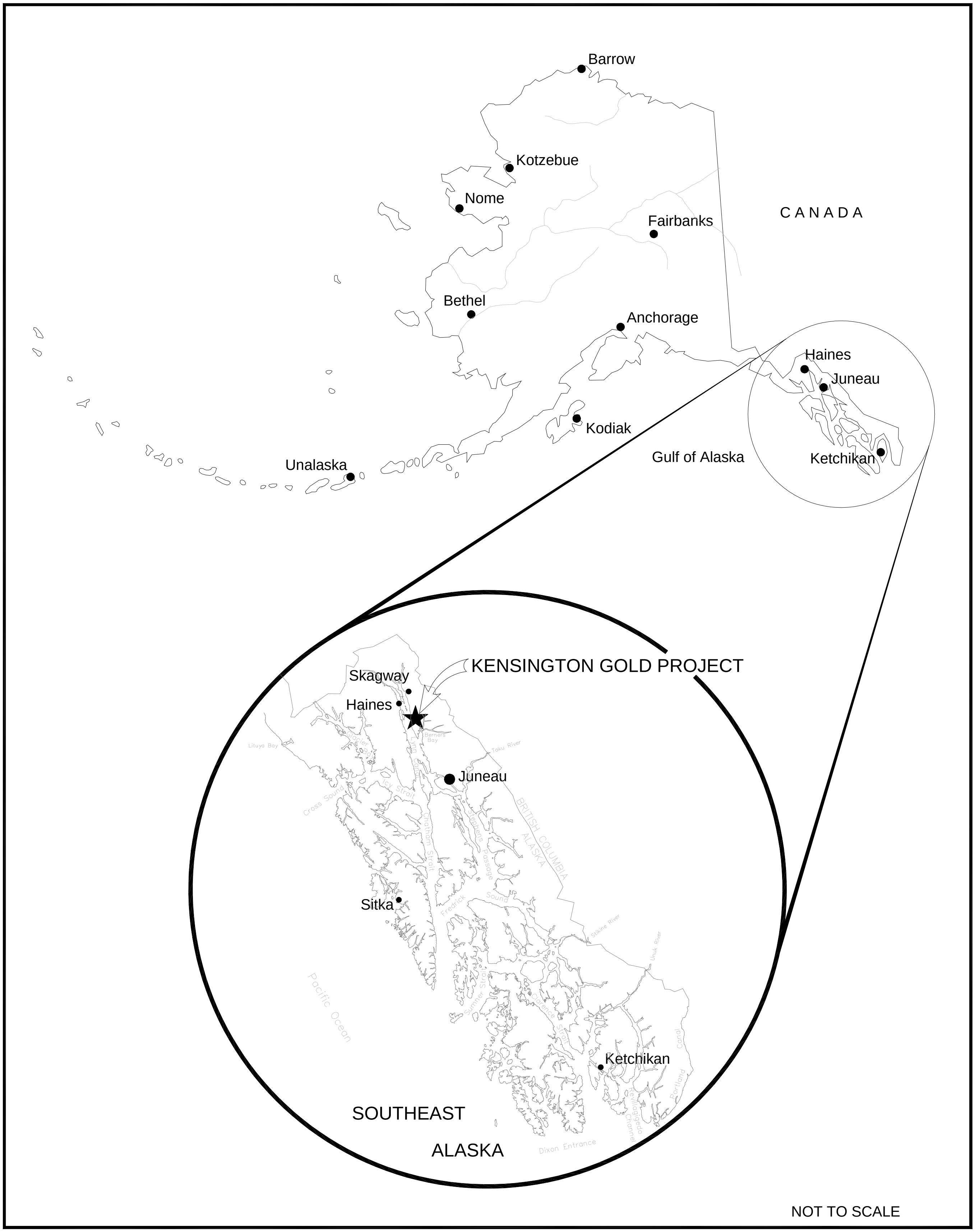
Background

Coeur Alaska, Inc. (Coeur), a wholly-owned subsidiary of Coeur d'Alene Mines Corporation, is proposing to construct and operate a 2000 ton per day (tpd) underground gold mine and processing facility on patented and unpatented mining claims located about 45 miles north-northwest of Juneau, Alaska (Figure 1). The project would be accessible by boat across Berners Bay. Berners Bay has important aquatic resources, marine mammals, and recreation uses.

The Kensington Gold Mine, as currently proposed, would involve the following major operating components:

- 2000 tpd underground mining operation
- Conventional flotation milling process at the existing Jualin Millsite; gold concentrate to be shipped offsite for final processing
- A tailings storage facility located at Lower Slate Lake
- A 6 mile access road from Slate Creek Cove to the millsite and mine
- Daily access across Berners Bay from a dock at Cascade Point to the upgraded Slate Creek Cove landing area and a newly constructed dock

Figure 2 shows a proposed general facilities siting arrangement for the project components. The primary transportation routings (Cascade Point to Slate Creek Cove; Jualin mine access road) are highlighted on the figure. The marine terminal at Cascade Point consists of a breakwater, pedestrian access dock, aluminum gangway, and moveable float. The breakwater has been reconfigured as a "dogleg," to minimize fill intrusion into the intertidal zone. The breakwater is also designed with a breach, to allow shallow water fish passage at most high tides. The breakwater also generally conforms to the shoreline, with limited perpendicular obstruction. As compared to the Echo Cove dock (150,000 yd^3 of dredging), only 70,000 yd^3 of dredging would be required. The Slate Creek Cove terminal consists of an earthen ramp, platform dock, moveable ramp and floating dock. No dredging is required. The proposed construction plan includes specific best management practices (BMP's) to reduce sedimentation, construction prohibition "windows," and seasonal noise constraints. Operational BMP's are described later in this document.



SHEPHERD MILLER
INCORPORATED

FIGURE 1
PROJECT LOCATION MAP

Date:	APRIL 2000
Project:	100619
File:	LOCMAP.dwg

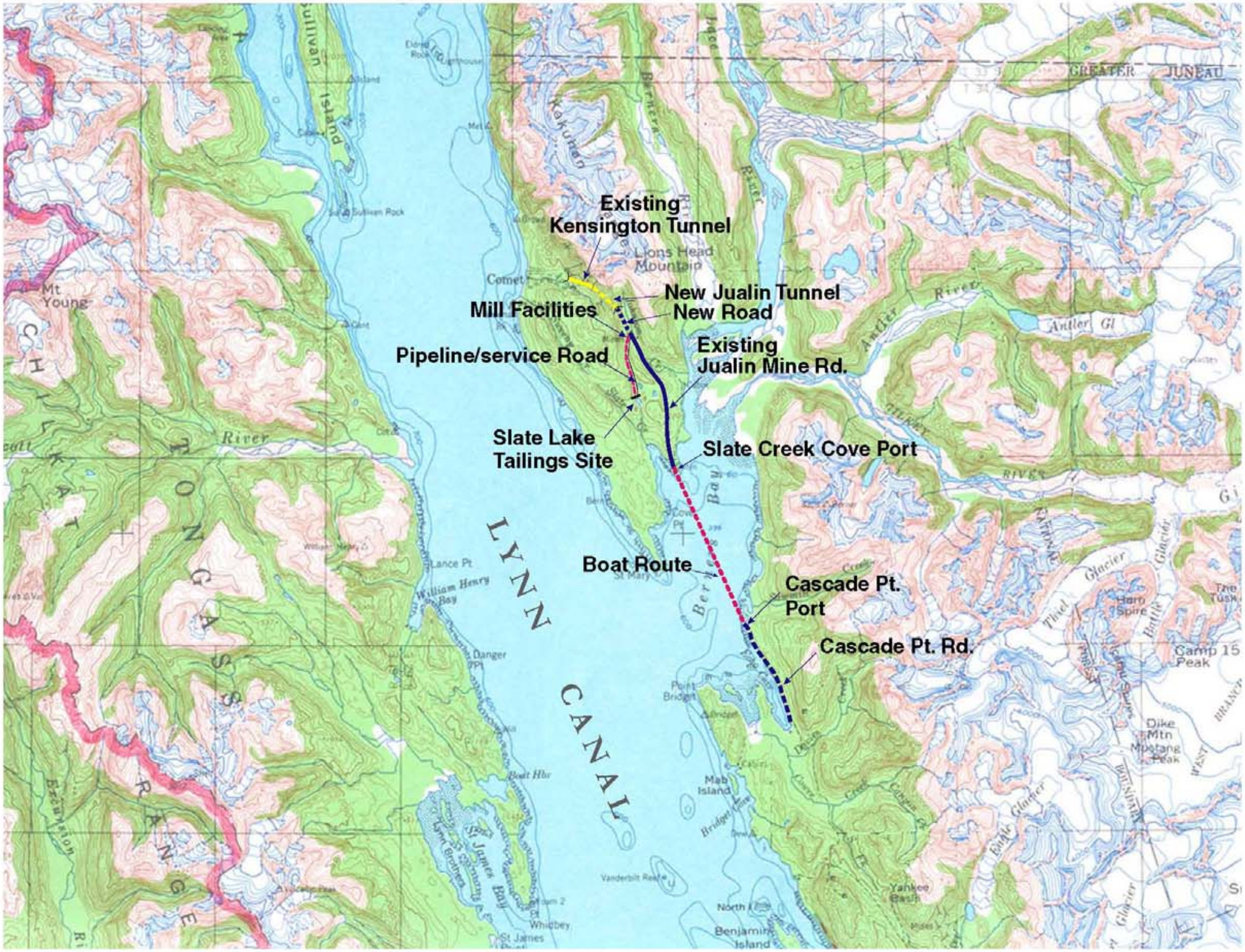

Existing
Kensington Tunnel
New Jualin Tunnel
New Road
Mill Facilities
Pipeline/service Road
Existing
Jualin Mine Rd.
Slate Lake
Tailings Site
Slate Creek Cove Port
Boat Route
Cascade Pt.
Port
Cascade Pt. Rd.
LYNN CANAL

Figure 2

Purpose and Need for Policy

During the environmental impact (NEPA) review process for the Kensington Gold Mine operation, resource agencies and certain publics raised concerns regarding potential impacts of construction and operation of the proposed docks at Cascade Point and Slate Creek Cove on local spawning eulachon and Pacific herring spawning, and Steller sea lion populations. Key concerns are summarized as follows, for the purposes of this plan:

- Eulachon – Returning adult fish are found congregating in Berners Bay near Slate Creek Cove during April and May, before moving into fresh water at the mouth of the Lace, Berners and Antler Rivers. At this time, Steller sea lion abundance also increases. Concern exists over construction and operational activities involving noise and increased dock traffic, and effects on fish spawning and sea lion feeding.

- Pacific herring – Returning fish are known to congregate in the vicinity of the proposed Cascade Point dock during about a 2-3 week period between late April and early May when they spawn. Construction of a breakwater and dock at Cascade Point could result in a loss of permanent habitat; residual hydrocarbons potentially resulting from accidental petroleum spills and/or general marine vessel operations could also adversely affect fish growth and development, and possible spawning.

- Steller sea lion – Excessive noise associated with dock construction and marine vessel operations and traffic could potentially stress sea lion populations, foraging behavior, and reproduction.

Transportation use, such as the daily transport of mine workers and barging of supplies and concentrate, could also impact recreation users. Regular announced schedules, limited trip schedules, and adherence to speed limits and wake control will largely offset these effects.

The effects of the proposed dock facilities and marine traffic associated with the daily commute are difficult to predict. Resource managers indicate they do not have enough information regarding specific habitat factors and potential environmental stressors from development projects such as Kensington. These researchers and managers agree that a combination of Best Management Practices (BMP's) and a monitoring program are necessary to mitigate potential impacts of the proposed project. The BMP's would focus on reducing impacts during construction by prohibiting "in water" work during the critical spawning and incubation period, and controlling sedimentation. BMP's implemented during operations would focus on limiting potential pollution from petroleum hydrocarbons, and optimizing avoidance actions for marine mammals (sea lion) congregating populations in the area, to the extent practicable.

For the purposes of this plan, best management practices are activities, including passive treatment, operating procedures, and avoidance actions, that prevent or reduce the discharge of pollutants, and limit encounters with marine mammals and special fish species. The BMP's included herein are also intended to provide mitigation, consistent with the Clean Water Act, Endangered Species Act, and other applicable federal, state and local laws and regulations. The plan is also intended to be consistent with Coeur's Environmental Policy: "producing and protecting." Key provisions are intended to increase employee awareness of hazards, and thereby improve worker safety and limit pollution liabilities and risks.

Associated monitoring programs would at the same time provide critical information on herring habitat, spawning locations, and water quality. Best Management Practices and monitoring priorities for this Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan can be generally summarized as follows:

Best Management Practices listed in this plan would include (but not be limited to):

- Prohibit in-water construction activities during the period April 15 through June 30
- Silt curtains or other methods to control sediment from being transported off-site into adjacent habitat during construction
- Measures to prevent and control petroleum hydrocarbons from getting into the water during both construction and operations

Monitoring would include:

- Water quality monitoring for petroleum hydrocarbons in Berners Bay
- Map submerged aquatic vegetation between Echo Cove and Cascade Point
- Monitor and document colonization and habitat value of the breakwater
- Monitor and document herring spawning activity and location(s) in Berners Bay

Overview of Coeur's Goals, Policy and Transportation/Mitigation Plan

Coeur has developed environmental management policies, guidelines, and practices included in this document to ensure that environmental impacts are minimized and mitigated during construction and operation of the Kensington Gold Mine, including related transportation facilities and needs. Implementation of these environmental protection measures will occur, as soon as the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD), and related applicable permits are issued by the respective agencies, approving the project. The BMP plan outlined herein will be incorporated into the "Final Plan of Operations for the Kensington Gold Mine," and submitted to the USDA Forest Service for approval, in advance of construction of related facilities on National Forest lands.

The following primary goals are identified for the "Coeur Alaska Kensington Gold Mine Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan":

Goal #1: The overall policy and direction of this plan is comprised of "standard operating procedures" (SOP's), to be followed by Coeur and all its contractors, service providers, and consultants as part of the marine facilities construction and operating plans. These SOP's will be included in all related construction and service contracts.

Goal #2: The primary overriding goal is: "to protect the Berners Bay environment as part of a coordinated and comprehensive transportation and environmental management plan, consistent with the current U.S. Forest Service land use

planning goal of Modified Landscape (ML) with a minerals overlay Land Use Classification, and the stated goals and objectives of the Kensington Berners Bay Consortium. The stated goals of the ML minerals designation are to encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for mineral development.

Goal # 3: Other key objectives of the Coeur Transportation Policy and Mitigation and Best Management Practices Plan are:

- Avoid in-water construction activities during the period of herring spawning and incubation (about April 15 through June 30)
- Avoid incremental water quality impacts to Berners Bay
- Commit to one coordinated marine vessel fueling option involving one fueling location, for transport of mine workers from Cascade Point to Slate Creek Cove
- Mitigate potential effects of hydrocarbon inputs from gasoline and fuel on sensitive fish species through the implementation of a sound fueling plan, and responsible operational BMP program
- Incorporate recent design improvements for the dock facilities at Cascade Point and Slate Creek Cove, in order to facilitate fish passage and intertidal flushing at the facilities
- Continue to financially support and participate in a coordinated/cooperative Berners Bay environmental monitoring program initiated by Coeur, ADNR / ADF&G, NMFS / Auke Bay Laboratory, and University of Alaska; the program could also be expanded, as appropriate and agreed upon

Goal # 4: Coeur will work with ADNR to develop effective monitoring and mitigation programs and appropriate environmental thresholds for mitigation, for the Cascade Point and Slate Creek Cove dock sites, as part of the State's Tideland Leases for the two facilities

Goal # 5: Primary Operating Procedures (SOP's) of the Transportation/Mitigation Plan for Berners Bay to be followed by Coeur, its service providers, and consultants are as follows (these will be contractual requirements):

SOP #1: Coeur will identify and operate according to a "designated transportation routing" from Cascade Point to Slate Creek Cove, for the daily marine vessel transport of mine workers

SOP #2: Regular schedules will also be established for weekday and weekend workers' transport (these will minimize the number of daily trips, to the extent practicable)

SOP #3: Routings and schedules will be strictly adhered to, except where unusual environmental or workers' safety considerations dictate an alternative approach

SOP #4: Designated routing and schedules will also be established for barge transport to the Slate Creek Cove dock site

SOP #5: Vessels will operate at low, constant speeds and regular scheduled intervals; vessels will not approach within 100 yards of Steller sea lions, humpback whales, and other sensitive marine mammal species

SOP #6: Marine fueling of Coeur transport vessels will occur only at Cascade Point dock or Auke Bay dock, or other approved U.S. Coast Guard facilities. Kensington marine vessel fueling will not take place at Slate Creek Cove dock, except for emergency environmental situations and/or conditions involving worker safety which dictate such limited use. Other requirements for Cascade Point, based on a separate agreement with Goldbelt are as follows:

- The Cascade Point dock will be used primarily by a single dedicated marine vessel, to transport mine workers to and from the minesite
- No other vessel fueling except the Coeur Kensington marine vessel would be fueled a the Cascade Point facility
- No fuel storage would occur at the site; a fueling truck from Juneau would be used to meet the dedicated vessels needs

SOP #7: The following special considerations will be given by Coeur during the spring eulachon spawning season:

- Coeur will work with the NMFS and USF&W Service to develop a "Steller sea lion awareness training" manual, to be used by Coeur (and other) marine pilots operating vessels in Berners Bay
- Marine vessel encounters with special fish species, marine mammals and important bird species will be recorded and reported, as part of the overall monitoring plan
- Coeur, ADNR/ADFG, and NMFS will annually mutually agree to that year's "eulachon spawning season" to encompass 2-3 weeks, during which a "transportation action strategy" will be implemented by the company as part of an overall traffic plan
- As part of the transportation action strategy, during the designated eulachon spawning season (approximately between April 15 to May 15 window – typically about 2-3 weeks), marine transport vessels for the Kensington Gold Project will be fueled outside of Berners Bay, at a U.S. Coast Guard approved facility
- During the designated eulachon spawning season, Coeur will fund a NMFS "observer" to accompany the designated vessel pilot and take part in determining the best daily routing from Cascade Point to Slate Creek Cove dock, so as to minimize Steller sea lion encounters, and also minimize incidental takings within the context of insuring reasonable access to the Kensington Gold Project minesite
- During this period, Coeur will attempt (to the extent practicable) to reduce the typical daily worker transport schedule from 3-5 trips/day, to not more than 2 or 3 trips/day (except for emergency environmental or safety situations)

- Coeur will build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period
- Coeur will, to the extent practicable, limit concentrate barging during this 2-3 week period (similar to reduced fuel shipments)
- Other chemical and supplies shipments will be curtailed during that period, to the extent practicable, so as to further limit all barging and reduce Steller sea lion encounters
- **Coeur will evaluate the potential practicability and safety considerations related to utilizing a portable, moveable dock which could receive Kensington mine workers at alternative sites within Slate Creek Cove, during the eulachon spawning season. (Note: may not be possible/practicable)**
- During the herring spawning season, Coeur and/or their transportation contractor will adjust regular Cascade Point to Slate Creek Cove routing so as to avoid large congregations of surface spawning forage fish (NMFS observer and Coeur to determine routes)
- Design considerations for the Cascade Point dock facility will consider the slope and composition of fill used in breakwater construction to provide shallower water and large rock outcrops, to the extent practicable
- Coeur will conduct dive surveys of the breakwater and adjacent habitat likely to be impacted by construction and operation of the breakwater, initially on an annual basis following construction for every year during a 5 year period, then at year 10 and year 20 (post-operations)
- During the herring spawning season, Coeur and/or their transportation contractor will limit refueling inside Berners Bay at the Cascade Point to one event per week; the vessel will also be "boomed" during fueling
- Fueling will occur from upland by a fuel truck stationed in a totally contained facility; all related activities will be subject to strict provisions of Coeur's Spill Contingency Plan

<u>Other Standard Operating Procedures (SOP's)</u>

SOP #8: Coeur will implement Stormwater Pollution Prevention Plan (including stormwater management control practices, measures to reduce pollutants in stormwater, SPCC Plan, preventive maintenance programs, employee education programs, record-keeping and audits, annual plan revisions) at the two dock sites

SOP #9: Controls for erosion and sedimentation, total containment of petroleum products, oils and grease separation, stormwater diversions, and covered storage areas will be employed by Coeur and its contracting operators at the Cascade

Point and Slate Creek Cove transport facilities, and by boat operations serving the project

SOP #10: Specific BMP's for Marine Vessels and Docks Required by Coeur include the following commitments by Coeur. Coeur or its contractor(s) will:

- Require (contractually) that service providers and users abide by approved BMP's at the two docks
- Provide designated work area(s) for outside boat repairs and maintenance – no maintenance will be permitted outside of these areas
- Prohibit bottom cleaning and sanding in or near the Cascade Point or Slate Creek Cove dock area; upland area(s) are required for these activities
- Perform maintenance over tarps to ease cleanup at these upland maintenance areas
- Provide upland cleanup areas with adequate stormwater management facilities
- Utilize oil and water separators for stormwater collection and treatment at the dock facilities and parking areas
- Inspect stormwater drainage and washing systems regularly at these upload sites
- Develop and implement standard operating procedures BMP's for the management of all solid waste associated with the docks and boat transport facilities, including recycling, compacting, and reuse as appropriate
- Use flyers, pamphlets and newsletters to raise operators and passengers awareness of need to implement BMP's
- Provide and maintain appropriate storage, transfer, containment and disposal facilities for all liquid and solid wastes generated by the mine transportation operations
- Separate containers for disposal and clearly mark those containers for: used antifreeze, oils, greases, solvents and other materials
- Store and dispose of incompatible or reactive materials in accordance with the CBJ Fire Code (designated storage areas should be covered and the inside area sloped to a dead end sump with total containment provided (all drains to be equipped with positive control valves or devices)
- Leaking containers must be emptied promptly upon detection, either by transferring the material into a non-leaking container or by disposing of it in a proper waste container
- Coeur will develop and implement a waste management and spill response plan, to be adhered to by its employees and contractors
- Annual training of employees and contractors on appropriate waste management and spill response will be provided by Coeur; attendance will be mandatory; federal, state and local regulators will be invited to take part in this training program
- An adequate supply of spill containment and response equipment will be maintained by Coeur at the following locations: 1) Cascade Point dock; 2) Slate Creek Cove dock; and 3) the minesite (supplies are described in the Spill Contingency Plan)
- Regular inspection and cleaning of bilges will be required, including the installation and maintenance of oil/water separators and filters

- Regular inspection of fuel lines and hoses for chaffing, wear and general deterioration is required (replace with USCG Type A)
- Non-spill vacuum systems for spill proof oil changes or to pump out oily bilge water is required
- Marine vessel engines must be regularly tuned and operating at peak efficiencies
- Waste oil must be removed from the maintenance site by a permitted waste oil transporter
- Use of oil-absorbing materials in the bilges of transport boats is required, along with replacement and proper disposal as necessary
- All sewage must be disposed of at approved land-based facilities
- Use of biodegradable treatment chemicals in holding tanks is required
- Use of low phosphate detergents to reduce phosphorous loads to approved treatment systems is required

Additional Construction and Operational SOP Requirements of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan

***SOP #11*:** Coeur will sponsor a "Berners Bay Working Group" to include: NMFS, USFS, USF&WS, ADNR, Coeur, a commercial fisheries organization, commercial crabbers association, and Goldbelt

SOP #12: Coeur will also implement the following construction best management practices (BMP's) at the Cascade Point and Slate Creek Cove dock sites for both the construction and operation of the two facilities:

- As part of the design criteria, Coeur will limit fill placement in subtidal areas to the extent practicable, to minimize effects on marine fish rearing habitat
- Coeur will use best efforts to place fill at low tides, to the extent practicable, to reduce impacts of sedimentation on the marine environment
- The design criteria will prohibit the use of creosote or pentachlorophenol treated wood materials in construction that would have contact with the water, in order to avoid toxic effects to juvenile fish
- The design criteria will promote the use of metal grating as a top surface, where practicable from an engineering and safety standpoint, for dock facilities (walkways, catwalks and gangways) in order to facilitate light penetration for aquatic plants
- Construction contracts will restrict the use of impact hammers to the extent practicable, both from a scheduling, engineering and safety standpoint, in the installation of steel piles required for the docks, as a fisheries mitigation activity
- The final design will include prudently engineered breach in the Cascade Point breakwater to allow for juvenile fish passage at high tides (this assumes, fish will also congregate behind the breakwater to take advantage of feeding opportunities.
- Coeur will maintain prudent engineering in the dogleg design concept for the Cascade Point breakwater to ensure:
  - reducing the amount of documented kelp that would be directly impacted
  - orienting the end of the breakwater away from habitat to the north that is generally better suited for herring spawning than to the south

- reducing the amount of habitat to the east and south of the breakwater that will have reduced wave energy as a result of the breakwater

- Reduce fill needed for Slate Creek Cove dock facility loading ramp, so as to limit protrusion into Berners Bay, while not jeopardizing loading and offloading worker safety and creating unnecessary environmental risk

SOP #13: Coeur will develop a Spill Response Plan to be implemented at both the Cascade Point and Slate Creek Cove dock facilities, and the minesite, in order to prevent fuel and chemical spills, and minimize their environmental impacts in the event of an accidental spill. The Spill Response Plan will be adopted and implemented as a key component of this mitigation plan. The primary objective of the Spill Contingency Plan will be to:

- Reduce the risk for accidental spills and environmental degradation
- Provide the operating facility with the necessary information to properly respond to a fuel or oil spill or chemical spill event.
- Clearly define line of function responsibilities for a spill situation
- Provide a concise response and clean-up program which minimizes environmental impacts

SOP #14: The effectiveness of the Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan and related contingency plans and monitoring programs would be evaluated after year one of construction, and year one of operations, and every third-year thereafter in order to facilitate the goals and policies of the program. The findings of the review or "environmental audit," to be conducted by a qualified third-party contractor commissioned by Coeur, would be presented to the "Berners Bay Working Group" and key resource management agencies during the month of February of that year, in order to evaluate programs and recommend modifications an/or realignments to policies, where necessary.

Coeur will commit to these policies, BMP's, mitigation activities, and monitoring programs, to be incorporated into the overall mitigation component of the Final Plan of Operations, to be approved by the U.S. Forest Service. It is understood that approval of this plan by the U.S. Forest Service does not relieve Coeur of its responsibilities to comply with other Federal, State, and Local laws, rules, and regulations.

Appendix B

Kensington Gold Project Spill Response and Best Management Practices (BMP) Plan, Including the Emergency Response Plan

Kensington Gold Project

SPILL RESPONSE and BMP PLAN

Including the

EMERGENCY RESPONSE PLAN

Prepared by
RTR Resource Management, Inc.

for
Coeur Alaska Inc.

October, 2004

Annual Certification:______________________________Date:_____________
Signature Required

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INTRODUCTION

This document has been prepared for inter-agency review and comment. It is not intended to serve as a replacement document for any one of the four existing plans, listed below, that cover the current configuration of the Kensington Gold Project:

1. Marine Transfer-Related Facility Response Plan (USCG);
2. Spill Prevention, Control, and Countermeasures Plan (USEPA);
3. Emergency Response Action Plan (ADEC); and the
4. Facility Operations Plan (USCG).

These documents have been incorporated into a unified Facility Response Plan as required by 33 CFR 154, Subpart F for marine transportation-related facilities. As dictated, these plans and associated facilities are required to be reviewed by a Registered Professional Engineer and will be updated to include the revised facilities at Kensington once they have been constructed.

The following document has been designed to incorporate all of the considerations for the transportation, handling, and storage of hazardous materials for the optimized Kensington Gold Project as described in the Draft Supplemental Environmental Impact Statement for discussion purposes only. Special planning serves as partial mitigation to minimize the effects associated with handling these materials and responding to accidents or spills in this remote area in a timely manner and this document serves as a mechanism to receive regulatory agency comments and considerations for Standard Operating Procedures adopted for the Kensington Gold Project. Recently Coeur Alaska has distributed the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004),* for comments in the same manner that this document is being distributed.

There are two main sections to this document: the Emergency Response Plan and the Spill Prevention and Response Manual. The Emergency Response Plan appears in Section 1 as it was considered the most time critical section, first to be seen upon opening the document. It is intended that the Emergency Response Form, on the inside front cover of this document is the only piece of paper required to systematically gather and report the required information in the event of an emergency situation. All potential users of this document must be made

aware that in an emergency, only the Emergency Response form needs to be completed initially. The Spill Prevention and Response Manual, Section 2, first lists the industry standard preventative measures required when storing bulk materials at the facility, then identifies the potential risks to the environment, and finally suggests appropriate mitigation for the identified risks.

Section 1 – Emergency Response Plan

The FIRST ACTION in the event of an emergency is to comply with the Emergency Response Form located inside the front cover of this document. Do not read any further, please refer immediately to the Form on the inside cover of this binder.

This section of the plan is to document the systematic approach that will be taken by Coeur Alaska personnel to respond to accidents along the regularly traveled corridor to access the minesite. The response plan is targeted towards personal injury and/or spills as defined in the following section and on the Emergency Response Form located inside the front cover of this document.

These plans must **only** be located at:

1. The Mine Receptionist Desk;
2. The Environmental Manager’s Desk;
3. The Safety Officer’s Desk; and
4. The Corporate Office Receptionist Desk.

There shall **only** be 4 copies of this document in existence and each of the documents must receive the same update information (i.e. be of the same version and date as shown in the footer of each page). Updating this document is the responsibility of the Environmental Manager.

The first person to learn of the accident and refer to the Emergency Response Plan assumes the role of Incident Commander and must comply with the form inside the front cover.

1.1 Emergency Action Form for Accidents and Spills

All employees of Coeur Alaska will be made aware that there is an Emergency Response Form located immediately inside the front cover of this document. The purpose of the Form

is to streamline the gathering and reporting of accurate information to provide to the appropriate response agency(ies) and the appropriate Coeur Alaska staff. Subsequent follow-up reporting, once the emergency situation has been attended to, is the individual responsibility of the environmental and safety managers, as described in Section 1.5.

1.2 Identification and Notification of Spills

A spill is defined as "any discharge of hazardous materials or special waste upon land or into waters of the State of Alaska". This would include accidental spills involving discharge outside of a defined total containment system to the environment.

Per state regulation 18 AAC 75.300 releases of hazardous substances other than oil, or discharges of oil to water, or discharges in excess of 55 gallons of oil outside of a containment area require immediate notification. Releases in excess of 10 gallons, but less that 55 gallons of oil to land require notification in 48 hours.

The policy of Coeur Alaska will be to comply with all ADEC and federal regulations by responding and reporting all of the minor and major spills occurring as a result of Coeur Alaska operations.

1.3 Incident Command System

Once an emergency is discovered, one of the 4 Emergency Response Plan locations will be contacted:

1. The Mine Receptionist Desk;
2. The Environmental Manager's Desk;
3. The Safety Officer's Desk; and
4. The Corporate Office Receptionist Desk

Once contact has been established, that person, equipped with the Emergency Response Plan will refer to the Emergency Response Form and assume the role of Incident Commander. The Incident Commander then becomes responsible for completing, or assigning the tasks listed on the Emergency Response Form located in the front cover of this document. The

acceptance and potential transfer of the role of Incident Commander is documented on the Emergency Response Form by signature.

1.4 Product Characteristics

The potentially hazardous materials that will be transported to the Kensington Gold Project site include: lime, cement, diesel, hydraulic fluid, oils and greases, anti-freeze, acids, reagents (PAX, MIBC, surfactant, scale inhibitor), polymers, and flocculants.

Each potential hazardous material has an updated Material Safety Data Sheet located in Appendix 4. These sheets should be consulted in the event of an accident to determine if any special precautions or handling requirements are warranted.

1.5 Standard Reporting Form and Contact Information

The responsibilities of the Incident Commander filling out the Emergency Response Form are defined to immediately attend to any reported incidents of personal injury and spills that could potentially degrade waters of the State.

Follow-up post-emergency reporting is deferred to the appropriate environmental and safety managers with Coeur Alaska. Their responsibilities are to determine the extent of reporting required for the incident and contact the appropriate agencies to comply with required incident reporting. Emergency reporting for releases of hazardous materials other than oil, discharges of oil to water, and discharges greater than 55 gallons of oil outside of secondary containment is required to be submitted to the Alaska Department of Environmental Conservation (Appendix 2 – Spill Report Form) and incidents of personal injury require reporting to MSHA.

Once the Mine Manager has been notified of the incident, all subsequent notices to company personnel and others are the responsibility of the Mine Manager. The Incident Commander does not release any information to the public or media.

Subsequent to any accident, Coeur Alaska personnel will commit to completing and documenting a formal post-accident review to ensure that any changes to the existing

operating and response procedures that are warranted, will be implemented. The Safety Manager will also be included in the debriefing session to evaluate the cause of the accident with the intent to rectify any identified contributing issues.

Coeur Alaska will commit to an annual review of all planning and response documents, to be certified by signature on the front cover of this document.

Section 2 – Spill Prevention and Response Manual

As described in the previous section, Coeur Alaska is committed to providing employees, contractors, and suppliers with the skills and knowledge required to ensure that the maximum effort is afforded to spill prevention and response. The following text describes the specific actions to be taken by Kensington staff.

2.1 Prevention Programs and Training

All employees of the Kensington Gold Project are covered by the regulatory jurisdiction and training requirements of the Mine Safety and Health Administration (MSHA) while engaged in their normal work duties. Training for all employees, contractors, and suppliers working onsite, will include emergency response for accidents and spills as well as spill response containment and clean-up as part of the required MSHA hazard training requirements. All personnel that would be exposed to petroleum or chemical products, or assisting in the clean-up of petroleum or chemical products, will be tasked trained according to the following programs.

2.1.1 Prevention Training Program

All employees using petroleum products stored at the Kensington Gold Project, or involved in maintenance of petroleum storage and dispensing systems, will receive training and instruction in the areas of:

1. Operation and maintenance of equipment necessary to prevent unintended discharges.
2. The location and use of spill containment and cleanup supplies.
3. Applicable pollution control laws, rules, and regulations.
4. Discharge prevention.
5. Changes pertaining to any of the above items.

Employees handling, using, or who are otherwise exposed to petroleum products will also receive training in accordance with applicable MSHA (30 CFR 48, 57) and Occupational

Safety and Health Administration (OSHA), Hazard Communication regulations (29 CFR 1910.1200). This training will address:

1. Hazards
2. Appropriate work practices, procedures, and protective equipment to be used during both normal operations and in the event of a foreseeable emergency.

Employees designated or expected to perform emergency response functions for releases of hazardous substances (including petroleum products) will receive training as required by OSHA (29 CFR 1910.38).

Training will be conducted by supervisory personnel, and/or training program contractors according to the following table.

Table 1 - Kensington Annual Training Schedule

Position	Type of Training				
	Hazwoper	Oil Spill Response	Confined Entry	Incident Command	Wildlife Hazing
Key Managers	24 hour, 8 hr Annual refresher	Annual with drills	For selected personnel	Initial training, Annual refresher	Initial training, Annual update
Facility Response Personnel	As above for all response personnel	As above for all response personnel	For selected Personnel	As above for all response personnel	For selected personnel
Contractors and Suppliers	Required for selected personnel	Initial Training, Annual Refresher	For selected personnel	Initial Training, Annual Refresher	Upon introduction to the project

All personnel who have spill response duties as part of their job function will be trained at the time they first report for work. Employees transferring to new job functions which have oil spill response duties will be trained at the time they assume their new responsibilities.
Any changes or new information concerning discharge prevention and operational and emergency procedures for petroleum storage and dispensing systems will be communicated to all affected employees by either memoranda, routine safety meetings, and/or supplemental

training sessions. Training sessions will be recorded and filed in the safety department's filing system.

2.1.2 Drug and Alcohol Abuse Program

Accidents are often a result of human error due to poor judgment or delayed response caused by the effects of drugs or alcohol. Coeur Alaska's zero tolerance drug and alcohol abuse program is presented below. Contractors and Suppliers will also be required by signed contract to abide by the Program as described below:

Statement of Policy

To ensure a safe and productive work environment at all Coeur Alaska facilities and to safeguard Coeur Alaska employees and property, Coeur Alaska strictly prohibits the use, sale, transfer or possession of alcohol, drugs, or controlled substances or the presence of an illegal drug, illegal drug metabolite, or alcohol in the employee's system, on any Coeur Alaska premises, work sites, or during work time. Excluded are prescribed drugs when used in the manner, combination, and quantity intended unless job performance could be affected. This policy applies to all personnel, including supervision and management. Compliance with this policy is required as a condition of continued employment. Any employee found in violation of this policy will be terminated. Depending on the circumstances, other actions, including notification of appropriate law enforcement agencies, will be taken in response to a violation of the policy.

Purpose

The purpose of this policy is to outline standards and procedures for dealing with employee and drug abuse. Substance abuse has been linked to numerous on-the-job accidents. Employees not only endanger themselves when they are impaired, but also their fellow workers. Providing a safe work place is a strict policy of Coeur Alaska. To avoid the many problems that result from employee substance abuse, Coeur Alaska maintains a zero tolerance drug and alcohol policy.

In order to provide high quality service and a safe and efficient work environment, Coeur Alaska requires its employees to report to work fit to perform their jobs. To ensure this,

Coeur Alaska has established the following policies and procedures dealing with employee drug and alcohol abuse:

Definitions

Alcohol or Alcoholic Beverages: "Alcohol" means beer, wine, and all forms of distilled liquor containing ethyl alcohol. References to the use of, or the possession of alcohol, include the use or possession of any beverage, mixture, or preparation containing ethyl alcohol.

Drug: Any substance (other than alcohol) that has known mind- or function-altering effects on a person, including psychoactive substances, and substances prohibited or controlled by State and Federal controlled substance laws.

Prescribed Drug: Any substance prescribed by a licensed medical practitioner for the individual consuming it.

Under the Influence: Being unable to perform work in a safe and productive manner, being in a physical or mental condition which creates a risk to the safety and well being of the individual, other employees, the public, or Coeur Alaska's property. The symptoms of influence and/or impairment are not confined to those consistent with misbehavior or to obvious impairment of physical or mental ability such as slurred speech or difficulty in maintaining balance.

Inspections and Searches

Coeur Alaska's vehicles, lockers, desks, filing cabinets, files, etc. remain the property of Coeur Alaska and will be subject to Coeur Alaska initiated searches at any time and without notice.

Employees and their possessions, including their vehicles located on Coeur Alaska property, are subject to Coeur Alaska initiated searches at any time and without notice if management has reason to suspect that any employee(s) will be in violation of the terms of this policy.

Employee Substance Abuse Tests

In order to assure compliance with Coeur Alaska's prohibition concerning alcohol and drug use and as a condition of continued employment, employees are required to cooperate in drug and/or alcohol substance abuse testing procedures. Any employee who refuses to cooperate in any aspect of the drug and alcohol testing process described in this policy will be terminated.

Urine/blood testing of employees will be conducted in accordance with the following:

A. Periodically, upon the approval of the corporate Administrative Manager Resources and without reason for suspicion of abuse, any or all employees at a particular facility will be tested for drug and alcohol usage without advance notice.
B. Upon reasonable suspicion that drugs or alcohol are being used at a particular facility, department, or work group, any or all employees at the facility, department, or work group will be tested without advance notice.
C. When company officials have a reasonable suspicion that an employee(s) is/are intoxicated or under the influence of drugs and/or alcohol, a test will be conducted immediately without advance notice.

The following are examples of reasonable suspicion, as that phrase is used in this policy:

(1) Reports of drug or alcohol use from police, customers, other employees, or other individuals.
(2) Observation by supervisor that an employee is apparently under the influence or impaired by drugs or alcohol and not fit for duty.
(3) Ongoing work performance problem.
(4) Rule violation that created a dangerous situation.

After testing of an employee for reasons B. and C. stated above, that individual will be suspended without pay until the test results have been received by the Human Resource Department. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results. If the results are positive, the employee will be terminated.

Post-accident drug and/or alcohol testing of employees will be conducted in accordance with the following:

A. An employee involved in an accident, injury, or safety violation will be required to submit to a drug and/or alcohol test immediately. An employee shall be tested under the following circumstances:

1. After any work-related accident resulting in damage exceeding $1,000.
2. After any work-related injury.
3. After any work-related safety rule violation.

After testing of an employee for reasons stated above, that individual will be suspended without pay until the test results have been received by the Human Resources Manager. Each injury or accident will be evaluated by the supervisor and the Safety Department. It will be left to their discretion as to whether the employee will be suspended.

If the employee is suspended and test results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension. In the event disciplinary action is taken pursuant to the incident, the pay will be forfeited.

B. All employees who were in the vicinity of a work-related accident, injury, or safety rule violation, and who, in the opinion of the supervisor, will have contributed to such accident, injury, or violation, shall also be required to submit to a drug or alcohol test.
C. An employee testing positive will be terminated.
D. An employee who refuses to cooperate in drug and/or alcohol testing procedures will be terminated.

An employee required to submit to blood or urine specimen for testing shall be informed by a designated Coeur Alaska representative of the reason why he/she is being requested to submit a specimen. An employee who refuses to cooperate in drug and alcohol testing procedures will be terminated.

Tests shall be accomplished through analysis of a blood or urine sample and /or any other testing method recommended by the designated medical clinic. All specimens will be obtained from the employee by an authorized representative designated by Coeur Alaska. A supervisor or designated representative will escort the employee to the authorized Coeur Alaska representative and the employee's cooperation with the collection procedures will be required.

Coeur Alaska will have the specimen identified and tested by a competent laboratory for the presence of drugs and/or alcohol.

Confidentiality

The Human Resources Department will receive all test results. The appropriate department manager will be notified of results strictly on a need-to-know basis.

No laboratory results or test results shall appear in a personnel folder. Information of this nature will be included in a medical file with a marker to appear on the inside cover of the personnel folder to show that this information is contained elsewhere.

Use of Results

If the test results are positive for any substance, Coeur Alaska will notify the employee(s) of the results.

A positive result to a drug or alcohol test will result in termination. If the results are negative, the employee will be allowed to return to work and will be paid for the regular scheduled shift(s) lost due to the suspension which occurred prior to receiving the test results.

If test is positive, an employee will be provided an opportunity to explain the presence of the identified substance. In the absence of an acceptable explanation, the employee will be terminated immediately.

Pre-Employment Substance Abuse Tests

Each applicant who is given favorable consideration for a position in Coeur Alaska will be subject to Coeur Alaska's drug and alcohol policy.

An applicant who refuses to submit to pre-employment testing when requested, or refuses to sign Coeur Alaska's drug testing policy consent form, will not be employed.

Coeur Alaska will notify the applicant of the results of any test taken that is positive for any substance included in the procedure. In the case of a positive result, Coeur Alaska will provide the applicant with an opportunity to explain the presence of the identified substance prior to taking any action on the application for employment. In the absence of an acceptable explanation, an applicant with a positive test result will not be employed.

Use of Prescription and/or Over-the-Counter Drugs

In the event an employee is under the care of a physician and taking prescribed medication which might impair his or her ability to perform a job, the employee must notify his or her manager in advance. It is at management's discretion whether the employee will continue to perform the normal assigned duties.

When taking a prescribed drug, the employee must provide a statement from his/her doctor advising that the employee's job performance is not materially affected by the drug prescribed. the doctor's statement will also describe what restrictions will be put on the

employee to ensure that the employee does not pose a threat to his/her own safety, the safety of co-workers or the public.

In those circumstances where the use of a prescribed or over-the-counter drug is inconsistent with the safe and efficient performance of duties, an employee will be required to take sick leave, a leave of absence, or other action determined to be appropriate by Coeur Alaska management.

2.1.3 Medical Monitoring Program

All personnel engaged in facility fuel transfer operations, handling of hazardous materials, and spill response duties, will be monitored by the Safety Officer to ensure their ability to safely perform their job assignments based on their general physical condition as determined by the pre-hire physical and periodic assessment by the Safety Officer.

2.1.4 Security Policies and Practices

The Kensington Gold Project is located in a remote area. Warning signs will be posted at points of entry and Kensington Gold Project personnel will inspect the operations to keep unauthorized persons from entering the facility.

It is not expected that vandalism, unauthorized entry or sabotage will be a problem as the Kensington Gold Project is remote, access is limited, and personnel are on-site 24 hours per day, and will conduct inspections of the facility as part of the normal operational routine. A check of the fuel storage and dispensing areas, and oil storage systems, is part of these regular inspections.

The following operational procedures will help ensure facility security.

- Close and lock all valves
- Close and lock all electrical panels
- Close and lock all doors to pump rooms, generator buildings, and other spaces related to the operation of fuel facilities
- Inspect facility product lines, valves and connections on a routine daily basis
- Verify that all yard lighting is functional on a daily basis.

2.1.5 Storage Vessel Requirements

Tank design, fabrication, and erection shall be in accordance with the applicable portions of the following standards:

- API Standard 650
- American Society of Civil Engineers Standards for Tank Construction
- 1991 Uniform Building Code Guidelines on Tank Construction and Foundations
- 1991 National Fire Protection Association Guidelines
- UL specifications for above-ground self-contained oil storage tanks

In addition all vertical welded tanks shall be designed and constructed for compliance with UBC Seismic Zone 3 and Wind Shear Load Category C (100 mph).

2.1.5.1 Corrosion Control and Leak Detection

In accordance with API 651 principles, corrosion protection for the tanks will not be warranted. The tanks will not come into contact with any soils and no pathways of conductivity exist between the tank bottoms and potential sources of corrosion.

All single wall tanks will be located within secondary containment structures and impervious 30-oz/square yard polymer coated polyester liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment structure sidewalls. The floor of each containment structure slopes to a collection ditch at one end of the containment.

Vertical welded steel tanks are mounted within the secondary containment structures on concrete ring wall foundations with oiled sand pads supporting the tank floors. The oiled sand pads are installed on top of impervious liners that are sealed to the inside surface of the ring walls to provide under floor containment. Any tank floor leaks will discharge to the oiled sand pads and then drain to the secondary containment structure via 1" HDPE drainpipes cast into the ring walls.

Horizontal welded steel tanks are mounted within the secondary containment structures on concrete slabs to which the impervious containment liners are sealed.

A release from either vertical or horizontal tanks would be detected visually during daily visual inspections of the secondary containment structures.

2.1.5.2 Overfill Protection

Overfill protection for all tanks will be designed in accordance with API Recommended Practices 2350, Overfill Protection for Petroleum Storage Tanks.

Bulk storage tanks will be equipped with a visual float level gauging system that shows the actual fluid level inside the tanks. The indicators shall be clearly visible and easily read from ground level outside the tank during routine inspections, tank inventory, and fuel transfer operations.

Each bulk tank shall also be equipped with an independent automatic overfill alarm and transfer pump shutdown system, that uses liquid level floats to activate audible alarms and emergency shutdown of internal transfer pumps. A pre-alarm level shall be set at 95% of the working fill height. When fuel level reaches this height a pre-alarm condition shall be initiated during which an audible alarm sounds and an indicator light is energized on the control panel. The pre-alarm light and audible alarm can be reset only by Kensington Gold Project personnel at the control panel. When fuel level reaches working fill height a second float initiates an alarm condition during which a second alarm and light are energized and all facility in-line transfer pumps are shut down. Resetting of this alarm condition shall be possible only after the level in the tank drops below the working fill level.

All double-walled or self-diked tanks shall be equipped with overfill limiter valves set at 95% of tank capacity and shall have locking fill-containment pans fitted to the fill pipes.

2.1.5.3 Secondary Containment

All single wall tanks are located within secondary containment structures and impervious liners are provided under each containment structure. Each liner is sealed to the interior and exterior surface of each foundation ring wall (for vertical welded tanks), to each concrete slab (for horizontal tanks), and to the containment sidewalls. Each secondary containment structure is sized to contain 110% of the capacity of the largest tank retained by the structure.

The floor of each containment structure is sloped to drain toward a collection ditch at one end. Accumulated precipitation will be removed as necessary by site personnel by operating a normally closed and locked drain valve. Only water that is free of any sheen will be discharged from each containment structure. Containment drainage will be discharged to the facility stormwater management system, which is operated in compliance with EPA BMPs.

Truck load-in/load-out facilities are located adjacent to three of the bulk storage areas. Each truck load-in/load-out facility is equipped with a catchment system that drains to an integral containment tank sized to hold the volume of the largest single compartment of the tank truck. The containment tank is visually monitored by Kensington Gold Project personnel during routine operations and manually pumped to the adjacent bulk storage secondary containment structure whenever necessary.

All day tanks located outside of the secondary containment areas will be self-diked steel tanks that provide full secondary containment.

2.2 Potential Discharge Risk Analysis

The following materials are considered to be most at risk for release to the environment:

Petroleum Product	Individual Capacity	Material of Construction	Manufacture Date	Potential Type of Failure	Secondary Containment
diesel, gasoline	6,500 gallons	Stainless steel cylinder in metal box	N/A	rupture, pierce or overturning	lined, bermed laydown area
gasoline, lubrication oils/greases, hydraulic oils	55 gallons	steel drums	N/A	rupture, pierce or overturning	lined, bermed laydown area

Typically, barges 286 feet long by 75 feet wide will be used to import petroleum products to the site. Unloading of materials will be by a roll-on, roll-off forklift transfer system.

2.3 Receiving Environment Risk Analysis

There are two receiving environments that are subject to the highest degree of risk for the potential release of hydrocarbons: Johnson Creek and the intertidal zone at the marine terminal facilities.

Two bridges cross Johnson Creek while transporting petroleum, and other hazardous materials, to the minesite. Accidents and potential discharges here will require rapid response and specialized equipment. To address this issue, portable spill containment equipment will be stored and readily available at these two bridge locations. Rapid response equipment will also be cached at the stormwater collection pond located at the toe of the process area, which would accept any contaminated runoff from accidental discharges at this facility.

Spill response equipment will also be readily available at each marine facility to shorten the response time of discharges to the intertidal zone.

2.4 Response Strategies and Safety Considerations

This section discusses measures for hazardous material, spill prevention, control and countermeasure plans, as currently planned for the Kensington Gold Project. The project is currently undergoing a NEPA analysis (EIS), and final feasibility study. The plan described herein is, therefore, conceptual by necessity. Once the FEIS and Record of Decision are completed, a final plan will be developed for inclusion into the Final Plan of Operations.

Applicable regulations include the Federal Oil Spill Prevention Regulations (40 CFR Part 112) designed to help prevent spills, and US Department of Transportation regulations that govern oil transport and carriers, the Emergency Planning and Right-to-Know Act (EPCRA which requires reporting of 'reportable quantities' of hazardous materials, and other applicable requirements. The objectives are:

- Reduce the risk of accidental spills to the environment, and related environmental degradation
- Provide the Kensington Gold Project with the necessary information to properly respond to diesel fuel and chemical spills

- Clearly define line of function responsibilities for a spill event
- Provide a concise response and clean-up program which minimizes environmental impacts

All observers to an accident or spill must first identify the mechanism of failure or accident and the materials involved to ensure that there is no danger by entering the discharge or accident area.

The sequence of events for anyone discovering a spill will be:

1. Determine the origin of the spill and identify the discharge material.

2. Stop the discharge as safely as possible, which includes closing valves, stoping pumps, and transferring fuel out of leaking tanks.

3. Safeguard human life by alerting unnecessary personnel to evacuate, shutting off power in the vicinity or path of a discharge.

4. Attempt for immediate containment if possible, including the use of boom and sorbents, blocking culverts and drains, and excavating trenches to redirect flow (Appendix 5 - Typical Spill Response Containment Procedures)

5. Reporting the spill by contacting one of the four Emergency Response Plan centers at the minesite noting material type and estimated quantity released.

A standard spill response form is presented in the document as Appendix 2 . It outlines the mandatory reporting needs for an accidental spill event. Key reporting requirements are:

- Date, time and physical conditions
- Location
- Occurrence situation
- Appropriate identification (person, vehicle, equipment)

- Nearest dwelling, water body, weather
- Extent of human exposure, injury
- Same for environmental
- Same for wildlife, fisheries
- Materials involved, container types
- Containment procedures, documentation
- Disposal procedures, documentation, chain of custody
- Environmental sampling
- Photo-documentation
- Signature of preparer.

A display of BMPs is presented later in Appendix 5 of this document.

Personnel involved in oil spill response activities at the Kensington Gold Project will comply with all applicable worker health and safety laws and regulations. Federal regulations include Mine Safety and Health Administration standards for mandatory health and safety as codified in 30 CFR for mining activities.

2.5 Final Notification and Reporting Required By Law

The following agencies must be notified if each of their respective thresholds are breached during a release of a hazardous material or petroleum product to water or land:

National Response Center: Sheen on water (releases to land are not reportable to the NRC)
ADEC: Sheen on water or, Releases to land 55 gallons
EPA: Water N/A, Land 1,000 gallons

The contact numbers for these agencies are listed in Appendix 3 in this document. Reporting to these agencies is the sole responsibility of the Environmental Manager at the Kensington Gold Project.

2.6 Transportation Impact Mitigation

2.6.1 Dust Control Measures

The application of water on roadways and exposed stockpiles serves as mitigation for dust control. Enhanced dust control is achieved with the use of surfactants that increase the retention time for applied moisture to the soils.

2.6.2 Soil Erosion Reduction

Remediation for sediment loading includes bank stabilization with revegetation, the use of BMPs described in Appendix 5, and primary treatment with settling ponds prior to water flow introduced into culvert.

2.6.3 Snow Removal and Maintenance

Unplanned snow removal has the potential to introduce additional sediment loading into the waterways unless disposal areas away from direct discharge areas have been planned and prepared in advance. At the Kensington Gold Project, snow cache areas will be designed into the road system to control snowmelt runoff.

2.6.4 Spill Response Equipment Stations

To address the risks identified in Section 2.2 and 2.3, and as remediation for unexpected spills, it is planned that spill response trailers will be placed at strategic locations along the traveled corridor where discharges of hazardous materials could directly enter the Johnson Creek system. Spill response equipment stations will also be located at each marine facility and at the process area siltation pond which accepts stormwater runoff from that area. Those stations will be equipped with significantly more boom for the marine area.

Spill kits will contain the following minimum equipment: Visqueen bags, silt fence and posts, shovels, life jackets, waders, gloves, rope, buckets, floating oil boom and sorbent pads.

Rapid response caches will be secured with a combination style lock with the code set to "1,2,3,4".

2.6.5 Marine Transportation

All of the fuel and supplies required for the construction and operation of the Kensington Gold Project are to be delivered via the Slate Creek Cove marine terminal. Consultation with regulatory agencies, special interest groups, and the public has identified several important considerations for the construction and operation of this facility which Coeur Alaska has formally adopted into the *Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, (September 2004).* A key aspect of this plan, with respect to BMPs associated with the risk of fuel spills, is Coeur's commitment to "…build up onsite fuel inventories in advance of the eulachon spawning season to a level which would support operations for a 30-day period, in order to reduce or eliminate mining operation fuel barging during the eulachon spawning period."

2.6.6 Cascade Point Marine Terminal Facility

Coeur Alaska is planning on contracting with Goldbelt to provide passenger ferry service from Goldbelt's proposed marine terminal facility located at Cascade Point. The terminal will be under the direct ownership and control of Goldbelt, however, as with all contractors providing services to the Kensington Gold Project, adherence to Coeur Alaska stipulations with respect to environmental protection and controls will be required.

The Cascade Point marine terminal is being designed to preclude the need for diesel fuel storage tanks for refueling the passenger ferries. Instead, an on-call fuel truck will be dispatched from Juneau as required to meet the fueling needs of the dedicated ferries. It is estimated that the refueling exercise will only require an average of one fueling per week. No other vessels will be refueling at the Cascade Point facility.

The fuel truck will tie into an upland fuel header located at edge of the parking lot area. The header will be located within a permanent structure secured by a locked

door on a bermed concrete pad to provide a non-permeable surface for containment of any spills.

A small diameter steel fuel pipeline will run from the header to the approach dock. It will be located above ground and away from any areas with vehicular traffic. The pipe will be mounted to the edge of the approach dock until reaching the gangway. A flexible hose connection will connect the pipe to an identical pipe section mounted on the gangway. Another flexible hose connection will join the gangway pipe to a pipe along a protected edge of the float dock. All flexible hoses will be protected by a flexible steel covering to limit the potential for vandalism.

At approximately mid-dock the fuel pipe connects to a hose reel. The reel is enclosed in a protective housing for security and weather protection purposes. The housing will be secured to a metal pan to capture any possible fuel drippings. At the end of the fuel hose is the nozzle.

<u>Standard Operating Procedures</u>

The actual transfer of fuel will be conducted under a standard operating procedure (SOP). The list of SOP's is as follows:

1. The fuel truck driver will connect the truck hose to the header. The driver will control and visually monitor the fuel transfer process at this location. Extra care will be taken to minimize any fuel leaks at the header connection.

2. The vessel engineer will do the actual fueling of the boat. The engineer will control and visually monitor the fuel hose nozzle during the transfer process. Extra care will be taken to prevent fuel spills at the nozzle location. The engineer will inform the fuel truck driver of the number of gallons to be transferred prior to starting.

3. The marine facility manager will supervise the overall fuel transfer process. It will be the manager's responsibility to ensure that all SOP's are being followed.

4. The truck driver, vessel engineer, and the marine facility manager will be in constant radio contact throughout the fuel transfer process.

Best Management Practices

A properly designed, constructed, and operated fuel transfer process with associated BMPs, should prevent releases of fuel to the environment. The BMPs for fuel transfer at the Cascade Point Marine Terminal are as follows:

1. All persons involved in the fuel transfer operation will be trained to follow the SOP's and the use of the identified BMPs.

2. A detailed spill response plan will be developed for the marine terminal facility (once the facility is constructed) and all personnel will be trained accordingly on the specific features of that facility.

3. Appropriate spill response equipment including various absorbent materials will be placed at the header and hose reel locations. The materials will be within easy reach in case of any spills. All used materials will be properly disposed of and replaced immediately.

4. A drip bucket will be hung below the fuel header connection. The bucket and the concrete pad will be kept in a clean condition.

5. An absorbent pad will be placed against the fuel nozzle while fueling and a drip bucket placed below the vent to catch any possible overflow.

6. The system will be inspected by the facility manager prior to each fuel transfer operation. In addition, the transfer system will be formally inspected and pressure tested on an annual basis. All maintenance and repair needs will be taken care of immediately in order to ensure continued trouble-free operation.

Appendix – 1

Original Emergency Response Form for Photocopying

Use the following form for photocopying only and ensure that there is always a clean copy in the front cover.

EMERGENCY RESPONSE FORM – INJURY and SPILLS

First Incident Commander's Name:___________________________ Time:_______________
Second Incident Commander's Name:_________________________ Time:_______________

1. Information to gather from the observer:

Number of persons affected:____

Mechanism and Extent of Injuries:____

Location of Accident:____

Best Access Route:____

Know Hazardous Goods Involved:____

Quantity of Hazardous Goods Spilled (consult the emergency information in Appendix 4 &5 for any precautions or special handling procedures):_________________________________

Site Weather Conditions:____

Observer's Call-back Number:____

2. **Call the Medivac Operator at: (907) 789-1099 if there are reported injuries for their assessment. The Mine Location is: Lat. 58 degrees 46 minutes North, Long. 135 degrees 01 minutes West. Give them YOUR callback number. Dispatch an Coeur Alaska First-Aid Technician to the scene of the accident, if possible.**

3. **Call the Environmental Manager (or the on-call environmental contact) at: (907) 789-1591 to assess the required action for a spill of any size. Dispatch a Coeur Alaska environmental spill response team, if possible.**

   If the environmental contact person cannot be reached, and the spill is deemed to be potentially detrimental to the surface waters of the State, the following agency must be notified: ADEC 907 465 5340 (daytime) 1-800-478-9300 (after hours).

4. **Call the Safety Officer (or the on-call safety contact) at: (907) 789-1591 to assess any required further action.**

   If the Safety Officer cannot be reached and the mechanism of injury is deemed to be potentially dangerous to the other employees (Hazardous Material), the following agency must be notified: Juneau Fire Department/Police Department – call 911.

5. **Notify the Mine Manager at: (907) 789-1591**

Appendix – 2

Initial Spill Report Form

Do not use this form. Make copies and have available in the back cover of this document.

Kensington Gold Project – Initial Spill Report Form

CALL THE COEUR ALASKA ENVIRONMENTAL GROUP CONTACT BEFORE YOU COMPLETE THIS FORM

Incident Information:

Date:_________________Time:__________________Observer's Name:___________________

Operator's Name:____

Spill Location:____

Description of
Incident:____
____
____

Quantity Spilled:______________________Material Spilled:____________________________

Discharged to:_______Land___________Water___________Air (check one)

If water, which waterbody:___________________________________

Source of Material Spilled:___________________________________

Clean-up
method:____
____

Clean-up: Planned:_______Completed:_________(check one)

Contaminated Area:____

Quantity of Soil:____

Actions taken to correct or mitigate the cause of the
release:____
____

Weather Conditions: Dry/Rain/Snow:____

Signature:__________________________________Date:_________________________

- FAX THIS FORM TO THE ENVIRONMENTAL MANAGER AT: (907) 789-1503 -

Appendix – 3 Contact Information

Appendix 3 – Contact Information

a. National Response Center/United States Coast Guard

1-800-424-8802

b. Alaska Department of Environmental Conservation

(907) 465-5340 (daytime) 1-800-478-9300 (after hours)

c. Juneau Fire Department/Police Department/LEPC

9-1-1

d. Southeast Alaska Petroleum Resource Organization (SEAPRO)
(only if directed to call by Management official)

1-907-225-7002
1-888-225-7676

e. Division of Homeland Security

1 (800) 478-2337

f. State Emergency Coordination Center (SECC)

1 (888) 462-7100

g. CBJ Fire Department Helicopter: 789-7554

h. Juneau Ranger District (<u>wildfires</u>): 586-8800

i. Medivac: 789-1099

APPENDIX 4

MATERIAL SAFETY DATA SHEETS FOR EACH CHEMICAL ONSITE

(to be completed once products are delivered to site)

APPENDIX 5

TYPICAL SOIL EROSION AND SPILL RESPONSE CONTAINMENT PROCEDURES

Appendix C

Allowable Use Permit for Gold Mine Development and Production within the Rural Mining District at Berners Bay

City/Borough of Juneau
Planning Commission
NOTICE OF DECISION
September 13, 2004
File No.: MIN2004-00003

Construction of Dock at Cascade Point

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

PLANNING COMMISSION
NOTICE OF DECISION
Date: September 13, 2004

File No.: MIN2004-00003

Coeur Alaska
3032 Vintage Blvd, Suite 101
Juneau, AK 99801

Application For:	An Allowable use permit for gold mine development and production within the Rural Mining District at Berners Bay.
Legal Description:	Berners Bay area
Parcel Code No.:	3-M00-0-BB0-004-0
Hearing Date:	August 31, 2004

The Planning Commission, at its regular public meeting, adopted the analysis and findings listed in the attached memorandum dated and approved the Allowable use permit for gold mine development and production within the Rural Mining District at Berners Bay to be conducted as described in the project description and project drawing submitted with the application and with the following conditions:

Traffic

1. Speed limit signs that are provided by, or are comparable to, Alaska Department of Transportation speed limit signs, shall be posted in readily visible locations at the tidewater and mill site ends of the haul road.
2. Coeur shall state in the approved Plan of Operations that passengers and freight vessels must reduce speed and/or alter course to lessen the wake effect on other boat traffic in the bay, particularly non-motorized vessels.
3. Unless weather, safety procedure, emergencies, or Federal Aviation Administration requirements dictate otherwise, the mine operator shall operate helicopters at elevations and along the flight path that follows, in order to minimize noise levels on residential areas and recreational users of Berners Bay.
   - The minimum flight elevation shall be 1,000 feet above ground level. The highest practicable elevation shall be maintained, preferably at least 2,000 feet above mean sea level.
   - The flight path shall be: from the Juneau Airport, head west while immediately climbing to FAA-directed or highest practicable altitude, cross the Mendenhall River, turn north to Montana Creek and proceed northwest following the creek drainage, on past Windfall Lake toward the mouth of Cowee Creek, north across Berners Bay, and then along the coastline of Lynn Canal to Comet Beach.

Parking and Circulation

4. The applicant shall develop and operate a bus commute for mine workers for the life of the project. This requirement may be waived only upon modification of this permit. A fully-operational bus commute system, which includes both a bus commute and park-an-ride as described in conditions 5 and 6 below, must be in place before any Occupancy Permit is issued to the applicant or the Allowable Use Permit will be revoked.
5. The park-and-ride facility must be located between Mile 6 and Mile 12 of Glacier Highway, and must be designed and sized to support daily bus transportation to and from Cascade Point for all mining shifts and all mine workers per shift. The park-and-ride facility must provide enough parking spaces for two shifts of workers, or 100 vehicles.
6. The bus commute shall consist of round-trip bus transportation from a park-and-ride facility to the Cascade Point Terminal and back. The busses shall be operated daily, 365 days per year, and shall be operated so as to provide transportation to and from each work shift. The busses shall have sufficient capacity to transport all hourly mineworkers scheduled for each work shift.
7. The applicant shall institute a company policy that its employees utilize the bus commute on a daily basis.

Exterior Lighting

8. Lighting at the marine terminals shall be used only during loading and off-loading of workers and materials, or when the terminals are otherwise in use, and applicant shall use an appropriate low-intensity lighting system to implement this condition.
9. Lighting must, to the extent that safety is not compromised, be directed downward, and remain within the perimeter of the site.
10. Lighting must be of a type that provides for adequate illumination without unnecessary glare. The applicant shall install a low-level lighting system, subject to Department approval, that provides for onsite safety while minimizing or eliminating offsite glare.
11. Lighting required by the Coast Guard as Aids to Navigation is exempt from these recommendations.

Signs

12. Speed limit signs and other signs managing traffic on the haul road shall comply with appropriate Alaska Department of Transportation standards for highway signage.
13. Signage at the park-and-ride facility must comply with standards in CBJ 49.45.

Safety

No recommendations

Noise

14. Company policy shall forbid the use of "jake" brakes, or compression braking, on trucks transiting the haul road to Slate Creek Cove, except under emergency circumstances.

15. Only rubber-tired machinery may be used to load and offload freight at the Slate Creek Cove marine terminal. Track machinery may be used for on and off-loading only when rubber-tired machinery is incapable of handling the loads.

(See the Traffic section for a condition on helicopter flights.)

Dust

16. The speed limit on the haul road shall be posted at 20 miles-per-hour to minimize the amount of airborne dust.
18. The applicant shall abate visible airborne dust as necessary to protect the visual quality of the project area.

Visual Screening

18. Retain the values of the Modified Landscape VQO in the materials and colors used in construction of the Slate Creek Cove marine terminal.
19. Minimize tree clearing at the mine and mill complex and along the haul road. Maintain as large a buffer or standing timber as possible between the haul road, mill and processing area at Berners Bay.
20. Use earth tone colors and finishes on the exterior of the mill and processing buildings.

Surface Subsidence

21. The company must maintain a 150-foot crown pillar to assure stability and prevent surface subsidence.
22. The employment of mining techniques that modify the 150-foot crown pillar must be pre-approved in the Plan of Operations and be shown to have no increased potential for contributing to surface subsidence.

Avalanches and Landslides

23. The tailings pipeline must be buried for the entire mapped area of the Snowslide Gulch avalanche path. Burial must be at a depth and length that will assure the integrity of the pipeline to withstand a 100-year avalanche event.
24. If the tailings access road remains open for use during the November to May avalanche season, the applicant shall be required to prepare a Snow Safety Plan that includes, at a minimum, the following:
    a. avalanche search and rescue training for on-site employees;
    b. travel protocol on the tailings access road;
    c. placement of probes, beacons and shovels in all vehicles crossing Snowslide Gulch;
    d. radio checks for all travel across Snowslide Gulch;
    e. a system for daily and/or weekly avalanche forecasting;
    f. designation of an on-site avalanche expert;
    g. other practices and procedures that assure worker safety and rapid response to avalanche events.

    The plan shall be prepared by an organization such as the Southeast Alaska Avalanche Center or another comparable qualified organization.

25. If the tailings access road remains closed for use during the avalanche season, then the applicant shall be required to incorporate avalanche awareness training into the required 40 hour Mine Safety and Health Administrative (MSHA) training class that is given to every new miner hired for the project. The applicant is required to consult with the Southeast Alaska Avalanche Center, or a comparable qualified organization, in developing avalanche awareness training. Specific attention shall be given to the avalanche hazard posed at Snowslide Gulch.
26. Snow removal equipment must be staged on the mill side of the tailings pond access road, and must be in a ready-to-operate condition in the event the tailings pipeline is damaged. This equipment must be available to clear the access road of avalanche debris just as quickly as it is declared safe to do so in consultation with a qualified individual or organization such as the Southeast Alaska Avalanche Center. This consultation shall occur immediately following an avalanche event.
27. If the tailings access road is available for use during the avalanche season, signage must be placed warning all drivers of avalanche danger on the road. The road must be closed during periods of high avalanche risk as determined by mine officials in consultation with the Southeast Alaska Avalanche Center or comparably qualified organization or individual. This consultation shall occur on a daily basis during the November–May avalanche season.
28. A snow shed shall be constructed over the Kensington portal to shed snow away from the portal and prevent the portal from being covered by snow and impeding escape from the mine.

Erosion

29. Coeur shall identify methods in the approved Plan of Operations for the employment of best management practices that allows for quick action to be taken where erosion is imminent or under way.
30. Provide worker training in the employment of best management practices, including both techniques (how MBPs are employed) and protocols (when and where MBPs are employed).
31. Reclaim disturbed areas on steep slopes and avoid disturbing steep slopes during inclement weather.
32. Construct all storm water diversion ditches to accommodate a 100-year, 24-hour precipitation event.

JCMP Conditions

33. Preserved and pressure-treated wood shall not be used in the water, or have contact with the water, in the construction of the Slate Creek Cove marine terminal.
34. Fill in wetlands shall be avoided and minimized to the greatest extent practicable.
35. The best management practices enumerated in CBJ §49.70.1080 (b) (7) (A) (B) (C) (D) (F) and (G) are incorporated as MBPs for the project. These are:

    - There shall be no work in the stream bed or that would adversely impact the stream during egg incubation or out-migration of salmon smelts;
    - Filtration curtains shall be used to protect streams from turbidity due to adjacent soil disturbance activities;
    - Existing wetlands vegetation shall be stripped in mats and repositioned over regraded soils;

- The amount of fill shall be restricted to the minimum amount necessary to achieve stated purposes;
- All discharge material shall be free from toxic pollutants in toxic amounts as defined by state law, and;
- Erosion at the construction site shall be controlled through re-vegetation and other appropriate means. Exposed soils shall be re-vegetated within one year.

Wetlands Review Board Conditions

36. Marine construction shall not occur in Slate Creek Cove during the spring concentration of forage fish.
37. A strong monitoring and reporting program shall be instituted for water quality assessment in the Slate Lakes Basin and in Slate Creek Cove, with an emphasis on the fish population.
38. Species in Slate Creek Cove shall be monitored for vessel impacts. Measures shall be taken to reduce impacts to marine species, including reduction of vessel speed, vessel routing and timing of vessel arrivals and departures. Coeur should incorporate provisions for marine mammal protection in the approved Plan of Operations or through an agreement with the National Marine Fisheries Service.
39. Coeur shall sponsor a Berners Bay working group to coordinate activities and promote good communication among the operator, the agencies and the public.

Attachments: August 24, 2004 memorandum from Peter Freer, Community Development to the CBJ Planning Commission regarding MIN2004-00003.

This Notice of Decision constitutes a final decision of the CBJ Planning Commission. Appeals must be brought to the CBJ Assembly in accordance with CBJ §01.50.030. Appeals must be filed by 4:30 P.M. on the day twenty days from the date the decision is filed with the City Clerk, pursuant to CBJ §01.50.030 (c). Any action by the applicant in reliance on the decision of the Planning Commission shall be at the risk that the decision may be reversed on appeal (CBJ Sec. 49.20.120).

Effective Date: The permit is effective upon approval by the Commission
August 31, 2004

Expiration Date: The permit will expire 18 months after the effective date, or February 28, 2006, if no Building Permit has been issued and substantial construction progress has not been made in accordance with the plans for which the development permit was authorized. Application for permit extension must by submitted thirty days prior to the expiration date.

Project Planner: ______________________
Peter Freer, Planning Supervisor

____
Johan Dybdahl, Chairman
Planning Commission

Filed With Deputy City Clerk

____

Sept. 15, 2004

cc: Plan Review

NOTE: The Americans with Disabilities Act (ADA) is a federal civil rights law that may affect this development project. ADA regulations have access requirements above and beyond CBJ - adopted regulations. Owners and designers are responsible for compliance with ADA. Contact an ADA - trained architect or other ADA trained personnel with questions about the ADA: Department of Justice (202) 272-5434, or fax (202) 272-5447, NW Disability Business Technical Center 1 (800) 949-4232, or fax (360) 438-3208.

Appendix D

Conditional Use Permit to Allow Development of a Ferry Dock and Related Access Construction of a Dock at Slate Creek Cove

City/Borough of Juneau
Planning Commission
NOTICE OF DECISION
October 15, 2004
File No.: USE2004-00042

PLANNING COMMISSION
NOTICE OF DECISION

Date: October 15, 2004

File No.: USE2004-00042

Goldbelt, Inc.
9097 Glacier Highway
Suite # 200
Juneau, AK 99801

Application For:	A Conditional Use permit to allow development of a ferry dock and related access.
Legal Description:	Berners Bay area
Parcel Code No.:	3-B45-0-100-009-0
Hearing Date:	October 12, 2004

The Planning Commission, at its regular public meeting, adopted the analysis, findings and recommendations listed in the attached memorandum dated October 5, 2004 and approved the above Conditional Use permit to be conducted as described in the project description and project drawings submitted with the application and with the following conditions:

1. No vessel fueling is authorized to occur at this location except vessels used for transporting mineworkers to the Slate Creek Cove marine terminal and craft necessary for facility operation and maintenance, including fuel spill responsibilities.

2. No vessel maintenance is authorized at this location except routine maintenance activities required for daily vessel operations.

3. No on-site fuel storage is permitted in excess of one residential sized (550 gallon) above-ground tank as described in this report.

4. A fuel tank as described for this project must be located within an impermeable, diked area with a capacity equal to 110% of the tank capacity plus a 24-hour, 100-year rain event.

5. Expanded use of the facility may lead to the need for additional power generation, parking lot improvements, development of water supply, expanded on-site fuel storage, staging areas, improved sanitary services, upland facilities such as covered or enclosed structures, additional lighting and other improvements. No additional facilities or improvements other than those identified in the application and analyzed in this report, may be constructed on the site unless a modification of this permit, or a new permit, is obtained first.

6. Low-intensity lighting must be directed inward and not shed light and glare offsite or seaward. A lighting plan must be submitted to the Community Development Department for approval.

7. Sewage disposal at the caretaker/office structure, if it is included as a part of the structure, must be approved by the Department of Environmental Conservation before a building permit is granted.

8. The applicant shall contract with a qualified company to provide portable toilet pumping on a weekly basis, or more frequently to assure that sanitary conditions are preserved.

9. The parking lot shall be scaled to a size appropriate to service the Kensington Mine ferry and directly associated uses and shall have a capacity not to exceed 30 vehicle spaces.

10. If the parking lot is paved, ingress, egress, driving lanes, pedestrian lanes, aisle widths and parking stalls must be paint-striped in conformance with the requirements of CBJ 49.40.200 – 230. A plan addressing the requirements of CBJ 49.40.200-230 must be submitted to the Department for approval prior to paving. An oil-water separator shall be installed when the lot is paved.

11. As large a buffer of trees and natural vegetation as possible shall be left along the shoreline.

12. The facility shall be painted a neutral, non-reflective color, like that proposed for the marine terminal facility at Slate Creek Cove.

JCMP Conditions

13. No in-water work shall occur at the project site between March 15 and June 15 to avoid impacts on spawning herring and other species.

14. The best management practices identified in the discussion under 49.70.905 (5)[C] on pages 12 through 14 of this report shall be incorporated as best management practices for the project. Essentially, these are all related to spill prevention.

Construction

a) The dredge barge shall have sideboards to contain dredge spoils. If necessary, sideboards will be lined with a filter fabric to prevent mud from leaking through the joints between the barge deck and the sideboards and between individuals members.
b) Hydraulic equipment used on the barge will use vegetable oil or another biodegradable fluid rather than petroleum-based oils.
c) Refueling of construction equipment will be conducted on shore, with the exception of refueling barges.
d) Fuel transfers will incorporate level sensors, drip pans and other precautionary measures as required.
e) Oil spill response equipment will be readily available to respond to and/or to contain any oil spills. Spill response equipment will include absorbent materials, containment booms, and appropriate personal protective equipment. Personnel that are trained in responding to spills will be at the scene during all operations that could result in a spill.
f) Spills into coastal waters will be reported to the appropriate agency immediately. Oil absorbent booms/socks will be placed around the spill sheen to contain it and absorb it as much as possible.
g) Spills on land that cannot be completely cleaned up within 24 hours will be reported to the Department of Environmental Conservation.

Vessel Fueling

h) All persons involved in the fuel transfer operation will be trained to follow the SOPs and in the consistent use of BMPs.
i) A spill response plan will be developed for the marine terminal facility and all personnel will be trained accordingly.
j) Appropriate spill response equipment including absorbent materials will be placed at the header and hosereel locations. The materials will be within easy reach in case of spills. All used materials will be properly disposed of and replaced immediately.
k) A drip bucket will be hung below the fuel header connection. The bucket and the concrete pad will be kept in a clean condition.
l) An absorbent pad will be placed against the fuel nozzle while fueling and a drip bucket placed below the vent and nozzle to catch any possible overflow.
m) The vessel fueling system will be inspected by the Facility Manager prior to each fuel transfer operation. In addition, the transfer system will be formally inspected and pressure tested on an annual basis. All needed maintenance and repair needs will be taken care of immediately in order to ensure continued trouble-free operation.
n) The fuel truck driver will connect the truck hose to the header. The driver will control and visually monitor the fuel transfer process at this location. Extra care will be taken to minimize any fuel dripping at the header location.
o) The vessel engineer will do the actual fueling of the boat. The engineer will control and visually monitor the fuel hose during the transfer process. Extra care will be

taken to prevent fuel dripping at the nozzle location. The engineer will inform the fuel truck driver of the number of gallons to be transferred prior to starting.

p) The marine facility manager will manage the overall fuel transfer process. It will be the manager's job to assure that all standard operating procedures are being followed.

q) The truck driver, vessel engineer and facility manager will be in constant radio contact throughout the fuel transfer process.

Ship-Board

r) An oil/water separator shall be installed both in the bilge and in the bilge water pump discharge line of vessels used to transport mine workers. The separators must be maintained in a clean, working condition and replaced according to the manufacturer's requirements.

s) No bilge water may be discharged if it contains fuel, solvents, detergents, oils and greases or other substances that result in marine pollution.

t) Oil-absorbing material shall be used in the bilge areas of Goldbelt's boats that have inboard engines.

u) Only non-alkaline, biodegradable bilge cleaners may be used.

Uplands

v) Runoff from parking areas and other ancillary facilities shall be filtered by filter fabric, hay bales, or other appropriate method. The sediment traps shall be regularly inspected, cleaned and maintained.

w) The parking areas and drives leading to them shall be surfaced with crushed gravel to increase filtration.

x) Natural vegetation shall be retained along the shoreline whenever possible. Disturbed and exposed soils shall be vegetated as soon as practicable. Runoff shall be diverted from exposed soils.

Waste Oil and Like Materials

y) Waste oil and other waste material including but not limited to antifreeze, solvents, greases, and lubricants must be removed from the site by an authorized transporter.

z) Non-spill vacuum systems for spill-proof oil changes, or to pump out oily bilge water, are required.

aa) Separate, clearly-marked containers must be used for antifreeze, waste oil, greases, solvents, lubricants and other potentially harmful materials that are being disposed.

bb) Containerized waste oil, solvents, greases, lubricants, antifreeze and other potentially harmful materials used in routine vessel maintenance must be stored in a secure upland location while awaiting transport off site.

cc) An oil-water separator for stormwater collection and treatment shall be utilized on the dock.

15. Coeur-Alaska will prepare and implement a Spill Response Plan for Cascade Point as identified in their September, 2004 Berners Bay Transportation Policy and Mitigation and Best Management Practices Plan, as Standard Operating Procedure # 13. A draft plan will be circulated to federal and state agencies with responsibility for water quality and spill prevention and response, and to the CBJ, for review. A final plan shall be implemented by Coeur before terminal operations begin.

16. An adequate supply of spill containment and response equipment will be maintained at the Cascade Point dock as described in the Spill Response Plan prepared under #13 above.

17. Fueling will take place at a U.S. Coast Guard-approved facility outside of Berners Bay between April 15 and May 15 each year when herring are observed spawning within 250 meters of the marine terminal. The distances shall be clearly marked on the shoreline. The presence of spawning herring will be determined by a qualified observer whose salary and expenses shall be reimbursed by Goldbelt..

18. The vessel will be surrounded with by a containment boom during fueling between April 15 and June 15 each year.

19. The City and Borough of Juneau, working with other agencies as necessary, will prepare a monitoring program to assure the terminal operator is routinely employing best management practices and standard operating procedures.

20. Coeur shall implement Standard Operating Procedures #12 and #14 as identified in Coeur Alaska Gold Mine Berners Bay Transportation Plan and Mitigation and Best Management Practices Plan, September, 2004

Attachments: October 5, 2004 memorandum from Peter Freer, Community Development, to the CBJ Planning Commission regarding USE2004-00042.

This Notice of Decision constitutes a final decision of the CBJ Planning Commission. Appeals must be brought to the CBJ Assembly in accordance with CBJ §01.50.030. Appeals must be filed by 4:30 P.M. on the day twenty days from the date the decision is filed with the City Clerk, pursuant to CBJ §01.50.030 (c). Any action by the applicant in reliance on the decision of the Planning Commission shall be at the risk that the decision may be reversed on appeal (CBJ Sec. 49.20.120).

Effective Date: The permit is effective upon approval by the Commission on October 12, 2004.

Expiration Date: The permit will expire 18 months after the effective date, or April 12, 2006, if no Building Permit has been issued and substantial construction progress has not been made in accordance with the plans for which the development permit was authorized. Application for permit extension must by submitted thirty days prior to the expiration date.

Project Planner: [signature]
Peter Freer, Planner
Community Development Department

[signature]
Johan Dybdahl, Chairman
Planning Commission

Filed With City Clerk
[signature]
October 20, 2004

cc: Plan Review
David Crosby

NOTE: The Americans with Disabilities Act (ADA) is a federal civil rights law that may affect this development project. ADA regulations have access requirements above and beyond CBJ - adopted regulations. Owners and designers are responsible for compliance with ADA. Contact an ADA - trained architect or other ADA trained personnel with questions about the ADA: Department of Justice (202) 272-5434, or fax (202) 272-5447, NW Disability Business Technical Center 1 (800) 949-4232, or fax (360) 438-3208.

Appendix E

Lynn Canal Pacific Herring Stock

LYNN CANAL PACIFIC HERRING STOCK

1.0 Introduction

Berners Bay is an important region for the Lynn Canal Pacific herring (*Clupea harengus*) stock because it harbors substantial shoreline area used for spawning. This stock is also a seasonally important prey item for Steller sea lions. Steller sea lions feed on this stock, particularly during herring spawning when herring density is at its highest and sea lions are abundantly present. Because this herring stock is currently depressed, any human activity causing further impacts could result in an inability for the stock to recover, further leading to dietary impacts to Steller sea lions. For this reason, a summary of the analysis of potential project effects to this herring stock is included in this BA/BE.

The reader is advised that affects to other marine resources, including eulachon, salmon, and other potential marine food resources are presented in the 2004 SEIS and will not be repeated in this appendix. The details of the project descriptions are also presented in the 2004 SEIS.

2.0 Existing Condition of the Lynn Canal Pacific Herring Stock

The following description of Pacific herring was derived from site-specific field studies, published reports, and scientific literature. This section also summarizes the previously performed analyses as described in the 1992 FEIS, 1997 SEIS, and 2004 SEIS.

Pacific herring are found from southern California to the eastern Beaufort Sea. The region of greatest abundance is along the coasts of British Columbia and southeastern and central Alaska. Herring are one of the more abundant fishes along the coast of Alaska, although this abundance tends to be seasonal and varies tremendously from year to year. Prior to 1983, the Lynn Canal Pacific herring stocks supported several commercial fisheries, including a sac roe fishery, a bait pound fishery, and a winter food and bait fishery. The Lynn Canal herring stock traditionally spawned from Auke Bay to Point Sherman. The stock declined in 1982 and has since remained at low levels (Table E-1). The reason for the decline is not clear, although potential causes are overfishing, habitat degradation or disturbance, geographic shifting of spawning aggregations, population growth of major predators such as sea lions, or a combination of these factors. If the decline was attributable solely to overfishing, the stock would be expected to show signs of recovery during the 20-year period since the close of commercial harvests, as has occurred in other areas in Southeast Alaska. Because the stock has not shown signs of recovery, other factors are likely keeping this stock depressed.

Pacific herring spawn from December to July depending on latitude. In Southeast Alaska, most spawning activity takes place between mid-March and mid-April, with the Lynn Canal stock most often spawning from late April to early May. Between 1953 and 1981, the documented Lynn Canal herring spawn ranged between 6 to 28 nautical miles of shoreline, averaging approximately 12 miles (Table E-1). Auke Bay was among the key areas where spawning occurred. In recent years, ADF&G records demonstrate that spawning activity for the stock has centered between Point Bridget and the Berners Bay flats (Moulton 1999). Since 1982, the documented spawn has ranged from only 0.5 to 7.3 nautical miles, averaging 3.9 nautical miles (Table E-1), and occurred mostly in Berners Bay.

Before a herring fishery can be considered for the Lynn Canal stock, a forecast spawning biomass must meet or exceed 5,000 tons (the established biomass threshold). Based on shoreline miles of spawn, it is estimated that the stock biomass has only varied between 100 and 2,500 tons over the past 20 years (Table E-1). The most recent survey (spring 2004) documented the Lynn Canal spawn biomass at 1,400 tons, with over half (740 tons) found at Berners Bay (Monagle 2004).

During February and March, herring concentrate near the bottom (at 200 to 300 feet) off traditional spawning beaches in Lynn Canal. They remain there until late April, when sea-surface temperatures increase to 41°F to 42.8°F, and then move into tidal shallows to commence spawning, which typically takes place over a 2- to 3-week period between late April and early May. After spawning, the adult herring return to deep-water areas in Lynn Canal, Stephens Passage, and the western shore of Douglas Island (Carlson 1980). Herring spawning typically takes place over nearshore habitat from mean higher high water to -40 feet, but typically +3 to -7 feet deep. The herring deposit eggs on a variety of substrates, including kelp and eelgrass (Emmett et al. 1991). The eggs are sticky and adhere to whatever they contact. They hatch in about 10 days, and juveniles first begin feeding approximately 2 weeks or less after hatching. During this time, waves and currents may disperse the young herring, carrying many out to sea to perish. Those young-of-the-year herring remaining, congregate in suitable shallow bays, inlets, and channels, and spend time in the shallows before moving offshore into deeper water, typically in the fall (Emmett et al., 1991), where they presumably remain for 2 years (Morrow, 1980).

3.0 Effects of Alternatives B, C, and D on Lynn Canal Pacific Herring Stock

The following summarizes the effect of Alternatives B, C, and D on Pacific herring. Potential effects of alternatives on factors that may influence Pacific herring, including water quality and nearshore benthic resources, are discussed in detail in the 2004 SEIS, and will only be noted here where relevant to effects on herring.

Construction. Construction of the marine facilities at Cascade Point or Echo Cove and Slate Creek Cove could have short-term adverse effects on Pacific herring if the construction causes herring to avoid spawning areas. Increased turbidity from dredging and pile driving or a short-term reduction in benthic food resources from the benthic areas removed could cause herring avoidance. However, the potential areas affected are sufficiently small (about 2.9 acres of disturbance at Cascade Point, 3.6 acres of fill at Slate Creek Cove for Alternatives B and D, and 2.4 acres of fill at Slate Creek Cove for Alternative C, plus dredging of 150,000 cy from about 15 acres of Echo Cove) and impacts on this stock would not be significant. In addition, the type of habitat at the Cascade Point marine terminal where the largest dredged area would occur is boulder, gravel, and bedrock substrate, typically poor habitat for spawning herring. Similar hard substrate (gravel, boulder, bedrock) is present in the potential fill area at Slate Creek Cove. Turbidity could be managed by implementing approved BMPs. Some short-term loss of site-specific herring food sources could occur due to benthic disruption from fill and dredging because juvenile herring often feed extensively on benthic harpacticoid copepods (Simenstad et al., 1979). However, pelagic food sources (zooplankton), which are also commonly eaten (Emmett et al., 1991), would not be disrupted, supplying an alternative food source.

Installation of pilings at all of the proposed marine terminals could have short-term direct adverse effects on nearshore rearing fish if not properly conducted. Pressure waves associated with pile driving, particularly of metal piles, have been linked to adverse effects on fish, including localized behavior modification and, in worse cases, hemorrhage and rupture of internal organs resulting in direct mortality (Longmuir and Lively, 2001; Stotz and Colby, 2001 as cited in Tetra Tech FW, 2003; Feist et al., 1996). However, methods will be implemented to reduce or eliminate these impacts. This includes elimination of construction during herring spawning. Also under the US Army Corps Permit will insure that low-noise methods of pile driving will be used when impacts to fish resources are expected from high noise pile driving

Construction of the breakwater for the Cascade Point marine terminal could result in the permanent loss of approximately 350 feet of shoreline, which over the past 10 years has occasionally been used by spawning herring (Figure E-1 showing frequency). Herring often spawn directly on marine macrophytes such as kelp and eelgrass, but they will also use other substrates, including rocks (Robinson et al., 1996; Brown and Carls, 1998; ADF&G 2003). The proposed fill at the Cascade Point terminal could also indirectly affect spawning habitat by producing modified currents and other factors (see Operations for Noise, Spills, and Effects on Habitat). Although pre-spawning herring schools have been observed in Echo Cove (ADF&G, annual spawning survey notes), no spawning habitat has been reported (Moulton, 1999); therefore, herring spawning success would not likely be affected by construction at the Echo Cove site.

Operation. The breakwater at Cascade Point could interfere with tidal flushing and passage of fish during periods of low and lower high tides and consequently have a minor (e.g. less than a day delay in nearshore migration, localized modifications in food sources) impact on habitat. No breakwater is proposed at Echo Cove, so similar effects would not occur there under Alternative C.

Noise. Noise of crew shuttle boat traffic might have short-term adverse effects on schooling fish within Berners Bay. The reaction of fish to in-water sound is dependent on both the frequency and amplitude because different species have different detection capabilities (Hawkins 1981, cited in Nestler et al., 1992; Schwarz and Greer 1984). Herring are known to modify their location in the water column upon the approach and passing of motorized vessels (Valbo et al., 2002; Misund et al., 1996; Freon et al., 1993). Therefore, marine vessels, including the crew shuttle boat, are likely to produce sound characteristics that could be detected by herring, although the exact reaction to noise by the fish may vary. Schwarz and Greer (1984), in one of the earlier studies on the response of herring to boat noises, observed that herring response to playback of sounds of various boat types was short-lived when noise levels decreased (as in a boat departing from the region) or stopped. In these cases, herring typically returned to their previous behavior in less than 10 seconds. Valbo et al. (2002) found active avoidance of a large vessel (200 feet in length) to be short-term (less than a minute prior to the vessel's passing directly over herring schools), which resulted in some dispersal of fish relative to the boat path. In this case, the majority of herring remained under the boat path after its passing. Avoidance of boat noise appears partly related to life stage of herring. Valbo et al. (2002) observed marked avoidance of overwintering herring primarily in the upper 300 feet of water with some avoidance to the 450-foot depth. Juvenile herring showed less response to vessels with no avoidance below a depth of 210 feet. Active avoidance by overwintering herring has been documented to begin about 40 to 50 seconds before a boat passes over schools at a surface distance of 650 to 700 feet (Valbo et al., 2002). Misund et al. (1996) found that reaction of herring to a boat ranged from 75 to 3,300 feet directly in front of the boat path but was confined to those fish within a fairly narrow width (about 20 degrees of the boat's path). Furthermore, only about 20 percent of the herring schools encountered reacted to vessel noise (Misund et al., 1996).

Information also exists suggesting herring subjected to frequent vessel noise may become less affected, or react less, to noise (Schwarz and Greer 1984). Attempts to specifically use noise to cause herring species to avoid areas have often proved partly or totally ineffective (Nestler et al., 1992).

Pre-spawning herring adults are unlikely to congregate in the crew shuttle route and are unlikely to be affected by noise prior to spawning from crew shuttle traffic. Herring adults concentrate along the east shore of the bay during spawning, often from Cascade Point north. Based on observed reactions of herring and distribution, the effect of crew shuttle boat traffic is likely to be short-term avoidance by those herring in the crew shuttle route. Longer periods of avoidance in the vicinity of the marine terminals might occur from the noise generated by the crew shuttle boat while at the pier and by loading/unloading of the barges at Slate Creek Cove.

The potential effects of crew shuttle and dock noise on herring spawning activity near Cascade Point are unknown, but they might be slight due to limited trips during spawning, the presence of the breakwater located between the dock and the potential spawning area to the north, and the documented duration of herring response to noise. Direct boat noise during transport, as noted below, would be infrequent, and the breakwater would reduce noise transmission directly from the Cascade Point dock area to the potential spawning area to the north. In addition, as noted above, not all herring respond to noise. Herring have been observed resuming to their normal behavior rapidly (within seconds or minutes) following cessation or diminishment of the noise.

The crew shuttle boat schedule could result in some level of disturbance up to 10 times a day (assuming five round trips) between Slate Creek Cove and either Cascade Point or Echo Cove. Considering a rapid crossing of Berners Bay, active avoidance by some individuals would likely occur for less than 2 minutes each trip. Assuming that an individual fish remained within the crew shuttle route all day, overall disturbance (induced reaction) would occur for a maximum of about 20 minutes a day. Noise from the crew shuttle boat would be most likely to affect fish in the upper 300 feet of water. The actual dispersion would occur over a narrow width, based on the observations noted above. Adverse affects on populations of prey resources along the crew shuttle route would be none to slight considering that the size of the area affected is small, the duration is limited, and only some of the prey species would react. Furthermore, fish would naturally move in and out of the area where noise would be encountered and the area could be reoccupied following passage of the vessel. Finally, some acclimation to the noise can occur. The effects of noise on prey species might be slightly greater near the crew shuttle terminals. Additionally, as noted in proposed operations plans, a reduction in operation frequency would occur during spring as part of the mitigation measures to reduce effects to prey resources and marine mammals further reducing potential effects to spawning herring (See Appendix A and C).

Effects on Habitat. Some spawning habitat for Pacific herring at Cascade Point might be irretrievably lost due to construction of the breakwater at Cascade Point under Alternatives B and D, as noted above. This would include 1.3 acres of fill and 1.6 acres of dredge materials. However, the breakwater could be designed to enhance establishment of kelp or vegetation to mitigate for the loss of kelp (spawning substrate). Following completion of mining activities, the breakwater could be removed if determined necessary, to restore the areas' herring spawning habitat. Historically, herring spawning of this stock (Lynn Canal stock) included areas from (at least) Auke Bay to Point Sherman (north of Berners Bay) (Moulton, 1999, McGregor 2003). With a reduction in abundance, spawning of this stock has occurred in fewer locations, including regions on the east side of Berners Bay, Point Bridget, and some areas north of Point St. Mary (Cantillon 2003). Berners Bay has been consistently used for spawning with only a very few years not having at least some spawning in the bay. Typically, 2 to 10 miles of shoreline within Berners Bay may contain herring spawn (McGregor 2003). Within Berners Bay, the east shoreline and inside Point Bridget have been the areas most often selected. During the last decade the areas along the east shore of Berners Bay, primarily from area stretching from the Berners/Antler Rivers delta to just west of Cascade Point have been most often selected (Figure E-1). During this same period, about 50 to 100 percent of all documented spawning miles of the Lynn Canal stock were in Berners Bay (ADF&G spawning distribution maps). Historically, Cascade Point has had documented spawning 7 of the past 30 years, including 2 of the past 11 years (Juneau Area Herring Spawning Surveys and Activities and other summary memoranda; ADF&G, multiple years; Kevin Monagle, ADF&G, October 26, 2004, personal communication). However, the lack of documentation on spawning at a particular area does not necessarily mean that spawning did not occur there as spawning survey frequency of the whole region varied from year to year.

If the filled and dredged area at Cascade Point were entirely lost for spawning, approximately 350 feet of shoreline would be affected. Potential nearshore current changes from the addition of the breakwater could also have some effect on the spawning habitat (Nightingale and Simenstad, 2001). The overall effect of this loss of herring spawning habitat is not clear. Some studies document fidelity to spawning sites by herring (Emmett et al., 1991), whereas others indicate movement among sites (NMFS, 2001). There is also a general homogeneity of herring stock genetics, indicating mixing among stocks during spawning. Emmett et al. (1991) noted that there is no correlation between the number of eggs spawned and the adult population size because other factors affecting egg and early larval survival appear to be major events influencing population sizes. However, ADF&G uses spawn abundance as part of an overall model to estimate herring production in Alaskan waters (Fogels 2004). Moulton (1999) noted varied correlations between shoreline development and herring stock status in Puget Sound. He found that some stocks decreased while others increased in areas with extensive shoreline development; in some areas with low shoreline development, stocks also decreased. However, the absence of herring spawning in Auke Bay has followed intensive shoreline development in the area (McGregor 2003).

The presence of a breakwater at Cascade Point might result in some increase in usable rearing habitat for herring. Juvenile herring are found in protected areas such as protected bays and marinas in abundance (Nightingale and Simenstad, 2001). Herring were found to be the most abundant species in marina studies conducted in the state of Washington (Nightingale and Simenstad, 2001). The presence of the breakwater would increase some protected water habitat similar to that found in marinas. The environment would not change in a similar manner in Echo Cove because no breakwater would be constructed and it is already a protected (low-wave-energy) environment. At Cascade Point, the floating docks would serve as a support for marine macrophytes that might be used by herring for spawning (Nightingale and Simenstad, 2001). Pacific herring might use shoreline areas until their movement offshore in the fall. Increased predation in marina areas with piers, floats, riprap, and pilings has not been documented, although it is considered an area of concern (Nightingale and Simenstad, 2001). The over-water structures (piers) lower light levels, reducing potential food production and possibly the feeding success of some fish (Nightingale and Simenstad, 2001; Blaxter, 1985). The use of galvanized steel pilings for the dock would eliminate concerns about contamination from creosote treated wooden pilings. Further, BMPs would be employed for any fueling and maintenance operations at Cascade Point to minimize the potential for hydrocarbon contamination (See Appendixes A and B).

Effects on Predation. There is a potential that constructing docks at either Cascade Point, Slate Creek Cove, or Echo Cove could increase the predation risk to herring as predators are often attracted to such structures. However, increases in predation or reduction in survival from fish movement around or under docks have not yet been documented (Nightingale and Simenstad, 2001; Simenstad et al., 1999).

Spills. The most likely source of potential impacts on herring would be accidental petroleum spills. This risk is highest at Slate Creek Cove than at Cascade Point or Echo Cove because of the greater material loading and offloading (See SEIS for details of operations). Although the risk is lower at Cascade Point and Echo Cove because of lack of boat-to-shore material transfers, fueling activities at Cascade Point or Echo Cove would have a potential for spills. The implementation of fuel storage and fueling BMPs at these sites would greatly reduce any chance of accidental diesel fuel spills. However, if a spill were to occur the consequences could be serious, depending on the size and timing. Based on the record of the Alaska Marine Highway System ferry operations in Lynn Canal, which has had no in-water fuel spills (URS, 2004); chances of spills associated with crew shuttle operations would be low no matter which alternative is selected.

A spill occurring during the April–May herring spawning would expose the greatest number of individuals and eggs. A catastrophic release of petroleum to the environment could result in concentrations of petroleum compounds at levels that would adversely affect Pacific herring. The greatest concern would be from spills at Cascade Point because of its proximity to herring spawning areas. A spill at Echo Cove would be of lesser concern to herring because Echo Cove is not near spawning areas and a spill could be more easily contained.

A large spill could also taint the flesh of the herring over the short term and subsequently have a negative impact on Steller sea lions, although eulachon are their primary food in the bay during the spring. So, tainted flesh of herring adults would have lower potential for effects to sea lions than eulachon. However based on the timing restrictions, vessels used, and implementations of BMPs, and as noted in SEIS Section 4.10, there is a very low risk of any large spills occurring.

In other seasons, spills would have fewer potential adverse effects on herring resources. While some adult and juvenile herring, especially shortly after hatching, will remain in Berners Bay, most will likely disperse to other regions of Lynn Canal. Also, relative to the spawning and egg development period, herring are less oriented near shore or near the surface, where any concentrations of petroleum products would be highest. The use of isotainers and implementation of BMPs would reduce chances of major spills and adequately protect against petroleum discharge levels that would cause adverse effects. A monitoring plan would be initiated to help determine if adverse effects may be occurring from petroleum leaks (see Mitigation and Monitoring Section 2.5 of the 2004 SEIS and attached Appendices A, B, and C

Among local fish stocks, Pacific herring are those of greatest concern for effects of hydrocarbon releases. This stock has ecological significance, is already depressed, and would have several life stages present in Berners Bay at or near the Cascade Point marine facility, which would be close to spawning areas. Pacific herring are a major prey source for many marine species. Reductions in the already depressed Lynn Canal population could therefore affect other resources in the greater Lynn Canal region, including salmon and marine mammals. But the elimination of fueling and transport at Cascade Point before and during spawning greatly reduces the risk of petroleum effects on this stock (see Appendix G for additional mitigation). Potential effects on herring would be less at Echo Cove because it does not contain herring spawning areas and spills would be more likely to remain confined in the cove due to low flushing.

Total petroleum hydrocarbons (TPHs) include a mixture of light and heavy polyaromatic hydrocarbons (PAHs). These compounds have different toxicity characteristics based on their water-solubility, volatility, vapor pressure, and molecular weight (Irwin et al., 1997). Lighter aromatic hydrocarbons, like those contained in diesel fuel, are generally more volatile and water-soluble and, therefore, are associated with potential acute hazards to aquatic life in the water column. The larger and heavier aromatic hydrocarbons, which are more persistent in the environment, have the potential for chronic toxicological effects (Irwin et al., 1997). High-fraction PAHs (those of high molecular weight), known as HPAHs, are some of the most toxic petroleum compounds. These compounds are most prevalent in weathered crude oil, but only a very small amount occurs in diesel. HPAHs are 10 to 1,000 times more toxic than lighter aromatic hydrocarbons, which would be more common in diesel (Black et al., 1983). Commonly reported effects of individual PAHs on fish include reduced growth and development, impairment of reproductive and immune systems, and altered endocrine function (Irwin et al., 1997; Carls et al. 1997, 1999). Fish eggs exposed to PAHs may suffer similar adverse effects including yolk sac edema, hemorrhaging, cardiac dysfunction, mutation, and deformity (Billiard et al., 2002, Brinkworth et al., 2003, Marty et al., 1997, Barron et al. 2004a, b).

NOAA conducted several studies on Pacific herring using weathered Alaskan crude oil and found a direct relationship between PAH accumulation in muscle and ovaries of exposed fish and PAH concentrations of oil in water (Carls et al., 1997). The study noted that PAH exposure resulted in a depression of immune function and expression of the viral hemorrhagic septicemia virus.

TPH compounds appear to have a greater effect on the early life stages of fish because adults have the ability to avoid areas affected by spills. Eggs exposed to TPHs experienced shorter incubation times and reduced egg survival, larval survival, and swimming ability, as well as morphological abnormalities. At TPH concentrations of 7.6 µg/L, significant larval abnormalities of skeletal and craniofacial defects, finfold defects, and failure to develop pectoral fin rays were observed (Carls et al., 1999). Carls et al. (1999) also found that PAH concentrations of 0.7 µg/L caused malformation and genetic damage in herring eggs and levels as low as 0.4 µg/L caused sublethal effects such as yolk sac edema and premature hatching. Edema was induced in larvae exposed to PAH concentrations of 0.2 µg/L. These results imply that oil persistent in the intertidal spawning areas might adversely affect egg development months after the initial spill.

As noted above, some of the lowest hydrocarbon concentrations that had adverse effects were for weathered crude oil PAHs. Diesel, the most likely source of petroleum to enter Berners Bay from project operations, contains small portions of most typically low molecular weight PAHs. The concentrations from vessel leakage of diesel in the area are unknown, but they are likely to be very low due to proposed operational practices (e.g., BMPs such as storage of fuels away from the marine environment). To put the chance of fuel leaks reaching even these extremely low levels of concentration in perspective, it is informative to examine examples of where these concentrations have been observed in marine waters. Rice et al. (2001) reported that peak levels during sampling of areas with heavily oiled beaches from the Exxon Valdez oil spill reached a maximum of 30 µg/L. Areas immediately adjacent to the oiled beaches often showed concentrations of PAH in the range 1 to 6 µg/L. Maki (1991) summarized water column samples taken during the Exxon Valdez oil spill from three bays with the heaviest oil-contaminated beaches and reported that the highest average PAH concentrations in these three bays was 0.7 µg/L; less affected areas averaged peak values less than 0.2 µg/L.

In the highly urbanized (10 million people) San Francisco Bay area, where chronic runoff occurs from large industrial activities and high shipping traffic, PAH water concentrations in nearly all areas remain lower than those known to cause adverse effects on sensitive aquatic organisms (San Francisco Estuary Institute [SFEI], 2004; and data for 1993–2001;http://www.sfei.org). Results from 10 years of PAH monitoring in San Francisco Bay and local tributaries suggest that even under highly developed conditions nearly all levels remain low. Annual monitoring of PAH levels has occurred at about 30 sites each year in five bay regions and several of the streams entering the bay. From 1993 to 2002 the average PAH concentration of more than 300 samples of surface water (upper 1 m depth) was 0.06 µg/L, and 94 percent of all samples were less than 0.2 µg/L. The highest single value was 0.85 µg/L from a south bay slough, which drains a major urban area (San Jose), at the head of the bay. This stream often had the highest concentrations found in the annual survey, but of the other 12 samples from this stream, none exceeded 0.3 µg/L. Only three other samples from all sites exceeded 0.4 µg/L, and all were from small streams or sloughs draining major urban areas. In 10 years of study, the highest concentration in bay water (i.e., not in a slough or small creek) was 0.13 µg/L. Even considering that San Francisco Bay is in the range of 100 times larger than Berners Bay, the relative development is much greater than anything foreseeable in Berners Bay and associated watersheds. Even with the development in San Francisco Bay and the large potential for PAH input, PAH concentrations, with few exceptions, are below the lowest levels (0.4 to 0.7 µg/L) found to have adverse effects on sensitive marine organisms. Although hydrocarbon levels near the Alaska Marine Highway ferry terminals have not been monitored, NOAA believes normal levels in these areas would be very low (Short 2003). The likelihood of any spill level reaching the magnitude of the Exxon Valdez event or PAH concentrations within Berners Bay reaching the levels observed in San Francisco Bay are extremely low. Thus, it is reasonable to assume that occasional leaks or low-volume spills of diesel fuel would not result in PAH concentrations high enough to produce negative effects on herring and other marine species in the vicinity of the marine terminals.

4.0 Mitigation and Monitoring

Several documents address mitigation measures and monitoring plans that would be implemented if the project were to proceed. The specific documents addressing these plans have been included as Appendices A, B, C, and D in this document. In addition, there will be specific stipulations under ADNR's Tideland's Lease. The goals of these plans/stipulations are to minimize or eliminate impacts to resources of concern, including herring. A summary of those mitigation and monitoring plans that directly or indirectly affect herring are noted below. Additional detail of mitigation actions and proposed monitoring for Pacific herring are included in Section 2.5 of the 2004 SEIS.

4.1 SEE APPENDIX A - TRANSPORTATION AND MITIGATION PLAN

Coeur has developed a Transportation and Mitigation Plan for the Kensington Mine operation that includes many actions specifically addressing marine issues that may affect herring. This document includes the BMPs and policies of the Plan. It is intended to address the major concerns for eulachon and herring from construction of marine facilities, fueling, fuel storage, spill preventions and cleanup plan, transport of supplies, transport of workers, and monitoring to be incorporated to help assess affects.

The document includes three categories: 1) Best Management Practices (BMP) to be implemented, 2) Monitoring Plans, and 3) Goals, Policy, and Transportation/Mitigation Plan. The major items in each are summarized:

Best Management Practices including, but not limiting to:

- Prohibit in-water work during April 15 through June 30.
- Use silt curtains and other methods to control sediment and reduce transport off-site
- Measures preventing and controlling petroleum hydrocarbons from getting into the water

Monitoring would include:

- Water quality monitoring of hydrocarbons in Berners Bay
- Mapping submerged aquatic vegetation between Echo Cove and Cascade Point
- Monitoring and documenting colonization and habitat value of the breakwater
- Monitoring and documenting herring spawning activity and locations in Berners Bay

Goals, Policy and Transportation/Mitigation Plan:

This section describes the Goals and Standard Operating Procedure that would be implemented. Some of the general highlights of this Plan that potentially have the greatest benefit to herring include:

- Develop detailed and approved fueling plan
- Monitor for fuel (petroleum hydrocarbons) in the environment
- Work with agencies to develop mitigation and monitoring plan
- Fund groups to conduct monitoring
- Will develop a spill response plan
- Periodic review of BMPs usefulness and implementation
- Restrict in-water construction timing to outside of spawning window for herring
- Restrict fueling to just Cascade Point, Auke Bay, or other Coast Guard approved site
- No fuel will be stored at Cascade Point. Fueling at Cascade Point will be from a contained truck following Spill Contingency Plan
- Fuel only Coeur vessels at Cascade Point
- During "eulachon" spawning (this will be modified to "herring spawning" in the State Tidelands Lease) fueling will not occur in Berners Bay (would occur in Auke Bay or other Coast Guard approved site)
- During eulachon spawning (which overlaps most herring spawning) reduce daily vessel trips from 3 to 5 down to 2 to 3 and reduce speed to 12-13 knots
- Establish restrictive schedule for transport of personnel and supplies
- Consider a barge site for housing site workers in Slate Creek Cove during eulachon run to reduce frequency of transport trips during eulachon run.
- Water discharge control and spill prevention plans will be developed
- A variety of Standard Operating Procedures for on-shore, dock and vessels activities will include detailed plans for storage, maintenance, vessel bilge discharge, and sewage management and discharge requirements
- Reduce or eliminate all toxic substances, such as creosote used in marine construction materials and pilings
- Restrict piling installation methods to reduce impacts to fish
- Environmentally important habitat will be considered when placing fill at Cascade Point and, where practical, be avoided
- To minimize affects to habitat would consider material and slope of breakwater and would monitor site conditions.

4.2 SEE APPENDIX B - SPILL RESPONSE AND BMP PLAN

Coeur has developed this document to describe how transportation, handling, and storage of hazardous materials for the project would occur (Appendix B). This document has actions relevant to the protection of herring in that it develops specific plans to minimize risks of hazardous substances from entering the environment, which include areas herring may be found.

This document defines the Standard Operating Procedures (SOPs), training, and chain of command for actions relating to potential spills. It includes the details of how fueling would occur. The plan would be in place before construction begins.

4.3 SEE APPENDIX C - CONDITIONAL USE PERMIT FROM CITY/BOROUGH OF JUNEAU FOR FERRY DOCK AND RELATED ACCESS

This document includes the limitations and specific requirements of actions that can occur at the Cascade Point marine terminal site. These restrictions are intended to reduce impacts to the marine environment including herring. The restrictions indicated in this document are generally related to:

- Restrictions on what vessels can be fueled for transporting crews to Slate Creek Cove
- Restriction on vehicle maintenance
- Restrictions on fueling and fuel storage
- Restrictions on lighting, sewage disposal, toilet facilities, parking lot size, type of parking lot, buffers, paint color
- Restriction on in-water construction (none between March 15 and June 15) to avoid herring spawning, other fish effects, and reduce risk of injury to marine mammals, however, Coeur's proposed transportation plan and ADNR's Tideland Lease would extend this restriction through June 30
- Implementation of BMPs for spill prevention
- Dredging restrictions
- Spill reporting and response requirements
- Details of allowed vessel fueling methods
- Vessel handling of bilge and other potential oil sources
- Parking lot runoff control
- Waste oil control
- Fueling will occur outside of Berners Bay from April 15 to May 15 when herring are spawning within 250 meters of the marine terminal (the State Tidelands Lease also requires no fueling in Berners Bay from the beginning of herring spawning until the eggs hatch)
- Vessels will be surrounded by oil spill containment booms April 15 to June 15

4.4 SEE APPENDIX D - ALLOWABLE USE PERMIT FOR GOLD MINE DEVELOPMENT AND PRODUCTION

This document includes the limitations and specific requirements of actions that can occur at Slate Creek Cove, the mining access roads, and the affected lakes. These restrictions are intended to reduce impacts to the terrestrial and marine environment, including potentially to herring. The restrictions indicated in this document that generally may affect herring are:

- Restrict light use and intensity at marine terminals
- Preserved and pressure treated wood may not be used in contact with water at Slate Creek Cove
- Discharges shall be free of toxic compounds meeting state water quality standards
- Marine construction shall not occur in Slate Creek Cover during the spring concentration of forage fish

4.5 ADNR MITIGATION FOR POTENTIAL IMPACTS TO PACIFIC HERRING

ADNR has developed specific mitigation and monitoring requirements for protection of Pacific herring relative to project construction and operations in marine waters. These mitigation and monitoring requirements are part of granting a ADNR Tideland Lease to ensure consistency with the Alaska Coastal Management Program (ACMP). These permit requirements, if more restrictive than other proposed actions by Coeur or other agencies requirement, would be the actions required of the applicant. The requirements that are currently being considered to be included in the Tidelands Lease specifically relating to herring are summarized below.

- In water construction will be prohibited from March 15 to June 30
- No vessels will be operated from Cascade Point during pre spawning aggregation and spawning of herring, as determined by ADF&G (typically two weeks in April and or May)
- No vessel fueling will occur at Cascade Point from during herring pre-spawning aggregation, spawning and egg development, as determined by ADF&G (typically 4 to 5 weeks)
- Monitoring Berners Bay, during the life of the mine operations, for: PAHs (water, sediment, mussel tissue), herring spawning habitat on the breakwater, herring spawning locations and biomass, and submerged aquatic vegetation
- Applicant would sponsor a “Berners Bay Working Group” to monitor impacts and trends, and recommend operational changes as needed

Table E-1. Lynn Canal/Juneau Pacific herring spawning and harvest data

Year	Nautical Miles of Spawn	Estimated Spawning Biomass (Tons)	Total Commercial Harvest (Tons)
1953	8.2		
1954	9.4		
1955	12.2		
1956	10.0		
1957	28.1		
1958	24.1		
1959	10.8		
1960	12.9	6,850	156
1961			22
1962			354
1963			101
1964			195
1965			200
1966			109
1967			100
1968			475
1969			600
1970	11.5		240
1971			654
1972	6.5	12,450	524
1973	10.6	2,950	798
1974	13.2	4,600	396
1975	10.9	7,450	544
1976	15.9	5,400	631
1977	9.7	6,800	926
1978	8.0	5,400	966
1979	5.7	2,350	7
1980	9.8	4,850	976
1981	9.2	4,300	777
1982	2.5	1,500	551
1983	6.0	1,800	0
1984	2.6	200	0
1985	5.1	2,350	0
1986	5.0	1,250	0
1987	2.5	1,750	0
1988	7.0	2,500	0
1989	5.0	1,250	0
1990	3.0	750	0
1991	2.5	625	0
1992	4.0	1,850	0
1993	3.2	800	0
1994	4.3	1,075	0
1995	1.0	238	0
1996	2.9	725	0
1997	2.2	550	0

Table E-1. Lynn Canal/Juneau Pacific herring spawning and harvest data (continued)

Year	Nautical Miles of Spawn	Estimated Spawning Biomass (Tons)	Total Commercial Harvest (Tons)
1998	0.5	123	0
1999	6.0	1,500	0
2000	7.0	1,760	0
2001	4.0	1,000	0
2002	3.0	750	0
2003	3.0	750	0
2004	7.3	1,393	0
Average	**7.6**	**2,682**	**452**

Source: Personal communication, Kevin Monagle, ADF&G, October 26, 2004

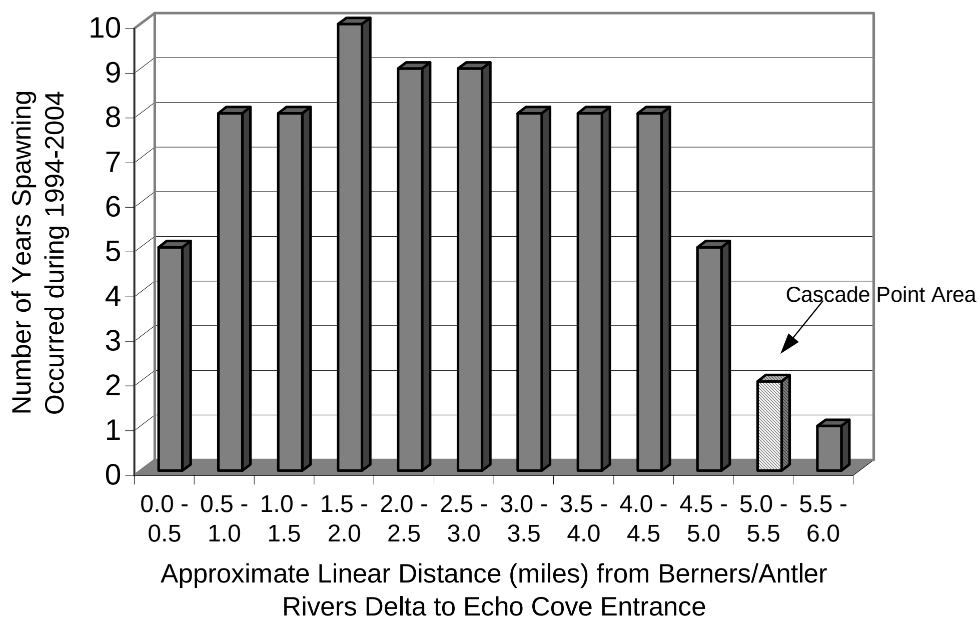

Figure E-1. Location of herring spawning areas along the eastside of Berners Bay

LITERATURE CITED

ADF&G (Alaska Department of Fish and Game). 2003. Ecology of herring in Silver Bay, Alaska. Briefing paper.

Barron, M.G., R. Heintz, and S.D. Rice. 2004a. Relative potency of PAHs and heterocycles as aryl hydrocarbon receptor agonists in fish. Mar. Environ. Res. 58: 95-100.

Barron, M. G., M. G. Carls, R. Heintz, and S. D. Rice. 2004b. Evaluation of fish early life-stage toxicity models of chronis embryonic exposures to complex polycyclic aromatic hydrocarbon mixtures. Toxicological Sciences. 78(1): 60-67.

Billiard, S.M., M.E. Hahn, D.G. Franks, R.E. Peterson, N.C. Bols, and P.V. Hodson. 2002. Binding of polycyclic aromatic hydrocarbons (PAHs) to teleost arylhydrocarbon receptors (AHRs). Comp. Biochem. Physiol. B.133:55-68.

Black, J.W., W.J. Birge, A.G. Westerman, and P.C. Francis. 1983. Comparative aquatic toxicology of aromatic hydrocarbons. Fundamental and Applied Toxicology 3: 353-358.

Blaxter, J.H.S. 1985. The herring: A successful species? Can. J. Fish. Aquat. Sci. Vol. 42, P. 21-30.

Brinkworth, L.C., P.V. Hodson, S. Tabash, and P. Lee. 2003. CYP1A induction and blue sac disease in early developmental stages of rainbow trout (*Oncorhynchus mykiss*) exposed to retene. J. Toxicol. Environ. Health - Part A. 66:47-66.

Brown, E. and M. Carls. 1998. Pacific herring (*Clupea pallasi*). Restoration Notebook. *Exxon Valdez* oil spill trustee council.

Cantillion, D. 2003. Personal communication between Dave Cantillion (NMFS) and John Knutzen (Tetra Tech FWI) on August 28, 2003.

Carls, M., S. Johnson, R. Thomas, and S. Rice. 1997. Health and reproductive implications of exposure of Pacific Herring (*Clupea pallasi*) adult and eggs to weathered crude oil and Reproductive conditions of herring stocks in Prince Williams stock of Prince Williams Sound six years after the *Exxon Valdez* oil spill. *Exxon Valdez* oil spill Restoration project final report. NOAA NMFS Auke Bay Laboratory, Juneau, Alaska.

Carls, M.G., S.D. Rice and J.E. Hose. 1999. Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in Pacific herring (*Clupea pallasi*). Environ. Tox. Chem. 18:481-493.

Carlson, H.R. 1980. Seasonal distribution and environment of Pacific herring near Auke Bay, Lynn Canal, southeastern Alaska. Transactions of the American Fisheries Society 109: 71-78.

Emmett, R., S. Hinton, S. Stone, and M. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries, Vol 2, Species Life History Summaries. ELMR Report No. 8. National Oceanic and Atmospheric Administration, National Ocean Service, Strategic Environmental Assessments Division, Rockville, MD.

Feist, B. E., J.J. Anderson, and R. Miyamoto. 1996. Potential impacts of pile driving on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon behavior and distribution. Fisheries Research Institute, University of Washington, Seattle, WA.

Fogels, E. 2004. April 7 Letter from Ed Fogels (ADNR) to Steve Hohensee (USDA FS), providing ADNR's comments on the Kensington Gold Project Draft SEIS.

Freon, P., F. Gerlotto, and M. Soria. 1993. Variability of *Harengula* spp. school reactions to boats or predators in shallow water. ICES Mar. Symp. 196: 30-35.

Irwin, R.J., M. Van Mouwerik, L. Stevens, M.D. Seese, and W. Basham. 1997. Petroleum *In*: Environmental Contaminants Encyclopedia. National Park Service, Water Resources Division, Water Operations Branch.

Longmuir, C. and T. Lively. 2001. Bubble curtain systems for use during marine pile driving. Report by Fraser River Pile & Dredge Ltd., 1830 River Drive, New Westminster, British Columbia, V3M 2A8. (as cited in Tetra Tech FW 2003).

Maki, A.W. 1991. The Exxon Valdez oil spill: Initial Environmental Impact Assessment. Part 2 of a five-part series. Environmental Science and Technology 25(1): 24-29.

Marty, G. D., J. W. Short, D. M. Dambach, N. H. Willits, R. A. Heintz, S. D. Rice, J. J. Stegeman, And D. E. Hinton. 1997. Ascites, premature emergence, increased gonadal cell apoptosis, and cytochrome P4501A induction in pink salmon larvae continuously exposed to oil-contaminated gravel during development. Can. J. Zool. 75: 989-1007.

McGregor, A. 2003. Personal communication between Andy McGregor (ADFG) and John Knutzen (Tetra Tech FWI) on September 3, 2003.

Misund, O.A., J.T. Ovredal, and M.T. Hafsteinsson. 1996. Reactions of herring schools to the sound field of a survey vessel. Aquatic Living Resources 9: 5-11.

Monagle, K. 2004. Personal communication between Kevin Monagle (ADFG) and John Knutzen (Tetra Tech FWI) on May 19, 2004.

Moulton, L. 1999. Review of Lynn Canal herring. Final Report May 1999. Prepared for SAIC, Inc., by MJM Research.

Morrow, J. 1980. The freshwater fishes of Alaska. Alaska Northwest Publishing Company, Anchorage, AK.

Nestler, J.M., G.R. Ploskey, and J. Pickens. 1992. Responses of blueback herring to high-frequency sound and implications for reducing entrainment at hydropower dams. North Am. J. of Fisheries Mgmt. Vol. 12, No. 4: 667-683.

Nightingale, B., and C. Simenstad 2001. Dredging activities: Marine issues. White Paper. Submitted to the Washington Department of Fish and Wildlife, Washington State Department of Ecology, and the Washington State Department of Transportation.

Rice, S.R., R. Thomas, R. Heintz, A. Wertheimer, M. Murphy, M. Carls, J. Short, and A. Moles. 2001. Synthesis of long-term impacts to pink salmon following the Exxon Valdez oil spill: Persistence, toxicity, sensitivity, and controversy. Final Report, Project No. 99329, Exxon Valdez Trustee Council. NMFS/NOAA Fisheries Science Center, Auke Bay Laboratory, Juneau, AK.

Robinson, C. D. Hay, J. Booth, and J. Truscott. 1996. Standard methods for sampling resources and habitats in coastal subtidal regions of British Columbia: Part 2-Review of sampling with preliminary recommendations. DFO Nanaimo, BC.

San Francisco Estuary Institute (SFEI). 2004. PAH data for 1993-2001. Available online [http://www.sfei.org].

Schwarz, A. L. and G.L. Greer. 1984. Responses of Pacific herring, *Clupea harengus pallasi*, to some underwater sounds. Can. J. Aquat. Sci. 41: 1183-1192.

Simenstad, C.A., B.S. Miller, C.F. Nyblade, K Thornburgh, and L.J. Bledsoe. 1979. Food web relationships of Northern Puget Sound and Strait of Juan De Fuca. Prepared for USEPA EPA-600/7-79-259. Fisheries Research Institute, College of Fisheries, University of Washington, Seattle Washington. 335 pages.

Simenstad, C., B. Nightingale, R. Thom, and D. Shreffler. 1999. Impacts of ferry terminals on juvenile salmon migrating along Puget Sound shorelines: Phase I synthesis of state of knowledge. Research Project T9903 Task A2. Washington State Transportation Center, University of Washington, Seattle, WA.

Stotz, T. and J. Colby. 2001. January 2001 dive report for Mukilteo wingwall replacement project. Washington State Ferries Memorandum. 5 pp. + appendices. (as cited in Tetra Tech FW 2003).

Tetra Tech FW. 2003. Head of the Thea Foss Waterway remediation project, Tacoma, Washington – Draft Biological Assessment Addendum. Prepared for PacificCorp Environmental Remediation Company and Puget Sound Energy. Bothell, WA.

URS Corporation. 2004. Essential Fish Habitat Assessment Draft. Juneau Access Improvements Supplemental Draft Environmental Impact Statement. Prepared for Alaska Department of Transportation and Public Facilities. Juneau Alaska. March 1, 2004. Valbo, R., K. Olsen, and I Huse. 2002. The effect of vessel avoidance of wintering Norwegian spring spawning herring. Fisheries Research 58: 59-77.

Appendix F
Proposed Vessel Specifications for Ferry and Barge/Tug use by Coeur Alaska for the Kensington Gold Project

Proposed Vessel Specifications for Ferry and Barge/Tug use by Coeur Alaska for the Kensington Gold Project

Barge/Tug Specifications

Barges- 360-L X 100-W X 22 Deep- The barge will only be drawing 5ft.

Tugs- 100-L X 35W X 20 Deep- Tug draws 18ft- Cruise speed is 9.5 knots.

Ferry Boat Specifications (Vessel Class?)

Length: 75'

Beam: 20'

Draft: 7.5'

Tonnage: 90 - 100

Passenger Capacity: 149

Cruise Speed: 18 knots (20.7 mph)

Engines: diesel (three)

Propulsion: propeller (three)

Fuel Capacity: 1,600 gallons diesel

Hull Type: mono (aluminum)

Exhaust System: dry (above water)

Appendix K

USEPA and State of Alaska Preferred Alternative and Environmentally Preferable Alternative Letters

Forest Service Environmentally Preferable Alternative Discussion and Rationale

The Forest Service has identified Alternatives A and D as the environmentally preferable alternatives. While both alternatives include environmental impacts ranging from short to long term, each are protective of water and air quality standards. Each has different environmentally negative and positive aspects that, when compared, make the two alternatives different but near equal with respect to overall impact to the environment.

The Forest Service has reviewed the input received from USEPA and ADNR in reaching its determination. The written conclusions and rationale from both agencies is provided in Appendix K. While the Forest Service and ADNR are generally in agreement about the relative effects of Alternatives A and D on the environment, the USEPA differs in its assessment of impacts and has determined that Alternative A is its environmentally preferable alternative.

In large part, Alternatives B and C were eliminated from selection as the environmentally preferable alternative because the operator could not comply with effluent limitations for the TSF discharge and, at the same time, meet the State's minimum instream flow requirements in East Fork Slate Creek below the TSF. Meeting the effluent requirements would require installation of a treatment system comparable to the reverse osmosis system included in Alternative D. Alternative C also provides for a marine terminal at Echo Cove rather than Cascade Point. As documented in the ROD, the decision on the location of the terminal is outside of the Forest Service's jurisdiction. The expected mitigation at Cascade Point will, however, minimize effects on marine aquatic resources, while the Echo Cove location would impact existing recreational use of the cove as well as require periodic dredging to allow crew shuttle passage. Cascade Point is, therefore, environmentally preferable to Echo Cove.The Forest Service's rationale for selection of both Alternatives A and D as the environmentally preferable alternatives is discussed below for specific resources where effects are predicted.

- **Surface water quality.** The discharges to surface water under Alternatives A and D are predicted to meet applicable water quality standards protective of human health and aquatic life, although additional treatment for aluminum could have to be installed at the DTF discharge under Alternative A. Under Alternatives A and D, any sediment-related impacts on surface water would be minimized by the proper implementation of BMPs required by Forest Service guidelines and EPA's storm water permit requirements. Alternative D presents a lower risk of fuel spills impacting surface water quality because of the use of isotainers for diesel fuel transport. As a result, surface water quality impacts slightly favor Alternative D.

- **Surface water hydrology.** Alternative A would affect the surface water hydrology by eliminating or altering the flows in the six ephemeral drainages in the DTF area. Alternative D would locally affect the hydrology in and between Upper and Lower Slate lakes. Neither Alternative A nor D would cause other surface water hydrology impacts in the drainages in the project area. This would be ensured by compliance with minimum instream flow requirements that will be finalized in the State of Alaska's Title 41 permits. There is no difference in surface water hydrology impacts between Alternatives A and D.

- **Fresh water aquatic resources.** Both alternatives would cause the loss of resident fish species. Specifically, approximately 100-200 Dolly Varden char would be lost under

Alternative A and about 1,000 Dolly Varden char would be lost under Alternative D. In each case the losses would be temporary. Under Alternative A, the diversions would be removed and the stream channels restored. Under Alternative D, the ecological risk assessment reviewed by EPA and ADNR shows that the fish populations in the TSF will be restored after closure. This is further ensured by incorporation of the tailings cover requested by EPA. The cover would provide a much larger area of shallow native material to support macroinvertebrate recolonization compared to existing conditions. ADNR specifically noted in its environmentally preferable alternative letter (Appendix K) that the Lower Slate Lake Dolly Varden char population appears to be limited by a variety of factors in the lake. No other impacts on resident fish are predicted in part because of ADNR's minimum instream flow requirements as well as State and Forest Service standards and requirements for proposed construction/improvement of stream crossings. Neither Alternative A nor D would affect the segments of Sherman, Slate, or Johnson creeks used by anadromous fish. Because of the nature of the Dolly Varden char population in Lower Slate Lake and the expected restoration/habitat improvement at closure, Alternative A is only slightly favored for fresh water aquatic resources.

- **Marine aquatic resources.** The Forest Service recognizes the importance of the Berners Bay ecosystem and potential impacts to this resource were identified as a significant issue for the NEPA analysis. Alternative A has very limited predicted effects on marine resources, except for impacts to nearshore organisms should a spill occur during fuel transfers at Comet Beach. Berners Bay provides important habitat for marine mammals, including threatened steller sea lions and, to a lesser extent, endangered humpback whales during the spring eulachon run. The crew shuttles and barges under Alternative D could impact individual marine mammals, particularly from vessel noise and other physical disturbance. However, as documented in the BA/BE (Appendix J), the Forest Service has determined that there would be no adverse impacts because of the BMPs expected to be required by the USACE, State, and local permits, including prohibitions on construction during critical times, reduced crew shuttle trips and speeds and minimized barge traffic during the eulachon run, adherence to NMFS guidelines for approach distances, no fueling at Slate Creek Cove, and the presence of a qualified observer on the crew shuttle boats. The Forest Service further anticipates that additional mitigation will be required, as necessary, to protect marine mammals as a result of ongoing formal consultation with NMFS.

The Forest Service also understands the importance of the Pacific herring stock and its decline in Southeast Alaska over the past 20 years. It is important to recognize that herring spawning has only been observed twice at Cascade Point during the past 10 years. The construction of the breakwater would eliminate some herring spawning habitat although there is the potential for recreating this habitat in the future. The Forest Service concurs with the State of Alaska's finding in its environmentally preferable alternative letter that impacts to herring during operations will be minimized by the mitigation measures expected to be included in Federal, State, and other permits. These include dedicating the site to mine transportation, requiring fueling from trucks, avoiding in-water construction during herring spawning, and likely limiting use and prohibiting fueling during critical herring spawning and early life stage periods. Ongoing monitoring during operations would be conducted used to assess the performance of mitigation measures and determine the need for additional requirements.

The Forest Service has determined that the likelihood of a catastrophic spill in Berners Bay associated with mining operations is negligible.

Overall, Alternative A is favored for marine resources because generally no impacts would occur, but the differences between the alternatives are limited because of the mitigation measures that would be implemented under Alternative D.

- **Wildlife.** While there are slight differences between Alternatives A and D in terms of effects on wildlife habitat for different species, the impacts are generally comparable and small in the context of overall available habitat in the area. Under Alternative D, potential effects on birds that congregate in Berners Bay during the eulachon run would be minimized by the same mitigation described above for marine aquatic resources.

- **Wetlands.** Alternative D would disturb~~s~~ approximately 197 acres, of which 96 acres are wetlands, while Alternative A disturbs 268 acres, all of which are wetlands during operations. Following reclamation most wetlands under alternative D would be restored while Alternative A would result in the permanent loss of 170 acres of forested and scrub-shrub wetlands. The Forest Service recognizes the relative importance of the wetlands that would be affected by Alternative D in and around Lower Slate Lake. While lacustrine wetlands are relatively uncommon in Southeast Alaska, there is nothing particularly unique about Lower Slate Lake and the lake's depth limits productivity and subsequently the value of the habitat for fish. Moreover, both the Forest Service and ADNR concur that the TSF would be restored to equivalent or better aquatic habitat after closure. Overall, the wetland impacts associated with Alternatives A and D are generally equivalent.

- **Recreation (including noise).** Alternative A would have effects on recreational use in Lynn Canal through the visual quality impacts described above. In addition, helicopter traffic and noise would affect the recreational experience in both Lynn Canal and at the mouth of Berners Bay. The Forest Service recognizes the importance placed on the "wildland" qualities of Berners Bay by recreational users of the Bay. Alternative D would generally not preclude recreational use because of current minimal direct use of the mine area. It would, however, have some impacts on the recreational experience in the Bay through both noise and visual effects. Such impacts are limited by the relatively low number and duration of crew shuttle trips during daylight hours (even further reduced during the spring eulachon run) and the CBJ requirement for the Cascade Point facility to be only used for mine-related transportation. Alternative A is slightly favored for recreational resources.

- **Visual resources.** The marine terminals at Cascade Point and Slate Creek Cove under Alternative D would have some visual effects on users of Berners Bay. Under Alternative A, the DTF, borrow areas, and roads would meet the Maximum Modification Visual Quality Objective (VQO) where visible from the Visual Priority Travel Route in Lynn Canal but would not meet the current Modification VQO until reclamation became effective 5-10 years following closure. The duration of the effects is long-term because of the extended time that would be required to complete reclamation of the DTF. In contrast, visible mine and marine terminal facilities under Alternative D are expected to be removed immediately after mine closure. Alternative D is strongly favored over Alternative A for visual resource impacts.

- **Transportation.** Under Alternative D, the use of Slate Creek Cove offers more reliable conditions for marine transportation. This reduces the need to store excess fuels, chemicals, and materials onsite as well as minimizing the risks to personnel safety, although accident and spill risks are generally low for both alternatives. For transportation, Alternative D is slightly favored.

- **Cumulative Effects.** Alternative D generally has greater cumulative effects than Alternative A because of proposed development activities in and around Berners Bay. For most of the resources where cumulative impacts are observed, e.g., surface water, wildlife, and aquatic life both the incremental and combined effects are small especially given the limited past, current, and reasonably foreseeable future development in the area. Mine expansion would cause loss of additional aquatic life in Upper Slate Lake and extend the duration of impacts. The proposed road under the Juneau Access Improvement project would cause cumulative impacts on the recreational users of Berners Bay. As documented in the 1992 Final EIS and 1997 Final SEIS, the increased helicopter traffic caused by Alternative A beyond current uses would also affect the wildland character of Berners Bay. Overall, cumulative effects favor Alternative A.

For air quality, geotechnical engineering, ground water, soils, vegetation, and cultural resources, little or no long-term impacts are predicted for any alternatives taking into consideration required mitigation measures. These resources were not, therefore, considered by the Forest Service in the determination of the environmentally preferable alternative. Because of the type of effects predicted, socioeconomic impacts were also not considered in the identifying the environmentally preferable alternative.

In the end, a meaningful difference between Alternatives A and D was not apparent in the resource values affected, nor to the degree those values would be affected. Both alternatives, therefore, are the environmentally preferable alternatives.

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PROJECT MANAGEMENT AND PERMITTING

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December 1, 2004

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Dear Mr. Cox:

The purpose of this letter is to provide the State of Alaska's position on the Environmentally Preferable and Agency Preferred alternatives for the Kensington Gold Project Supplemental Environmental Impact Statement. Because we do not consider alternatives A1, B, and C to be permittable, this discussion focuses entirely on alternatives A and D.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

After spending considerable time analyzing the potential environmental impacts resulting from each project component of both alternatives A and D, the State Team recommends that both alternatives should be ranked equivalently for their overall environmental impacts. Overall, it is the State's position that, when evaluated in their entirety with all components included, and taking into consideration mitigation measures, both of the alternatives have an environmental impact that is essentially equivalent. In coming up with this conclusion, it is important to note that we believe that proposed mitigation measures exist which can effectively mitigate the potential impacts resulting from either of these alternatives.

Herring. It is clear from the analysis in the EIS that the shorelines in the vicinity of Cascade Point marine facility are spawning habitat for the Lynn Canal herring stock. If permitted, development and operations of a marine facility in this location will have to be undertaken with care. The State agrees with the conclusion of the November 15, 2004 Biological Assessment that proposed mitigation measures should reduce the impacts to the herring stock to an acceptable level that would not threaten this herring stock. For example, project design calls for no fueling during spawning times, and restricts dock use to the mine ferries only. The direct habitat loss resulting from dock construction would be small, and spawning habitat could be recreated on the breakwater. Also, additional mitigation measures will be discussed during the upcoming Section 7 consultation process which could include restriction or elimination of operations at Cascade Point during the time the herring are spawning near the facility.

The State also believes that the comprehensive monitoring program planned will allow the agencies to determine how these mitigation measures are working, or if any modifications are appropriate.

Marine Mammals. Suitable operational procedures and proposed mitigation measures will result in negligible impacts to marine mammals in Berners Bay resulting from the mine ferries. The proposed use would be three to five boat trips each day, and even restricted further to two or three boats per day during critical time periods (except for emergency, environmental, or safety situations). Trained observers can be placed on the boats, and the boat trips can be carefully routed and managed to avoid the mammals. The boats will abide by the Marine Mammal Viewing Guidelines and Regulations and will not be permitted to approach to within 100 yards of marine mammals.

Lower Slate Lake. The other significant difference between alternatives A and D is the tailings storage facility. Alternative A would create a 160-acre drystack tailings facility, and Alternative D would entail subaqueous tailings disposal in Lower Slate Lake, resulting in an increase in the lake's area from 20 to 55 acres and a productive bottom of greater than the present 11 acres. It is the State's position that there is a high probability that the post-closure lake can be restored to be at least as productive as before mining. While Alternative A would recreate 160 acres of forested uplands, any of the Lower Slate Lakes disposal options would eventually recreate wetlands with a function at least equivalent to and very possibly higher than what existed prior to mining.

The State has looked closely at the toxicity of the tailings that would be discharged to Lower Slate Lake under alternative D from the standpoint of both the potential effect on water quality and post-closure habitability of the tailings. In general, we have concluded that the chemical composition of the tailings suggest that toxicity risks due to chemical constituents -- primarily metals and metalloids -- would be low both during and after operations. There is some indication that undiluted residual milling reagents have the theoretical potential to cause toxic effects, though mixing and dilution of these reagents in the disposal facility will reduce concentrations and risks, and effluent discharged from the facility will be subject to permit limits that guard against toxic effects in Slate Creek. Results of tests performed on the acid generating potential of the tailings suggest that there is virtually no risk either during or after operations.

The State acknowledges that there is some uncertainty as to the habitability of the tailings. However, our review of the analysis leads us to conclude that the toxicity risks are low, and that the tailings are very likely to recolonize. In addition, monitoring and additional testing will be required of the tailings during the mine's life and during the reclamation and closure period, with provision for contingency measures, such as adding organics to deposited tails, in the event they are needed to ensure or speed recolonization.

The State acknowledges that there will likely be a short-term loss of lake productivity, including the likely extirpation of the resident Dollies. However, because this is a largely isolated population and lake productivity will be restored, the State considers this temporary loss to be acceptable. The ongoing biological and chemical monitoring of the effects of subaqueous tailings disposal in Slate Lake will contribute significantly to our understanding of the environmental effects and practicability of this disposal technique, and will help in making future permitting decisions. There is substantial value to that, which should not be overlooked, and provides a level of compensatory mitigation.

Echo Cove. The analysis in the SEIS and the November 15, 2004 Biological Assessment clearly shows that with proper mitigation, the impacts from siting the facility at Cascade Point would be less than if the facility were sited in Echo Cove. There is significant recreational use in Echo Cove, and the ferry traffic and dredging necessary to keep this constrained bay open would be very disruptive to these uses. Also, there are significant habitat values in Echo Cove, including extensive eel grass beds, that would be difficult to mitigate.

PRACTICABILITY

The Alaska Department of Natural Resources, Division of Mining, Land and Water's Mining Section has reviewed the cost information for the two alternatives, and has determined that it is unlikely that the Kensington Project could be feasible if developed under Alternative A. Therefore we do not consider Alternative A to be a "practicable" or "reasonable" alternative from the standpoint of cost or economics.

In coming to this conclusion, DNR Mining Section staff reviewed numerous documents containing financial feasibility information provided by Coeur Alaska. While DNR did not do a detailed economic evaluation of the proposed project, staff verified the general cost estimates for operating and capital costs. This verification consisted primarily of tracking the numbers to their source in a third-party produced report, and ensuring that the report was produced by reputable consultants with appropriate expertise.

DNR's review focused on verifying the operating and capital costs for Alternative A, which are $646 million and $240 million, respectively (these are inflation adjusted numbers as provided in a third-party review conducted by Bechtel Corporation in 1997). Our conclusion is the total cost to develop and build the mine and extract the recoverable gold metal, $886 million, is greater than the value of the gold produced (even at $450/oz). These figures are summarized in the following table:

2004 Dollars with 1.9 Million Ounces of Reserves

Reserves	1.9 Million OZ.		
Gold Price	$350	$400	$450
Net Worth of Reserve	$ 665,000,000.00	$ 760,000,000.00	$855,000,000.00
Operating Costs	$ 646,000,000.00	$ 646,000,000.00	$646,000,000.00
Profit not deducting Capital Costs	$ 19,000,000.00	$ 114,000,000.00	$209,000,000.00
Capital Costs	$ 240,000,000.00	$ 240,000,000.00	$240,000,000.00
Profit/Loss including Capital Costs	($221,000,000.00)	($126,000,000.00)	($31,000,000.00)

PREFERRED ALTERNATIVE

It is clear from the EIS analysis and the proposed mitigation measures that the environmental impacts from both Alternative A and Alternative D are expected to be reasonable and fairly equivalent in magnitude. Based on this alone, there is no reason not to select the applicant's proposed alternative, with the changes embodied in Alternative D. Further, because our review of the cost data confirms that the project under Alternative A is not economically viable even at today's metal prices, the choice of Alternative D as the Preferred Alternative is even more justified.

The State of Alaska recommends that the US Forest Service select Alternative D as the Preferred Alternative.

Please feel free to give me a call at 907-269-8629 if you have any questions or comments.

Sincerely,

Ed Fogels
Project Manager

Cc: Hanh Gold, USEPA
John Leeds, USACOE
Kaja Brix, NMFS
Luke Russell, Coeur
Gene Weglinski, Tetra Tech, Inc.
Ron Rimelman, Tetra Tech, Inc.

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

Reply To
Attn Of: OWW-130

DEC - 1 2004

Forrest Cole
Forest Supervisor
648 Mission Street
Federal Building
Ketchikan, AK 99901-6591

RE: EPA's Environmentally Preferable and Preferred Alternatives
Kensington Gold Project

Dear Mr. Cole:

At the request of the Forest Service, EPA, a cooperating agency in the NEPA process for the Kensington Gold Project, is submitting our designation of an environmentally preferable alternative, and a preferred alternative, for inclusion in the Final Supplemental Environmental Impact Statement (FSEIS). It is EPA's understanding that the Forest Service intends to finalize the FSEIS on December 10, 2004, with publication of the document in the Federal Register on December 17, 2004.

Our selections of an environmentally preferable alternative and a preferred alternative, as outlined below and explained in the enclosures, are based on the current record, without the benefit of either a completed ESA analysis in conjunction with NOAA Fisheries addressing potential impacts to the herring population and marine mammals in Berners Bay, or a completed Clean Water Act (CWA) § 404(b)(1) analysis from the U.S. Army Corps of Engineers evaluating the least environmentally damaging practicable alternative. EPA's preference would be to incorporate those analyses, when they are performed, into the selection of environmentally preferable and preferred alternatives.

Based on current information and the collective analysis performed during the inter-agency meeting in Juneau on October 15, 2004, we conclude that Alternative A would have less adverse environmental impacts than Alternatives B, C or D. Alternative A is the only alternative that will avoid the habitat loss in Lower Slate Lake during mine operations, and the uncertainty in terms of the Lake's long term recovery. It is also the only alternative that avoids the significant impacts to sensitive habitat and resources in Berner's Bay that would result from Alternatives B, C and D.[1] In addition, if the project were to expand beyond the current proposal to mine only the smaller high-grade ore body, which is reasonably foreseeable, then

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[1]While we understand that there are some ongoing discussions among various state and federal agencies about possible measures to mitigate the ecological impacts on Berner's Bay, it is not yet clear what those measures will be because both the Alaska Department of Natural Resources and NOAA Fisheries have proposed measures, but no consensus has been reached as to which of the proposed measures will be implemented.

Alternative A's dry tailings facility would have the capacity to store the additional tailings material with far less additional impacts than would result from future mine expansion under the other alternatives. For these reasons, Alternative A is the environmentally preferable alternative.

Alternative A is also EPA's preferred alternative, because in addition to being environmentally preferable, it appears to be a practicable and feasible alternative. The dry tailings facility proposed under Alternative A is a standard industry technology in use at other mines in Alaska. In June 1996, when the applicant submitted a revised plan of operations, gold prices were at approximately $390 an ounce. In 1998, Alternative A, in the form proposed by the applicant, was fully permitted by all the relevant federal and state agencies, which involved a finding by the U.S. Army Corps of Engineers that Alternative A was practicable. Gold prices are at approximately $450 an ounce today, which is approximately 50% higher than they were in 1998.

The enclosed analyses, which factor into the evaluation our CWA § 402 and 404 statutory authorities and our Clean Air Act § 309 review authority, explain our rationale in more detail.

EPA requests that our preferences, justification, and the enclosed analyses of the environmentally preferable and preferred alternatives be included in the FSEIS to meet our NEPA compliance requirements and for purposes of public disclosure. Also, pursuant to paragraph C.8 of the Memorandum of Agreement (MOU) executed on July 29, 2003, EPA requests an opportunity to review the environmentally preferable and preferred alternatives discussion in the FSEIS prior to publication. If the Forest Service decides not to include our analyses in the FSEIS, then we request a written response with an explanation of your reasoning, as provided in the MOU (¶ C.4).

EPA appreciates all the hard work and dedication of the agencies and staff toward this project. Please feel free to contact me at (206) 553-7151 if you have any questions or would like to discuss this letter. If you would like to arrange a meeting, please have your staff contact Hanh Gold of my staff at (206) 553-0171.

Sincerely,

Michael F. Gearheard
Director
Office of Water and Watersheds

Enclosures

cc: Ed Fogels, ADNR
John Leeds, U.S. Army Corps of Engineers
Aleria Jensen, NOAA Fisheries

Kensington Gold Project
U.S. Environmental Protection Agency
Environmentally Preferable and Preferred Alternative Analyses

INTRODUCTION

This purpose of this analyses is to determine EPA's environmentally preferable and preferred alternatives for the Kensington Gold Project Supplemental Environmental Impact Statement (SEIS). The analyses are based on discussions among the U.S. Forest Service, the U.S. Army Corps of Engineers, NOAA Fisheries, the U.S. Fish and Wildlife Service, the Alaska Department of Natural Resources, and the Alaska Department of Environmental Conservation. EPA participated with those agencies in a collaborative process designed to achieve consensus on an environmentally preferable alternative, and thereafter a preferred alternative. As part of that process, the agencies identified various resources impacted by the alternatives identified in the Preliminary Final SEIS (PFSEIS, September 2004). The alternatives are summarized in Table 1. The agencies reached a general consensus, at staff level, on the degree of impact on each resource for each alternative, and also agreed on relative importance, or weighting, of each of the resource impacts (Table 2).

For the environmentally preferable analysis, EPA considered the list of affected resources described in Table 2. The three categories listed correspond to the resource impacts given maximum weight (called "maximum resource considerations"), those given medium weight ("medium resource considerations"), and those given minimum weight ("minimum resource considerations"). The specific resource considerations listed in each category correspond either to one resource impact that the agencies identified, or to a small group of closely related impacts.

For each resource consideration, the environmentally preferable alternative analysis below uses the degree of impact to which the agencies' staff agreed ("low," "moderate," "high," etc.).

DESCRIPTION OF ALTERNATIVES

Table 1 - Description of Alternatives

Alternative	A	A1*	B (Proposed Alternative)	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

* Alternative A1 was not evaluated in the environmentally preferable alternative analysis. Instead, mine expansion considerations and potential environmental impacts were incorporated into the evaluation of Alternatives B, C, and D.

DTF - drystack tailings facility
TSF - tailings storage facility
RT - round trip
CFS - cubic foot per second
gpm - gallons per minute

Table 2 - Environmentally Preferable Alternative Evaluation by Resource

RESOURCE	Alt. A	Alt. B	Alt. C	Alt. D	WEIGHTING
Air	X	X	X	X	
Geotechnical					
Probability of tailings disposal facility failure	Low	Low	Low	Low	Minimum
Consequence of tailings disposal facility failure	Low and short-term	High and mid- to long-term	High and mid- to long-term	High and mid- to long-term	Minimum
Surface Water Hydrology					
Instream flow	Meets instream flow requirements	Does not always meet instream flow requirements	Meets instream flow requirements	Meets instream flow requirements	
Potential sediment production	X	X	X	X	
Surface Water Quality (Fresh Water)					
Effluent quality	Meets NPDES permit limits	Does not meet NPDES permit limits	Does not meet NPDES permit limits	Meets NPDES permit limits	Maximum
Fuel spill probability	Low	Lower	Lower	Lower	Minimum
Fuel spill volume	High	Low	Low	Low	Minimum
Fuel spill consequence	High	High	High	High	Minimum
Groundwater Hydrology	X	X	X	X	
Groundwater Quality	X	X	X	X	
Aquatic Resources (Freshwater)					
Short-term habitat loss	Low	High	Highest	High	Medium
Long-term habitat loss	None	Low (Moderate)*	Low (Moderate)*	Very Low (Moderate)*	Medium
Dolly Varden char loss	100-200	1000 (2,380)	1000 (2,380)	1000 (2,380)	Minimum (Medium)
Marine Resources					

Herring habitat loss short-term	None	High	Low	High	Maximum
Herring habitat loss long-term	None	High	Low	High	Maximum
Marine mammals	Very Low	High	Moderate	High	Maximum
Birds	Low	High/ Seasonal	High/ Seasonal	High/ Seasonal	Maximum
Spill probability	Moderate	Low	Low	Low	Maximum
Spill volume	High [880 gallons]	Low [20 gallons]	Low [20 gallons]	Low [20 gallons]	Maximum
Spill consequences	Low	High	Moderate	High	Maximum
Wildlife	Mountain goats - Moderate; Others-Low	Low (Geese-Moderate)	Low (Geese-Moderate)	Low (Geese-Moderate)	Minimum
Acres of Disturbance/% Watershed	268 acres/ 3.0%	195 acres/ 2.1%	215 acres/ 2.2%	197 acres/ 2.1%	
Vegetation (Productive old growth [POG]/% POG)	135 acres/ 1.6%	140 acres/ 1.7%	149 acres/ 1.8%	142 acres/ 1.7%	
Wetlands					
Wetlands - On land (acres/type)**	265.8 [mostly forested, no palustrine emergent]	90.9 [9.6 palustrine emergent; 20 lacustrine]	111.3 [15 palustrine emergent; 20 lacustrine]	92.8 [9.8 palustrine emergent; 20 lacustrine]	Maximum
Wetlands - Marine (acres)	2.3	33.3	38.2	33.5	Minimum
Visual (short-term)	High	Low-Moderate	Low-Moderate	Low-Moderate	Medium
Visual (long-term)	Low	Low-Moderate	Low-Moderate	Low-Moderate	Medium
Recreation* **	Low-Moderate	Moderate	High	Moderate	Medium
Cultural Resources	X	X	X	X	

( ) = cumulative impacts from mine expansion
X = no impacts of consequence
* Small risk of restoration failure
** Table 4-22 of PFSEIS
*** There was some disagreement among the agencies as to whether recreation should be considered in the evaluation of the environmentally preferable alternative.

Alternatives B vs. D

While Alternative B is nearly identical to Alternative D, Alternative B cannot be the environmentally preferable alternative because the differences between the two alternatives all favor D over B. Three main considerations lead to this conclusion. First, D would meet NPDES requirements and B would not, because of B's lack of wastewater treatment. B also lacks a diversion, which would increase the volume of wastewater being discharged. Second, B would not always meet in-stream flow requirements for Slate Creek because of the lack of the diversion (which is a feature of D). Third, D would better ensure long-term protection of habitat and water quality of Lower Slate Lake because of the tailings cap. Alternative B has no environmental advantages over D and is eliminated from further analysis.

Alternatives A vs. C

Maximum Resource Considerations:

Effluent quality considerations favor Alternative A because its effluent would meet NPDES requirements, while effluent quality from Alternative C would not.

Setting aside fuel spills, marine resource considerations all favor A as well, taking into account herring habitat loss (none for A, low for C), marine mammal impacts (very low for A, medium for C), and impacts on birds (low for A, seasonally high for C).

Marine fuel spills involve a tradeoff. Alternative A has a higher spill probability and volume, but a lower impact due to less sensitive receiving environment in Lynn Canal as compared to Berner's Bay. In EPA's view, this consideration favors A because while it is reasonable to expect that over the life of the mine, there may be more spills under alternative A than C, the total number of spills would likely be small or zero in either case, but the impacts would be more significant under Alternative C. This seems to favor Alternative A from this standpoint.

Freshwater wetlands impacts also involve a tradeoff. Alternative A would impact over twice as many acres of wetlands overall (265.8 acres for A compared to 111.3 acres for C), but most are forested or scrub-shrub wetlands. While C affects fewer acres overall, it would affect 20 acres of lacustrine wetland and 15 acres of palustrine emergent wetlands (compared to none for A). EPA believes that forested wetlands are far more plentiful, and of far less ecological value at this location, than lacustrine and palustrine emergent wetlands, which are rare and ecologically important at this location. For that reason, EPA believes that this consideration favors Alternative A from an environmental perspective, though EPA recognizes that this consideration involves tradeoffs between the two alternatives.

In weighing these considerations against one another, the NPDES problems seem to weigh heavily against C, and the marine considerations other than spills also strongly favor A. The marine spills considerations involve tradeoffs and do not seem to cut strongly either way; on balance we believe they favor A, but less strongly than the prior two considerations. The fresh water wetlands considerations also involve tradeoffs. While one could make a case for C based on the numbers of acres impacted, we believe the consideration of the type of wetlands impacted by the options makes it a much closer question, tilting in favor of A in our opinion but less decisively than the first two considerations. Overall, all of these factors either strongly favor A, or are closer calls that one could argue either way but which we believe favor A as well.

Medium Resource Considerations:

Impacts to fresh water aquatic resources all favor A over C. This includes short term habitat loss, long-term habitat loss,[1] and Dolly Varden char loss (100-200 fish for A, 1000-2380 fish for C[2]).

Visual impacts involve a tradeoff. Short-term impacts favor C because the dry stack facility would not be vegetated in the short-term, while long term impacts favor A due to revegetation of the tailings facility post-operation. The marine terminals in Berner's Bay (Echo Cove and Slate Creek Cove) would be permanently visible. Overall, long-term impacts seem more significant because they will be essentially permanent rather than temporary.

Recreation impacts favor A. There is some disagreement as to whether this is an environmental consideration, but from EPA's perspective, the 404 (b)(1) guidelines require consideration of affects on water-related recreation and aesthetics. Recreation and visual impacts are getting at largely the same considerations, and both should be taken into account in determining the environmentally preferred alternative. We note that recreation was one of the three main issues identified during the public NEPA scoping process.

Overall, these factors either clearly favor A (fresh water resources) or involved tradeoffs that weakly favor A but we recognize could be argued either way. Whatever the conclusion regarding the visual and recreational impacts, it appears to EPA that on balance these factors favor A, given the clear advantages in the area of fresh water aquatic resources.

Minimum Resource Considerations:

The impacts of a tailings disposal facility failure are more adverse for Alternative C than A. In both cases, the probability of failure is low, but for Alternative A the consequences are low

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[1]The impact is low based on the proposed mine size in alternative C, but medium taking into account cumulative impacts from reasonably foreseeable mine expansion.

[2]1000 fish lost as currently proposed, 2380 lost based on cumulative impacts from mine expansion.

and short term, whereas for Alternative C they are high and mid- to long-term.

The risks of a freshwater fuel spill favor Alternative C over Alternative A because the spill risk is lower for C, and the volume that would be spilled is much lower for C than A, though the consequences of a spill are comparable for the two alternatives.

Wildlife concerns favor Alternative C over A (moderate versus low), but only because C assumes a smaller mine than A assumed. If, for Alternative C, we take into account the cumulative impacts of continuing to develop the mine to its originally proposed size, as is assumed for Alternative A, then the wildlife impacts are comparable.

Marine wetlands considerations favor Alternative A because it would disturb only 2.3 acres, versus 38.2 acres for Alternative C.

Overall, these factors do not strongly favor either alternative. Two of the factors (tailings facility failure and marine wetlands impacts) favor A, one (freshwater fuel spills) favors C, and the remaining factor (wildlife impacts) either favors C or is a wash. All of these factors are of relatively minimum significance, and since they do not all favor the same alternative, they do not seem to affect the analysis based on the more heavily weighted factors.

Conclusion:

All of the maximum or medium environmental considerations favor Alternative A over Alternative C or are neutral. The only consideration favoring C over a is the risk from freshwater fuel spills, a minimum factor, which is balanced by other minimum factors favoring Alternative A. Overall, Alternative A is environmentally preferable to Alternative C.

Alternatives A vs. D

Maximum Resource Considerations:

Both alternatives would meet NPDES requirements, so effluent quality does not favor either alternative.

Marine resource impacts excluding fuel spills all favor A over D even more strongly than they favor A over C (as discussed above). Alternative D involves higher herring habitat loss than Alternative C, compared to no impacts for Alternative A. Marine mammal impacts are very low for A, but are medium for C and significantly higher still for D. Impacts on birds are seasonally high for D (as they are for C), and very low for A. Overall, adverse effects on marine resources are much higher for Alternative D than they are for Alternative A.

Fuel spills are more likely, and also likely to involve larger volumes, under Alternative A as compared to Alternative D. However, the environmental consequences would be much greater under D than A because of the sensitivity of the ecosystem in Berner's Bay compared to Lynn Canal. This is similar to the comparison of Alternatives A and C, except that the ecological sensitivity is even higher for Alternative D than C because even within Berner's Bay, Cascade Point is a much more ecologically sensitive area than Echo Cove. Because spill likelihood is relatively low under either alternative, but the consequences much more severe under Alternative D, EPA believes that the risk of fuel spills favors Alternative A over D from an environmental standpoint.

Regarding impacts to fresh water wetlands, the comparison between Alternatives A and D is similar to that discussed above for A and C, except that Alternative D impacts slightly fewer forested wetlands, and about 2/3 the number of palustrine emergent wetlands (9.8 acres for D, compared to 15 acres for C). For the same reasons discussed above for A vs. C, EPA believes that the 9.8 acres of palustrine emergent wetlands affected by Alternative D (compared to none for Alternative A) outweigh in ecological significance the fact that Alternative A impacts more forested wetlands than Alternative D (265.8 acres for A compared to 92.8 acres for D). Therefore, this consideration favors Alternative A from an environmental standpoint.

Overall, the marine impacts strongly favor Alternative A over D, while fresh water wetlands impacts weakly favor A and the effluent quality is neutral. These considerations as a group therefore favor Alternative A.

<u>Medium Resource Considerations</u>:

Impacts to fresh water aquatic resources all favor A over D, for the same reasons that they favor A over C, as discussed above, but less strongly since the impacts from D are slightly less than those from C. Short term habitat loss is less for D than C, but still greater than A. Long-term habitat loss is lower for D than C, but there is none under Alternative A. Dolly Varden char loss is the same for D as it is for C (1000-2380 fish[3]), compared to 100-200 fish for A.

Visual impacts are the same for Alternatives C and D, so the discussion above applies. Short-term impacts favor D, while long term impacts favor A. Overall, long-term impacts seem more significant because they will be essentially permanent rather than temporary.

Recreation impacts favor A over D, but less strongly than they favor A over C.

Overall, these considerations each favor A over D or are neutral.

<u>Minimum Resource Considerations</u>:

All of the considerations in this category are identical for Alternatives C and D, except

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[3]1000 fish lost as currently proposed, 2380 lost based on cumulative impacts from mine expansion.

for marine wetlands impacts. Marine wetlands impacts are nearly the same for Alternatives C and D, however (38.2 acres affected versus 33.5 acres), and for both alternatives are significantly greater than the impacts for Alternative A (2.3 acres impacted). For these factors, therefore, the comparison between Alternatives A and D is essentially the same as it is for Alternatives A and C, and for the reasons discussed above, these factors do not strongly favor either alternative, and do not change the analysis from the more significant considerations discussed previously.

Conclusion:

As for the comparison between Alternatives A and D, all of the maximum or medium environmental considerations favor Alternative A over Alternative D or are neutral. The only consideration favoring D over A is the risk from freshwater fuel spills, a minimum factor, which is balanced by other minimum factors favoring Alternative A. Overall, Alternative A is environmentally preferable to Alternative D.

Alternatives A vs. CD Composite

Alternatives B, C and D each contain environmental advantages and disadvantages compared to one another that could just as easily be recombined into a new composite alternative that contains the environmental advantages of each. There is no reason that the advantages of these to alternatives cannot be combined; they were distributed among those two alternatives simply for ease of analysis. To be specific, a composite alternative could involve NPDES treatment (as provided in Alternative D, but not B or C), dock facilities in Echo Cove rather than Cascade Point (as in Alternative C, but not B or D), and sediment capping (as in Alternative D, but not B or C). For discussion purposes, this composite alternative will be referred to as "CD."

Maximum Resource Considerations:

Both Alternatives A and CD will meet NPDES requirements, so that consideration is neutral as between these alternatives.

Marine impacts other than fuel spills are the same as discussed in the comparison between Alternatives A and C, because CD incorporates the Echo Cove location as in Alternative C. As discussed above, this consideration favors Alternative A over CD.

Marine impacts from the risk of fuel spills are also as discussed in the comparison between Alternatives A and C, since CD takes its marine configuration from Alternative C. As discussed above, this consideration weakly favors Alternative A over CD.

Impacts to fresh water wetlands are as discussed above in the comparison between Alternatives A and D, since CD incorporates the wetlands-related configuration from Alternative D. For the reasons discussed above, this consideration favors Alternative A over CD.

Overall, these maximum considerations all either clearly favor A (non-spill marine impacts), or weakly favor A or are neutral.

Medium Resource Considerations:

Impacts to fresh water aquatic resources are as discussed above in the comparison between Alternatives A and D, since CD incorporates the fresh water-related configuration from Alternative D. For the reasons discussed above, this consideration favors Alternative A over D.

Visual impacts are the same for Alternatives C and D, so the visual impacts discussion in both of the above comparisons applies. Short-term impacts favor CD, while long term impacts favor A. Overall, long-term impacts seem more significant because they will be essentially permanent rather than temporary.

Recreation impacts of Alternative CD are the same as those for Alternative C, so the discussion of recreation impacts in the comparison between Alternatives A and C applies here. For the reasons explained above, recreation considerations favor Alternative A over CD. There is some disagreement as to whether recreation is an environmental consideration, but it seems to EPA staff that recreation and visual impacts are getting at largely the same considerations, and both should be taken into account in determining the environmentally preferred alternative. We note that recreation was one of the three main issues identified during the public NEPA scoping process.

Overall, these considerations each favor Alternative A over CD or are neutral.

Minimum Resource Considerations:

All of the considerations in this category are identical for Alternatives C and D, and therefore for CD as well, except for marine wetlands impacts. The marine wetlands impacts for CD are the same as for Alternative C. So all of the minimum resource considerations for Alternative CD are the same as for Alternative C, and the comparison of minimum resource considerations for Alternatives A and C applies here in the comparison between Alternatives A and CD. For the reasons discussed in the comparison between Alternatives A and C, these factors do not strongly favor either alternative, and since they do not all favor the same alternative, they do not seem to affect the analysis based on the more heavily weighted factors.

Conclusion:

All of the maximum or medium environmental considerations favor Alternative A over Alternative CD or are neutral. The only consideration favoring CD over A is the risk from freshwater fuel spills, a minimum factor, which is balanced by other minimum factors favoring Alternative A. Overall, Alternative A is environmentally preferable to Alternative CD.

PREFERRED ALTERNATIVE ANALYSIS

The Council on Environmental quality (CEQ) Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations defines the "agency's preferred alternative" as "the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors." EPA's "statutory mission and responsibilities" in this case include NPDES permitting under CWA § 402, and review of the Corps of Engineers' application of the CWA § 404(b)(1) guidelines to this project in the CWA § 404 permitting action.

The EPA's mission, generally, is primarily environmental protection. The Congressional declaration of the goals and policy underlying the CWA is set forth in CWA § 101, and its focus is entirely on the prevention of pollution and degradation, and the restoration, of the nation's waters. For example, the CWA § 101(a)(3) states, "It is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." The § 404(b)(1) guidelines, however, do incorporate the concept of the practicability of particular alternatives, in that they require the permitting under CWA § 404 only of the "least environmentally damaging *practicable* alternative" (emphasis added), also known as the LEDPA.

The project proponent, Coeur Alaska, has asserted that Alternative A is not *practicable*. In EPA's view, however, the information submitted to date is not adequate to establish that Alternative A is not a practicable alternative. In June 1996, when the applicant submitted a revised plan of operations, gold prices were at approximately $390 an ounce. In 1998, Alternative A, in the form proposed by the applicant, was fully permitted by all the relevant federal and state agencies (including EPA, the U.S. Army Corps of Engineers, USFS, ADNR, and ADEC), gold prices were around $300 an ounce. Gold prices are at approximately $450 an ounce today, which is approximately 50% higher than they were in 1998. Based on the current gold prices, we cannot conclude that Alternative A is not practicable.

In selecting an Environmentally Preferable Alternative, EPA concluded that Alternative A is the least environmentally damaging alternative. Since Alternative A, based on the current record, appears to be practicable, it appears to be the LEDPA as well, and therefore the only alternative that may be permitted under CWA § 404.

The 404 (b)(1) guidelines also prohibit significant degradation of waters of the U.S. The Corps of Engineers previously determined that Alternative A would not cause or contribute to significant degradation of waters of the U.S. when they permitted the project in 1998. While Alternative D attempts to address significant degradation of Lower Slate Lake by capping the tailings, it does not entirely avoid significant degradation because of the permanent loss of the natural Lower Slate Lake ecosystem. Alternative D is also inconsistent with the national policy mandated by the Clean Water Act to prohibit the discharge of toxic pollutants in toxic amounts.

Alternative A is EPA's Preferred Alternative because, based on the current record, it appears that: (1) it is the environmentally preferable alternative, (2) it is the least environmentally damaging practicable alternative, (3) it is the only alternative that avoids significant degradation, and (4) it is the only alternative that is consistent with the national policy that prohibits the discharge of toxic pollutants in toxic amounts.

Appendix L

Draft SEIS Comments and Responses

Appendix L: Draft SEIS Comments and Responses

Table of Contents

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Section 1
Comment Summary

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Comment Summary

The Forest Service received comments on the Draft SEIS from federal, state, and local government agencies; Native American organizations and corporations; nonprofit organizations; environmental groups; businesses and trade organizations; and individuals. Comments were received by regular mail, by e-mail, and on comment forms submitted at the open houses in Juneau and Haines. Twenty-four comment letters were received from agencies, native corporations and organizations, and environmental groups. In summary,

- State and federal agency comments generally focused on technical aspects of the Draft SEIS requesting clarifications and additional information. As documented in the responses, the Forest Service has specifically included further information in the Final SEIS regarding Tailings Storage Facility (TSF) discharge quality and developed an additional alternative (Alternative D) to address concerns about the need for water treatment and, at the request of EPA, a tailings cap to eliminate the potential for tailings toxicity after closure. The marine discussion in the Final SEIS has also been expanded to incorporate additional information on potential effects on marine mammals and mitigation, which either became mandatory after distribution of the Draft SEIS (through the CBJ Conditional Use Permits) or expected to be required in other local, state, and federal permits and authorizations. The Forest Service worked closely with the State of Alaska (as a cooperating agency), USFWS, and NMFS in preparing the marine resources sections of the Final SEIS.

- At the municipal level, the City and Borough of Juneau (CBJ) provided detailed comments on the socioeconomics evaluation. These have been addressed in the Final SEIS, including evaluation of a 50 percent local hire scenario. Based on the company's commitments to local hiring and training programs, both the Forest Service and CBJ concur that 50 percent local hiring is a realistic goal for the mine. The Haines and Ketchikan boroughs sent letters generally supporting the selection of Alternative B.

- Klukwan, Inc., the Central Council of the Tlingit and Haida Tribes of Alaska, and Goldbelt, Inc., also supported selection of Alternative B. The Tlingit and Haida Central Council cited a broad range of economic and environmental factors supporting Alternative B that were mentioned by many of the individual commenters (see below) and specifically noted the council's preference for avoiding potential impacts on the commercial fishery in Lynn Canal.

- Ten environmental groups commented on the technical analysis in the Draft SEIS as well as compliance with NEPA and other federal and state regulations. As noted above, detailed responses to these comments follow in this section. Overall, concerns were raised about the impacts from Alternatives B, C, and D, and these concerns focused on the tailings facility and the broad range of effects on the biological and recreational resources within Berners Bay. In response to specific comments, the Final SEIS includes expanded information on TSF water quality with treatment incorporated into Alternative D, more data and analyses on marine impacts in Berners Bay, and further evaluation of cumulative effects.

A total of 316 comment documents were received from individuals and 44 comment documents were received from businesses and trade organizations. These comments and specific responses have been included in the planning record. Of the commenters, 341 provided addresses, as follows:

- 213 comment documents from Juneau and Douglas
- 82 comment documents from Haines and Skagway
- 11 comment documents from other Southeast Alaska communities
- 19 comment documents from the Anchorage and Fairbanks areas
- 6 comment documents that listed Alaska without a city or town
- 9 comment documents from other states
- 1 comment document from Canada

For the most part, the individual comments provided opinions on which alternative the Forest Service should select in its Record of Decision (ROD). Of the 360 comment documents, 280 commenters indicated a preference for Alternative B, while 66 commenters were opposed to Alternative B. Of the 66 commenters who opposed Alternative B, 15 supported selection of Alternative A or A1, and the remaining 50 either opposed the project in general or did not express a preference. Forty-two of the 44 business and trade organization commenters supported Alternative B. The other two businesses provided technical comments on the SEIS analyses but did not express a preference. Beyond those with views on the selection of an alternative, the remainder of the individual and business commenters either requested clarifications in the SEIS or expressed general concern about impacts on Berners Bay.

Among the supporters of Alternative B, many of the letters were written in the same formats and with similar language that addressed several key themes. First and foremost was the belief that the project was more likely to move forward with more favorable economics under Alternative B and would bring economic benefits and jobs to both Juneau and Haines. The following are other reasons that were provided:

- Less overall disturbance and fewer impacts on wetlands
- Safer and more reliable transportation of personnel and fuel to the site
- Lower fuel use and fewer air emissions
- Fewer visual impacts associated with the TSF compared with the Dry Tailings Facility (DTF); and that the TSF would be easier to reclaim and would support improved habitat for fish after closure
- No potential effects on the Lynn Canal commercial fisheries near Comet Beach

With respect to individuals who commented on Echo Cove versus Cascade Point, about 40 commenters were opposed to Echo Cove, citing potential conflicts with existing recreational uses. Several other individual commenters also expressed concern over the need for periodic dredging. Of the 360 comment documents, only 2 commenters supported the use of Echo Cove instead of Cascade Point.

Ten commenters who supported Alternative B raised doubts about the assumption of only 20 percent local hiring, suggesting a higher percentage especially in light of the elimination of the on-site personnel camp. With input from CBJ, a 50 percent local hire scenario has been included in the Final SEIS. This seems to be a more realistic scenario given Coeur Alaska's commitments to local hiring and providing workforce training.

A few commenters also questioned why a preferred alternative was not included in the Draft SEIS. Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) Part 1502.14 require the identification of a preferred alternative or alternatives in the Draft SEIS if one exists. When the Draft SEIS was published, the Forest Service and the cooperating agencies could not reach agreement on a preferred alternative; therefore, no preferred alternative was included in the Draft SEIS.

Among the individual commenters who opposed the project or specifically opposed Alternative B, the concerns focused on several areas:

- Comments were raised about the broad impacts on biological and recreational resources in Berners Bay. Some commenters specifically cited the need for additional detail in the SEIS related to effects on marine mammals, including seals. The Final SEIS, including the biological assessment/biological evaluation (BA/BE) in Appendix J, provides further data and analyses on potential impacts on sea lions and humpback whales. Further details on seal use and effects have been added to Section 4.10. The State of Alaska, as a cooperating agency, and NMFS provided information for these sections and reviewed them.

- Comments were received on the use of Lower Slate Lake to manage tailings and on water quality in the lake and at the discharge point to East Fork Slate Creek. Both the Draft SEIS and Final SEIS, including Appendices A (Water Quality) and C (Ecological Risk Assessment) describe the effects in detail. As cooperating agencies, USEPA and ADNR have participated in developing the finding that Lower Slate Lake can be restored to equivalent or better habitat after closure. This is further ensured by the incorporation of the native material cover over the tailings into Alternative D in the Final SEIS.

- Like the environmental groups, a number of commenters also questioned the legality of tailings disposal in Lower Slate Lake under the Clean Water Act and Alaska's water quality standards. As summarized in Section 1.7.1 of the Final SEIS and documented in EPA's May 17, 2004 memorandum (USEPA, 2004), the "conversion" of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. As cooperating agencies, USEPA, USACE, and ADNR have all concurred that the TSF is legal and permittable under their respective permitting authorities.

- Concerns were raised about the cumulative effects of other projects in Berners Bay. The cumulative effects portion of the document has been expanded to provide additional details related to the impacts of the Kensington mine when added to the potential effects of other past, present, and reasonably foreseeable future actions in the project area.

- Commenters noted that the mine would bring only limited jobs to Juneau because of the 20 percent local hiring scenario and that the project could adversely affect the local housing market and cause pressures on the school system. As noted above, after consultation with the CBJ, the Final SEIS includes a 50 percent local hiring scenario to more realistically reflect the commitment to local hiring and training.

Many comments were received on the need for financial assurance and expressed concern that reclamation cost estimates were not included in the draft SEIS. The National Environmental Policy Act (NEPA) does not require that reclamation costs be presented in an SEIS. The Forest Service, however, is required to ensure that adequate financial assurance (bonding) is provided, prior to initiation of mine construction. Financial assurance specifically includes the costs associated with implementation of all mitigation measures required by the ROD. Since the financial assurance requirements depend on the alternative selected for implementation, the actual calculation of financial assurances cannot occur until after the ROD is signed. Conceptual reclamation requirements are included in Section 2 and Appendix D of the Draft and Final SEISs.

Approximately 15 commenters expressed concern that the Forest Service did not hold a formal public hearing following distribution of the Draft SEIS. CEQ regulations at 40 CFR Part 1506.6 do not require the Forest Service to hold a public meeting between a draft and final SEIS. The Forest Service, however, often hosts informational meetings during a draft EIS comment period to provide supplementary information and provide a forum for discussion and clarification. The Forest Service prefers the informal format, rather than a formal hearing, because it provides a relaxed environment for interested parties to ask questions and share information.

Finally, the Forest Service received standardized letters by fax and e-mail from about 1,000 other individuals from throughout the nation and the world. An example faxed letter and e-mail are provided following the letters from and Forest Service responses to agencies, native corporations and organizations, and environmental groups. The demographics of the individuals who submitted the standardized letters and e-mails are summarized in Table L-1.

The letter opposes Alternative B because of the impacts of dumping tailings into Lower Slate Lake. The letter also questions the legality of the practice under federal and state law. The commenters further cite effects on ecological, cultural, and recreational resources from crew shuttle and barge transportation in Berners Bay. They specifically note potential damage to eulachon and herring, which are food sources for other fish, bird, and marine mammal species.

All of comments received on the Draft SEIS were considered in preparing the Final SEIS and the ROD.

Table L-1
Demographics of Standard E-mails and Facsimiles Received on the Kensington Gold Project Draft SEIS

Mailing Location	Number of Commenters	Mailing Location	Number of Commenters
Alabama	3	Nebraska	4
Alaska	4	Nevada	24
Arizona	43	New Hampshire	12
Arkansas	1	New Jersey	33
California	165	New Mexico	14
Colorado	43	New York	65
Connecticut	9	N. Carolina	13
Dist. Columbia	5	North Dakota	1
Delaware	4	Ohio	24
Florida	57	Oklahoma	4
Georgia	22	Oregon	28
Hawaii	4	Pennsylvania	33
Idaho	12	Rhode Island	6
Illinois	40	S. Carolina	12
Indiana	9	Tennessee	11
Iowa	7	Texas	36
Kansas	3	Utah	8
Kentucky	4	Virginia	23
Maryland	22	Vermont	3
Massachusetts	20	U.S. Virgin Islands	1
Maine	7	Washington	57
Michigan	24	W. Virginia	4
Minnesota	14	Wisconsin	21
Mississippi	2	Wyoming	6
Missouri	9	Canada	8
Montana	5	Other Countries	28

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Section 2
Agency and Tribal Organizations
Comment Letters and Responses

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CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

March 8, 2004

Mr. Steve Hohensee
SEIS Team Leader
U.S. Forest Service
8465 Old Dairy Road
Juneau, AK 99801

Subject: Comments for DSEIS on the Kensington Mine Project

Dear Mr. Hohensee:

I am pleased to offer these comments on the Draft Supplemental Environmental Impact Statement (DSEIS) on the Kensington mine project. My comments are in two sections: general comments on the work overall, and more detailed comments on specific provisions of the socioeconomic inventory and analysis.

I have addressed primarily the socioeconomic component of the DSEIS, but have also commented on land use and recreation. I have found the socioeconomic inventory and analysis to be thoughtfully prepared and reasonably complete. I appreciate the effort by the consultant to incorporate, to the extent possible, the methodologies and assumptions used in the Reed Hanson socioeconomic impact assessment of the Kensington Mine in 1997.

GENERAL COMMENTS

Effect of Local Hire on Forecasted Impacts

The socioeconomic impact assessments prepared for the Kensington mine in 1997 by Reed Hanson Associates, and by Tetra-Tech in 2004, have calculated socioeconomic impacts based on the assumption that 80% of the mine construction and operations workforces will in-migrate from outside the area. Coeur has stated that they are committed to local hire, and, in an opinion piece that appeared in the Juneau Empire on Sunday, Match 7th, a Coeur spokesman asserted that the company's goal is to achieve maximum local hire, as high as 90%. Obviously, the percentage of workers who are hired locally compared to the percentage who move to the community for work has a significant effect on population growth and demand for public facilities and services. PF-1

Coeur's announced plans to instigate a mine training program would, if it lowered the in-migration of workers from 80% to 50%, for example, significantly change the population growth attributable to the mine, and consequently reduce the impacts anticipated on schools, housing and other public services. Coeur should announce the specifics of its plans for a mine training program as soon as possible. The socioeconomic analysis can then be informed about company PF-2

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plans before the Final EIS is published, and, conjecturally at least, a forecast of the likely effects of the project on the community can be made based on higher local hire assumptions.

Ability to Absorb Impacts

The flat to downward-trending regional economy, declining school enrollment projections, and the prospect of budget reductions and state employee lay-offs, are cited as factors that, to some extent, may mitigate the forecasted effects of population growth attributed to the project. In effect, these factors contribute to the ability of local service delivery and institutional capacity to 'absorb' the effects of mine-related growth with reduced demand for additional facilities and services. PF-3

Some clarification, or perhaps some additional discussion, of the dynamic between economic downturn and mine-induced growth would be helpful. This is the "flip side" discussion to one a reader might expect to see if all services were at or over capacity when the mine started. Perhaps it would be possible to illuminate the relationship between economic trends and mine development by further quantifying some of the 'downturn' data, such as declines in government agency employment and other employment sectors, utility dis-connects, projected declines in school enrollment and other 'slowdown' or 'downturn' indicators.

Locally-Generated Taxes

Locally-generated tax revenues that are directly attributable to the mine should be forecasted by type and amount and presented in a table. This would include real property tax, business property tax and probably sales tax on company purchases if it is calculable. Induced tax earnings, for example, property taxes on housing constructed because of the mine, or sales tax attributable to the mine-induced population, should be forecasted and presented separately. PF-4

Now, the analysis contains just one discrete figure for locally-generated tax revenue, the $1.4 million figure for direct property taxes forecast to be paid by Kensington. It is impossible to understand the local revenue implications of the project, or develop clear sense of project revenues and CBJ costs, unless the revenues payable to local government can be discretely identified

$1.4 million in direct property tax payments forecast to be paid by Kensington seems low for the 10-year life of the mine. For comparison purposes, in 2003, Greens Creek mine paid $365,281 in taxes on real property at the mine-site valued at $54,357,300. The company also paid $322, 504 on business personal property valued at $47,991,725. This equals $687,785 per year, or $6,877,850 over a 10-year period not taking into account inflation, changes in assessed value and other factors. This leads me to think that the tax revenues forecast for the Kensington may be under-estimated at $140,000 per year. The $1.4 million figure should be re-examined and revised as necessary. PF-5

Land Use Effects

The impacts identified and analyzed in an EIS should be reasonably foreseeable, and not speculative. The discussion on land use is consistent with this notion, based on the direct, PF-6 physical impact on the land caused by mine construction and operation. Still, some speculative effects can be reasonably concluded. PF-6

I think it may be reasonable to conclude that, over time, the mine may create pressure for residential development well-beyond the city's water and wastewater systems and at some distance from fire, police and emergency medical services. Workers are proposed to be transported daily by bus to a marine terminal at Cascade Point. If, however, the bus commute proves impractical or inefficient, or mine workers simply do not want to sue it, they may begin choosing to commute by car, and, to shorten commuting distances, may seek to live as close as possible to the marine terminal.

Pressure for the development of residential land in the Herbert/Eagle River area or beyond could stretch out development even further along the city's road system, and create a growing demand for public services and facilities at some distance from town. I realize that this is conjectural in the context of the SDEIS, but also believe that it is a legitimate community development concern that should be taken into account as a potential effect of mine development.

Finally, use of the Cascade Point area for mining support and other activities could prompt additional consideration of its future development as a New Growth Area. A New Growth Area is described in the Land Use Code (CBJ 49.70.110) as a classification that accommodates new communities with a full range of uses and densities, including public services, commercial and industrial activity, utility infrastructure and housing. The establishment of a new community at Cascade Point is not within the scope of the SDEIS, and is only conjectural at this time, but should be identified as a possible cumulative effect of mine development. PF-7

Recreation

Berners Bay has long been one of the city and borough's top 'backyard' recreation areas, popular for kayaking, wildlife viewing, camping, sport fishing and jet-boat access to the up-bay rivers. The SDEIS uses categories and classifications such as Semi-Primitive Non-Motorized and Visual Priority Travel Route to create a context for rationalizing the effects of the project, and yet these do not frame the key issue with regard to the development: the further loss of wilderness values in the Bay. PF-8

Recreational boat activity, commuter airplane flights, jet boat access to the up-bay rivers and commercial vessel traffic in Lynn Canal all create a noticeable human presence in and around the Bay. But they do not create a continuous presence linked to an activity at the Bay itself. The establishment of daily vessel commutes and regular barge service in the Bay will bring with it the continuous presence of human activity and will represent a permanent (ie, life-of-mine) increase in human presence and activity in the area. PF-9

While conjectural, the future development of Cascade Point as a full-service community (New Growth Area) in support of mining and other commercial and/or industrial activities could also lead to increases in the number of recreational users in the Bay. PF-10

Early, Temporary or Unanticipated Mine Closure

Early, temporary or unanticipated mine closure could have foreseeable effects on the city and borough. For example, it could lead to out-migration of households, increased housing availability and lowered growth rates, or declines, in school enrollment. It could place stress on social service providers as families adjust to job loss and the prospect of seeking other employment and/or leaving the area. PF-11

The effects of early, temporary or unanticipated mine closure are also closely related to the proportion of workers hired locally or from outside the community. A high proportion of 'outside' workers (the 80% assumption used in the SDEIS) might mean a higher out-migration of workers with a closure, while a higher percentage of workers hired locally (or regionally) might mean higher local (or regional) unemployment and a higher demand for social and family services. The narrative should address, if only briefly, the potential effects of early closure, linked to the to the assumed number of workers who will work at the mine from outside the community.

The mine operator is required to give 60 days notice to workers under WARN, the federal Worker Adjustment and Retraining Notification Act, when 50 or more employees will be terminated in a 30-day period. Federal law requires that this notice is given to the Mayor of the affected municipality. Pre-closure notice requirements should also be included in the U.S. Forest Service Plan of Operations for the mine, which might stress requirements for hazard abatement, safety and security of the mine workings and improvements. Pre-closure notice could also be a requirement of a state or federal resource agency with permitting responsibility, such as the Department of Environmental Conservation has under its wastewater discharge permit with the Greens Creek mine. PF-12

SPECIFIC COMMENTS

3.15.1, Demographics. I don't know what the statement means, "On average from 1991 to 1999, 1.8 people per 1,000 moved into the CBJ." PF-13

3.15.2, CBJ Economic Setting. The statement "after Juneau was established as the seat of the Alaska Territorial Government" leads the reader to think that Juneau became the capital after closure of the gold mines in 1944. Juneau became the territorial capital in 1906, during the "heyday" of the Treadwell Mine, and well before the AJ mine became the world's largest low-grade gold mine. PF-14

3.15.2, Employment. In the paragraph that concludes below Table 3-36, state government employment is identified as being up 5% between 1997 and 2001, with an additional 212 jobs. This is seemingly at odds with an earlier statement in this section that "recent economic downturns have led to significant cuts in the state budget." PF-15

3.15.5, Schools. The Yaakoosge Daakahidi Alternative High School is operated by the Juneau School District. I would drop the reference to the Alyeska Central Correspondence School as it is a statewide program, now operated (I believe) by the City of Galena school district. PF-16

PF-17

3.15.7, Community Services. I have attached revised language for the sub-sections on Law Enforcement, Fire Protection, Ambulance Services and Health Care. If the IMPLAN model is capable of it, it would be very helpful to forecast increased staffing needs for fire, EMS and police services, in the same manner that the need for 19 additional teachers was identified in the analysis of schools. PF-18

PF-17

Law Enforcement
The Juneau Police Department provides law enforcement services for the CBJ. The service area covers 3,248 square miles. The department employs a Chief, one Assistant Chief, one Captain, 2 Lieutenant's, 7 Sergeants, 35 Officers, 5 Community Service Officers, and other support staff.

Fire Protection
Fire protection is provided by Capital City Fire/Rescue, a department within the City and Borough of Juneau. Fire protection is provided to all of the roaded areas of Juneau as far north as Cohen Drive, at the north end of the Tee Harbor area. Service is provided from five stations: Juneau, Douglas, Glacier located at the Juneau International Airport, Auke Bay, and Lynn Canal located at Tee Harbor. The Juneau and Glacier are staffed continuously with career firefighter/EMTs. Emergency responses are staffed by a combination of career and volunteer personnel.

Ambulance Services
Capital City Fire/Rescue Air Medevac, Airlift Northwest/Air Ambulance, Greens Creek Emergency Medical Service, and the US Coast Guard Rescue Coordination Center provide ambulance services in the Juneau area. Ground ambulance services are provided throughout the roaded areas of Juneau by Capital City fire/Rescue. Ambulances respond from the Juneau and Glacier stations and are staffed by career firefighter/EMTs. Volunteer firefighter/EMTs are available to respond to large incidents and medical emergencies distant from the staffed stations. The CCF/R Air Medevac service is available to areas within the CBJ beyond the road system, and to neighboring communities in northern Southeast Alaska.

Bartlett Regional Hospital
Bartlett Regional Hospital is a primary care facility serving Northern and Central Southeast Alaska. Physicians working the hospital's Emergency Department are trained in Emergency Medicine with board certifications in associated medical fields. The Emergency Department nursing staff maintains specialized certifications including Advanced Cardiac Life Support, Pediatric Advanced Life Support, Advanced Burn Life Support and Trauma Nursing. Bartlett Regional Hospital's Emergency Department is equipped with five trauma beds, an ear, nose and throat room, orthopedic and minor surgery rooms, three private exam rooms and a mental health room. The department has access to the latest medical equipment found in a primary care hospital.

PF-19

4.15, Socioeconomics. The key assumption that 'drives' all the calculations in this section is the 80% in-migration of construction and operations workers. As discussed earlier in the City and

Borough's response, the impacts should also be calculated at 50% to account for local and regional hire through the establishment of a mine training program.

4.15.3, Employment Impacts. The paragraph that precedes Table 4-19 states that the construction phase would generate on average 155 jobs the first year and 206 jobs during the second year. The narrative says these figures are in Table 4-19, but I can't find them. The figures should either be corrected or be made more explicit in the Table. PF-20

4.15.3, Housing Impacts. The construction workforce numbers of 228 in the first year and 98 in the second year do not match the numbers 226 and 96 respectively that are in Table 4-19. PF-21

4.15.3, Population Impacts. The narrative refers to Table 4-17. I believe it was meant to refer to Table 4-20. PF-22

4.15.3, Other Public Service Impacts. The narrative projects a minor, temporary increase in demand for police, fire, emergency, and health services during mine construction, but does not characterize the actual kinds of services that are in demand. Are these service increases representative of the existing pattern of service delivery (ie, a microcosm), or are they more uniquely related to the construction workforce? Perhaps review of a NEPA socioeconomic impact database, or the review of another database of social impacts, could reveal this, and lend more descriptive content to the narrative. PF-23

4.15.3, Tax Impacts. The narrative states that long-term direct and indirect beneficial [tax] impacts would be expected, but the actual amounts and sources are vague. While the narrative notes that tax earnings to the CBJ include direct, indirect and induced revenues, it does not differentiate these revenues by type or amount. If the IMPLAN model is capable of it, a table should be created for this sub-section, forecasting local tax revenues by type and amount. PF-24

A table created to display local mine-related revenue sources should be contrasted with a table displaying the known public costs associated with mine development, for example, the 19 teaching positions, and to the extent they are credible or can be made, projected increases in police, fire and/or EMS staffing. PF-25

Thank you for the opportunity to review the SDEIS and provide the City and Borough's comments. We look forward to the publication of the Final SEIS and to a discussion of the issues we have raised in our comments.

Cordially,

Peter Freer, Planning Supervisor
Community Development Department
(907) 586-0465
Peter_Freer@ci.juneau.ak.us

Responses to Comments

Affiliation	*Comment ID*	*Response*
City/Borough of Juneau	PF-01	For the Final SEIS, the economic impact analysis evaluates the effects under a scenario in which only 50 percent of the mine workforce would in-migrate. The ability of the mine to recruit local labor will depend on the available labor pool at the time of the start-up of operations, as well as outreach and training efforts by the mining company. The Final SEIS document acknowledges the company's efforts at other localities to recruit and train local labor (see Section 4.15.3).
City/Borough of Juneau	PF-02	Comment noted. See the response to comment PF-01.
City/Borough of Juneau	PF-03	Commented noted. Some additional language has been added in Section 4.15 to clarify this issue.
City/Borough of Juneau	PF-04	Commenter is correct that estimated tax revenues likely underestimate total tax revenues that would be generated from the proposed action. For example, property tax on new housing construction is not accounted for in the current analysis. However, it is too speculative to project such tax revenues without knowing the number of houses to be built or the value of the houses.
City/Borough of Juneau	PF-05	The $1.4 million property tax revenue is an annual estimate, not the total stream of payments over the lifetime of the facility. The estimate is generated by IMPLAN, which is a static model and predicts outputs for only a single year at a time. Text has been changed in the Final SEIS to better clarify this point.
City/Borough of Juneau	PF-06	Although there could be pressure for housing in the Herbert/Eagle River area in response to development of the mine, predicting where the workers will live is speculative in terms of the SEIS. The SEIS considered Goldbelt's development at Echo Cove in the cumulative effects discussion but sufficient information was not available to consider potential development pressures elsewhere. The conditional use permit issued by CBJ to Coeur Alaska (see Appendix I) requires the company to provide bus transportation and establish a company policy that its employees use the bus to commute.
City/Borough of Juneau	PF-07	Cumulative impacts of the proposed project in combination with Cascade Point development and other reasonably foreseeable actions are discussed in Section 4.21.
City/Borough of Juneau	PF-08	It is important to distinguish between impacts at the proposed project site, which is governed by Forest Service land use policies, and off-site impacts on Berners Bay. The Forest Service's categories and classifications (including Semi-Primitive Non-Motorized and Visual Priority Travel Route) are planning tools designed to inventory the resource and then develop goals and prescriptions for managing future activities. Through the Forest Service planning process, the proposed project site has been designated for mining activities, consistent with the Forest Service's multiple use goals, except the Slate Creek marine terminal. Resource activities in this area are encouraged to maintain the existing recreational setting where possible. Impacts on Berners Bay and Echo Cove are not governed by Forest Service land use policies, but need to be disclosed as part of the SEIS. A paragraph has been added at the end of Section 4.13 to emphasize this distinction and to summarize the key issues, including the loss of wilderness values in Berners Bay.
City/Borough of Juneau	PF-09	A discussion of the continuous nature of the proposed project-related crew shuttle and barge traffic has been added to the text in the Final SEIS in Section 4.13.
City/Borough of Juneau	PF-10	Increased recreational pressure due to development at Cascade Point is discussed in Section 4.21.12.

Affiliation	Comment ID	Response
City/Borough of Juneau	PF-11	Mining operations like most businesses are subject to the vagaries of business cycles, commodity prices, and other economic and financial factors. While extraction industries tend to be more volatile than other industry sectors, it would be too speculative and beyond the scope of the SEIS to evaluate the impacts of premature closure for the facility. The main objective of the economic impact analysis is to determine whether the regional economy can absorb the economic impacts of implementing the alternatives, including impacts on labor and housing markets, and public services. The magnitude of the impacts forecasted by the modeling efforts indicates that the alternatives would not result in effects that could not be reasonably absorbed by the regional economy either in the project buildup or expansion or closure phase. This would also likely be true in an early closure scenario.
City/Borough of Juneau	PF-12	As noted by the commenter, Coeur Alaska is required to give 60 days notice to workers under WARN. The Final SEIS notes in Section 2.3.19, Table 2-6, and Section 4.4 that a financial assurance requirement would be imposed on Coeur Alaska to ensure sufficient funds are available for hazard abatement at the time of closure.
City/Borough of Juneau	PF-13	Commenter is correct. Text has been revised in Section 3.15.1.
City/Borough of Juneau	PF-14	Text revised in Section 3.15.1 and 3.15.2.
City/Borough of Juneau	PF-15	The text has been clarified in Section 3.15.2 to reflect "recent budget cuts" and refers to 2003 and 2004 actions.
City/Borough of Juneau	PF-16	Text revised in Section 3.15.5.
City/Borough of Juneau	PF-17	Text revised per comment in Section 4.15.3. The Final SEIS indicates the ratio of public personnel per resident for each public service category.
City/Borough of Juneau	PF-18	See the response to comment PF-17.
City/Borough of Juneau	PF-19	Comment noted. The Final SEIS includes in the analysis in Section 4.15 a 50 percent local hire scenario.
City/Borough of Juneau	PF-20	Numbers were revised in Section 4.15.3.
City/Borough of Juneau	PF-21	Numbers were revised in Section 4.15.3.
City/Borough of Juneau	PF-22	Text edited per comment in Section 4.15.3.
City/Borough of Juneau	PF-23	The increase in demand for services is a function of population increases only and is not related to specific employment categories. The public services impacts represent the primary types of publicly funded services that are provided to the general population and for which tax revenue is the major source of funding.
City/Borough of Juneau	PF-24	IMPLAN projects annual increases in tax revenues but does not differentiate those revenues by type (direct, indirect, induced).
City/Borough of Juneau	PF-25	Such a table would imply that the economic impact analysis is also a cost-benefit analysis. This type of approach would exceed the scope of a NEPA analysis and would also imply a degree of accuracy not achievable in a static model. The current presentation provides overall magnitude of impacts and allows the decision maker to determine whether or not CBJ would bear significant impacts from the implementation of any of the alternatives.

Goldbelt
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RECEIVED
MAR 08 2004
Juneau Ranger District

March 8, 2004

Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
Juneau, Alaska 99801

Re: Kensington Gold Project Draft SEIS

Dear Mr. Hohensee,

Introduction

DG-2-1 My name is David Goade, Executive Vice President for Goldbelt, Incorporated. I am writing to articulate my strong support for Alternative B. To put it directly in concise terms, Alternative B is the most environmentally responsible and economically sustainable mine operating plan. Furthermore, Alternative B is critically important to the long-term financial health of Goldbelt. I will focus the balance of my comments primarily on the Goldbelt perspective.

However, I would fail in my purpose if I did not first acknowledge the vital importance of the Kensington Mine to Juneau and to Southeast Alaska. That is, 325 high-paying construction jobs, 225 high-paying mining jobs, and an additional several hundred indirect jobs. In concert with the mine developer's commitment to local hire, this adds up to a major boost to our economy. Not only will the mine broaden Juneau's economic diversification, it will provide meaningful, long-term employment opportunities for many families living in the Southeast Alaska region.

Background

Before discussing my rationale for supporting Alternative B, I will provide a brief historical perspective on Goldbelt's deep-seated interest in the Berners Bay area and the long-term success of the Kensington Gold Project.

- Goldbelt is an Urban corporation formed pursuant to the Alaska Native Claims Settlement Act of 1971. Its primary areas of business operations include tourism, land development, and real estate investment. It is headquartered in Juneau and has approximately 3,400 Alaska Native shareholders.

- Goldbelt owns 1,382 acres of land located at Echo Cove, which is at the northern terminus of Glacier Highway and approximately 10 miles from the Kensington Mine area. We received ownership of this land in 1981 from the Bureau of Land Management. Echo Cove is the gateway to Berners Bay and northern Lynn Canal.

- Goldbelt completed the Echo Cove Master Plan in 1996. After many public hearings the plan was accepted by the City and Borough of Juneau as an integral part of its Comprehensive Plan. Among its many features, the master plan identified Cascade Point as a site of significant economic opportunities. They are, commercial fisheries support, tourism, transportation (marine highway terminal), and mining support services. All that was lacking was road access.

- On December 22, 1998, Goldbelt received a Record of Decision from the U.S. Forest Service authorizing the construction of a 2.5-mile extension of the Glacier Highway to Cascade Point. This action marked the successful conclusion of an Environmental Impact Statement process that spanned a two-year time frame.

- On March 9, 2000, Goldbelt received a U.S. Army Corps permit authorizing the construction of a 2.5-mile extension of the Glacier Highway to Cascade Point. This action marked the successful conclusion of a one-year long permit review process.

- The current Kensington Mine development plan, Alternative B, presents a major economic opportunity for Goldbelt to realize its vision for Cascade Point. Namely, develop and operate long-term, year-round, mine support services.

Discussion

Overview. The Kensington Gold Project Draft SEIS presents different alternatives for the development and operation of the mine. Of these, Alternative B permits a mine operation that is practical, efficient, sustainable, and achievable from construction to reclamation. Alternatives A, A1, and C represent mine operations that will have relatively more environmental and other land use impacts. They not only directly impact more land areas, but also are more costly to build, maintain, and operate. The imposed operating conditions of Alternatives A, A1 and C would decrease the mine operator's ability to withstand changing economic conditions, such as gold price fluctuations. This makes Alternative B relatively superior since it has lower capital costs and lower long-term operating costs. It would be best if the mine were to begin and end mining operations without periods of shutdown in between. This is much more likely to happen if development and long-term operating costs are as low as reasonable and practical.

Goldbelt Perspective. I have already mentioned that the development and operation of the Kensington Mine Project is critically important to Goldbelt. We have spent years preparing the foundation upon which to build our Cascade Point vision. Years of planning and permitting paved the way to our present situation. One that provides Goldbelt with the opportunity to provide important mine support services such as employee transportation.

DG2-2 and DG2-3

Alternatives A and A1. These two alternatives are viewed together because they are both uneconomic in form and function. They prescribe mine development alternatives that include expensive construction and operational methods, e.g. dry tailings stack. I am fully aware that Alternative A is the already approved mine operation. However, I believe it represents a series of compromises and arbitrary decisions that when added together rules out the long-term, sustainable economic operation of the mine. For instance, underwater tailings disposal, as opposed to the required dry tailings stack, may have been the best method of economically and responsibly dealing with waste rock. But, the mine developer was precluded from pursuing this option by a policy decision at the EPA.

Alternative B. Alternative B represents an evolutionary improvement above and beyond Alternative A. It not only reduces environmental and other land use impacts, it also improves the mine economics and thereby greatly enhances its enduring viability. And only Alternative B provides Goldbelt with the year-round, long-term opportunity to operate mine employee transportation services.

Under Alternative B, Goldbelt intends to use busses to transport mine workers to and from Cascade Point where we will then ferry them across Berners Bay to Slate Creek Cove. The use of busses will mitigate traffic impacts on Glacier Highway as well as save on energy costs. The ferryboat operation will be similar to the already proven safe and effective Greens Creek Mine run from Auke Bay to Admiralty Island. In contrast, Alternatives A and A1 limit employee transportation to helicopters, which may not be as safe in the long run for daily, year-round operations. This brings me to another related point since a ferry dock location in Echo Cove is listed as a possible alternative to Cascade Point.

DG2-4

Alternative C. Alternative C includes the operation of the employee ferryboat from a dock location inside Echo Cove. As the upland landowner with many years of land management experience in this area, I must honestly say that such an idea is loaded with problems. Echo Cove is a very popular public recreation area that is growing in intensity every year. I already have serious on-going land management issues at Echo Cove with illegal tree cutting, littering, irresponsible campfire practices, illegal discharge of firearms, and alcohol abuse. The thought of operating an employee ferryboat service from a dock location inside Echo Cove fills me with dread.

There are four main problems with a dock facility in Echo Cove:

1) Security. Because of Echo Cove's popularity with the general public, it would be necessary to securely separate dock operations from the surrounding area. Separation of public and commercial land-based uses could be achieved by fencing that would unfortunately appear institutional and would have a very negative aesthetic impact. In stark contrast, Cascade Point does not have this issue because of its relative isolation from the heavily used Echo Cove area.

2) Dredging. The entrance to Echo Cove is constricted by a shallow, narrow passage formed by sand bars. It would be necessary to dredge a substantial amount of this material in order to clear a wide and deep enough channel adequate for at least a 100' ferryboat. In addition, regular maintenance dredging would need to occur in order to keep the passage open. It is also presumptuous to believe that the Army Corps of Engineers would permit such large scale dredging. And finally, removal of the sand bar could expose Echo Cove to wave energies it is currently protected from. The dredge activity proposed at Cascade Point is far smaller in size and scope and need only occur once. Also, ferryboat operations from here would not affect Echo Cove.

3) User Conflicts. A dock in Echo Cove would mean conducting a commercial activity amidst recreational user groups that include people operating skiffs, kayaks, other boats, jet skis, four wheelers, motorcycles, and who will be picnicking, beach fishing, hiking, and camping. This is a potent recipe for serious conflicts and would only bring negative consequences for all involved.

4) Master Plan Conflict. Operating a ferryboat dock in Echo Cove is inconsistent with the Echo Cove Master Plan. At the very heart of the plan is a vision to keep Echo Cove for recreational uses and to separately locate commercial activities at Cascade Point. This separation is realistic and achievable by consistently basing future land use decisions on this accepted vision.

<u>Summary</u>

Goldbelt does not support Alternatives A and A1 and advises against their further consideration. They both bring about a totality of impacts that exceed those of Alternative B. They are in essence a mine prescription that is uneconomic from the outset and the selection of either is tantamount to denying the mine project. There is a better alternative - Alternative B.

Goldbelt does not support Alternative C. Any scenario that includes a ferryboat dock facility inside Echo Cove is asking for difficult and troublesome operations. Goldbelt owns the majority of the land surrounding Echo Cove and can speak from experience - a dock in the cove will not work. There is a better alternative.

Goldbelt strongly supports Alternative B. We are looking forward to the long-term business opportunities provided by the mine operation described and permitted by this alternative. Alternative B is environmentally responsible and has the vital added benefit of being economically sound.

I will close with a compelling phrase; Alternative B is the "least environmentally damaging practicable alternative." When the alternatives are viewed relative to one another and apart from strong emotional reactions, Alternative B clearly emerges as the best choice. It is my hope that reason, common sense, and science will prevail over personal bias and fear. I also have faith in the permitting process that will ensure the mine operation will operate in an environmentally responsible manner. And in the same breath I hope the U.S. Forest Service will permit Coeur Alaska to build and operate an economical mine. We can accomplish both goals by approving Alternative B.

Thank you. I appreciate the opportunity to comment on this very important project.

Sincerely,
GOLDBELT, INCORPORATED

David D. Goade
Executive Vice President

cc: U.S. Senator Ted Stevens
U.S. Senator Lisa Murkowski
U.S. Representative Don Young
Governor Frank Murkowski
Senator Kim Elton
Representative Beth Kerttula
Representative Bruce Weyhrauch
Mayor Bruce Bothello

Responses to Comments

Affiliation	*Comment ID*	*Response*
Goldbelt	DG2-01	Comment noted. The Forest Service has considered all of Goldbelt, Inc.'s, views and comments in preparing the ROD.
Goldbelt	DG2-02	Comment noted.
Goldbelt	DG2-03	Comment noted.
Goldbelt	DG2-04	Comment noted.

HAINES BOROUGH, ALASKA

P.O. BOX 1209 • HAINES, ALASKA 99827
Administration (907) 766-2231 • Fax (907) 766-3179
Tax Office/Assessor (907) 766-2711 • Fax (907) 766-2716
Tourism (907) 766-2234 • Tourism Fax (907) 766-3155

RECE[illegible]
MAR 0[illegible] 2004
Juneau R[illegible]
District

March 5, 2004

Mr. Rick Richins, Vice President
Coeur, Alaska, Inc.
3031 Clinton Dr., Ste. 202
Juneau, AK 99801

Re: Kensington Gold Project

Thank you and your staff very much for the excellent overview of the Kensington project that you presented here in Haines. It is clear the Coeur has done an extraordinary job in planning for the development as well as the eventual closing of the project.

MC-1 I strongly endorse alternative B of your plans. It appears to strike the best balance of economic development and limited impact on the surrounding areas and lifestyle. MC-2 I also applaud your efforts to explore opportunities for the community of Haines to contribute to the project. We have a multi-talented workforce pool from which to draw for both the construction phase and during mining operations. Haines would be the location of choice for many people who would like to work at Kensington. Compared to opportunities in other communities, Haines has lots of relatively inexpensive land in various stages of development, highway access to mainland Alaska, Canada and the Lower-48 and a moderate climate. Further, there is an entrepreneurial spirit here that will rise to the occasion of supplying the goods and services you will need.

I look forward to working with you as the Kensington plans progress towards production.

Sincerely,

Mike Case

Mike Case, Mayor
Haines Borough, Alaska

Cc: Mr. Steve Hohensee

Responses to Comments

Affiliation	Comment ID	Response
Haines Borough	MC-01	Comment noted. The Forest Service has considered all of the Haines Borough's views in preparing the ROD.
Haines Borough	MC-02	Comment noted.

Kake Tribal Corporation

PO Box 263 ~ Kake, AK 99830 Office: 907-785-3221 ~ fax: 907-785-6407

BOARD RESOLUTION: # 04-03

TITLE: KAKE TRIBAL CORPORATION SUPPORTS ALTERNATIVE PLAN B FOR THE COEUR ALASKA KENSINGTON MINE

WHEREAS Kake Tribal Corporation is a founding member of the Berners Bay Consortium that was developed to advise and assist Coeur Alaska in developing a mine that would have regional support and that would be environmentally conscientious, and

WHEREAS the Berners Bay Consortium and Coeur Alaska have spent six years evaluating, researching and designing environmentally conscientious proposals to extract minerals from the Kensington Mine, and

PM -1

WHEREAS Coeur Alaska has submitted four alternatives for public view and comment on their Draft Supplemental Environmental Impact Statement (DSEIS), and

WHEREAS, Kake Tribal Corporation and its shareholders have a 10,000 year history of protecting the environment through Native environmental stewardship, and

WHEREAS, Kake Tribal Corporation has thoroughly analyzed the environmental issues and complexities raised in the four proposes alternatives, now

THEREFORE BE IT RESOLVED THAT the Kake Tribal Corporation Board of Directors fully support Alternative B as proposed by Coeur Alaska as the best environmental alternative for extracting minerals from the Kensington Mine. Alternative B increases wetlands, increases fisheries and wildlife habitat, eliminates surface water issues, is supported by Lynn Canal salmon fishermen, eliminates the need for long term fuel tanks, provides for a safer operation and fuel transfer, has the smallest amount of land disturbance and is the overall superior environmental and economic alternative. On behalf of our 700 Kake Tribal Corporation shareholders that primarily live in Southeast Alaska, we are on record of supporting Coeur Alaska's Kensington Mine Alternative B.

I certify that the Kake Tribal Corporation Board of Directors adopted this resolution in a regularly scheduled board meeting on February 3, 2004 by unanimous consent.

Pete Martin

Pete Martin, Jr., Corporate Secretary

Responses to Comments

Affiliation	*Comment ID*	*Response*
Kake Tribal Corporation	PM-01	Comment noted. The Forest Service has considered the Kake Tribal Corporation's board resolution in preparing the ROD.

KAKE TRIBAL CORPORATION
P.O. Box 263 Kake, AK 99830 (907) 785-3221 FAX (907) 785-6407

RECEIVED
MAR 08 2004
Juneau Range District

March 4, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group
USDA Forest Service
8465 Old Dairy Road
Juneau, AK 99801

RE: Support for Coeur Alaska's Alternative B mine proposal

Dear Mr. Hohensee,

I would like to take the time to inform you that Kake Tribal Corporation fully supports the development and operation of the Coeur Alaska's Alternative B proposal for the design, construction, and operation of their Kensington mine.

DM-1

Our company is deeply concerned with any development in Southeast Alaska that could alter or negatively affect the environment we exist and live in. Therefore, we have reviewed the Coeur Alternative B proposal with a critical eye. As a result we find Alternative B unquestionably congruent with our premise that "any" development in "our" rainforest be environmentally sound and promote positive environmental stewardship. The public and the Forest Service should congratulate the management at Coeur Alaska for accomplishing such a daunting task of extracting minerals in such an environmentally friendly manner.

Our company represents over 700 Native American shareholders who understand the environment. After all, it is "our" Native American environmental principles that environmental organizations attempt to emulate. Our shareholders represent a people who have inhabited Southeast Alaska for over 10,000 years. We do not lightly recommend or support any development without thoroughly investigating the environmental impact that the development will create. As a people who have been environmental stewards as our first calling to our subsistence and existence, we recommend the Kensington Alternative B as the economically and environmentally sound proposal.

The Kensington Alternative B proposal dramatically reduces the tailings of the Kensington mine. No chemicals are used in the processing of ore and the ore concentrate is shipped out from the site. The tailings therefore are "natural" without any chemical additives. Depositing the mine tailings into Slate Lake is an ingenious method of disposal and is environmentally proactive because the tailings lake increases the biological activity in an otherwise stagnant and unproductive lake. Furthermore the lake is increased in size and the proposal increases wetlands habitat by 32 acres! This out of the way wetlands will quickly become a congregation point for migratory birds that frequent our coastal flyway. The continued urban growth around Gastineau Channel makes the current area wetlands less suitable and desirable every year for migrating waterfowl. Therefore, the Slate Creek wetlands expansion is a very positive event that will issue regional environmental dividends for years long after the mine has ceased operations and reclaimed back to nature.

DM-1 (cont'd)

The alternative B proposal radically reduces the footprint of the mine by over 80% from the initial permitted proposal. Alternative B has less buildings, less housing and related sewer issues, less fuel storage, less fuel handling and pumping, is safer in operation and therefore has substantially less human impact on the environment. Coeur has taken the concerns raised in Alternative A and spent years mitigating the environmental impact in a sound and commonsense manner.

Coeur Mines has received many environmental awards from the Sierra Club and other environmental groups for their past performance at other locations and their commitment to being a proactive and good neighbor mining company is without parallel in the industry. Their past record is insurance of their commitment to the future.

Kake Tribal Corporation is on record of supporting this important Southeast development and urges the Forest Service to select Alternative B because it is the best alternative for the environment.

I am attaching a copy of our recent Board of Directors resolution supporting the Kensington Alternative B proposal.

Sincerely,

Duff W. Mitchell
Chief Operating Officer

Kake Tribal Corporation

PO Box 263 ~ Kake, AK 99830 Office: 907-785-3221 ~ fax: 907-785-6407

BOARD RESOLUTION: # 04-03

TITLE: KAKE TRIBAL CORPORATION SUPPORTS ALTERNATIVE PLAN B FOR THE COEUR ALASKA KENSINGTON MINE

WHEREAS Kake Tribal Corporation is a founding member of the Berners Bay Consortium that was developed to advise and assist Coeur Alaska in developing a mine that would have regional support and that would be environmentally conscientious, and

WHEREAS the Berners Bay Consortium and Coeur Alaska have spent six years evaluating, researching and designing environmentally conscientious proposals to extract minerals from the Kensington Mine, and

WHEREAS Coeur Alaska has submitted four alternatives for public view and comment on their Draft Supplemental Environmental Impact Statement (DSEIS), and

WHEREAS, Kake Tribal Corporation and its shareholders have a 10,000 year history of protecting the environment through Native environmental stewardship, and

WHEREAS, Kake Tribal Corporation has thoroughly analyzed the environmental issues and complexities raised in the four proposes alternatives, now

THEREFORE BE IT RESOLVED THAT the Kake Tribal Corporation Board of Directors fully support Alternative B as proposed by Coeur Alaska as the best environmental alternative for extracting minerals from the Kensington Mine. Alternative B increases wetlands, increases fisheries and wildlife habitat, eliminates surface water issues, is supported by Lynn Canal salmon fishermen, eliminates the need for long term fuel tanks, provides for a safer operation and fuel transfer, has the smallest amount of land disturbance and is the overall superior environmental and economic alternative. On behalf of our 700 Kake Tribal Corporation shareholders that primarily live in Southeast Alaska, we are on record of supporting Coeur Alaska's Kensington Mine Alternative B.

I certify that the Kake Tribal Corporation Board of Directors adopted this resolution in a regularly scheduled board meeting on February 3, 2004 by unanimous consent.

Pete Martin

Pete Martin, Jr., Corporate Secretary

Responses to Comments

Affiliation	*Comment ID*	*Response*
Kake Tribal Corporation	DM-01	Comment noted. The Forest Service has considered the Kake Tribal Corporation's views and comments in preparing the ROD.

KAKE TRIBAL LOGGING & TIMBER, INC.

March 3, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group
USDA Forest Service
Juneau, Alaska 99801

Dear Steve:

CVJ-1 I have been studying the Kensington "Gold Project" and **I strongly support "Alternative B"**. I believe this alternative to be the most environmentally friendly option as well as the most positive option for economic benefit to the local region around Juneau.

Thank you for this opportunity to voice my opinion on this project.

Sincerely;

Coyne Vander Jack
Logging Manager
Kake Tribal Logging & Timber

P.O. BOX 350, KAKE, AK 99830
907-785-3233 PHONE 907-785-3239 FAX

Responses to Comments

Affiliation	Comment ID	Response
Kake Tribal Logging & Timber, Inc.	CVJ-01	Comment noted. The Forest Service has considered Kake Tribal Logging & Timber, Inc.'s, views in preparing the ROD.

KETCHIKAN GATEWAY BOROUGH

OFFICE OF THE BOROUGH MAYOR
Michael B. Salazar
344 FRONT STREET
KETCHIKAN, ALASKA 99901
PHONE: 907.228.6605
FAX: 907.247.8439

March 4, 2004

Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
USDA Forest Service
8465 Old Dairy Road
Juneau, AK 99801

RE: Kensington Gold Project Draft SEIS

Dear Mr. Hohensee:

MS3-1

I have reviewed the Kensington Gold Project Draft SEIS and support selection of Alternative B because it is the least environmentally damaging practicable alternative, reduces the operating costs, and creates substantial economic benefit in the State and Southeast Alaska.

Specifically, alternative B meets applicable water quality standards (as demonstrated in the DSEIS) and results in the smallest amount of land disturbances, including delineated wetlands. Alternative B also provides a geotechnically sound dam design and does not require construction of a major structural berm around the facility due to long-term stability concerns. This alternative also offers the best long-term reclamation proposal, involving creation of 56 acres of enhanced fisheries and wildlife habitat and eliminates any long-term acid rock drainage (ARD) potential including care and maintenance issues related to major surface water diversions. The alternative improves transportation safety, and improves the safety of fuel transfers (provides sheltered docks) and relocates the docking area from the important Lynn Canal commercial fishery. It has substantially lower operating costs than the previously permitted dry tailings facility ($274/ton vs. $0.10/ton) and the Cascade Point dock site provides the most reliable all-weather transportation and access, as compared to Comet Beach or Echo Cove.

In terms of economic benefits for Juneau, Haines and Southeast Alaska, Alternative B provides for the lowest capital and operating costs and creates 325 high-paying construction jobs. The alternative provides an annual estimated payroll and benefits of about $16 million, ramping up from 130 jobs at start-up to 225 during project life. Alternative B would create over 180 additional indirect jobs, and result in $7.5 million in direct local purchases during construction.

Mayor/Personal Address: P.O. Box 6918, Ketchikan, AK 99901
Telephone: 907.225.6608

The Kensington Gold Project, Alternative B, is a prime example of responsible and sustainable mining practices being put to work to create economic strength and diversity in Southeast Alaska. Select Alternative B to the Draft SEIS.

Sincerely,

Michael B. Salazar
Mayor

Cc: KGB Assembly
KGB Manager Eckert

Responses to Comments

Affiliation	Comment ID	Response
Ketchikan Gateway Borough	MS3-01	Comment noted. The Forest Service has considered the Ketchikan Gateway Borough's comments in preparing the ROD.

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April 7, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group
USDA Forest Service
8465 Old Dairy Road
Juneau, AK 99801

Subject: Comments on Kensington DSEIS

Dear Mr. Hohensee:

This letter is written on behalf of Klukwan, an Alaska Native Claims Village Corporation headquartered in Haines, Alaska. Klukwan has approximately three hundred eighty (380) Alaska Native Shareholders.

Klukwan has worked with Coeur since 1994, when the Berners Bay Consortium (BBC) was formed. The goal of the BBC, which also includes Kake and Goldbelt, is the environmentally responsible development of the Kensington Gold Mine.

I am writing to support the selection of Alternative B as the environmentally superior alternative by the USFS. Our specific comments listed below are also intended to support Alternative B as the most practicable alternative. Our reasons are as follows: TLC-1

- Alternative B presents a tailings management option which impacts far fewer wetlands than Alternatives A and A1, as described in the DSEIS document. The reclamation proposal for Alternative B is innovative and will result in a net improvement to the fishery and wildlife habitat at Lower Slate Lake. Representatives of Coeur have also presented to our Shareholders a sound concept for financial assurance needed to insure that both the site-specific reclamation activities are completed when mining is completed, and long-term care and maintenance is funded by insurance-backed bonding.
- Alternative B meets State of Alaska Water Quality Standards; water quality conditions in the lake at post-closure will actually improve with corresponding habitat benefits.
- Placement of tailings in the lake with a water cover will eliminate any potential for acid rock drainage in the long term; and will not require extensive borrow area development needed to cap the DTF on land (Alternatives A and A1).
-

Klukwan, Inc.
425 Sawmill Road / PO Box 209 • Haines, AK 99827
907-766-2211 Phone • 907-766-2973 Fax

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- Tailings disposal in Lower Slate Lake cannot be seen from Lynn Canal or Berners Bay; noise impacts of machinery to build the DTF will be significantly reduced with Alternative B.
- The Cascade Point docksite is uniquely located on Goldbelt land, outside the major recreation use area inside Echo Cove, which is planned for Alternative C.
- Alternative B also moves the docksite away from the important Lynn Canal commercial fishery thus avoiding transportation conflicts; it also significantly reduces the potential for fuel spills associated with barge to shore off-loading, by use of isotainers at the Slate Creek Cove dock.

The Lynn Canal fishery is important to our fishermen. While harvest rates have been relatively high in the past 10 years, net value of salmon taken in this area has substantially declined. The long-term risk of the DTF related to withstanding decades of earthquakes, high-precipitation, and extreme stormwater events is, frankly, unacceptable when a better environmental option is available like Alternative B. Shellfish and halibut resources in Lynn Canal must be protected. TLC-2

Jobs are important to Klukwan Shareholders and the communities of Haines and Juneau. So is the Environment. All these environmental advantages should be documented in the DSEIS. Alternative B is clearly the best alternative, and should be selected. TLC-3

Thank you for the opportunity to support Alternative B. Coeur has pledged local hire and training. Historically, they have lived up to this pledge in our business dealings. We are confident that they will be an environmentally responsible operator.

Sincerely,

Thomas L. Crandall
President
Klukwan, Inc.

Klukwan, Inc.
425 Sawmill Road / PO Box 209 • Haines, AK 99827
907-766-2211 Phone • 907-766-2973 Fax

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Responses to Comments

Affiliation	Comment ID	Response
Klukwan, Inc.	TLC-01	Comment noted. The Forest Service has considered all of Klukwan, Inc.'s, views and comments in preparing the ROD.
Klukwan, Inc.	TLC-02	Comment noted. The Final SEIS documents in Section 3.10.7 the fishing use of Lynn Canal as well as Berners Bay. With the engineered berm, the DTF will not fail under high levels of precipitation. The design would also have to meet safety standards for a level of seismic conditions established by the Alaska State Engineer. The reclamation plan will ensure long-term stability of the final DTF slopes.
Klukwan, Inc.	TLC-03	Comment noted.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

FEB 20 2004

RECEIVED
MAR 08 2004
Juneau Ranger District

Steve Hohensee
United States Forest Service
Juneau Ranger District
8465 Old Dairy Road
Juneau, Alaska 99801

RE: Kensington Gold Project, Draft Supplemental Environmental Impact Statement (DSEIS), Essential Fish Habitat Assessment Comments

Dear Mr. Hohensee,

The National Oceanic and Atmospheric Administrations's National Marine Fisheries Service (NOAA Fisheries) has reviewed the Kensington Gold Project Draft Supplemental Environmental Impact Statement (DSEIS) and provides the following comments regarding issues of concern, including essential fish habitat (EFH) consultation. The DSEIS presents alternatives that have been developed to resolve issues identified during scoping, the environment impacted by the development, and the potential environmental consequences of each alternative. An EFH assessment is also included. A Biological Assessment, pursuant to the Endangered Species Act, is not included in the DSEIS. We understand that the Forest Service is providing that document separately , and NOAA Fisheries will respond once we have an opportunity to review it.

General Comments:

Every alternative presented in the DSEIS would have some environmental impact. However, upon examination of the various alternatives compared to the "no action" alternative (previous alternative D, in the 1997 Supplemental EIS), and the reduced mining rate alternative, A1, we have concluded that the marine facility modifications proposed in Alternative C would have the least damaging environmental impacts to living marine resources under our jurisdiction. This conclusion is based on the following points. SAK-1

1) For the Slate Creek Cove marine facility, intertidal fill would be reduced in Alternative C as compared to Alternative B, by exclusion of the 30' X 210' landing craft ramp. This structure has been included in Alternative B to provide added flexibility, but apparently is an optional feature that is not crucial to the functioning of the marine terminal. This permanent fill would eliminate intertidal habitat and alter hydrology of the intertidal zone at Slate Creek Cove.

2) Selection of the Echo Cove marine docking facility in Alternative C, as opposed to the Cascade Point marine docking facility in Alternative B, would pose less environmental

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impact. The Cascade Point proposal involves filling and placing structures in documented spawning habitat for the depressed Lynn Canal stock of Pacific herring, and also subjecting herring to increased risk of hydrocarbon contamination, which impedes spawning (Carls et al.1997). The Echo Cove dock includes no intertidal fill, and would not directly (from fill) or indirectly (from hydrocarbon contamination associated with vessel fueling or fuel storage) impact spawning habitat for herring.

Vessel fueling and fuel storage is planned for the Cascade Point marine terminal (see enclosed Alaska Department of Natural Resources applicant environmental risk questionnaire from Goldbelt), although this is not discussed in the DSEIS. As discussed in our previous comment letters and in the DSEIS, hydrocarbons pose a significant threat to early life history stages of both salmon and herring, with toxicity effects occurring at extremely low concentrations of contamination. The exposed nature of the Cascade Point location would make it difficult, if not impossible, to contain and clean-up any fuel spillage, which would be dispersed to nearby waters that include documented herring spawning areas. As acknowledged in the DSEIS, even minuscule amounts of weathered oil may adversely affect herring eggs months after a spill. A facility located either at Cascade Point or Echo Cove would be on private land, and therefore would not be subject to the administrative, preventive and corrective best management practices under U.S. Forest Service jurisdiction. This lack of administrative control highlights the higher risk to herring spawning at the Cascade Point facility compared to the Echo Cove facility. Although Echo Cove is located near a pink salmon stream at the head, NOAA Fisheries considers protection of the depressed Lynn Canal herring stock to be of higher priority for the potential economic value of the resource and the ecosystem function of Berners Bay. SAK-2

The final SEIS needs to discuss in detail plans for vessel fueling, fuel storage and associated best management practices at the Cascade Point and Echo Cove marine docks. The DSEIS only discusses fuel transport and unloading to the Slate Creek Cove dock, for the purpose of mine operations and not vessel fueling.

The document also needs to discuss plans for testing and disposing of dredged materials from all of the marine terminal facilities. SAK-3

Specific Comments:

Page 2-3, Table 2-3. "Size of Selected Project Components"

Information needs to be added for Alternatives B and C for "Fuel Storage." NOAA Fisheries has provided your consultant information on Goldbelt's plans for fuel storage at the Cascade Point facility. SAK-4

Pages 2-11 and 2-14, Figures 2-8 and 2-11. Alternative B and C, Cascade Point and Echo Cove Marine Terminals. SAK-5

Fuel storage areas need to be identified.

Page 2-29, Section 2.3.13 Fuel Use and Storage SAK-6

This section does not include a discussion of vessel fueling and storage at the Cascade Point and Echo Cove marine docks.

Page 2-44, Table 2-6, Summary of Mitigation and Control Measures. Aquatic resources: marine. SAK-7

Include BMP's for control of hydrocarbon contamination from vessel fueling and fuel storage for Cascade Point and Echo Cove marine terminals.

Page 2-50, Table 2-7, Monitoring Requirements by Resource Area. SAK-8

The table needs to incorporate the joint ADF&G and NOAA Fisheries proposed monitoring plan for the Cascade Point Facility (enclosed).

Page 2-56, Table 2-8, Summary of Potential Impacts of Each Alternative by Significant Issue SAK-9

Under "Alternative C - Revised Dock Designs/Diversions, add "Fuel leaks or spills in Echo Cove would be easier to contain and clean up compared to Cascade Point."

Page 2-61, Table 2-9, Summary of Potential Impacts of Each Alternative by Resource (continued) SAK-10

Under "Aquatic Resources: Marine", Fish, for Alternative B and C cells add:

"Acute and chronic exposure of sensitive life history stages to hydrocarbon toxicity from fueling and fuel storage spills."

Page 4-41, Nearshore Marine Organisms, Construction SAK-11

Indicate plans for testing and disposal of dredged material from the Slate Creek Cove, Cascade Point and Echo Cove marine docks.

Page 4-42, Spills

Discussion needs to acknowledge, describe and discuss implications of vessel fueling and fuel storage at the Cascade Point and Echo Cove marine docks. Also counter balance statement that low flushing in Echo Cove would have greater impacts to nearshore marine organisms, with the greater ability in Echo Cove to detect, contain and clean up such spills, without contaminating a wider area. SAK-12

Page 4-49, Spills, paragraph three AND page 4-50, Spills, last paragraph SAK-13

Ferry leakage is not the only potential source of hydrocarbon contamination at the ferry terminals. Vessel fueling and fuel storage could introduce much higher levels of contamination. Cascade Point shares an equal risk of spills with Slate Creek Cove due to vessel fueling and fuel storage operations.

Page 4-49, Spills SAK-14

Reference to Carls et al., 1997, is not provided in Literature Cited section, Page 6-5.

EFH Assessment Response:

The EFH assessment adequately addresses water quality and quantity impacts of the Slate Creek impoundment and Jualin Mine developments to anadromous fish streams, including Slate and Johnson Creeks, including the potential effects of acid drainage and toxicity, instream flow, construction and operational impacts to these streams. NOAA Fisheries agrees with the EFH assessment conclusion that the proposed actions are expected to result in no adverse effects on EFH for salmon species in the freshwater environment of the project area, provided that all mitigation measures identified in the EFH assessment are carried out as described. SAK-15

NOAA Fisheries also agrees that both short term and long term adverse effects to EFH, including prey, would result from the proposed action. NOAA Fisheries disagrees with the EFH assessment's conclusions on page B-10 and B-11 regarding relative impacts of hazardous spills at the three marine terminal facilities. These issues are discussed in our General Comments section of this letter. As required by Section 305 (b)(4)(a) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (50 CFR 600.920, 67 FR 2380), we offer the following EFH Conservation Recommendations. SAK-16

1) Select Alternative C option for Slate Creek Cove facility. Select Alternative C, Echo Cove terminal for originating employee transport.

2) If Alternative B (Cascade Point) is selected for the employee transport facility, adopt a mitigation and montoring program. Such a program should be implemented by Goldbelt in a memorandum of agreement betweeen Goldbelt, Coeur, USFS, ADF&G and NOAA Fisheries. A copy of the NOAA Fisheries proposal for monitoring is enclosed. Alaska Best Management Practices for Harbors has been provided to both Tetra Tech and Goldbelt.

3) No in-water work, including dredging, should be conducted from March 1 to June 30 at the marine terminal facilities, to protect migrating juvenile salmon, spawning herring, eulachon and marine mammals from construction-related disturbance. Auke Lake weir data shows pink salmon outmigrating as early as March 2 (Taylor and Lum, 2003). The DSEIS notes that herring spawning typically occurs in Lynn Canal during a 2 to 3 week period between

late April and early May and that eulachon spawn for similar periods of time in April and May. All marine terminals are near both salmon streams and herring or eulachon spawning locations, with the exception of Echo Cove and Comet Beach. Echo Cove and Comet Beach are both near pink salmon streams (ADF&G cataloged stream #115-20-10590 (Juneau Quad C-3) , un-named and ADF&G cataloged stream #115-31-10330, Sherman Creek, respectively). Pink salmon outmigration in northern Lynn Canal may extend to the end of June (Taylor and Lum, 2003), so the no in-water work window is appropriate for all proposed marine terminals.

4) Wood structures associated with any of the marine dock facilities should not include creosote or ammoniacal copper zinc arsenate (ACZA) treated components. Creosote leaches polyaromatic hydrocarbons (PAHs), which are toxic to salmon and herring (Carls et al., 1997, Hutton and Samis, 2000). ACZA leaches metals which impair salmonid orientation and sensory organs and osmoregulation (Hobson et al., 1979, as cited within Eisler, 1997).

Upon receipt of NOAA Fisheries EFH Conservation Recommendations, Section 305(b)(4)(B) of the MSFCMA requires you to respond in writing to NOAA Fisheries within 30 days. SAK-17

Thank you for your continued coordination on this project. If you have any questions please contact Linda Shaw at (907) 586-7510

Sincerely,

Susan A. Kennedy
Acting NEPA Coordinator

Enclosures:
December 31, 2003 letter from James Balsiger to Carl Schrader.

Goldbelt Applicant Environmental Risk Questionnaire from Goldbelt to
Alaska Deparment of Natural Resources, Division of Mining, Land and Water

cc: EPA Seattle (Hahn Gold)
ADEC, AADGC, ADNR, USFWS Juneau
ADF&G, Juneau
Brandee Gerke, PR

Responses to Comments

Affiliation	***Comment ID***	***Response***
NOAA/NMFS	SAK-01	Comment noted. As stated in the ROD, the final decision on the location of the marine terminal at Cascade Point or Echo Cove is not within the Forest Service's jurisdiction and is deferred to other Federal and State permitting agencies.
NOAA/NMFS	SAK-02	The fueling situation has been clarified. The analysis assumes that fueling would take place at Cascade Point under Alternatives B and D and at Echo Cove under Alternative C.
NOAA/NMFS	SAK-03	The need for testing dredged materials from marine facilities has been added to Section 4.10.3. In addition, details have been provided on the disposal of dredged material for all marine terminals.
NOAA/NMFS	SAK-04	The largest potential source of hydrocarbons would be diesel fuel, which would be delivered to the site in individual 6,500-gallon containers specifically designed to withstand the rigors of transport. The SEIS discusses the impacts of low-level leaks and small spills of diesel fuel that could reasonably be expected as part of day-to-day operations; however, determining the size, location, and conditions leading to a large spill of hydrocarbons or other toxic material would be entirely speculative. Further information regarding fueling operations, fuel use, storage, and spill control has been added to the text. The company has submitted a Spill Prevention, Control, and Countermeasures Plan, included in Appendix E. ADEC's Geographic Response Strategies has also been noted in the discussion on spills (Section 4.6), and the applicable plans for Echo Cove and Berners Bay have been included in the planning record.
NOAA/NMFS	SAK-05	The fuel storage locations have been added to the drawings of Cascade Point (Figure 2-8) and Echo Cove (Figure 2-9).
NOAA/NMFS	SAK-06	See the response to comment SAK-04.
NOAA/NMFS	SAK-07	Coeur Alaska has submitted a Spill Control Containment and Countermeasures plan that has been included in Appendix E. The problem with enforcement of BMPs, as noted in the commenter's letter, is that the marine terminals at Cascade Point and Echo Cove would be out of Forest Service jurisdiction. BMPs are expected to be required in ADNR's Tidelands Leases.
NOAA/NMFS	SAK-08	Table 2-7 (Monitoring Requirements) has been modified to include the monitoring program proposed by NMFS and ADNR.
NOAA/NMFS	SAK-09	Text edited per comment in Section 4.10.3.
NOAA/NMFS	SAK-10	Text revised per comment. However, acute or chronic contamination from hydrocarbons as a result of fueling and fuel storage assumes that the facilities are operated improperly and assumes a failure of BMPs specifically identified to address the issue. These potential impacts are discussed in the section(s) of the text that address spills (e.g., Section 4.10) but are not highlighted in the table.
NOAA/NMFS	SAK-11	Text edited per comment. The text in Section 4.10.3 has been modified to indicate that dredged materials not disposed of in upland areas would be tested prior to marine disposal.
NOAA/NMFS	SAK-12	During the normal course of operations and assuming BMPs are adequately implemented, fuel storage and fueling operations should not result in impacts to nearshore organisms. A statement has been added to compare the dispersion of a spill under Alternatives B and D with that under Alternative C (see Section 4.10.3). See also the response to comment SAK-10.
NOAA/NMFS	SAK-13	See the responses to comments SAK-10 and SAK-12.
NOAA/NMFS	SAK-14	Text edited per comment. The missing reference (Carls et al., 1997) has been added to the References section.
NOAA/NMFS	SAK-15	Comment noted.

Affiliation	Comment ID	Response
NOAA/NMFS	SAK-16	The finding with respect to the impact of fuel spills on essential fish habitat (EFH) has been modified to reflect that spills could affect EFH (see Section 4.10.3). The commenter's recommendations have been noted and to the extent possible included in the Final SEIS under monitoring and mitigation (Section 2.5). Coeur Alaska has entered into an agreement to fund the study proposed by NMFS and ADNR. The timing of the construction window has been incorporated into the CBJ's Allowable Use Permits and could be expanded in the State's Tidelands Leases. This is of the Forest Service's jurisdiction. Finally, the designs submitted to the USACE as part of the 404 permit application indicate that galvanized steel rather than treated wood would be used for pilings (see Section 2.3.18).
NOAA/NMFS	SAK-17	Forest Cole, Supervisor of the Tongass National Forest, responded to your comment letter on April 21, 2004.

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STATE OF ALASKA

FRANK H. MURKOWSKI, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PROJECT MANAGEMENT AND PERMITTING

550 W 7th AVENUE SUITE 900D
PH: (907) 269-8629
FAX: (907) 269-8930

April 7, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group, Tongass National Forest
8465 Old Dairy Road
Juneau, AK 99801-8800

Dear Mr. Hohensee:

The State of Alaska Large Mine Permitting Team has reviewed the January 2004 Kensington Gold Project Draft Supplemental Environmental Impact Statement prepared by Tetra Tech, Inc. The Team has the following comments:

GENERAL

The State of Alaska supports the choice of Alternative B for the development of the Kensington Gold Project. We feel that, with proper mitigation, the environmental impacts from this Alternative will be minimal. With close monitoring of reclamation progress, the Lower Slate Lake tailings facility has a high likelihood of being reclaimed to be at least as productive as before mining, and perhaps to be even more productive. This should be more beneficial for the environment than a 160-acre drystack facility as permitted on the Kensington side. The main impacts to the marine environment of Berners Bay would be from two dock facilities and four or five round trips by a crew shuttle boat (a total of 2.5 hours of running time per day). Proper mitigation can ensure that these impacts would be minimal. ADNR-1

The DSEIS presents a huge amount of information, and for the most part is well written. The State team did find it difficult at times to relate this analysis with the two EIS's which preceded this one. This may be an unavoidable consequence of three back-to-back NEPA processes, but if there is any way which we can clarify or relate all these documents, this could only help the readability of the final SEIS. ADNR-2 An example of this is the lack of information in the DSEIS on the extent of the underground workings. This made it difficult for us to analyze the potential impacts of the underground workings on the surface resources, in particular on surface hydrology. We believe that this SEIS should include a graphic representation of the proposed extent of the underground workings. ADNR-3

We also recommend that in finalizing this SEIS, effort be put into making it easier to compare the impacts from alternatives. We found this difficult to do in the DSEIS. Perhaps better tables could be used to do a side-by-side comparison of the alternatives. Or a summary section could be written for each resource, which compares the impacts from each alternative. ADNR-4

"Develop, Conserve, and Enhance Natural Resources for Present and Future Alaskans."

We suggest that throughout the document, the term "ferry" be replaced with a term such as "crew shuttle boat" to avoid the impression that these boats are similar to the Alaska Marine Highway ferries. Similarly, the term "marine terminal" should be used instead of "ferry terminal." ADNR-5

CHAPTER 2

Page 2-17, 4th paragraph, last sentence: it should be clarified that the 4.5 million tons of tailings would go to the TSF only under alternatives B and C. ADNR-6

Page 2-19, paragraph 2, sentence 4. Wouldn't there be <u>less than</u> twice as much concentrate produced under Alternative A, as the ore would be of lower grade? ADNR-7

Page 2-60, Table 2-9, *Stream Crossings* (and S-10, Summary Table). It is our understanding that the bridge designs have changed, and there may be more instream disturbance at the Johnson Creek crossings. This table should be modified to reflect this. ADNR-8

CHAPTER 4

Section 4.4, Section 4.5. We suggest adding a graphic representation of the extent of the underground workings, ore body, and potential stopes. The Geotechnical Stability section should address the potential (or lack of) for surface effects of subsidence. The Surface Water Hydrology section should address the potential (or lack of) for increased permeability of surface waters into underground workings. ADNR-9 ADNR-10

Page 4-69. The second paragraph states that the wetlands on the Kensington side were not mapped with the same level of detail as those on the Jualin side, and as a result, 100 percent of the 268 acres of disturbance under Alternative A occurs within wetlands. We are not sure what this statement really means. The paragraph refers the reader to Section 3.12.3, but there is no further explanation there. The document needs to be very clear as to how many acres of each type of wetland would be disturbed in Alternative A. This should be made clear in sections 3.12.3 and 4.12.3, and also in Table 2-9 and the Summary Table S-11. ADNR-11

In general, we feel that the wetlands analysis in the document could be clarified to better present the impacts to wetlands from each alternative. The DSEIS makes it hard to do a side-by-side comparison of wetlands impacts resulting form each alternative. ADNR-12

Page 4-72, last paragraph. The document needs to better explain why the wetlands impacts under any of the alternatives would not be expected to produce noticeable effects on a watershed or regional basis. ADNR-13

Page 4-89, first paragraph. We question the assumption that 80 percent of the construction and mine workforce would relocate from outside the City and Borough of Juneau. The document needs ADNR-14 to provide a more detailed discussion to substantiate this. Perhaps include employment data from the Greens Creek mine.

COMMENTS FROM THE ALASKA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT

ADNR-15

The Department of Community and Economic Development fully supports Alternative "B" as presented in the Kensington Mine DSEIS. Specific reasons for favoring this alternative are detailed as follows.

- Alternative "B" presents not only an optimized mine development plan, but this alternative also optimizes sorely needed regional economic development as a function of mine construction and operation. Further, Alternative "B" minimizes the environmental footprint of the project and provides for predictable, stable, and functional long term reclamation of the project.

- The construction of the tailing storage facility (TSF) in lower Slate Lake minimizes the wetland disturbance necessary for project development. This engineered facility also provides for an exceptionally stable, geotechnically superior, long term tailing containment site. Finally, ultimate reclamation of this TSF will provide for a more functional habitat than currently exists in Slate Lake.

- The relocation of milling facilities to Johnson Creek greatly shrinks the overall project footprint and eliminates duplication of facilities in Johnson Creek and at the original surface facility site near Comet Beach on Lynn Canal. The location of milling facilities in Johnson Creek also provides the most secure and safe access for delivery of mine consumables and staff to the operation and removes the necessity to either construct a port at the highly storm exposed Comet Beach or the necessity to construct a major haul road from Slate Creek Cove to the Comet Beach site.

- The elimination of the on site personnel camp optimizes local hire for the overall operation. Mine workers will be much more likely to own homes, raise families, and be active participants in local communities. This not only leads to a higher economic return to the communities but also leads to a more stable and productive workforce. The elimination of a full scale personnel camp also lessens the overall project environmental footprint.

- Alternative "B" presents the most efficient mine operating plan with the lowest capital and operating costs. This is vital since the long term success of any mining venture in volatile metals markets is greatly enhanced by rapid capital payback which does much to assure long term profitability. Lower operating costs allows the most sustainable utilization of a valuable resource with the greatest beneficial return to both the mine operator and local communities.

The overall changes proposed in Alternative "B" result in a much improved mine development plan from both an environmental and economic perspective. This Alternative allows for the orderly and cost effective development of this valuable resource and important regional economic development project. Alternative "B" provides significant environmental protection and is a marked improvement from earlier project development scenarios.

COMMENTS FROM ADNR—OFFICE OF HABITAT MANAGEMENT AND PERMITTING

The Office of Habitat Management and Permitting has reviewed the January 2004 Kensington Gold Project *Draft Supplemental Environmental Impact Statement* prepared by Tetra Tech. Inc. Our review included consultation with the Alaska Department of Fish & Game (ADF&G). Concerns and information provided by ADF&G are incorporated in our comments below.

Project Description

The Draft Supplemental Environmental Impact Statement (DSEIS) evaluates the potential environmental consequences associated with proposed modifications of the 1997 Plan of Operations for the Kensington Gold Project, proposed by Coeur Alaska, Incorporated (Coeur). The Kensington Gold Project is a proposed gold mine located in the Tongass National Forest, 45 miles north of Juneau. As currently authorized in the Plan of Operations and permitted by the regulatory agencies, the project would be located on the eastern side of Lynn Canal in the Sherman Creek drainage. The existing project (Alternative A) would process 4,000 tons per day of ore, and would use a dry tailings facility (DTF) for tailings disposal.

The *proposed action* (Alternative B) would process a smaller quantity of higher-grade ore (2,000 vs. 4,000 tons/day), and would locate most of the facilities in the Slate Creek and Johnson Creek drainages north of Berners Bay. A dam would be constructed on Lower Slate Lake for a tailings storage facility (TSF), and marine terminals would be constructed in Berners Bay at Slate Creek Cove and Cascade Point. Alternative C modifies Alternative B by locating the marine terminal in Echo Cove, rather than Cascade Point, and includes construction of a diversion ditch around the tailings storage facility in Lower Slate Lake. Alternative A1 modifies Alternative A by reducing the quantity of ore processed at the Sherman Creek site to the same level as with Alternatives B and C.

In our review comments that follow, we have made suggested changes and recommendations for how to improve the SEIS and to allow for a much easier comparison of the various alternatives.

Preliminary ACMP Comments

We are assuming that the Alaska Coastal Management Program review of the Kensington Project will follow the protocol set out in the *Memorandum of Understanding between the State of Alaska and USDA Forest Service, Alaska Region, on Coastal Zone Management Act/Alaska Coastal Management Program Consistency Reviews* (ACMP MOU). For projects with an EIS, the MOU requires (Section 206(D)(3)) that the state provide comments to the FS during the NEPA comment period. State comments should distinguish between NEPA and preliminary ACMP comments. The consolidated position of the state will be submitted to the FS within 60-days following receipt of a Project Clarification. ADNR-16

Habitats in the project area that may be affected by the proposed project include estuaries; wetlands and tideflats; and rivers, streams, and lakes. Pursuant to 6 AAC 80.130(b), all habitats that are subject to the provisions of the Alaska Coastal Management Program (ACMP) must be managed so as to maintain or enhance the biological, physical, and chemical characteristics of the habitat that contribute to its capacity to support living resources. In addition, ADNR-17

- estuaries must be managed so as to assure adequate water flow, natural circulation patterns, nutrients, and oxygen levels, and avoid the discharge of toxic wastes, silt, and destruction of productive habitat;
- wetlands and tideflats must be managed so as to assure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances.
- rivers, streams, and lakes must be managed to protect natural vegetation, water quality, important fish or wildlife habitat and natural water flow.

For ease of reference, our comments follow the text and format of the DEIS, referring to specific sections where we have comments or concerns. Where the concerns described relate to the habitat types listed above, those should be considered as preliminary ACMP issues, because we expect to consider those issues relative to consistency with the ACMP standards at the time of the ACMP review.

GENERAL COMMENTS

Range of Alternatives

The DSEIS presents the existing project authorized under the approved Plan of Operations (Alternatives A and A1) as "no action" alternatives. However, since the project identified in Alternatives A and A1 has never been built, the impacts associated with Alternative A and A1 have not occurred. The "no action" alternative generally describes the existing condition and expected future condition if no project is built, rather than a particular development scenario, as is currently presented. The SEIS should provide a more thorough discussion of why it is appropriate to use Alternative A as the "no action" alternative. ADNR-18

Alternative C differs from Alternative B (the proposed action) in two significant respects – an alternative location for the marine terminal in Echo Cove, rather that Cascade Point, and adding diversion channels around the tailings storage facility (TSF) in Lower Slate Lake. We believe that it is appropriate to include the alternative marine terminal location in Alternative C and we understand that the diversion ditching around Lower Slave Lake was included to address the issue of whether ditching was or was not needed for compliance with water quality standards. However, we do find that the diversion ditches would cause significant additional environmental impacts due to wetlands loss and flooding as a result of an additional dam constructed on Upper Slate Lake. ADNR-19

SECTION 2.0 DESCRIPTION OF PROPOSED ACTION AND OTHER ALTERNATIVES

Under Alternative B, all of the flow in East Fork Slate Creek will be pumped from Lower Slate Lake. The SEIS needs to describe how flow in East Fork Slate Creek will be maintained in the event the pumping system should fail. The SEIS should also describe how the flow of clean water would be maintained in East Fork Slate Creek in the event of an upset in the TSF that would otherwise cause water quality standards to be exceeded at the outfall from the dam. ADNR-20

Page 2-2 and Table 2-1 describe the development of alternatives for analysis. An alternative site for the marine terminal in Echo Cove was included in Alternative C that would eliminate the fill at Cascade Point. Locating the marine terminal in Echo Cove would also eliminate several miles of road that would not need to be constructed along the eastern shore of Berners Bay. As a result, the area of the road to Cascade Point should be included in comparisons of the areas of disturbance, and assessed for impacts to wetlands and wildlife habitat. ADNR-21

Figures 2-6 and 2-9: The location of the proposed road and pipeline is not clear because the legend doesn't agree with the drawing: it isn't clear where the pipeline would go. The figures show a dashed line branching off from the proposed pipeline access road to Mid-Lake Creek. Is this a road? What is it for? ADNR-22

Page 2-17, paragraph 2 states that under alternatives B and C, Coeur would develop the mine workings in the ore itself rather than in waste rock, as would be done under Alternative A. Which method would be used for Alternative A1? ADNR-23

Page 2-17, paragraph 4: The last sentence states that under Alternatives A1, B, or C, a portion of the tailings would be backfilled and a portion disposed of in the TSF. Use of the TSF for Alternative A1 appears to be an error, because page S-4 indicates that tailings from Alternative A1 would go to the DTF, as opposed to the TSF. ADNR-24

Page 2-32, Cascade Point, paragraph 3; page 4-46, paragraph 3; and page 4-48, paragraph 3 states that the breakwater incorporates a breach at the shoreline to promote flushing and facilitate passage of juvenile salmonids. We support a design that provides fish passage along the shoreline, and promotes flushing of the facility. However, it is not clear why the breakwater was designed to provide for fish passage during only a portion of the tidal cycle (24% of the time). The SEIS needs to provide the rationale for not providing a breach that would function during all or most stages of the tide. We are also concerned that sediment may collect and fill in the breach over time, thus reducing or eliminating its effectiveness. The SEIS should describe whether the breach is expected to be self-maintaining, or if not, what maintenance dredging or other management practices would be required, and what impacts would be associated with those activities. ADNR-25

Page 2-38, French Drain Diversion Component. This section describes a project component that was considered but not carried forward for further analysis. We can't tell from the description what was proposed or why. Please clarify. ADNR-26

Page 2-41 and Table 2-6 Summary of Mitigation and Control Measures: Much of the justification for accepting impacts from the TSF is that at closure, fish habitat and productivity in Lower Slate Lake would be restored to as good or better condition than the current condition. We believe that ADNR-27

Lower Slate can be restored to a level of productivity similar to that which currently exists. However, there remains some degree of uncertainty about how successful reclamation will be, and how soon a similar level of productivity would be restored. The State intends to work with the applicant and the landowner to ensure that the reclamation objectives are met to the maximum extent possible.

Page 2-53, *Aquatic habitat characteristics* describes monitoring for aquatic habitat characteristics. The SEIS should include ADNR-OHMP as part of the review team. ADNR-28

Page 2-56, Table 2-8 and page 2-61, Table 2-9: Statements that Lower Slate Lake aquatic habitat would be adversely affected only *for the life of mining operations*, resulting in the elimination of an estimated 1,000 Dolly Varden char, should be modified. It will likely require years following mine closure and reclamation for the fish populations and aquatic productivity to be fully restored. ADNR-29

Page 2-60, Table 2-9, *Aquatic resources, freshwater, habitat loss*: To facilitate comparison among alternatives, Table 2-9 should include the acreage (or other measure) of aquatic resources lost with Alternative C due to flooding of Upper Slate Lake. This includes adjacent stream, riparian, and other wetlands habitats, as well as potential spawning habitat in streams and along the lakeshore. ADNR-30

Page 2-61, Table 2-9, *Aquatic resources, marine, marine mammals*: Harbor seals should be added to the list of marine mammals affected by construction and vessel traffic. ADNR-31

S- 9, Summary Table and Table 2-9, *Aquatic resources: freshwater* compares the area of habitat loss among alternatives. Note that for Alternative B, an additional stream at the upper end of the lake that has not been previously identified in the DSEIS would also be flooded. This stream was identified during fieldwork in October 2003, but has not yet been accurately mapped. For Alternative C, the table needs to identify the area and type of habitat lost through flooding (acreage flooded, amount of wetlands, stream, and riparian habitat lost). ADNR-32

S-11 Summary Table and Table 2-9, Wetlands: The category 'type of wetlands lost (majority)' obscures the important differences in types of wetlands impacted. Although we agree that the *majority* of wetlands are forested, there are significant differences in the values and functions of the wetlands impacted by the different alternatives. We suggest listing the major types of wetlands impacted, with perhaps the three most predominant types of wetlands and their relative percentages. ADNR-33

SECTION 3.0 AFFECTED ENVIRONMENT

Page 3-9, 1st paragraph, states that the geochemical characterization of tailings was performed on materials processed in different ore than would be mined as part of this project. Most of the work was performed on combined floatation (rougher) and carbon-in-leach (CIL) tailings, which would have been produced by a process that is no longer being considered for the project. For all alternatives, only the rougher tailings would be produced. How does this difference affect the accuracy of the geochemical characterization of tailings expected from this project? ADNR-34

Page 3-27, paragraph 5, describes the characteristics of Upper Slate Lake. The maximum depth is given as 50 feet, which is the same as Lower Slate Lake. We understand that recent fieldwork by Kline Environmental indicates that Upper Slate Lake is shallower than Lower Slate Lake (i.e., 40 feet deep). Please verify whether 50 feet is the correct depth for Upper Slate Lake. ADNR-35

Page 3-28, last paragraph, and Table 3-15 identify fish species found in the Slate and Johnson Creek drainages. The description of fish species present in these watersheds is inaccurate, and Table 3-15 does not agree with the text on page 3-28. The description on page 3-28 states that four species have been captured in Slate Creek: Dolly Varden char, cutthroat trout, juvenile coho salmon and sculpin. However, Table 3-15 also includes pink and chum salmon, as well as rainbow trout. Kline (2003a) indicates that pink and chum salmon occur in Slate Creek, which is consistent with DNR-OHMP data. We are not aware of documentation for presence of rainbow trout in Slate Creek, but it may exist. Table 3-15 also includes additional species (pink salmon, chum salmon, and sculpin) not mentioned in the text. Please clarify. ADNR-36

Page 3-30, 1st paragraph states that it is likely that fish found in Mid-Lake East Fork, Lower Slate Lake, East Slate Creek and waters farther downstream have a genetic link to the Dolly Varden char in Upper Slate Lake. Scientific rationale to support this statement should be incorporated into the SEIS. ADNR-37

Page 3-30, 2nd paragraph, discusses spawning habitat available to char in Lower Slate Lake. We generally agree with this characterization of spawning habitat. Available data have documented spawning habitat along the lakeshore; however, additional surveys are needed to document the full range of spawning habitat available. ADNR-38

Page 3-32, 2nd paragraph, states that fish tissue collected from Upper and Lower Slate Lakes exceeded EPA screening levels for arsenic and mercury. It would be helpful to provide a brief discussion about the potential source of these metals. Could high levels of arsenic and mercury be associated with past mining activity, or do they reflect the concentration of these metals in natural soils? ADNR-39

Kline Environmental (*Kensington Project: Analysis of Dolly Varden Tissue Chemistry Data from Upper and Lower Slate Lakes*, April 9 2003) indicates that fish tissue levels of selenium are near a laboratory-defined effects threshold and could potentially be a stressor to the population. The U. S. Fish and Wildlife Service (USFWS) has published a fish tissue-based toxicity threshold for selenium of 4 mg/kg. Both Lower and Upper Slate Lakes had mean concentrations of 7.25 and 7.63 mg/kg respectively – nearly twice the toxicity threshold. What are the likely sources of high levels of selenium in fish tissues, and what is the significance? Some preliminary information may be available from OHMP for comparison with selenium levels in fish in Interior Alaska. ADNR-40

Page 3-34, 1st paragraph discusses levels of metals in natural sediments in the Slate Lakes and references the *Draft Ecological Risk Assessment of Aqueous Tailings Disposal at the Kensington Gold Mine* (Tetra Tech, 2003). This citation is incorrect (Tetra Tech, 2003 is a different report), and should be updated to refer to the Ecological Risk Assessment contained in Appendix C. ADNR-41 Because concentrations of arsenic exceed federal screening criteria, this section needs to include a brief ADNR-42 statement or discussion of whether high arsenic levels reflect natural conditions, or are the result of past mining operations.

Page 3-41, Table 3-21 titled *Fish Species Identified in Berners Bay Streams,* includes only some of the anadromous fish species. This table should either be renamed to identify only specific anadromous fish species, or the table expanded to include other species. This table is not consistent with Table 3-15 and the first paragraph on page 3-29, which lists cutthroat trout for Johnson Creek. Note that this table does not include eulachon, a very important anadromous species found in the Lace, Berners, and Antler Rivers. ADNR-43

Page 3-43 presents a discussion of eulachon in Berners Bay. Note that juvenile eulachon were recently captured by NMFS in net tows in late January of this year, suggesting that juvenile eulachon may be present in Berners Bay for much longer that was previously thought. ADNR-44

Marine Aquatic Resources, Pacific herring

DNR and ADF&G are concerned about potential impacts to habitats used by the severely depressed Lynn Canal stock of Pacific herring, which now spawns almost exclusively in Berners Bay. The SEIS needs to provide a more complete description of the status of this stock and potential environmental stress that could result from the proposed and future reasonably foreseeable development of Berners Bay (see below). ADNR-45

Page 3-44 presents a brief discussion of Pacific herring in Berners Bay, but it is incomplete. Because the Lynn Canal herring stock is severely depressed and not recovering, and because of the importance of this stock of herring to local marine mammal, bird, and fish populations, we believe that the status of this stock and importance of Pacific herring to the local ecosystem warrants further discussion. The narrative should be expanded to include the following discussion:

> Prior to 1983 the Lynn Canal herring stock was one of the larger stocks in Southeast Alaska supporting several commercial fisheries including a sac roe fishery, bait pound fishery, and a winter food and bait fishery. Lynn Canal herring traditionally spawned from Auke Bay to Point Sherman. This stock declined in 1982 and has since remained at low levels. The reason for the decline is not clear; however, potential candidates are over fishing, habitat degradation and/or disturbance in Auke Bay, geographic shifting of spawning aggregations, population growth of major predators such as sea lions, or a combination of these. If the decline was attributable solely to over-fishing, the stock should be showing signs of recovering during the 20-year period since commercial exploitation was stopped. In other areas in Southeast Alaska, such as West Behm Canal, herring stocks have grown from low levels to very high levels over a span of only a few years.
>
> The documented spawn for the Lynn Canal herring stock from 1953 to 1981 ranged from 6 to 28 nautical miles, averaging approximately 12 miles. Significant spawning occurred in the vicinity of Auke Bay. In recent years however, ADF&G records demonstrate that the entire Lynn Canal herring stock has centered its spawn activity between Pt. Bridget and the Berners Bay flats. Since 1982, the documented spawn has ranged from 0.5 to 7 nautical

miles, averaging only 3.5 nautical miles. The established biomass threshold level for this stock is 5,000 tons of spawning biomass, meaning that before a herring fishery may be considered for the Lynn Canal stock, a forecast of spawning biomass must meet or exceed 5,000 tons. Based on shoreline miles of spawn, it is estimated that the stock biomass has varied between 100 and 2,500 tons over the last 20 years. ADNR-45

ADF&G records of the area since 1971 document herring spawn between Cascade Point and the Berners Bay flats in most years, with few exceptions. The consistent herring spawn along this shoreline for the last 20 years is indicative of its importance to this stock. Continued encroachment on shoreline that has historically been used for herring spawning could have cumulative effects leading to the total collapse of the herring resource in this area. This could reduce forage for large predators such as salmon, sea lions, whales and seals that inhabit Lynn Canal, with unknown ramifications. Some measures could be implemented during construction and operation that may minimize or delay impacts to this stock.

We also request that information on Pacific herring be added to the list of key pieces of baseline data on the affected environment presented on page S-5. ADNR-46

Page 3-44, *Marine Essential Fish Habitat*: This section needs to present some of the results and recommendations from the Essential Fish Habitat (EFH) Assessment (Appendix B). As presented, this section merely states that an EFH assessment is required under federal law, and refers the reader to Appendix A. This section should provide a better description of what the *Magnuson-Stevens Fishery Conservation and Management Act* requires. Although "essential fish habitat" is broadly defined to include waters and substrate necessary to fish for spawning, feeding or growth to maturity, the list of species covered under the Act is actually quite narrowly defined. ADNR-47 Many other species not listed in the Act that occur in the project area and support local fisheries may also be important and should be assessed, even though this is not strictly required under the Act. These include Pacific halibut and shellfish (Dungeness crab, red crab, king crab, etc.). ADNR-48

Wildlife

Overall, it appears that the impacts to wildlife from Alternative B would likely be much greater than those associated with Alternative A or A1. The waters and shoreline of Berners Bay is an extremely rich wildlife area for birds, terrestrial mammals, and marine mammals. Although the uplands are also valuable for wildlife, the most pronounced impacts are likely to be related to the disturbance within the bay rather than from the footprint of the mining activity itself. In comparison, the value to wildlife of the area near Sherman Creek and adjacent uplands where mining activity is already occurring is substantially less than the value of the Berners Bay system. The value of Berners Bay lies partly in the rarity of the place given its productivity. ADNR-49

Page S-6 states "Wildlife habitat is limited by the distribution of old-growth habitat within the project area. The 17,000-acre project area contains less than 1 % high-volume old-growth timber, and slightly over 10% of the project area consists of medium-volume old-growth forest. Over 50% of the site consists of low-productivity forest or non-forest land cover." This seems to be making ADNR-50 the case that since most of the project area is <u>not</u> old-growth forest, that it does not provide particularly important wildlife habitat. We agree that old-growth forests provide important wildlife habitat, and that assessing the amount of old-growth forest potentially impacted by the project is important. However, relative timber productivity is only one measure of important wildlife habitat. Beach fringe, wetlands, lakes, and riparian areas, etc. are also important wildlife habitats, and may be more "limiting" to some species of wildlife than old-growth forests because of their relative rarity and position in the landscape. ADNR-50

The DSEIS uses Tongass Land and Resource Management Plan (TLMP) measures of habitat quality in relation to Management Indicator Species (MIS) such as goshawks, marten, wolves, and deer, all of which are at least partially dependent on old-growth forest habitat. Use of these measures is clearly appropriate for reviewing logging activity that targets old-growth forest, but in this case the assessment should look at the value of the entire area to wildlife. The SEIS should clearly delineate effects of the project on loss of habitat for old-growth associated species, as well as other affected habitats and species that use them. ADNR-51

Page 3-48, Table 3-24: Although not included in this table as a Species of Concern, MIS, or Threatened or Endangered, wolverines are one of the rarest terrestrial mammals in northern Southeast Alaska. Furbearer sealing records kept by ADF&G indicate that Berners Bay is one of the main sources of wolverine harvest in all of Game Management Unit (GMU) 1C. Records show a harvest of 5 wolverines from the Johnson and Slate Creek area in 2001, and during the past 3 years, 7 of 14 wolverines harvested in Game Management Unit 1C were taken in this area. ADNR-52

Page 3-50, Black and Brown Bears (MIS): The text cites ABR, 2000b regarding the relative scarcity of brown bears in the area, and lists a bear observation in the Antler River. ADF&G staff report that brown bears are not at all uncommon in Berners Bay. Although they are quite widely dispersed, they regularly use the shoreline from Point Sherman to the inside of Berners Bay. ADNR-53

Page 3-51, Alexander Archipelago Wolf: The text states "The primary prey species for the wolf in the area is the Sitka black-tailed deer, and the wolf's distribution is therefore related to the distribution and abundance of deer." This is true on Prince of Wales and on some of the other islands in the southern archipelago, but not in Berners Bay or most of the mainland. Moose, mountain goats, salmon, and beaver are all part of mainland wolves diets, while deer are likely a minor part. ADNR-54

Page 3-63, 1st paragraph acknowledges that "volume class" is not necessarily a good indicator of habitat values for wildlife (Caouette et al. (1997), as a range of habitat types could occur within a single volume class. We question whether the Forest Service vegetation maps used in the DSEIS provides the level of detail needed to assess the wildlife habitat impacted in the project area. ADNR-55

Caouette's work indicates that Volume Class 6/7, as used formerly by the Forest Service, does correlate well with large tree, coarse-canopy stands that constitute rare and valuable wildlife habitats, both across the Tongass as well as within the project area. Given that "high volume" forests, defined as greater than 35 mbf/acre, occur on less than 1 percent of the project area, it would be valuable to identify these areas and assess any potential effects of the project on these habitats. ADNR-56

The information should be available from the Forest Service, because they agreed in 2002 to provide coarse canopy information to reviewers of timber sales and old-growth habitat reserves (September 19, 2002 letter to former ADF&G Commissioner Frank Rue).

Page 3-54, 3rd paragraph, last sentence, change "ADF&G" to "ADNR". ADNR-57

Page 3-55, last paragraph, discusses the osprey, a "sensitive" species. Some general information is provided regarding this species, but it isn't clear whether ospreys have been observed, or are likely to be found, in the project area. ADNR-58

Page 3-57, Kittlitz's murrelet (Species of Concern), states that this species forages almost exclusively at the face of tidewater glaciers or near the outflow of glacier streams, and nests in alpine areas in bare patches amid the ice and snow. This section cites the McBride Glacier in Glacier Bay National Park as the closest appropriate habitat. There are a number of glaciers with outflow streams much closer to the project area in the Lace and Antler River drainages. Would these provide suitable habitat for the Kittlitz's murrelet? We understand that the USFWS has recently conducted surveys for Kittlitz's murrelet in Berners Bay. The SEIS should include the most recent results analysis from those surveys. ADNR-59

Wetlands

The SEIS is inconsistent in the classification of the Slate Lakes. Figure 3-8 classifies Lower Slate Lake (LSL) as "lacustrine lake", and Upper Slate Lake as "palustrine aquatic bed". The text on page 3-65, 3rd paragraph, identifies Upper Slate Lake as "lacustrine (open-water), and Lower Slate Lake as "palustrine aquatic bed" – the opposite of Figure 3-8. We suggest that Figure 3-8 is correct and that the text needs to be corrected. ADNR-60

The most common type of wetland in the project area is forested wetlands – which is the type of wetland most impacted under Alternatives A and A1. However, Alternatives B and C would additionally impact a significant amount of lacustrine and palustrine aquatic bed wetlands in the Slate and Spectacle Lakes area. Half of the lacustrine (lake) habitat in the project area (Lower Slate Lake), accounting for <u>all</u> of the lacustrine wetlands supporting resident fish, would be filled with tailings. This qualitative difference in wetlands types that would potentially be filled should be considered in more detail in the analysis. ADNR-61

Wetlands/Wildlife Habitat

Page 3-69, paragraph 3, makes an important comparison of wildlife habitat in the Kensington area (Alternatives A and A1) compared to the Jualin area (Alternatives B and C) that needs to be brought forward in a comparison of alternatives. Referring to the function of wetlands to support wildlife, the DSEIS states: "The highest levels are provided by wetlands diverse in form and surrounded by old growth forests such as those around Slate and Spectacle Lakes. Wetlands in the vicinity of existing disturbances -- the waste rock storage and settling ponds at Kensington and the camp near the Jualin Mine -- provide this wildlife function to a lesser degree due to occasional human activity." The potentially higher value of wildlife habitat in the Jualin area needs to be considered ADNR-62 in the comparison among project alternatives. The suggestion that the highest value wetlands are those surrounded by old-growth forest may not be true in this instance: the wetlands associated with the shores of Berners Bay where waterfowl, bears, moose, and other species feed are much more valuable than those in the uplands surrounded by old growth forest. ADNR-63

Wetlands/Fish Habitat

Page 3-68, Table 3-31 *Functional Ratings for Selected Wetlands Types Within the Project Area*: Because Upper and Lower Slate Lakes are the only lakes in the project area that support resident Dolly Varden, one could rate their importance as high. ADNR-64

Page 3-69, 4th paragraph, states "*Fish habitat* applies to those wetlands that provide direct or indirect support to fish and fisheries...." and references forested wetlands in the vicinity of Upper and Lower Slate lakes, the scrub-shrub and emergent wetlands around Spectacle Lake, and the forested wetlands along Sherman and Johnson creeks. The SEIS should also include both Upper and Lower Slate lakes as supporting fish habitat. Lower Slate Lake is a lacustrine wetland; Upper Slate Lake is a palustrine aquatic bed wetland; they both directly support populations of Dolly Varden char. As stated elsewhere in the DSEIS, some Dolly Varden char originating in the Slate Lakes likely migrate downstream to saltwater and may ultimately become part of the anadromous fish population. ADNR-65

SECTION 4.0 ENVIRONMENTAL CONSEQUENCES

Comparison of Impacts Among Alternatives

In addition to the impacts that would occur in Berners Bay, the proposed action would require converting a 20-acre pristine lake (Lower Slate Lake), which supports a population of approximately 1,000 Dolly Varden char, into a Tailings Storage Facility. The impacts from use of Lower Slate Lake as a tailings storage facility needs to be objectively compared to impacts of constructing a Dry Tailings Facility in a complex of forested wetlands in the Sherman Creek drainage. As the DSEIS points out, forested wetlands are fairly common in the region. However, lakes supporting native fish populations are relatively rare. ADNR-66

Page 4-29, Aquatic Resources: Alternatives A and A1 would affect only the freshwater resources in the Sherman Creek drainage. Alternatives B and C would affect freshwater aquatic resources in both the Sherman Creek <u>and</u> Slate and Johnson Creek drainages. ADNR-67

Page 4-30, paragraph 1: With Alternatives A and A1, the DTF would impact six small ephemeral non-fish bearing streams. By comparison, the TSF in Lower Slate Lake, under Alternatives B and C, would impact fish populations in the Slate Lakes system, which includes two lakes and numerous fish-bearing streams (East Fork Slate Creek below the dam, Mid-Lake Creek, inlet streams to Upper Slate Lake, and several small un-named creeks draining into Lower Slate Lake). ADNR-68

Page 4-33, second paragraph, cites two estimates for the number of Dolly Varden char in Lower Slate Lake that would be impacted under Alternatives B and C (Konopacky, 1995; Kline, 2003a). We recommend dropping reference to the earlier Konopacky estimate in favor of using the most recent estimate by Kline (2003a) of approximately 996 char. Continuing to reference the older (and much lower) estimate for Lower Slate Lake tends to minimize the value of the fish resource that would be lost in Alternatives B and C. ADNR-69

Page 4-33, last sentence, states that Dolly Varden char in Lower Slate Lake appear to be small and exhibit slow growth, according to a comparison of the literature on other Dolly Varden char in SE Alaska lakes (Kline, 2003a). Lower Slate Lake is what it is – a low-elevation lake supporting populations of Dolly Varden char and sticklebacks. Whether the fish are large or small is irrelevant in terms of their role in the ecosystem and the need for resource protection. There are very few fish-bearing lakes in the general project area. Alternatives B and C would significantly affect these lakes. ADNR-70

Page 4-37, *Effects of Alternative C*, does not adequately discuss the impacts to aquatic resources from constructing a dam on Upper Slate Lake. This section should describe how construction of a dam and raising the water levels would impact these resources. Not only would maintenance of the Dolly Varden char populations be at risk due to flooding of habitat, but the success of restoring Lower Slate Lake is to a large degree dependent on maintaining Upper Slate Lake in a near-pristine condition to provide seed stock for fish and wetland plants. ADNR-71

S-6, Environmental Consequences, 3rd bullet, states that Alternatives B & C would result in loss of 1,000 Dolly Varden char. This is a conservative (but probably realistic) assessment for Alternative B, although DNR is hopeful that through appropriate monitoring, best management practices, and modest habitat manipulations during operations, many of the char may survive in Lower Slate Lake. The DSEIS does not provide an adequate analysis of impacts from Alternative C. Our opinion is that diversion of the natural water flow to Lower Slate Lake, as proposed in Alternative C, would ensure that all Dolly Varden char would be eliminated from the lake. In contrast, efforts to maintain char in Lower Slate Lake during operations would facilitate eventual restoration of Lower Slate Lake at closure. ADNR-72

Aquatic Resources: Marine

The SEIS should present a side-by-side comparison of the impacts to marine aquatic resources. For example, impacts to marine mammals and fish are quite low with Alternative A and A1, but could be substantial with Alternatives B and C. There would be no impacts to Pacific herring from Alternatives A and A1, but there is some level of risk to herring from development in Berners Bay. ADNR-73

Page 4-41, 4th paragraph - *Nearshore Marine Organisms, Construction*, identifies the volume of subtidal fill (10,000 cubic yards) at Slate Creek Cove, but also should provide the area of the proposed fill, as is presented for Cascade Point (1.6 acres dredged and 1.3 acres filled) and Echo Cove. ADNR-74

Page 4-42, 5th paragraph, states that fueling operations would occur at the Slate Creek Cove side of the operation, so the potential for impacts from spills at Cascade Point or Echo Cove would be limited to hydrocarbon leaks from the marine. However, page 4-47, paragraph 1, last sentence, states that fueling may occur at Cascade Point or Echo Cove terminals. Which is correct? Please clarify. ADNR-75

Page 4-46, 2nd paragraph, states "Construction of the breakwater for the Cascade Point marine terminal could result in the permanent loss of a very small area of kelp habitat. Pacific herring use this kelp for spawning in some years." This statement is misleading, because the potential loss of Pacific herring spawning habitat is not limited to kelp. Herring spawning may also occur on other substrates, including rocks, cobbles, pilings, etc. ADNR-76

Page 4-47, 3rd paragraph, referring to Pacific herring, states that there is *no correlation* between the number of eggs spawned and adult population size, as other factors affecting egg and early larval survival appear to be major events influencing population size. Although an imperfect assessment tool, measurement of the volume of herring spawn *is* one of the major metrics used by ADF&G fisheries managers to assess herring populations. ADF&G generally incorporates volume of spawn into a much more complex model to forecast adult biomass. ADF&G and NMFS scientists are in the process of correlating spawn volume with acoustic assessment of adult populations in Lynn Canal to refine the accuracy of population estimates. ADNR-77

Section 4.11, *Wildlife*: There is no discussion of Alternative A1 in this section. ADNR-78

Table 2-6 on page 2-47 describes restoring the mountain goat herd if monitoring shows a significant decline. The Amended Plan of Operations (page 4-7) states, "Approved mitigation measures planned for the Kensington project will be retained for the revised project." The 1996 Amended Plan of Operations, page 5-7, states that mountain goats will be monitored as part of a 3-year telemetry program currently being conducted, and that results of the study will be evaluated at the end of the 3-year period to determine if project development has affected the goats. The SEIS should be updated with the results of this study, the purpose of which was to collect baseline information on habitat use and home ranges, and identify whether additional studies would be required if Alternative B or C is selected. ADNR-79

Page 4-51 and elsewhere: The analysis presents information on Alternative A separately from Alternatives B and C, which makes comparison among all alternatives very challenging. The information needs to be presented side-by-side for all alternatives. For example, Tables 4-12 and 4-14 should be combined to show areas and percentage cover by habitat type for all alternatives, similar to what was done for patch size analysis in Table 4-13. ADNR-80

It would be helpful to present a table that lists the amount of habitat impacted for each key species by alternative. For example, the loss of acres of old-growth forest important to red squirrel and marten (Management Indicator Species, or MIS) would total 39 acres under Alternative A, 93 acres under Alternative B, and 100 acres under Alternative C. ADNR-81

Note that the use of a percentage of "Project Area" impacted for a given habitat type may be useful when comparing impacts among alternatives, but is meaningless when looking at a single alternative, because the area defined as "Project Area" is somewhat arbitrary and not locally or regionally calibrated.

ADNR-82

Page 4-51, last paragraph, states that an increased level of edge effect from fragmentation would occur under all alternatives (Table 4-13). The SEIS should discuss in more depth what this means in terms of quality of habitat and impacts to wildlife. In many situations, the edges of meadows, riparian areas, and beaver ponds, for example, are very productive places. In the Midwest, edges are sometimes created by managers to increase biodiversity. In the case of mature forests such as those in Southeast Alaska, however, where many forest species are adapted to old growth, indications from logging practices are that the negative effects of fragmentation, including increased predation on interior forest birds, overshadow any benefits derived from creating edge. Some species of birds and mammals do benefit to some degree from clearcuts in the short term, but the value of those areas decreases dramatically over time as the forest canopy closes over.

ADNR-83

Page 4-56, Columbia Spotted Frog: The DSEIS states that this amphibian is found in riparian areas with still or slowly moving waters. Alternative A would impact about 124 acres of wetland/riparian amphibian habitat. Alternative B would impact 11 acres, and Alternative C would impact 19.5 acres. This suggests that Alternative A would impact substantially more amphibian habitat than the other alternatives. However, this may not be the case. The report doesn't present how these areas of habitat were determined. The wetland analysis doesn't present any acreages, or identify "wetland/riparian" as a category of wetland. The DSEIS needs to specifically identify and characterize this habitat and the areas potentially impacted. We find it difficult to identify the 124 acres of "still or slow-moving" waters (frog habitat) associated with riparian areas that would be filled in Alternative A.

ADNR-84

Page 4-67 indicates loss of muskeg forest with Alternatives B and C, but no loss with Alternative A. Please double-check this.

Wetlands

ADNR-85

The DSEIS does not adequately consider the differences in functions and values of various wetlands types that could be impacted. S-6, *Environmental Consequences*, 5th bullet, compares acreage of wetlands disturbance among alternatives, and states that the greatest area of wetlands fill would occur in Alternative A, where impacts would occur primarily on forested wetlands. While we agree with what is stated in general terms, this bullet obscures some important distinctions between the types of wetlands that would be filled in the various alternatives. For example, wetland fills in Alternatives A and A1 would be limited mainly to forested wetlands, whereas Alternative B and C would also impact, through burial in tailings or flooding, extensive lacustrine (e.g., Lower Slate Lake), riparian, and palustrine aquatic bed wetlands (e.g., Upper Slate Lake).

ADNR-86

The SEIS should present an analysis comparing not only the acreages of wetlands impacted by wetland type, but also the functions lost. For example, the largest wetlands loss in Alternative A is from the DTF, which would result in a permanent loss of over 100 acres of palustrine forest and palustrine scrub-shrub wetlands. However, the "functions" of these wetlands are of relatively low value, compared to some of the other types of wetlands impacted in Alternatives B and C, e.g., high values for fish and wildlife associated with Slate Lakes, palustrine emergent, and estuarine tidelands. Habitat values of wetlands related to supporting fish and wildlife needs to be better linked to a discussion of fish and wildlife species impacted by habitat loss, as we are most concerned about loss of wetlands that provide the highest support for fish and wildlife resources.

Page 4-69, Table 4-18, showing acreages of wetlands impacted under each alternative, is incomplete and does not appear to be accurate. For example, the table doesn't show the "subtidal estuarine" tideland fills from the marine terminals for Alternatives B and C. Tidelands affected by dredging are also missing. ADNR-87

Although the draft reclamation plan for Lower Slate Lake looks promising, the degree to which aquatic resources (particularly fish) and wetlands functions will return, and on what time-scale is not known. Page 4-72 states "Assuming a successful implementation of the reclamation plan, wetlands functions provided by Lower Slate Lake ... should be improved over the long-term." While we believe that Lower Slate Lake can be restored to a level of productivity similar to what exists now (supporting approximately 1,000 char), it is not certain that restoration will be successful to the extent that productivity would be <u>improved</u>. The criteria for <u>improvement</u> of the various functions of Lower Slate Lake for supporting wetlands and fish and wildlife populations needs to be defined. ADNR-88

Temporary Loss of Resources

The EIS does differentiate between "short-term" loss of wetlands, aquatic, wildlife and other resources that would be lost during operations, compared to after reclamation at the end of the project. However, the distinction often gets lost in the presentation. In comparing impacts among alternatives, it needs to be clear that short-term impacts are compared to short-term impacts, and long-term impacts are compared to long-term impacts. ADNR-89

<u>Cumulative Effects</u>

This section should be expanded to include at least summaries of quantifiable information available from other sources. Of particular concern are effects of future development of Goldbelt, Inc. land adjacent to Berners Bay that will be facilitated by development of the Kensington Gold project, and the potential for a DOT road and marine terminal (Juneau Access Project). In particular, we are concerned about cumulative impacts to marine fish and wildlife resources in Berners Bay. The DSEIS gives only a cursory description of potential future development, but makes no attempt to quantify the impacts and compare these impacts among alternatives. The Juneau Access SEIS is well underway, and draft technical reports are now available from ADOT&PF for wetlands, anadromous fish, essential fish habitat, and wildlife. These reports include the results of field studies conducted as recently as this last summer, with considerable information on resources and potential impacts in the Berners Bay area. ADNR-90

Page 4-119, Extension of Mining Operations: This discussion assumes production of 20 million tons of tailings as proposed under Alternative A. The assumption is that these additional tailings would be stored at the TSF in Lower Slate Lake, requiring the dam to be raised approximately 175 feet. Given the questionable feasibility of expanding the TSF, it appears reasonable that the DTF proposed in Alternative A would be considered rather than expanding the TSF in the Slate Lakes under Alternatives B and C. The SEIS should assess use of the DTF as well as expanding the TSF. This would appear to be feasible, given that Coeur has already designed and permitted the DTF. ADNR-91

Please feel free to give me a call at 907-269-8629 if you have any questions or comments.

Sincerely,

/s/

Ed Fogels
Project Manager

Cc: Hanh Gold, USEPA
John Leeds, USACOE
Rick Richins, Coeur
Gene Weglinski, Tetra Tech, Inc.
Ron Rimelman, Tetra Tech, Inc.

Responses to Comments

Affiliation	*Comment ID*	*Response*
ADNR	ADNR-01	Comment noted.
ADNR	ADNR-02	The Draft and Final SEIS attempted to bring forward as much information as possible from the previous NEPA documents to reduce the need to refer to them. It would be nearly impossible to have a seamless document that would simply supplement the previous analyses.
ADNR	ADNR-03	Figure 2-13 of the Final SEIS illustrates the extent of the mine workings in relation to the ground surface.
ADNR	ADNR-04	Each resource discussion in Section 4 includes a summary of impacts for each alternative. To the extent possible, Table 2.9 includes comparisons between all the alternatives.
ADNR	ADNR-05	Throughout the document, the references to ferries for shuttling workers has been changed to “crew shuttle boats” to avoid confusion with references to the Alaska Marine Highway ferries (see, for example, Section 4.19). The document refers to the docks associated with mining operations as marine terminals.
ADNR	ADNR-06	The text in Section 2.3.2 has been clarified to reflect that 4.5 million tons of tailings would be placed in the TSF under Alternatives B, C, and D and 4.5 million tons of tailings would be placed in the DTF under Alternative A1.
ADNR	ADNR-07	The concentrate shipment numbers presented in the Draft and Final SEIS reflect numbers provided by the proponent. These numbers are based on average projections over the life of the mine and might or might not reflect the number of containers shipped at any given time under a given alternative scenario. For the purposes of the analysis, the Forest Service is comfortable with the numbers as presented.
ADNR	ADNR-08	The bridges work would need to be consistent with Forest Service standards and guidelines, as well as ADNR's Title 41 permits. The construction is expected to have minimal effect on habitat as stated in Table 2-9.
ADNR	ADNR-09	See the response to comment ADNR-03.
ADNR	ADNR-10	As shown in Figure 2-13, the mine workings are generally well below (hundreds of feet) the ground surface. The workings, therefore, are not expected to affect surface water hydrology. This has been addressed in Section 4.5 of the Final SEIS.

Affiliation	Comment ID	Response
ADNR	ADNR-11	Numerous approaches are available to map and identify wetlands. The U.S. Fish and Wildlife Service maintains the National Wetlands Inventory (NWI), which bases its wetland delineations on the publication Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). Maps of NWI wetlands are available to overlay U.S. Geological Survey (USGS) topographic maps and are also available digitally. Wetlands subject to jurisdiction under Section 404 of the Clean Water Act are considered jurisdictional wetlands and delineated using specific criteria based on soils, vegetation, and hydrologic characteristics of a site. Jurisdictional wetlands may or may not coincide with wetlands mapped under the NWI program. The basis for discussion of wetland impacts for the Kensington Gold Project has changed minimally during the three NEPA analyses beginning in 1992. The wetlands analysis in the 1992 FEIS was based on a Tongass wetland map and a jurisdictional delineation conducted by a contractor (IME). The 1992 FEIS states that "it was decided to utilize the Tongass wetland mapping since it tended to show a larger extent of wetland acreage than did the National Wetland Inventory Mapping." The 1992 FEIS continues, "except for minor areas, nearly all of the Sherman Creek basin… met the criteria for jurisdictional wetlands. The survey found that wetlands existed on all but the steepest mountain slopes in the study area" (IME, 1991b). The Tongass wetlands map illustrated a combination of wetland, mixed wetland/upland, and upland areas with the Kensington and Jualin areas being predominantly mapped as wetland and mixed wetland/upland. The 1997 SEIS focused on the Sherman Creek and terrace area drainage basins and considered the entire extent of the project area as wetlands based on Coeur Alaska's Section 404 permit application that mapped the entire site as wetland. The approach was similar to the 1992 finding that most of the site met the criteria for jurisdictional wetlands. Based on the project area being 100 percent wetlands, the short-term wetland impacts of the 1997 No Action Alternative (which equated to the 1992 FEIS Alternative F) increased from 234 acres to 271 acres (approximately 16 percent). Assuming that the tailings impoundment was reclaimed as a wetland, the 1997 SEIS reported that the long-term impact on wetlands from the 1997 No Action Alternative would have been 51 acres. The 1997 Selected Alternative (Alternative D), which corresponds to the 2004 No Action Alternative, would have impacted 262 acres of wetlands over the short term and 164 acres of wetlands over the long term. This SEIS encompasses the Sherman Creek, terrace area, Johnson Creek, and Slate Creek drainages. In support of this SEIS, Coeur Alaska submitted a preliminary jurisdictional wetland delineation and functional assessment (ABR, 2000c) focusing on the Johnson Creek and Slate Creek drainages. The level of detail in this report went further than previous wetland information in that it identified wetland communities at a greater level of detail than had been done in previous efforts. Specifically, the Tongass wetlands map and the IME delineation simply identified wetlands (and wetland/upland mix) versus uplands. The ABR mapping effort identified wetlands down to the "subclass" level using terminology from the classification system developed by Cowardin et al. Rather than lose the information available in the ABR document by converting their results to wetlands versus uplands, the USACE worked with the Tetra Tech wetland scientist to refine the information for wetlands within the Sherman Creek and terrace area drainages. The effort by the USACE and Tetra Tech assumed the 100 percent wetland distribution described in the 1997 SEIS and used aerial photographs, soils data, wetland data collected by IME, and information gathered from site visits to categorize and map the Kensington wetlands using Cowardin's wetland classes. Wetlands within the Sherman Creek and terrace area drainages were categorized into forested, palustrine, and mixed wetland/upland forest classes so that the wetlands identified by ABR could be more closely compared with wetlands on the Kensington side of the proposed operation (see Sections 3.12.3 and 4.12.3). The discussion of wetlands in the Final SEIS is supplemented by a brief comparison of wetland impacts based on NWI maps. As noted in the 1992 FEIS, the extent of wetlands identified using the NWI maps is less than other mapping efforts but provides a level of direct comparison of wetlands within the Kensington and Jualin portions of the project area.

Affiliation	Comment ID	Response
ADNR	ADNR-12	Table 4-18 in the Draft SEIS clearly presents a comparison of the acreage of wetland impacts by alternative. Functional losses are not presented in tabular form because the nature of the impacts is qualitative rather than quantitative and requires discussion. The summary at the end of Section 4.12.4 has been expanded to discuss the difference in impacts between the palustrine wetlands that would be affected under Alternatives A and A1 and the combination of lacustrine and palustrine (primarily) wetlands affected under Alternatives B, C, and D.
ADNR	ADNR-13	The discussion in Section 4.12.4 of impacts on a watershed and regional basis has been expanded to provide a greater level of detail.
ADNR	ADNR-14	The mining company has indicated that it will establish an outreach program to recruit local hires. This could entail some training for Juneau residents who would otherwise not be qualified to work at the mine. The Final SEIS takes this effort into account by evaluating a scenario in which only 50 percent of the employees in-migrate to the CBJ. The 95 percent estimate provided by the mining company is thought to be unrealistically optimistic given the limited size of the CBJ workforce and the specialized nature of mining activities.
ADNR	ADNR-15	Comment noted.
ADNR	ADNR-16	Comment noted.
ADNR	ADNR-17	Comment noted.
ADNR	ADNR-18	The No Action Alternative, in the case of an SEIS, reflects the status quo. Section 2.2.1 notes that the operation as permitted following the 1997 SEIS represents the status quo for this project regardless of what has or has not been built to date.
ADNR	ADNR-19	Comment noted.
ADNR	ADNR-20	The Final SEIS has been revised to indicate that backup pump and generator capacity is included in Alternative B (Section 2.3.12). The Final SEIS indicates that under Alternative B the operator might not be able to meet effluent limits and ensure that downstream flow is maintained. With the incorporation of the treatment system under Alternative D, the Forest Service expects that the effluent limits intended to protect water quality will be met and discharge can occur at all times. Furthermore, the gravity-fed diversion associated with Alternative D would maintain the flow in East Fork Slate Creek downstream of the TSF. The NPDES permit specifically prohibits bypass of the treatment system except under very limited conditions.
ADNR	ADNR-21	The impact analysis for the road to Cascade Point is not considered under any of the alternatives directly, although it is discussed as part of the cumulative effects analysis. The Cascade Point Access Road was approved following the Cascade Point Access Road EIS, and it also received a Section 404 permit from the USACE. Therefore, it is not considered a component of any of the alternatives under consideration in this SEIS.
ADNR	ADNR-22	The figures have been modified to clearly label the roads and pipeline.
ADNR	ADNR-23	The mine workings under Alternative A1 are assumed to be constructed similarly to Alternatives B, C, and D. However, Alternative A1 represents only one possible outcome of Alternative A being selected.
ADNR	ADNR-24	See the response to comment ADNR-06.
ADNR	ADNR-25	The design for the breakwater at Cascade Point was part of the package submitted by the proponent, and therefore the question of rationale for the design needs to be directed to the proponent. The SEIS describes the impact of the proposed action as submitted by the proponent. The proponent has indicated that if sediment accumulates at the breach, a maintenance program will be implemented. The Forest Service has no jurisdiction over the private and state lands at Cascade Point and therefore lacks the authority to place stipulations on activities at Cascade Point.
ADNR	ADNR-26	The discussion of the French drain component has been clarified. See Section 2.4.3.
ADNR	ADNR-27	Comment noted. The Forest Service concurs that monitoring and additional studies during operation will help ensure successful reclamation of the TSF.

Affiliation	Comment ID	Response
ADNR	ADNR-28	ADNR-OHMP has been added to the review team.
ADNR	ADNR-29	Aquatic habitat should begin to be restored soon after TSF closure, and therefore the summary tables have not been modified. Sections 4.9 and Appendices C and D provide detailed discussion of Lower Slate Lake restoration. As noted earlier in the comment letter, ADNR and the Forest Service will work with Coeur Alaska to optimize reclamation of Lower Slate Lake.
ADNR	ADNR-30	The areas affected by flooding were addressed in terms of land disturbance and in discussions of wildlife and wetlands. Additional clarification has been included in the freshwater aquatic resources discussion as well. See Table 2-9.
ADNR	ADNR-31	Harbor seals have been added to the list of marine mammals that could be affected by construction and vessel traffic. See Section 4.10.3.
ADNR	ADNR-32	Without an accurate map or any kind of documented linear measurements, the Forest Service is unable to include the impacts associated with the additional stream discussed in the comment. Additional descriptions of impacts associated with flooding are presented for Alternative C in Section 4.12.3. The intent of the summary tables is to present the range of potential impacts among alternatives. The tables are not intended to replace the discussion presented in Chapter 4.
ADNR	ADNR-33	Table 4-22 has been modified to present the acres of wetland impacts by wetland “system” (i.e., estuarine, lacustrine, or palustrine) to better illustrate the range of impacts among alternatives.
ADNR	ADNR-34	Appendix A discusses in detail the geochemical testing that has been performed on rougher tailings samples. Sampling performed on CIL tailings are not considered. The discussion specifically describes why the Forest Service believes that the testing is representative of the current mining plan and the tailings that will be generated.
ADNR	ADNR-35	In October, 2003, Kline Environmental Research found that the maximum depth of Upper Slate Lake is 43 feet. The text has been modified in Section 3.5.2 to reflect this information.
ADNR	ADNR-36	The text in Section 3.9.2 refers to resident fish in the Slate and Johnson Creek drainages. The text in Section 3.9.2 also refers to anadromous fish in the Slate and Johnson Creek drainages. Table 3-15, Fish Species and Their Locations, has been edited to say Freshwater and Anadromous Fish Species and Their Locations. Rainbow trout has been deleted from Table 3-15. Sculpin is discussed in the "Resident Fish: Slate and Johnson Creek Drainages" in Section 3.9.2. Pinks and chums are also discussed in the anadromous section in Section 3.9.2.
ADNR	ADNR-37	The supposition is based on the lack of barriers preventing migration from Upper Slate Lake to downstream of Lower Slate Lake. Although barriers limit migration upstream, Dolly Varden char are able to move downstream from Upper Slate Lake.
ADNR	ADNR-38	Comment noted. Additional spawning surveys are included in the monitoring program described in Section 2, Table 2-7, and Section 5.5 of the risk assessment (Appendix C).
ADNR	ADNR-39	There are no identified anthropogenic sources for metals in the watershed. Therefore, the baseline conditions measured reflect the natural background conditions for the watershed.
ADNR	ADNR-40	As noted in the response to comment ADNR-39, there are no anthropogenic sources of metals in the watershed, so the reported selenium concentrations reflect natural background conditions. In addition, EPA, in its Draft 2002 Aquatic Life Water Quality Criteria for Selenium, states that conditions are protective of aquatic life if fish tissue concentrations are less than 7.9 mg/kg (dry weight).
ADNR	ADNR-41	Comment noted. Text was edited in Section 3.9.3 per comment.
ADNR	ADNR-42	See the response to comment ADNR-39.
ADNR	ADNR-43	Table 3-21 has been revised to include eulachon, and the table has been renamed to reflect that it includes “major” species.

Affiliation	Comment ID	Response
ADNR	ADNR-44	The presence of juvenile eulachon in Berners Bay in winter has been noted in Section 3.10.5.
ADNR	ADNR-45	Some of the narrative provided has been incorporated into the Final SEIS.
ADNR	ADNR-46	A bullet referring to the Lynn Canal Pacific herring stock has been added to the summary section.
ADNR	ADNR-47	Chapter 3 describes the affected environment and is not the appropriate place for a discussion of the results and recommendations for Essential Fish Habitat. Because of the amount of detail presented in the Essential Fish Habitat assessment and the requirement that NEPA documents be concise, the Forest Service believes that it is appropriate to refer readers to Appendix B for additional information on Essential Fish Habitat.
ADNR	ADNR-48	NEPA requires EISs to be analytic rather than encyclopedic. Literally hundreds of species could be affected by various aspects of the proposed action and alternatives. The SEIS focuses on key species within the various resource areas. The SEIS considers management indicator species, as required by Forest Service standards and guidelines, and includes resident, anadromous, and marine species identified as important by cooperating agencies and the public. The document also discusses commercial fisheries (including halibut and shellfish) on general terms but does not assess affects on individual commercial species in an effort to manage the length of the document. The Forest Service believes that the species analyzed in the document provide an adequate representation of the impacts to allow comparison across alternatives.
ADNR	ADNR-49	Comment noted.
ADNR	ADNR-50	Comment noted. Additional discussion on connectivity, beach fringe, etc. has been added to the text along with the Old Growth Reserve discussion in Sections 3.11.2 and 3.11.5.
ADNR	ADNR-51	The vast majority of MIS and Forest sensitive species are tied to productive old-growth habitat. The discussion in Section 3.11 includes a brief discussion on the use of different habitat types. The impact analysis in Section 4.11 provides an assessment of the acres of habitat affected for productive old growth, as well as other land cover types mapped in the area.
ADNR	ADNR-52	Comment noted. The wolverine is typically not addressed in NEPA evaluations. The species addressed in the Final SEIS are those identified as Management Indicator Species, Forest sensitive species, or species on the threatened or endangered species list.
ADNR	ADNR-53	Comment noted. The text in Section 3.11.1 (Black and Brown Bear) does not state that brown bears are uncommon.
ADNR	ADNR-54	Additional clarification on wolf prey has been added to the discussion in Section 3.11.1.
ADNR	ADNR-55	The reference in the Draft and Final SEIS indicates that there are limitations in interpreting the data from which some of the vegetation and wildlife discussions are derived. Data limitations are inherent in almost any analysis and the intent of the discussion is to point out the uncertainty that might be introduced with the land cover data set. The vegetation maps used for the vegetation and wildlife discussions are the same as those used for other NEPA analyses conducted in the Tongass.
ADNR	ADNR-56	The areas of high-volume timber have been identified in Figure 3-7 (Vegetation Types). Note that they are outside the area affected by any of the alternatives. Therefore, none of the alternatives would be expected to affect the habitat value of these areas.
ADNR	ADNR-57	The reference in Section 3.11.1 (River Otter) to ADF&G has been changed to ADNR.
ADNR	ADNR-58	Additional text has been added to Section 3.11.2 (Osprey).
ADNR	ADNR-59	Recent survey information for Kittlitz's murrelet from the USFWS has been included in the Final SEIS in Section 3.11.2.

Affiliation	Comment ID	Response
ADNR	ADNR-60	Lower Slate Lake is classified as "Lacustrine" and Upper Slate Lake is classified as a "Palustrine Aquatic Bed." These labels have been corrected in Section 3.12.3.
ADNR	ADNR-61	The discussion of fish habitat has been expanded to include lacustrine and palustrine aquatic bed wetlands (Lower and Upper Slate Lakes) in sections 3.12.3 and 4.12.3.
ADNR	ADNR-62	As noted in the response to ADNR-12, side-by-side comparisons of impacts on the functions and values of wetlands is impractical because of the subjective nature of the comparisons. The description of functions provided by lacustrine and estuarine wetlands has been supplemented in Section 3.12.3. The discussion of impacts on functions and values in Section 4.12.3 has also been modified. In addition, a summary section at the end of Section 4.12.3 provides some additional comparison of impacts on functions and values among alternatives.
ADNR	ADNR-63	Wetland value ratings are subjective. Arguments could be made that the wetlands including and surrounding Spectacle Lakes are unique and therefore more valuable from an ecological standpoint than the wetlands surrounding Berners Bay. On the basis of productivity, the wetlands surrounding Berners Bay could arguably be considered of higher value than other wetlands in the project area. The extent and nature of the impacts also need to be considered in such an assessment. Impacts on wetlands surrounding Berners Bay in and of themselves would receive minimal impacts from any of the alternatives. The discussion of wetlands and impacts on wetlands in Section 4.12.3 has been expanded to include estuarine wetlands.
ADNR	ADNR-64	The ratings presented in Table 3-31 of the Draft SEIS referred to emergent, scrub-shrub, and forested wetlands in the vicinity of Slate and Spectacle lakes. These wetlands do not directly support fish and would not be rated high using the rating system developed by the USACE. Lacustrine (Lower Slate Lake) and palustrine aquatic bed (Upper Slate Lake) wetlands have been added to the table and the text to address the wetlands that provide high values for fish habitat.
ADNR	ADNR-65	See the response to comment ADNR-64.
ADNR	ADNR-66	The wetland resources (Section 4.12.3) discussion of the value provided by Upper and Lower Slate lakes in terms of fish habitat has been expanded. Additional detail has also been provided on the impacts expected during the life of operations and after implementing the mitigation and restoration measures submitted by the proponent. The recovery of habitat values in Lower Slate Lake is discussed more thoroughly in the Aquatic Resources Freshwater section (Section 4.9.4) and Appendix C.
ADNR	ADNR-67	Additional discussion has been added to the text in Section 4.9 to clarify which alternatives would affect resources in which drainages.
ADNR	ADNR-68	Comment noted.
ADNR	ADNR-69	The SEIS presents the range of population estimates for the Dolly Varden char that are documented for the project. The Forest Service believes that providing the full range of estimates is justified in disclosing the variability of the data used in the analysis. Note that throughout the document, the higher population estimates are used in any discussions of the nature and extent of impacts on the Dolly Varden char population.
ADNR	ADNR-70	The Forest Service agrees that "the lake is what it is." Therefore, the quoted statement accurately reflects the population condition in the lake. It is not meant to downplay the lake's value but simply to provide an accurate description of the environment. It is important, furthermore, to understand the dynamics of Lower Slate Lake relative to its ability to support a fishery in the context of planning for reclamation of Lower Slate Lake at closure.
ADNR	ADNR-71	Comment noted. Additional text has been added to Section 4.9.5.
ADNR	ADNR-72	The Forest Service agrees that it may be possible through monitoring, BMPs, and habitat manipulation to maintain Dolly Varden char during operations, although the primary purpose of the facility will be tailings disposal. The diversion of more water around Lower Slate Lake, as proposed in Alternative C, would be less conducive to the possible maintenance of Dolly Varden char during operations.

Affiliation	*Comment ID*	*Response*
ADNR	ADNR-73	The comparison of alternatives throughout Section 4 has been clarified by including all alternatives in tables (where applicable) and including summaries of impacts at the end of each resource section. The summary at the end of the Aquatic Resources: Marine section (Section 4.10) presents a concise description of differences in impacts between alternatives.
ADNR	ADNR-74	The area of fill covering the beach, intertidal and sub tidal areas (3.6 acres) for the Slate Creek Cove dock has been included in the discussion in Section 4.10.3.
ADNR	ADNR-75	The fueling situation has been clarified. The analysis assumes that fueling would take place at Cascade Point under Alternatives B and D and at Echo Cove under Alternative C.
ADNR	ADNR-76	The text has clarified in Section 4.10.3 to reflect that kelp would not be affected by construction of the breakwater, per the requirement to avoid the kelp in the draft public notice for the 404 permit. The text has also been revised to indicate that herring spawn on a variety of substrates.
ADNR	ADNR-77	The Draft and Final SEIS cite a published article that indicates that there is no correlation between herring spawning and the size of the adult population. The Forest Service acknowledges that ADF&G uses the amount of spawn as a metric for managers to assess population estimates. However, without additional clarification to substantiate the validity of ADF&G's approach, the Final SEIS defers to the results of published information on the subject.
ADNR	ADNR-78	Alternative A1 has been added to the text and tables in Section 4.11 in the Final SEIS.
ADNR	ADNR-79	The proponent indicated that monitoring was to have been conducted by ADF&G personnel with funding provided by the company. Coeur Alaska is unaware whether or not this additional monitoring was completed.
ADNR	ADNR-80	The document has been revised to provide direct comparisons among all alternatives in the tables. Summary sections at the end of each resource discussion in Section 4 also provide a concise comparison among alternatives.
ADNR	ADNR-81	Table 4-16 presents the affected acres by habitat type. Based on the information available, this approach is more practical as most species are associated with productive old growth habitats (see response to comment ADNR-51).
ADNR	ADNR-82	Comment noted. Additional text regarding the effects of fragmentation has been included in the Final SEIS in Section 4.21.10.
ADNR	ADNR-83	The discussion of Columbia spotted frogs in Section 4.11 has been revised to indicate that no habitat would be affected under Alternatives A and A1 and that the potential habitat affected under Alternatives B through D would be the areas around the Upper and Lower Slate lakes.
ADNR	ADNR-84	The Forest Service vegetation map used to develop the description and impact analysis did not identify muskeg as a vegetation community within the disturbance footprint for Alternatives A and A1. Based on aerial photographs and site visits, portions of the area mapped as “Low Site Index” include muskeg communities. For the purposes of the vegetation map, it is accurate to say that muskeg would fall into the Low Site Index cover type.
ADNR	ADNR-85	Additional discussion has been added to the wetland summary in Section 4.12.4 indicating that impacts would occur throughout Lower Slate Lake under Alternatives B and D and Upper and Lower Slate lakes under Alternative C. As noted in the response to ADNR-33, Table 2-9 has also been revised to indicate the extent of impacts by wetland system. The Forest Service again notes that the summary sections are not intended to replace the discussions presented in Section 4 of the Final SEIS.

Affiliation	Comment ID	Response
ADNR	ADNR-86	The Draft SEIS did provide a discussion of the functions affected by each alternative. Table 3-30 in the Draft SEIS clearly displays functional ratings for select wetland types within the project area. This table has been expanded in the Final SEIS. The description of impacts on wetlands functions, as noted in the responses to ADNR-12 and ADNR-62, does not lend itself to depiction in tabular form because of the subjective nature of functional assessments. The differences among alternatives were discussed in the text of Section 4.12.3 of the Draft SEIS. These discussions of impacts on lacustrine and palustrine aquatic bed wetlands have been expanded in the Final SEIS in Sections 4.12.3 and 4.12.4. While ADNR indicates that it is most concerned with the loss of wetlands that provide the highest support for fish and wildlife, other entities may be interested in the overall extent of impacts on wetlands and how they affect the function of the system within the landscape.
ADNR	ADNR-87	Table 4-18 (now Table 4-22) has been modified to include the impacts from the marine terminals at Cascade Point, Slate Creek Cove, and Comet Beach on estuarine wetlands.
ADNR	ADNR-88	The possible improvement is based on a slightly greater productive area within Lower Slate Lake at closure, due to an increased shoreline and a greater littoral area that receives sufficient light to allow primary productivity. Improvement could be related to a range of criteria including benthic organisms, aquatic vegetation, or fish population numbers. The Forest Service agrees that it is premature to state with certainty that the closed facility will be more productive, though monitoring and studies conducted during operations will help optimize the reclamation plan.
ADNR	ADNR-89	The Final SEIS provides a clearer description of short- versus long-term impacts in the Section 4 analyses and in the summary sections developed for each resource area.
ADNR	ADNR-90	The cumulative effects discussion in Section 4.21 focuses on the impacts of Goldbelt's Echo Cove Master Plan, the Juneau Access Road, mining expansion, and the Cape Fox Land Exchange and the impacts they would add to the proposed action under the Kensington Project. The Final SEIS quantifies the projected impacts from each of the projects using the data available for each—for example, the Cascade Point Access Road EIS and the 1997 Juneau Access Improvement Draft EIS. The Forest Service has obtained technical reports from the Alaska Department of Transportation and Public Facilities for the Juneau Access Improvements Supplemental Draft EIS. Data from the reports have been incorporated to the extent practical for this cumulative impact assessment. The Final SEIS does not quantify the impacts on an alternative-by-alternative basis but rather quantifies and discloses the additional impacts that could be expected from "reasonably foreseeable" actions.
ADNR	ADNR-91	The Forest Service stands by its decision to consider raising the TSF dam for additional tailings storage requirements that would result from an extension/expansion of mining operations as part of the cumulative effects discussion. Assuming a TSF alternative is selected, the likelihood that Coeur Alaska would continue to use the existing infrastructure to dispose of additional tailings seems as great as or greater than developing an entirely new facility on the Lynn Canal side of the operation. Evaluating a scenario with a further expanded TSF and/or construction of a DTF extends speculation even further and is not currently justified.

Central Council
Tlingit and Haida
Indian Tribes of Alaska

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TLINGIT AND HAIDA INDIAN TRIBES OF ALASKA
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RECEIVED
MAR 05 2004
Juneau Ranger District

February 26, 2004

Steve Hohensee, SEIS Team Leader
USDA Forest Service
8465 Old Dairy road
Juneau, Alaska 99801

RE: Draft SEIS Kensington

Dear Mr. Hohensee:

[GJ2-1] The Central Council Business and Economic Development Department has reviewed the various alternatives for the Kensington Mine DSEIS and our department supports the selection of Alterative B.

The Kensington Project and this type resource use has been a vital part of our Southeast Alaska economy for generations and this project will continue to provide employment to our community members of Southeast Alaska. The long term jobs and the economic effect of construction jobs will help to offset the loss of timber, fisheries and State government employment that Southeast Alaska has experienced over the last few years.

[GJ2-2] We ask that in your relationship with Coeur D'Alene Mines Corporation and before implementation of this opportunity the company implements Native hire and training with Central Council, and utilizes our VTRC facility. Mr. Archie Cavanaugh, Director of the Vocational Training and Resource Center, can be reached at 907-463-7375 to discuss training opportunities.

Thank you for the opportunity to support Alternative B, the Coeur preferred alternative. I can be reached at 463-7121 or e-mail: gjackson@ccthita.org for further discussion.

Sincerely,

Gordon Jackson

Gordon Jackson, Manager
Business and Economic Development

Cc: Archie Cavanaugh, VTRC Director

GJ:db

Responses to Comments

Affiliation	***Comment ID***	***Response***
Central Council Tlingit and Haida Indian Tribes of Alaska	GJ2-01	Comment noted.
Central Council Tlingit and Haida Indian Tribes of Alaska	GJ2-02	The proponent has stated that they plan to maximize local hiring, including native hire.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
JUNEAU REGULATORY FIELD OFFICE
JORDAN CREEK CENTER
8800 GLACIER HWY, SUITE 106
JUNEAU, ALASKA 99801-8079

REPLY TO
ATTENTION OF:

February 20, 2004

Regulatory Branch (1145b)
East Section
POA-1990-592-M

...VED
.. 24 2004

Mr. Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
Juneau, Alaska 99801-8041

Dear Mr. Hohensee;

This is in regard to the Kensington Gold Project Draft Supplemental Environmental Impact Statement (DSEIS) for a mine Process Area at Jualin, a Tailings Storage Facility (TSF) at Slate Lake, and a Marine Dock Facility at Slate Cove, in Berners Bay. The proposed project would be located within Section 1, T. 36 S., R. 61 E., Sections 10, 14, 15, 23, 24, 25 and Section 36, T. 35 S., R. 61 E., Copper River Meridian, near Juneau, Alaska.

The Corps has reviewed the DSEIS and has the following comments:

Reclamation: (p. 2-33) Fourth paragraph, next to last sentence is incorrect. Section 10 of the Rivers and Harbors Act of 1899 requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the U.S., below the Mean High Water (MHW) mark, prior to conducting the work (33 U.S.C. 403). Section 404 of the Clean Water Act requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., Below the High Tide Line within marine waters or below the Ordinary High Water (OHW) mark within fresh water systems, as well as within wetland areas, prior to conducting the work (33 U.S.C. 1344). SJH-1
(p. 2-34) Would the tailings pipeline access road be reclaimed or left in place for maintenance of the dam? SJH-2

Mitigation: (p. 2-34) Note that removal of inter-tidal fills to -2' MLLW or lower, if proposed, could be considered as mitigation. SJH-3

Treatment of Effluent: (p. 2-40) A mine-water treatment facility is mentioned as mitigation. Please note that the construction of additional structures could result in an increase of the overall project wetland footprint, requiring Corps authorization. SJH-4

<u>Alternatives</u>: (p. 2-60) The Upper Slate Lake Dam, if proposed, would also be considered as an impact. (p. 2-62) Wetland losses need to be quantified. Alternative 'C' would include the additional impact as a result of the proposed dam within Upper Slate Lake. SJH-5

<u>Wildlife</u>: Will a Bald Eagle Study be performed? None was referenced in the DSEIS. SJH-6

<u>Aquatic Resources</u>: (p. 4-33) What affect would Alternative 'C' have on habitability studies proposed within Upper Slate Lake? SJH-7 Would some studies be done before the Upper Slate Lake Dam is constructed? SJH-8 What is the anticipated timeframe between mine closure and habitability? SJH-9

<u>Wildlife</u>: (p. 4-52) Fractured wildlife habitat can affect a much larger area. The Process Area should be evaluated as an old growth corridor to the lower peninsula, based on the steep terraine to the west and Johnson Creek to the east. SJH-10

<u>Soils</u>: (p. 3-58) Discuss the impacts associated with the tailings pipeline across the disturbed substrate of Snowslide Gulch and the mitigation measures proposed. SJH-11

<u>Noise</u>: (p. 3-106) Noise from pile driving activities would also affect fish and wildlife resources during construction. SJH-12

<u>Vegetation</u>: (p. 4-68) Muskegs would not be expected to recover quickly based on compaction and/or length of time necessary to build up a vegetative mat. SJH-13

<u>Wetlands</u>: (p. 4-70) The restoration plan states that fill areas would be re-contoured. Restoration of emergent wetland areas would require more than re-grading of the fill material, based on the fact that fill material for roads would be expected to be somewhat better drained than wetland soils. SJH-14

<u>Functional Losses</u>: (p. 4-71) Under Alternative 'C', would the Upper Slate Lake dam be removed upon reclamation? SJH-15

<u>Land Use and Recreation</u>: (p. 4-76) What effect would vessel wakes have on kayakers along the shoreline? SJH-16

<u>Cumulative Affects</u>: (p. 4-21) How would backfilling the mine affect groundwater hydrology? SJH-17

The following are general comments regarding water quality. While the Corps recognizes that water quality is beyond our regulatory authority, the following concerns are submitted for clarification.

<u>Water Quality</u>: How would monitoring of water quality be performed? For example, manual or computer? How often would monitoring be done, i.e. daily, weekly? SJH-18

Accidental Spills: (p. 4-31) Concerns expressed regarding aluminum levels in the tailings could also apply to spills if tailings were accidently discharged into receiving surface waters. These affects would also be variable depending on the time of year, such as the heavy fall rain events or dry summer periods. SJH-19

The Corps appreciates the opportunity to participate as a cooperating agency on the Kensington SEIS. A public notice and draft 404(b)(1) analysis will be prepared once a preferred alternative is chosen.

Please contact me at (907) 790-4490, or by mail at the letterhead address, if you have questions. For additional information about our Regulatory Program, visit our web site at www.poa.usace.army.mil/reg.

Sincerely,

Susan J. Hitchcock
Project Manager

Copies Furnished:

Mr. Ron Rimelman
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27972 Meadow Drive, Suite 210-C
Evergreen, Colorado 80439

Mr. William Riley
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Mr. Ed Fogels
Alaska Department of Natural Resources
400 Willoughby, 4th Floor
Juneau, Alaska 99801

Responses to Comments

Affiliation	*Comment ID*	*Response*
USACE	SJH-01	Text edited per comment. The text in Section 2.3.19 describing reclamation was corrected to reflect that dredge or fill work done below the ordinary high water would require a Section 404 permit.
USACE	SJH-02	The reclamation plan (Appendix D) provides the reclamation plan for Alternatives B, C, and D. The portion of the proposed tailings pipeline access road that extends from the mill to the TSF (see Figure 2-1 in the Final SEIS) would be removed (along with the pipeline and powerline) after closure. The proposed road that would extend from the existing road along Johnson Creek to the TSF (again see Figure 2-1) would remain to allow maintenance and long-term monitoring of the lake, including the dam.
USACE	SJH-03	Comment noted. The Tidelands Lease application submitted by Coeur Alaska to ADNR proposes leaving at least portions of the fill at Slate Creek Cove in place. The sections on the marine facilities and reclamation (sections 2.3.18 and 2.3.19) have been revised to reflect the current status of the 404 and State Tidelands applications.
USACE	SJH-04	The footprints of the water treatment facility and diversion pipeline would add about 2 acres to the overall disturbance (see Figure 2-12). This is included in the evaluation of Alternative D impacts in the Final SEIS.
USACE	SJH-05	The dam on Upper Slate Lake is included in the calculation of disturbed acres for Alternative C. The wetland section (Section 4.12.3) notes the extent of impacts resulting from the placement of fill for the dam, the disturbance from the diversion channels, and inundation resulting from raising the level of Upper Slate Lake.
USACE	SJH-06	The Final SEIS includes the most recent bald eagle information for the project area under all alternatives (see Section 4.11). Bald eagle and goshawk monitoring and mitigation is also required under all alternatives (see Tables 2-6 and 2-7).
USACE	SJH-07	It is unclear what the commenter is referring to as “proposed habitability studies” in Upper Slate Lake. Baseline aquatic life populations have been defined in Upper Slate Lake and additional discussion has been added to the Final SEIS in Section 4.9.5 to discuss the impacts of the Upper Slate Lake dam under Alternative C.
USACE	SJH-08	Adequate baseline data have been collected to describe Lower and Upper Slate lakes and Mid-Lake East Fork Slate Creek, i.e., no additional studies are planned before construction. As discussed in Table 2-7 of the Final SEIS, yearly aquatic life monitoring is required in each of the above drainages during operations.
USACE	SJH-09	Since some areas of the bottom of the lake would not be covered by tailings, the Final SEIS and the ecological risk assessment indicate that they would be habitable immediately after closure (see Section 4.9.3).
USACE	SJH-10	The discussion of habitat within the project area in Section 4.11 has been revised based on a reassessment of the vegetation mapping units, which resulted in a greater percentage of lands supporting high- and medium-volume forests.
USACE	SJH-11	The soils across Snowslide Gulch are mapped as entic cryumbrepts, which are deep, well-drained, and permeable soils. The tailings and recycle pipelines and the powerline would fit within the footprint of the pipeline access road. Therefore, impacts on these soils would be consistent with road construction impacts observed throughout the length of the new roads. Other soil types traversed by the pipeline access road include typic cryaquods south of Snowslide Gulch and cryohemists in the vicinity of Spectacle and Slate lakes. Additional discussion of the soils that would be impacted by the road is included in Section 3.12.1. Additional discussion has been added to Section 4.12.1 to address the specific impacts from road construction. Mitigation would be addressed through best management practices to reduce sedimentation (check dams, etc.). Mitigation measures for road construction are addressed in Section 2.5.
USACE	SJH-12	The discussion of noise from construction activities (Section 4.18.3) has been modified to include the noises from pile-driving activities. The analysis does not specifically include noise from pile-driving since that activity would be of shorter duration than other construction operations. Pile driving would be subject to the same mitigation measures as other construction activities to minimize impacts on marine mammals.

Affiliation	Comment ID	Response
USACE	SJH-13	The statement in the SEIS refers to timber and muskeg communities recovering since the original mining operations took place approximately 100 years ago. There was no reference to an expectation that muskeg community types would recover rapidly. We agree that it would take time to accumulate the organic mats that form the substrate within muskeg communities.
USACE	SJH-14	We concur that in many cases, the removal of fill would be required to reestablish wetland communities where building pads and roads had been constructed. The reclamation plan (included as Appendix D) provides additional detail on how wetlands would be restored following the cessation of operations.
USACE	SJH-15	Yes, under Alternatives C and D, which involve diversion of water around the TSF during operations, the upstream dams would be removed at closure. This has been clarified in the Final SEIS in Section 2.3.8.
USACE	SJH-16	The crew shuttle boats would operate near the shoreline only when approaching the Slate Creek Cove and Cascade Point marine terminals. Wakes generated by vessels operating in open water would be relatively small (less than 2 feet) and are not expected to affect kayakers along the shoreline. The speed of the vessels would be reduced resulting in a wake with a lower frequency but higher amplitude than when crossing open water. Though larger, these wakes are also not expected to affect kayakers operating in the immediate area.
USACE	SJH-17	Additional discussion has been added to the Final SEIS in Section 4.7 to address the impacts of backfill on ground water flow. Underground mine workings located below surrounding ground water levels typically cause the lowering of these water levels as ground water flows into the workings. This is analogous to a pumping well that creates a cone-of-depression in the water table surrounding the well as water is removed. The magnitude and extent of drawdown is a function of the pumping rate and hydraulic properties of the formation or aquifer. For open underground mine workings, the large void spaces create areas of high hydraulic conductivity at the mine-rock interface where relatively large quantities of ground water can flow into the workings if the native rock has sufficient permeability and ground water recharge. If an underground mine is backfilled, either completely or partially, the effect would be to reduce the magnitude and extent of ground water drawdown because the backfill material would reduce the hydraulic conductivity and ground water gradient at the mine-rock interface. Therefore, backfilling underground mine workings would lessen effects on groundwater flow/quantity compared to mining without backfilling.
USACE	SJH-18	The detailed water quality monitoring plan is specified in the draft NPDES permit, which was released to the public on June 17, 2004. Although a few parameters (e.g., flow) would be monitored continuously by automated instrumentation, most monitoring would be performed by collecting a sample in the field and sending it to a laboratory for analysis. As documented in the draft NPDES permit, the monitoring frequencies vary by pollutant (see Table 2-7).
USACE	SJH-19	Additional information has been added to the Final SEIS in Section 4.9.1 regarding potential aluminum exposure from a tailings spill. As documented in the Ecological Risk Assessment, aluminum in solids/sediment is not considered toxic to aquatic life, and aluminum concentrations in the tailings are lower than those found in Lower Slate Lake sediments. Aluminum concentrations in tailings water could cause acute impacts on aquatic life in the area of a spill entering a receiving water. It is, however, important to recognize that most of the tailings pipeline under Alternatives B, C, and D would be at least 1,000 feet from receiving waters and located along a bermed road.

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

[Date Stamped 4-14-2004]

Reply To
Attn Of: ECO-088

Ref: 02-064-AFS

Forrest Cole, Forest Supervisor
Tongass National Forest
648 Mission Street
Federal Building
Ketchikan, AK 99901-6591

Dear Mr. Cole:

The U.S. Environmental Protection Agency (EPA) has reviewed the draft Supplemental Environmental Impact Statement (DSEIS) for the **Kensington Gold Project** (CEQ # 040020) in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Our general issues are highlighted below with detailed comments enclosed for your consideration

The DSEIS analyzes the No Action Alternative, Alternative A, and three (3) action alternatives. The No Action Alternative is the Plan of Operations approved in a Record of Decision in 1998 and includes a mining rate of 4,000 tons per day and a 20 million-ton capacity dry tailing facility (DTF). Alternative A1 is a modification of the No Action Alternative which proposes a reduced scale of mining consistent with Alternative B and C (2,000 tons per day and 4.5 million tons of tailings in DTF). Alternative B proposes a tailings storage facility (TSF) in Lower Slate Lake, relocating the milling operation, elimination of employee camp, and construction of marine ferry terminals at Slate Creek Cove and Cascade Point to ferry employees daily to and from the project site. Alternative C contains similar components as B. However, a marine terminal would be constructed at Echo Cove instead of the Cascade Point and the Slate Creek Cove marine terminal would not include the landing craft ramp as in Alternative B. Also, Alternative C includes a diversion of Slate Creek around the tailings impoundment.

In July 2003, EPA signed a Memorandum of Understanding (MOU) to be a cooperating agency for the Kensington Gold Project DSEIS. We became a cooperating agency because of EPA's pending decision regarding a National Pollutant Discharge Elimination System (NPDES) permit for the project so that this DSEIS could serve to fulfill our NEPA compliance responsibilities (40 CFR Part 6). In addition, we became a cooperating agency because of our independent review responsibilities under Section 309 of the Clean Air Act so that we could participate early and cooperatively with the Forest Service and other Federal and State agencies in the identification of issues and concerns to be addressed in this document.

As a cooperating agency, we have provided substantive written and verbal comments on preliminary sections and the Preliminary Draft SEIS; participated in a significant number of discussions and meetings at the staff and management level; and participated in public scoping meetings. Issues and concerns that we previously provided to the Forest Service during this work together are reiterated in this letter and the enclosed detailed comments.

MP-1

Alternatives B and C could result in the damage to aquatic habitat in Slate Lake as well as the entire Dolly Varden, three-spine stickleback, and macroinvertabrate populations. This and the significant uncertainties about the rate of recovery post-closure, the ability of the project to meet NPDES effluent limits for Total Suspended Solids (TSS) and the Clean Water Act 404(b)(1) guidelines raise environmental objections. For these reasons, we are pleased that the Forest Service agreed to conduct water quality modeling of the tailings discharge to provide another basis for evaluating the projected performance of the Lower Slate Lake tailings impoundment facility. EPA also acknowledges the receipt of supplemental information regarding mitigation and will conduct a review of this information.

MP-2

EPA believes that the purpose and need of the project could be met with fewer environmental impacts by using a dry stack tailings facility as proposed in Alternatives A and A1. If Alternative A is not selected, there appear to be components of Alternative A and C that could also be feasible and provide a practicable and less environmentally damaging alternative to mine and process gold. These components are the Echo Cove marine ferry terminal, which avoids herring spawning habitat, the Slate Creek marine ferry terminal, dry stack tailings facility, and milling facility in the Jualin mine area. These components may provide for a feasible and practicable means to mine and process gold without degrading aquatic habitat.

MP-3

In addition, the DSEIS states that there is enough ore available at this site to potentially generate 20 million tons of tailings (page 119), which would result in the generation of an additional 12.5 million tons beyond what is currently proposed for this project. The DSEIS states that expanding the storage capacity of the TSF to accommodate the additional tailings would require a significant enlargement of the dam and would envelop both Lower and Upper Slate Lakes. The dry stack tailings facility would, however, accommodate this amount of additional tailings. Dry stack tailings facilities are a standard mining industry practice. For example, the Greens Creek mine on Admiralty Island, Alaska, has a large dry stack tailings facility and the Pogo Gold Mine near Delta, Alaska, which we just permitted, will construct a dry stack tailings facility.

MP-4

Further, EPA is concerned about impacts to herring spawning habitat and insufficient information and analysis regarding metals loadings, cumulative impacts, operation and maintenance of the tailings facility, dam safety, and financial assurance. EPA also recommends providing more comprehensive information regarding resource values in Berners Bay.

MP-5

Since the DSEIS for the Kensington Gold Project does not identify an agency Preferred Alternative, EPA has assigned a rating for each action alternative. For Alternative A *(No Action Alternative)* and Alternative A1, we have assigned a rating of LO (Lack of Objection) since this

MP-6

proposal was previously permitted. EPA has assigned a rating of EO-2 (Environmental Objections - Insufficient Information) to Alternative B *(Proposed Alternative)* and Alternative C.

A copy of the EPA rating system used in conducting our environmental review is enclosed for your reference.

EPA appreciates the opportunity to provide comments on the DSEIS for the Kensington Gold Project. As a cooperating agency, we are committed to continuing to work closely with the Forest Service and the other cooperating agencies to resolve our significant issues and concerns in a timely manner. Should you have any questions regarding our comments, please contact me at (206) 553-1272 or **Error! Hyperlink reference not valid.** or have your staff contact Judith Leckrone Lee at (206) 553-6911 or **Error! Hyperlink reference not valid.**.

Sincerely,

(Signed 4-14-04)

Michelle Pirzadeh, Director
Office of Ecosystems and Communities

Enclosures

cc: Steve Hohensee, USFS
Ed Fogels, ADNR
John Leeds, USCOE

U.S. Environmental Protection Agency (EPA) Comments
Kensington Gold Project
Draft Supplemental Environmental Impact Statement (DSEIS)
April 2004

MAJOR COMMENTS

Total Suspended Solids

MP-7

Significant uncertainty remains regarding the ability of the proposed tailings storage facility (TSF) to meet National Pollutant Discharge Elimination System (NPDES) effluent limits for total suspended solids (TSS). The applicant, Coeur Alaska, provided an analysis by Knight-Piesold that is referenced in Attachment 4 to Appendix A of the DSEIS that indicates the impoundment would have more than adequate volume and retention time for the tailings plume to settle and thus meet the 20 mg/l effluent limit. However, the formula used in the analysis is not applicable to the smallest 20% particle size fraction (less than 10 microns per Knight Piesold, citing British Columbia guidelines). Given that the coarser 40% of the tailings would be backfilled, this suggests that as much as one-third of the tailings discharged to the impoundment, or roughly 400 tons per day, would be within the particle size range that may not settle (See Attachment A).

MP-8

The applicant and third party consultants have therefore searched for a comparable project that would provide some indication of how well a system like this might function in terms of settling out fine particles. None have been identified to date that we would consider comparable, although Benson Lake on Vancouver Island is cited in the Ecological Risk Assessment as a surrogate for looking at lake recovery after tailings deposition (Mine Environmental Neutral Drainage [MEND], 1991). While this report focuses more on lake ecosystem recovery seventeen years after tailings disposal ceased, it does have the following statement regarding settling performance during operation:

> *Throughout the period of operation of the mine, the lake consistently exhibited increased levels of turbidity caused by the finer colloidal fractions of the tailings remaining in suspension despite the addition of flocculants to enhance particle settling. Moreover, tailings fines were also found in the Lower Benson River below the lake's outlet.*

Likewise, in an earlier related report (MEND, 1990), it is stated:

> *Throughout the operation of the mine, the company experienced problems with lake turbidity caused by suspension of the finer colloidal fractions of the tailings.*

MP-9

Our concern with the ability of the proposed discharge to meet TSS limits of 20 mg/l (daily average) and 30 mg/l (monthly maximum) is significantly heightened by the anticipated high flows, approaching 5,000 gallons per minute (gpm), that would need to be discharged. The average monthly flow during May, for example, is 3,201 gpm (DSEIS, Appendix A). Such high flows could well be beyond the capacity of a treatment system (e.g., media filtration) or the cost of such treatment could be prohibitive.

MP-10 For these reasons, we are pleased that the Forest Service agreed to conduct water quality modeling of the tailings discharge to provide another basis for evaluating the projected performance of the Lower Slate Lake tailings impoundment facility. Modeling of this nature is a standard tool for assessing potential water quality impacts from industrial effluent discharges. During the March 4, 2004 meeting, the Forest Service agreed to conduct modeling on the following for Lower Slate Lake: tailings discharge and distribution, tailing settling, and potential resuspension of tailings. This information will be particularly valuable for determining whether any contingency measures, such as water diversion or possibly treatment would likely be needed to assure compliance with NPDES effluent limits.

Operation of the Impoundment

MP-11 At present it is unclear how Coeur proposes to operate the impoundment. The DSEIS (Figure 2-6) does not indicate how the effluent discharge would be decanted from the TSF. However, on page 2-24, the DSEIS states, "operationally, water would be pumped from a clear portion of the pond, away from the tailings discharge, to the spillway inlet for discharge." This should be made clear in the figures, showing the placement of the tailings pipeline relative to the pumped discharge point of withdrawal.

MP-12 At a meeting in Juneau on February 25, 2004, a Coeur representative further indicated that incoming fresh water could be diverted around the impoundment through a pipeline rather than through a lines ditch (under Alternative C). This is new information that bears directly on the ability of the TSF to meet TSS limits and whether effluent flow could be reduced to levels more amenable to treatment if needed. It should be clearly described and the associated water quality and other environmental implications clearly analyzed and disclosed in the SEIS.

MP-13 Another relatively new operational change presented in the DSEIS is the proposal to raise the level of the water in the TSF by approximately ten feet after tailings discharge ceases. This would address in part EPA's concern that the tailings discharge may not remain confined to the deeper portions of the TSF but could disperse widely and potentially cover the otherwise productive lake margins, heretofore assumed to be devoid of tailings. The implications of this new operational detail need to be considered in the SEIS. For instance, how long would it take to raise the lake level? How would downstream flow be assured if the flow from Upper Slate Lake is dedicated to raising the lake level?

Metals Loading Analysis

MP-14 The DSEIS does not address our concerns regarding metals loadings from discharges from the TSF during operations, as compared to discharges from the dry tailings facility (DTF). Summaries of potential impacts of each alternative with respect to effluent quality, as portrayed in the table in the Summary (page S-8) and in Table 2-9, treat all alternatives as equals. Stating that the concentrations of pollutants would be similar does not consider the significant difference in flows from the DTF relative to the TSF and consequently the potentially significant difference in metals loadings to the respective downstream environments.

MP-15 We suggest the best way to disclose this information would be to calculate the incremental metals loading in the TSF discharge relative to current metal loads in the East Slate Creek discharge (at station SL-A). This information is readily available. This analysis should also distinguish metals loadings between alternatives B and C (see also comment below requesting a table similar to Table 4-11 for Alternative C).

Ecological Risk Assessment and Long-term Recovery of the TSF

MP-16 The Ecological Risk Assessment concludes that the post-operation TSF will likely be as productive or more so than the existing Lower Slate Lake soon after closure and will improve through time. This conclusion is based on the assumption that the new lake margins that are not covered with tailings would support rooted aquatic plants and a benthic macroinvertebrate community at least as robust as what currently exists and that this area is as large or larger than the current productive lake margins. This conclusion also assumes that some colonization of the tailings will occur despite the poor performance of tailings subjected to freshwater bioassays (see comment below).

Table 5.3 in the Ecological Risk Assessment presents areas of zonation in the TSF compared to Lower Slate Lake based on bottom types. The text is careful to clarify that the area covered by tailings has the potential to support macroinvertebrates and aquatic plants based on light penetration. The text, however, then goes on to discuss the 'habitability' issues associated with the tailings even though there is a great deal of uncertainty (see comments below). Given the poor performance of the bioassays, concerns with how the Mine Environment Neutral Drainage (MEND) studies have been characterized (see comments below), and a lack of understanding regarding why the bioassays performed so poorly, it would be better for this table to either be deleted or altered to better reflect current uncertainties with applying bioassay results to the TSF. The temporal uncertainties relative to recovery also support portraying the tailings zone as unproductive for an unknown time frame. This would be more consistent with the findings of the DSEIS.

MP-17 New information in the Ecological Risk Assessment regarding natural recovery is in error. The discussion on page 58 regarding presumed sedimentation rates in the TSF following closure states that about 2 cm/year of natural sediment would be expected to accumulate and that at such a rate 10 cm of natural substrate would cover the tailings within five years. These figures are based on recovery of Benson Lake on Vancouver Island into which reactive mine tailings were discharged from 1962 to 1974. The MEND reports (MEND 1991, 1990) regarding Benson lake, however, state quite clearly that 2-3 cm of natural substrate has accumulated on top of the tailings in total after 17 years of recovery. We also question the comparability of Benson Lake to Lower Slate Lake. Among other factors, it is situated in a much larger watershed with a much larger landscape and hence larger inflows capable of transporting sediment and organic debris. Parts of the watershed were apparently logged as well.

MP-18 The inflow to Lower Slate Lake from Upper Slate Lake has a total suspended solids loading of about 4 mg/l. The Ecological Risk Assessment should estimate the annual rate of sediment accumulation based on the actual rate of input and consider the TSS discharge out of Lower Slate Lake and identify how long would it take for 10 cm of natural sediment to

MP-19

accumulate.

The discussion of the MEND studies in the Ecological Risk Assessment needs to disclose both the comparability of the lakes that were monitored (for recovery after receiving reactive mine tailings) and the nature of the macroinvertebrate communities that were found. We are particularly concerned that in the oligotrophic Lower Slate Lake, which has apparently little input of sediment and organic material that there would be very little food source for aquatic organisms.

MP-20

Moreover, the Benson Lake macroinvertebrate data showed significantly lower diversity, averaging only 8 taxa per site as opposed to an average of 30 in the control lake. Statements regarding the biota of Benson Lake (see p. 61, paragraph 3) should disclose this disparity in diversity between Benson lake and the control lake (MEND, 1991).

The discussion of the habitability of the tailings in section 5.2 needs improvement. Figure 5.1, for example, makes it appear that all endpoints are equal and with approximately half above and half below the "1" line, it is confusing to the reader. A summary table of the tests run and brief results would be useful. However, it must be stressed that not all endpoints are "equal". For example, #18 and 19 which refer to survival during bioaccumulation testing are not as important a finding as the amphipod bioassays. Macoma and Nereis are specifically selected as bioaccumulation test species because they are hardy and not expected to die during a 28 day exposure. See detailed comments on Appendix C below.

Dam Safety and Financial Assurances

MP-21

Under Alternatives B and C, the existing lake will be enlarged in size from 20 acres to 56 acres and its height increased 90 feet by constructing a tailings dam. The DSEIS notes that the final water cover over tailings will be 20 feet and that the mine is located in an earthquake sensitive zone. EPA recommends that the DSEIS include assurances that the dam will be properly designed to withstand seismic activity and maintained throughout mine operations. Recent past experiences of similar methods have shown dam failures with coal slurry in Appalachia (see the Martin County coal case).

MP-22

EPA also recommends that there be financial assurance in perpetuity to cover the costs of maintaining the dam's integrity after the mine ceases operations. Dam integrity and its related water cover must be kept in place because the cover stops chemical reactions from occurring within the tailings.

MP-23

EPA recommends that a tailings dam trust fund be established at the beginning of mine operations and that trust fund have sufficient funds in it prior to the closure of mining to assure that either the state or federal authorities have access to funds to maintain the dam and are also able to fund emergency clean-up actions when required.

MP-24

Reclamation and Closure

The DSEIS lacks significant information on reclamation and closure of Lower Slate Lake. EPA recommends that the final SEIS provide more details on how the lake would be reclaimed. For example, a listing of general types of flora and fauna expected to recolonize or be restocked in the lake (since new lake conditions most likely would not support the same type of life as it currently does) and information on the expected length of time anticipated for reclamation activities, both man-made and natural succession. This would provide the decision maker and public more information about the long-term environmental impacts.

Marine Resources

MP-25 The DSEIS discusses marine species and recreation in Berners Bay. However, the DSEIS should provide a clear picture of the substantial value, productivity, and sensitivity of the area. The public is concerned that increased access to Berners Bay would alter recreation and resource values and change the character of the area. EPA recommends that the EIS include an introductory section explaining the valuable ecological and recreational resources and interconnectedness of habitat and fish and wildlife.

MP-26 Berners Bay supports a diversity of sensitive and critical habitats important for birds, fish, and wildlife. The steep mountains and icefields ensure isolation of the area, which maintains its pristine and undeveloped character. The large glacially fed systems of the Lace and Antler Rivers drain into Berners Bay, depositing silts and sands forming extensive intertidal mudflats and estuaries. Along with Johnson and Slate Creeks, these rivers support a number of anadromous fish, including pink, chum, coho, sockeye salmon, and Dolly Varden char, cutthroat and steelhead trout. Estuaries, muskegs, and floodplains adjacent to these rivers are excellent spawning and rearing habitat for fish, as well as habitat for moose, bears, and waterfowl. Coastal old growth forests provide nesting habitat for bald eagles.

Estuaries at the mouth of anadromous streams are among the most sensitive habitats. Estuaries provide exceptional productivity as a result of the up-welling of nutrient rich deep waters from the Lynn Canal and the large volume of freshwater flowing from the upland drainage of the Lace, Berners, Antler, Sawmill Rivers. The nutrients then become available for use by phytoplankton, which provide food for fish, shellfish, and other marine organisms. Thus, estuaries provide the foundation of most marine food chains and the productivity of the offshore waters.

The estuarine wetlands are important for eulachon and other smelts which spawn in the Berners, Lace, and Antler rivers. Juvenile salmon, especially chum and pink salmon, migrate from the rivers to the estuaries soon after emerging from the spawning gravels during their out migration adjustments to saltwater.

Furthermore, Berners Bay provides important recreational values. Recreational activities include kayaking, hiking, camping, hunting, sport fishing, wildlife viewing, boating, etc., in an undisturbed pristine environment.

Herring in Berners Bay

MP-27 EPA has concerns about the development of a marine ferry terminal at Cascade Point due to the potentially impacted herring spawning habitat. The herring population is depressed in

Southeast Alaska, particularly at Cascade Point. The EIS states that there will be permanent loss of a small area of kelp habitat, which are crucial for herring spawning. Herring are an important food source for species such as the humpback whale and American Peregrine falcon, which are ESA listed species. EPA recommends avoiding construction at Cascade Point.

Cumulative Effects

MP-28 EPA recommends that the SEIS include an expanded analysis and discussion of the potential cumulative impacts to Berners Bay. There are many actions/projects that are either proposed or reasonably foreseeable that could potentially result in the cumulative degradation of Berners Bay including the Juneau access road, an Echo Cove Master Plan by Goldbelt, Incorporated, and potential development of the Jualin Mine. EPA recommends an evaluation of transportation mechanisms that minimize cumulative environmental impacts and maximize the potential multiple use of access routes.

DETAILED COMMENTS

	Page	Section	Comment
MP-29	S-4		Alternative A1 states the life of the operation. Please add an additional sentence to the other three alternatives (Alternative A, B, and C) discussing the life of the operation.
MP-30	S-6		Environmental Consequences, 1st bullet: What would be the height of the DTF associated with Alternatives A and A1? Why would the height of the DTF be the same under Alternative A1 given that the size would be approximately 65% smaller? What would the visual impacts be after reclamation and closure?
MP-31	S-6		Environmental Consequences, 5th bullet: Please insert the word "affect" between "would 268".
MP-32	S-8		Effluent Quality: EPA has not been provided convincing data indicating that effluent limits would be met for TSS under Alternatives B and C.
MP-33	S-12		Socioeconomic Resources: Why would direct employment and payroll effects for Alternative A1 be the same as Alternative A when the mine life under Alternative A1 would be shorter?
MP-34	S-13		Employee Transportation: Please clarify that the 2 to 4 trips associated with Alternatives A and A1 are helicopter trips.
MP-35	1-4	1.2	Paragraph 3, 1st sentence: Please change "reduce the area of disturbance" to "reduce the area of *surface* disturbance". This clarifies the statement since subsurface aquatic disturbances are clearly increasing for Alternatives B and C.
MP-36	1-6	1.5	Paragraph 2, 2nd sentence: It is stated here that the history of the Kensington Gold Project dates back to 1992 while page S-1 says 1990.
MP-37	1-8	1.7.1	Paragraph 2, last sentence: This sentence directs readers to Section 3.12 for the Modified Landscape land use designation. Shouldn't this refer to Section 3.13?
MP-38	1-9	1.7.1	Paragraph 1: The first sentence refers to the 2002 Amended Plan of Operations while page 1-3, 3rd paragraph, only discusses the 2001 plan.
MP-39	2-3	Table 2-2	Footnote a indicates that the acreage figures do not include the disturbance associated with the docks at Cascade Point and Echo Cove, which begs the question of the size of disturbance associated with the respective docks.

MP-40	2-3	Table 2-3	The size of the marine facilities associated with Alternatives B and C is 6 acres. Does this include the total disturbance for the docks at Cascade Point and Echo Cove?
MP-41	2-3	Table 2-3	Footnote a: "bern" should be berm.
MP-42	2-9	Figure 2-6 and 2-9	The pipeline, road, and location of lake discharge are not clearly shown. Please include a map that clearly illustrates Alternatives B and C, including labeling streams.
MP-43	2-15		Again, please add an additional sentence to the three alternatives (Alternative A, B, and C) discussing the period of mining life.
MP-44	2-16	2.2.4	Is Coeur still seeking an exemption from the regulatory requirement that process water must be recycled?
MP-45	2-17	2.3.2	Paragraph 4, 4th sentence: Please add Alternative A1 to the sentence starting with, "Under Alternatives B and C..."
MP-46	2-20	2.3.5	Subaqueous Tailings Disposal, Paragraph 2: Please provide the actual particle size range to define the size of the "small particles" being targeted by polymer and flocculant. Please also provide data to support the conclusion that polymer and flocculant would induce/enhance settling rates of the targeted size particles, and what specific flocculants and polymers would be used. This section should also describe the anticipated overall particle size composition for the slurry, prior to and after the addition of polymer and flocculant. Finally, please describe what measures the operator would employ to assure that the tailings remain on the bottom of the lake and would not disperse to cover the entire bottom area, including the shallow margins.
MP-47	2-20	2.3.5	Subaqueous Tailings Disposal, Paragraph 3: Would the perforated pipeline be "above the bottom" of the TSF, or would it be maintained above the surface of the slurry? Also, what is the anticipated rate of tailings flow from the pipeline?
MP-48	2-23		The contour lines are not labeled for the modified lake. Please label the contour lines to show the reviewer what the post closure lake elevation would be.
MP-49	2-26	2.3.8	Paragraph 4: Should reference Figure 2-9, not Figure 2-8.
MP-50	2-29	2.3.13	The Facility Response Plan (FRP) is mentioned in the list of EPA actions, but is not mentioned here for Alternative A although an Spill Prevention, Control and Countermeasures Plan is mentioned.

MP-51	2-30	2.3.16	Figure 2-3 shows the borrow pits for Alternative A1, not B and C as stated. Alternative B's borrow pits are actually shown on Figures 2-4, 5, 6, and 7, while the borrow pits associated with Alternative C are shown on Figures 2-4, 7, 9, and 10.
MP-52	2-32		The EIS should state the source of the fill material for the construction of marine ferry terminals.
MP-53	2-34	2.3.19	Last 2 paragraphs: It states here that once the lake elevation is raised, the TSF would inundate "at least" the same acreage of natural sediments. After studying Figures 2-13 and 2-14, it appears that, in the process of doing this, the post-closure lake would support significantly more rooted plants than the original lake because of the much larger littoral zone compared to the original lake footprint. Is this the case? It also states that organic material will be added to encourage vegetation. Would the wetlands be manually planted with root plugs to stabilize the new littoral zone or would the area be allowed to re-vegetate naturally? This information should be provided. It says that reclamation would focus on restoring resident fish populations. This implies that multiple fish "populations" exist now. Pages 3-28 to 3-30 only focus on Dolly Varden char.
MP-54	2-40	2.4.9	EPA does not agree with the second sentence. As mentioned above, significant uncertainty remains regarding the ability of the proposed project to meet effluent limits for total suspended solids (TSS). Short of a demonstration that TSS limits would be met in the effluent, a contingency for treatment should be provided and planned for in the event that effluent limits could not be met.
MP-55	2-41	2.5.1	1st sentence: A contingency for effluent treatment should also be incorporated into the design.
MP-56	2-43	Table 2-6	Water quality and hydrology: In addition to using BMPs to enhance settling in TSF, a contingency for treatment of the effluent should be incorporated into Alternatives B and C.
MP-57	2-62		The DSEIS states in Table 2-9 under Alternative B that there will be permanent losses of production export values (high value). The DSEIS does not define this value nor discuss its importance to wetland functions. Please discuss further since there will be a permanent loss and it is rated as high value.
MP-58		Section 3	The header changes from "Chapter 3" to "Section 3"

MP-59	3-30	3.9.2	Paragraph 2: There is detailed information on Dolly Varden char throughout the area, but only one sentence stating, "...three-spine stickleback have been captured in Lower Slate Lake." Need to expand on this topic. If resident fish populations are to be restored in Lower Slate Lake during the reclamation phase, some type of information on general numbers of stickleback in the lake is needed.
MP-60	3-37		The DSEIS references the 1992 final EIS for a description of the biological communities in Lynn Canal. The 1992 final EIS is also referred to on other pages throughout the affected environment section. EPA believes that information should not be referenced in a document that is over ten years old. EPA recommends including any information related to the affected environment in this EIS.
MP-61	3-83		The DSEIS states that most of Berners Bay viewshed is a Class B landscape, but that Cascade Point is rated Class A. The EIS should explain this rating system and discuss whether or not this classification directs any management for the area and if so, what the direction is for a Class B and A landscape.
MP-62	4-9		The DSEIS does not fully disclose impacts to the stream diversion. It is difficult to assess whether the stream diversion would be less environmentally damaging or not. The EIS should more fully discuss the direct and indirect impacts, as well as the level of impacts caused by the diversion.
MP-63	4-16	4.6.1	The first two full paragraphs are duplicates of each other. Paragraph 3: Please delete the word "and" from the sentence beginning with, "The current and NPDES permit provides..." This paragraph also references Appendix WQ, which appears regularly throughout the document as well as references to Appendix ERA (page 4-25). These appear to be references to Appendices A and C.
MP-64	4-17	Table 4-9	This table does not contain the Sulfate and TDS limits for the permitted discharge. The permit has the AML and MDL equally set at 250 and 1000, respectively, and it is anticipated that this note will apply to Table 4-11 as well.
MP-65	4-19	4.6.2	DTF Effluent Quality: Under Alternative A and A1, effluent from the DTF would be discharged to Camp Creek...
MP-66	4-20		Last paragraph: Please add that the assumption is made that Alternative A1 would also meet water quality-based NPDES permit limits.
MP-67	4-23	Table 4-11	Anticipated TSS effluent limits are missing from this table.

MP-68	4-24	4.6.5	Paragraph 4: The sentence, "No model runs showed any conditions under which the water quality-based effluent limits would not be met." is awkward because of the double negative. Please reword for clarity. Please insert "be" between "would" and "covered" in the following sentence.
MP-69	4-24	4.6.5	Paragraph 5: This paragraph needs to be revised in light of the discussions during the March 4, 2004 meeting in Seattle regarding TSS modeling, lack of dilution by lake inflows (or diversions as a contingency).
MP-70	4-25		There are two sections 4.6.5. The second, related to water quality effects of alternative C, should be 4.6.6. This section should include a table comparable to Table 4-11 showing the anticipated effluent quality for Alternative C.
MP-71	4-30		The DSEIS states that stream crossings could affect spawning and feeding behavior of anadromous fish populations. However, the DSEIS does not say what species of fish could be affected and to what degree. The EIS should state what species would be affected, if they are ESA listed or a species of concern, and to what degree they will be impacted.
MP-72	4-31		Accidental Spills, Last paragraph: The discussion of probability is confusing. It says that 0.5% is 1 in 200 while 0.02 is 1 in 50. On the next page under Effects of Alternative A1, the discussion includes the percent, so 1.4% is about 1 in 70. A consistent way of labeling would be helpful.
MP-73	4-33	4.9.3	Paragraph 3: This paragraph discusses the possibility of the channels of Mid-Lake East Fork Slate Creek being inundated. Is there a place that could be designated for upstream (natural condition sampling) that would not be inundated so the monitoring location would not have to be moved during the life of the permit?
MP-74	4-39	4.10.1	Nearshore Marine Organisms, Spills: This discussion is referencing very outdated references. Several research/field studies conducted in the past ten years indicate that diesel entrained in intertidal and subtidal substrates is quickly removed in medium- and high-energy beaches and nearshore environments. Furthermore, lethal effects are only expected on the order of weeks, whereas sublethal effects would more likely occur over the following months.
MP-75	4-39	4.10.1	Marine Mammals, Spills: Although pinnipeds seem to have a good avoidance behavior for oil spills, fur-bearing mammals that haul-out do not.

MP-76	4-119	4.21.1	Extension of Mining Operations: Please also discuss how this relates to Alternative A1.
MP-77	6-1	Section 6	References: There are numerous cases where multiple references of "same author/same year" are not properly listed or cited. Here is one example: there are two different references listed as USFS 1997; two different references listed as USFS 1997b; and one reference as USFS 1997c. In all, there are five USFS 1997 documents, which should be listed as 1997a thru e. Citations throughout the document will also need to be updated with correct year/letter.
MP-78	7-1	Section 7	List of acronyms appears incomplete. Suggest adding: mg/L, μg/L, ND, °C, NM, $\mu g/m^3$
MP-79	A-23	I	Last sentence: "Knight Diesold, 2002"
MP-80	A-26	IV	The discussion of the study area precipitation is confusing. Is the precipitation at Eldred Rock 46.6 then you put in the orographic effect to get the project area precipitation of 58.3?
MP-81	A-30		Last paragraph, 7th sentence: "digestion used in digestion used in..."
MP-82	A-49		Why is the text at the top of the page italicized?
MP-83	A-60		Sulfate/TDS: The previous permit uses 250 and 1000 as the average and the max.
MP-84	C-4&5	Figures 1.2 & 1.3	The dotted portions in the key for Fig. 1.2 do not give any information. Shouldn't the plants, inverts and fish zone be different from the inverts and fish zone? Most importantly, Figs 1.2 and 1.3 are still difficult to compare to one another given their different labeling, orientation, etc. Please add a new figure just like Figure 1.3 but note the BEFORE project zones. Include depth definition in parentheses in the key to the figure, i.e., "rooted plants (<13 feet deep)". Figure 1.2 needs a quantification on descriptors such as productivity, unless this figure is meant to indicate the final desired condition of the lake. Please also include photos of the lake margins and vicinity.
MP-85	C-6		Last paragraph, 1st sentence: Should "evaluation" be "elevation"?

MP-86	C-11 &12	2.2	The end of section 2.2 is confusing. It starts with Kline's statement that everything is OK then gives a list of results. It should do a better job of summarizing the results (or point to Table 5.4 that has the same detail in more digestible format). This section would be improved if stated that most of the bioassays passed and then listed the ones that did not and the influence on recolonization (which is the point of this section on stressor/contaminant characteristics).
MP-87	C-13	Figure 2.2	The conceptual model should include discharging ground water as a mechanism for transporting the interstitial water of the tailings upward into the biotic zone. Certainly this mechanism should be discussed in the SEIS if there are any assumptions made about process water staying with tailings as they are deposited or interstitial water not being bioavailable. The influence of discharging GW should be discussed in sections 4.3.1.3. & 4.3.2.3, Post-Closure Water.
MP-88	C-20	Table 2.2	Table 2.2 should mention the toxicity test results in the measurement endpoint column and also in the interpretation column (right now they appear subsumed under "Evaluation of recolonization/habitability of tailings". Similarly, there is no indication of toxicity in Table 5.1.
MP-89	C-28		Correct spelling of the marine polychaete is: Nereis virens (v. Neries). Same comment for page C-55.
MP-90	C-48 to 50	5.1	Edit the discussion on chemical stressors to indicate that some bioassay lab results are more equivocal than currently indicated in the text. Rhepox and Neanthes more supportive than the Ampelisca (EVS) and Hyalella. The bioassays are important integrators of the various tailings constituents, including the process water. This is valuable information that complements the comparison to literature values on a metal by metal basis.
MP-91	C-55 thru 58		EPA agrees that the results for Initial and Retest #2 for Ampelisca should be dropped due to poor performance in the control and reference. However, in this narrative the discussion of Ampelisca (lab marine invert) results should indicate that Retest #1 for Ampelisca also showed "mixed results" relative to reference/control, therefore the statement "...both laboratory and field tests indicated that the tailings were as habitable as the native Lynn Canal and Auke Bay sediments" is not true. Retest #1 should be retained as the performance of the Lynn Canal and control sediments were close to or above 80%. Tailings survival was 39% in that test.

MP-92	C-58	5.2.2	Second paragraph, first sentence should read: "The results of the freshwater *and Ampelisca marine amphipod bioassay* indicate that there are possible limitations to the ultimate habitability...". The uncertainty issues related to the ultimate habitability and length of time to reach habitability should be mentioned here and clearly discussed in the uncertainty section as well. "Possible physical limitations *could eventually* be overcome with *enough* allochthonous inputs...". The Benson Lake references should be changed as discussed in the preceding general comments and actual likely inputs specific to the Lower Slate Lake scenario discussed here.
MP-93		Table 5.5	Physical Effects. For goal #1 of reestablishing Dolly Varden char, the results summary statements are not supported by the text and situation in the lake itself immediately after closure. "Forage availability should not be limiting" is not proven in the discussion, and certainly a time frame is required here. Are we implying that the tray tests in an active marine environment provides insight on the recovery time for a lake completely covered by tailings (except for the margins)? "Productivity in LSL should be similar to existing conditions soon after closure and will improve over time". This statement also is not supported by the narrative. What about time frame? What about inputs of material?
MP-94	C-59	5.2.3	3rd line, remove "likely". 5th line change undisturbed to "recently inundated".
MP-95	C-59	5.2.3	2nd paragraph. Change "While the area associated..." to "While the inundated acreage associated with natural sediment for benthic invertebrates would be the same for the TSF and the existing LSL..." Change the discussion on p. 59 same paragraph to be specific to inputs expected in LSL not Benson Lake (MEND).
MP-96	C-61		Provide the benthic information specific to Benson Lake comparing the control and Benson Lake data. Were the communities the same in terms of diversity and species before and after the tailings were placed and compared to the control? Are Chironomids and Amphipods present?

References

MEND (Mine Environment Neutral Drainage), 1991, *A Preliminary Biological and Geological Assessment of Subaqueous Tailings Disposal in Benson Lake, British Columbia*, March 1991

MEND (Mine Environment Neutral Drainage), 1990, *A Preliminary Assessment of Subaqueous Tailings Disposal in Benson Lake, British Columbia*, March 1990

Responses to Comments

Affiliation	*Comment ID*	*Response*
USEPA Region 10	MP-01	The results of the TSS modeling of the TSF discharge have been incorporated into the Final SEIS in Section 4.6.5.
USEPA Region 10	MP-02	Comment noted. The rationale for the Forest Supervisor's selected alternative is presented in the ROD at the front of the Final SEIS.
USEPA Region 10	MP-03	Comment noted.
USEPA Region 10	MP-04	Comment noted. See the responses to the specific comments raised by the commenter on these general concerns.
USEPA Region 10	MP-05	Comment noted.
USEPA Region 10	MP-06	Comment noted.
USEPA Region 10	MP-07	The Forest Service agrees with the commenter that the Knight Piesold analysis of required settling pond size does not take into account the small particle size fraction of the Kensington tailings. The Forest Service has undertaken modeling to determine compliance with the TSS limits and found that compliance cannot be assured at this time without treatment. Additional treatment for solids removal using reverse osmosis has now been incorporated into Alternative D in Sections 4.2.5 and 4.6.7.
USEPA Region 10	MP-08	Based on modeling of TSS settling during operations, the Final SEIS indicates that settling alone might not be sufficient to meet the TSS limits and additional treatment (reverse osmosis) has been incorporated into Alternative D (Sections 4.2.5 and 4.6.7) to ensure permit compliance. Modeling further shows that the tailings will not resuspend at closure.
USEPA Region 10	MP-09	As part of Alternative D, a reverse osmosis treatment system designed to treat up to 1,200 gallons per minute (gpm) has been incorporated (see Sections 4.2.5 and 4.6.7). Because flows from Mid-Lake East Fork Slate Creek would be diverted around the TSF, Coeur Alaska would not need to treat the maximum flows within the creek.
USEPA Region 10	MP-10	Comment noted.
USEPA Region 10	MP-11	The figures have been revised to improve clarity. The locations of the tailings pipeline and decant structure, however, will vary throughout the mining process. That is, the tailings pipeline will be moved periodically to provide for equal distribution throughout the TSF. The decant structure will also concurrently move to draw water from a clear portion of the lake away from the tailings pipeline.
USEPA Region 10	MP-12	Alternative D includes the pipeline diversion to be installed in conjunction with the treatment system (see Section 4.6.7).
USEPA Region 10	MP-13	The specific timing required to raise the lake will be dependent on precipitation conditions at the time of closure. Note that Coeur Alaska will be required to meet instream flows downstream of the TSF during these periods.
USEPA Region 10	MP-14	At the commenter's request, a table has been added (Table 4-11) to the Final SEIS comparing the average annual mass loadings from the DTF and TSF. It is important to recognize, however, that such differences have not been used to assess differences in impacts. The primary indicator for comparison of water quality effects from each alternative is projected compliance with applicable water quality criteria for protection of human health and aquatic life. Such compliance is required under the Clean Water Act.
USEPA Region 10	MP-15	See the response to comment MP-14.

Affiliation	***Comment ID***	***Response***
USEPA Region 10	MP-16	Table 5.3 in Appendix C clearly divides the spatial area covered by tailings and by natural sediment. Additional footnotes and changes in the text have been made in Appendix C to reflect the uncertainty in the habitability of the tailings. The text has also been changed to correct the sedimentation rate for Benson Lake. As discussed in the response to JH3-9, the case studies are discussed as part of the "weight-of-evidence" approach used in the risk assessment. Successful reclamation of Lower Slate Lake is not dependent on sediment covering the tailings because the Plan of Operations creates sufficient spatial area of natural sediments in the closed facility.
USEPA Region 10	MP-17	See the response to comment MP-16.
USEPA Region 10	MP-18	Modeling of the deposition of tailings in the lake would be a time-consuming and difficult exercise, given the variability in flows, the lack of information about natural particle sizes, and the final configuration of the TSF bottom. The Final SEIS notes that such settling will occur over time, but, at closure, the lake level would be raised to an elevation at which the TSF would inundate the same acreage of natural sediment that would initially support the reestablishment of aquatic life (see Sections 2.3.19 and 4.9.3).
USEPA Region 10	MP-19	See the responses to comment MP-16 with respect to the comparability of the case studies to Lower Slate Lake. In terms of sufficient food for aquatic organisms, at closure, the input of sediment and organic material in Lower Slate Lake will not be different from what currently exists. The lake is currently recognized as oligotrophic, and this is not expected to change when the facility is closed.
USEPA Region 10	MP-20	Text edited per comment.
USEPA Region 10	MP-21	The Final SEIS reflects the fact that the dam would be approved by the State Engineer and be required to meet safety standards consistent with 11 AAC 93.150 - 11 AAC 93.201 (see Section 4.4). The dam would need to be designed to withstand the same seismic event as would be required if people were living downstream.
USEPA Region 10	MP-22	The Forest Service will require financial assurance for the long-term stability and performance of either tailings disposal facility (DTF or TSF) under consideration. The need for long-term financial assurance is disclosed as part of the mitigation measures (see Section 2.1.9 and Geotechnical Stability in Table 2-6).
USEPA Region 10	MP-23	Comment noted.
USEPA Region 10	MP-24	Coeur Alaska has submitted a detailed reclamation plan attached as Appendix D. The measures identified in the reclamation plan have been considered in the analysis presented in Chapter 4.
USEPA Region 10	MP-25	An introduction has been added to Section 3.0, Affected Environment to provide an overview on the ecology of the area. The productivity and sensitivity of the area are discussed under the respective resource discussions as information is available. The value of the area would vary depending on the resource in question—the value of timber or commercial fisheries could be calculated, but determining the recreational or "wilderness" value could be completely subjective.
USEPA Region 10	MP-26	Comment noted. Portions of this discussion have been incorporated into the introduction to the Affected Environment (Section 3.0) (see the response to comment MP-25).
USEPA Region 10	MP-27	Comment noted. The USACE has included a requirement to avoid damage to the kelp bed as part of the public notice for the Section 404 permit application for the Cascade Point facility. Additional discussions of herring and potential impacts to the Lynn Canal stock have been included in Sections 3.10 and 4.10.

Affiliation	***Comment ID***	***Response***
USEPA Region 10	MP-28	Cumulative effects are discussed in Section 4.21 and include the Juneau access improvements and the Echo Cove Master Plan. The SEIS discusses an expansion (extension) of mining operations but does not discuss the Jualin property in particular because there is no exploration activity being conducted at the site, nor are there any proposals to initiate such activities. There is no description of the extent of reserves that might or might not be associated with the Jualin property; therefore, its inclusion in the cumulative effects discussions would be speculative. The Cascade Point Access Road EIS describes that the alignment of the Cascade Point access road and the Juneau access road would occur within the same right of way to minimize impacts. Should the Juneau access road be build after construction of the Cascade Point road, additional work would need to be done to the Cascade Point access section to address the differences in volume and speed requirements. The cumulative effects discussion in the Final SEIS has been revised to note that in the unlikely event that the Juneau access road were completed during the life of mining operations, the mine site would become accessible by road, eliminating the need for the crew shuttle boats and thus reducing the traffic using the Slate Creek Cove and Cascade Point marine terminals.
USEPA Region 10	MP-29	Comment noted. The life of the project under each alternative has been added to Section 2.3.1.
USEPA Region 10	MP-30	The DTF would be up to 210 feet tall per the 1997 SEIS. The height of the DTF is assumed to be the same under Alternative A1 because only one cell would be constructed rather than three. The design of the facility was assumed to be the same under Alternatives A and A1; therefore the height would be the same. Since the smaller footprint would come from not building the other two cells, decreasing the height could come only at the cost of increasing the disturbance footprint. The bullet has been revised to note that under both alternatives, the facility would be clearly visible from Lynn Canal during operations and less so following reclamation although approximately two-thirds smaller under Alternative A1.
USEPA Region 10	MP-31	The word "affect" has been inserted between "would" and "268" in the "Summary:Environmental consequences" section.
USEPA Region 10	MP-32	See the response to comment MP-01.
USEPA Region 10	MP-33	The text has been clarified to indicate the benefits of Alternative A1 would be shorter-lived compared with the benefits of Alternative A in the "Summary of Potential Impacts " table.
USEPA Region 10	MP-34	Alternatives A and A1 reflect that employee transportation would be by helicopter (see Section 2.2.1).
USEPA Region 10	MP-35	Text edited per comment in Section 1.2.
USEPA Region 10	MP-36	The text has been clarified to indicate that the NEPA process for the Kensington Gold Project dates back to 1990.
USEPA Region 10	MP-37	Yes. Text edited per comment in Section 1.7.1.
USEPA Region 10	MP-38	The Amended Plan of Operations was submitted in 2001 and all references to it have been revised to indicate the 2001 Amended Plan of Operations.
USEPA Region 10	MP-39	The acreages of the marine terminals for Cascade Point and Echo Cove are presented in Section 2.3.18.
USEPA Region 10	MP-40	No, the figures for Alternatives B and C refer only to the disturbance at Slate Creek Cove. A footnote has been added to Table 2-2 to explain this.
USEPA Region 10	MP-41	Comment noted.
USEPA Region 10	MP-42	Figures 2-6 and 2-9 have been modified to reflect the commenter's suggestions as well as the treatment system.
USEPA Region 10	MP-43	The duration of operations has been added to Section 2.3.1.

Affiliation	***Comment ID***	***Response***
USEPA Region 10	MP-44	No. Coeur Alaska is no longer actively seeking the exemption.
USEPA Region 10	MP-45	Alternative A1 has been added to the text in Section 2.3.2.
USEPA Region 10	MP-46	The Final SEIS indicates that flocculants/polymer would target materials smaller than 8 um, which constitute a significant percentage of the Kensington tailings. Available data suggest that flocculants can be used to enhance/induce settling, but the specific polymer to be used, the application process and rate, and the resulting “flocculated” particle size would have to be determined based on site-specific testing. The reverse osmosis treatment system has been included in Alternative D to ensure compliance with the TSS limits.
USEPA Region 10	MP-47	The perforated pipeline would be maintained above the surface of the deposited tailings. The anticipated rate of tailings flow from the pipeline is 2,000 tons per day or 83 tons per hour.
USEPA Region 10	MP-48	The lines within Figure 2-14 have been clarified.
USEPA Region 10	MP-49	The text has been modified in Section 2.3.8 to refer to Figure 2.9.
USEPA Region 10	MP-50	The Facility Response Plan has been added, as suggested by the commenter, to Table 2-6, under Aquatic Resources: Marine.
USEPA Region 10	MP-51	References to figures have been deleted from the discussions of the borrow areas in Section 2.3.16.
USEPA Region 10	MP-52	Additional text has been included in the Final SEIS to indicate that fill for the marine terminals would come from adjacent dredging activity (Cascade Point) or clean shot rock from quarries or borrow areas (Cascade Point and Slate Creek Cove) in Section 4.10.3.
USEPA Region 10	MP-53	It is correct that at closure there will be a slightly larger littoral area that might support more rooted plants. It is premature at this stage to determine whether organic material would need to be added to encourage vegetation or what methods would be used to revegetate. Finally, two species of fish occur in Lower Slate Lake, Dolly Varden char and three-spine sticklebacks. The text has been changed in Section 3.9.2 to clarify the occurrence of both species.
USEPA Region 10	MP-54	See the response to comment MP-01.
USEPA Region 10	MP-55	See the response to comment MP-01.
USEPA Region 10	MP-56	See the response to comment MP-01.
USEPA Region 10	MP-57	Production export and carbon/detrital export were used interchangeably in the text in Sections 3.12.3 and 4.12.3. The terminology has been clarified to refer only to carbon/detrital export for consistency with the USACE's methodology.
USEPA Region 10	MP-58	The headers in Section 3.0 have been edited for consistency.
USEPA Region 10	MP-59	Although the population of three-spine sticklebacks, a forage fish, has not been formally characterized, sticklebacks were caught at a much lower frequency than Dolly Varden char in the minnow traps used. However, this method is not effective at assessing observed large schools of stickleback minnows. Additional text has been added in Section 3.9.2 in the Final SEIS to provide this information.
USEPA Region 10	MP-60	The SEIS refers back to the 1992 FEIS because the SEIS is a supplemental EIS, building on the information presented previously. There is no evidence to suggest that the information presented in the 1992 FEIS is outdated or that the form or function of the ecosystem within Lynn Canal has changed since that time. The discussions of herring, eulachon, and marine mammals have been updated because these have been the key species of concern identified by the cooperating agencies and NMFS. NEPA requires that EISs be analytic rather than encyclopedic. Because the communities have been previously described, the Forest Service stands by the information referenced in the 1992 FEIS for Lynn Canal.

Affiliation	Comment ID	Response
USEPA Region 10	MP-61	The variety class rating system is discussed in Section 3.14.1. Variety class is part of the process used to inventory the visual quality of the resource. Once the resource is inventoried, Visual Quality Objectives (VQOs) are established to provide management direction. The VQOs are based, in part, on the existing quality of the landscape. VQOs do not apply to Cascade Point because it is private land. As explained in Section 4.14.3, the Retention VQO is applicable to the Slate Creek Cove terminal although the Forest Plan allows for exemptions for transportation and mining developments on a case-by-case basis. The process area and pipeline access road would need to conform with the Maximum Modification VQO.
USEPA Region 10	MP-62	Additional discussion has been added, as appropriate, to the relevant resource areas, including air, hydrogeology, surface water quality, hydrology, wetlands, vegetation, wildlife, and aquatic resources. Note that the diversions add slightly greater disturbance in terms of acreage compared to Alternative B and the relative differences in terms of impacts on wildlife and aquatic life are small. The summaries of impacts at the end of each resource section in Section 4 allow direct comparison of the relative impacts of each alternative.
USEPA Region 10	MP-63	Text edited in Section 4.6.1 per comment.
USEPA Region 10	MP-64	The TDS limits have been added to Table 4-9.
USEPA Region 10	MP-65	Text edited in Section 4.6.2 per comment.
USEPA Region 10	MP-66	Text edited in Section 4.6.3 per comment.
USEPA Region 10	MP-67	The TSS limits have been added to Table 4-9.
USEPA Region 10	MP-68	The sentence in Section 4.6.5 has been revised.
USEPA Region 10	MP-69	The paragraph in Section 4.6.5 has been revised to reflect the results of the effluent TSS modeling.
USEPA Region 10	MP-70	Sections 4.6.5 and 4.6.6 have been renumbered correctly. A table has been added to Section 4.6.6 describing the TSF water quality for Alternative C.
USEPA Region 10	MP-71	This Final SEIS indicates in Section 4.9.1 that pink, coho, and chum salmon, none of which have ESA or species of concern designations, are found in Sherman Creek. The degree of effects on individual fish and the fishery in general is difficult to quantify, although impacts would be minimized by using bridges instead of culverts. In addition, it is required that these stream crossings be constructed during non-spawning periods and BMPs will be used during construction to avoid impacts on the aquatic environment.
USEPA Region 10	MP-72	The expression of probabilities has been standardized across all alternatives in the Final SEIS.
USEPA Region 10	MP-73	Under Alternatives B and D, a portion of Mid-Lake East Fork Slate Creek would not be inundated and could be used for background sampling. Under Alternative C, the diversion dam would be constructed at the downstream end of Upper Slate Lake and background sampling would have to occur within or above the lake.
USEPA Region 10	MP-74	Comment noted.
USEPA Region 10	MP-75	Comment noted.
USEPA Region 10	MP-76	The text has been modified in Section 4.12.1: Extension of Mining Operations, to reflect that if mining operations were extended, Alternative A1 would become Alternative A.
USEPA Region 10	MP-77	The References section (Section 6.0) has undergone significant review and refinement in the Final SEIS.
USEPA Region 10	MP-78	The suggested acronyms have been added to the acronym list.
USEPA Region 10	MP-79	Correction made, Knight Piesold, to Appendix A.

Affiliation	Comment ID	Response
USEPA Region 10	MP-80	The commenter's assumption is correct. The text has been clarified in Appendix A.
USEPA Region 10	MP-81	Text edited per comment in Appendix A.
USEPA Region 10	MP-82	Italics removed in Appendix A.
USEPA Region 10	MP-83	The text has been revised in Appendix A to reflect the draft NPDES permit limits for TDS and sulfate.
USEPA Region 10	MP-84	Comment noted. Figures 1.2 and 1.3 in Appendix C have been modified to clarify the points raised. There is no specific need to include photos since they are not important to the analysis. The text adequately describes the lake and surrounding vicinity.
USEPA Region 10	MP-85	Correction made in Appendix C.
USEPA Region 10	MP-86	The suggested clarifications have been incorporated into Appendix C.
USEPA Region 10	MP-87	Based on the Rescan leach testing/flux analyses, any ground water upflows through the emplaced tailings would not be a source of constituent loadings to Lower Slate Lake.
USEPA Region 10	MP-88	Tables 2.2 and 5.1 in Appendix C have been changed to include the habitability testing.
USEPA Region 10	MP-89	Text edited in Appendix C per comment.
USEPA Region 10	MP-90	Additional explanatory text has been added to Appendix C, Sectin 5.1.
USEPA Region 10	MP-91	Additional text has been added in Appendix C to address this point.
USEPA Region 10	MP-92	Comment noted. The text has been changed in Appendix C, Section 5, to reflect this point.
USEPA Region 10	MP-93	As discussed in earlier comments, because of the presence of native flooded sediment and available sources for plant and invertebrate recolonization, productivity in Lower Slate Lake is expected to return soon after closure. Productivity on the tailings might require a much longer time frame and could be dependent on inputs of sediment and organic material.
USEPA Region 10	MP-94	Text edited in Appendix C, Section 5.2.3, per comment.
USEPA Region 10	MP-95	Text edited in Appendix C, Section 5.2.3, per comment.
USEPA Region 10	MP-96	As noted in the responses to comments MP-16, JH3-09, and JH3-15 through JH3-19, the conclusions of the Ecological Risk Assessment are not dependent on the presented case studies. However, additional information has been added to the text in Appendix C to reflect information on the benthic communities in Benson Lake.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1689 C Street, Room 119
Anchorage, Alaska 99501-5126

TAKE PRIDE IN AMERICA

ER04/199 April 7, 2004

Mr. Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
Juneau, Alaska 99801

Dear Mr. Hohensee:

General

The Department of the Interior (DOI) has reviewed the U.S. Forest Service's (USFS) January 2004 Draft Supplemental Environmental Impact Statement (Draft SEIS) for the Kensington Gold Project. We believe that the following comments need to be addressed in the Final SEIS. PB-1

Our recommendations are made pursuant to the Fish and Wildlife Coordination Act and the National Environmental Policy Act and address ways to minimize potential impacts to Berners Bay habitats; avoid old growth reserves; conduct annual Queen Charlotte goshawk surveys; and provide more detailed information on aquatic reclamation plans and the cumulative impacts of this and nearby reasonably foreseeable actions. As a member of the Federal Subsistence Board, the Fish and Wildlife Service (FWS) maintains an interest in conserving subsistence resources on Federal conservation units in Alaska, including the Tongass National Forest.

Minimizing Impact on Berners Bay Habitats

We believe construction of the Cascade Point Marine Terminal and mine-related transportation has the potential to adversely affect herring spawning habitat at Cascade Point. Cascade Point provides important habitat for the distinct, but remnant population of Lynn Canal Pacific herring. This area also provides habitat for shrimp, crab, juvenile chum, pink, and coho salmon, many species of sculpin, flatfish, and migratory birds that utilize this area for foraging. To eliminate potential adverse effects to herring spawning habitat at Cascade Point, we recommend that the Final SEIS examine locating the ferry terminal at Echo Cove, as in Draft SEIS Alternative C, or at Auke Bay, to reduce the need for marine fill and new road construction along Berners Bay. PB-2 Aquatic Marine Resources

Old Growth Habitat

We concur with the Tongass Interagency Team (comprised of USFS, FWS, and Alaska Department of Natural Resources biologists) recommendations that modification of three small old growth reserves in the project area be adopted as part of the decision document for this project. We believe this action will improve compliance of these reserves with the Tongass Land and Resources Management Plan (TLMP), which will in turn, help minimize potential impacts to old-growth dependent species such as goshawks and marbled murrelets, and subsistence species PB-3 Wildlife such as deer. It is our understanding that these recommendations would have little or no effect on design of the proposed project.

Queen Charlotte Goshawk

As stated in the Draft SEIS, the Queen Charlotte goshawk is a species of concern and a USFS sensitive species (Draft SEIS page 3-55). A survey for goshawks in the project area, conducted in 2000 by ABR Inc., identified an active nest which was located in the vicinity of the Jualin Mine.

The 1997 TLMP requires that goshawk surveys be conducted in project areas using current protocols. Individual goshawk pairs use different nest sites from year to year. Because protection of known goshawk nesting areas is an important strategy for maintaining this species, we recommend that goshawk nesting surveys be repeated annually in the project area prior to project implementation and during construction, so that construction schedules can be adjusted, if necessary, to avoid potential impacts. In addition, we recommend that surveys continue for a minimum of 3 years during operation of the Kensington Gold Project to verify that the goshawk territory remains active. We request that copies of completed goshawk survey reports be sent to the FWS Juneau Field Office Supervisor. We further recommend that these goshawk survey elements be included in the Final SEIS. PB-4 Wildlife/bird

Waterbirds

We recommend adding a figure in section 3.11.3 (Draft SEIS page 3-57) of the Final SEIS illustrating bird concentration areas during the heaviest bird use periods of spring and winter. PB-5 Wildlife/Bi

Aquatic Habitat Issues

Under Alternative B, aquatic habitat in Lower Slate Lake would be adversely affected or lost for the life of the mining operation, resulting in the elimination of an estimated 1,000 Dolly Varden char and the loss of 20 acres of habitat (Draft SEIS Table 2-8, page 2-56 and Table 2-9, page 2-60). Table 2-6 on page 2-45 provides a limited amount of information on post-project reclamation of Lower Slate Lake. We recommend that the Final SEIS provide a more complete description of the reclamation plan, including data to confirm tailings toxicity levels, suitability of tailings for colonization by invertebrates, and habitat requirements of resident fish. The feasibility of re-establishing Lower Slate Lake to pre-project productivity is important for the assessment and comparison of potential project impacts. PB-6 Aquatic

Resident and migratory fish species, associated macroinvertebrates, and their habitats are found in the Sherman Creek, Sweeny Creek, Johnson Creek, and Slate Creek drainages (Draft SEIS 3.9.2 Freshwater Biota, page 3-28 - 3-30). Sherman Creek, Slate Creek, and Johnson Creek also include Essential Fish Habitat for salmon below the fish barriers (Draft SEIS page 3-34). The Draft SEIS does not describe instream flows necessary to sustain the existing fisheries in these drainages. We recommend these stream flows be identified and discussed in the Final SEIS. PB-7

The marine invertebrate community is an important food source for resident, wintering, and staging seaducks such as scoters, goldeneyes, and harlequin ducks. Impacts on marine algae and PB-8 invertebrates are expected to be minimal, as recolonization is expected (Draft SEIS page 4.41, section 4.10.3). However, many marine invertebrate species are found at specific depths, and may not be able to colonize deeper areas. Therefore, marine invertebrate and plant communities will most likely be effected in dredged areas. We recommend the effects of dredging and marine fill on the marine invertebrate community be more thoroughly discussed in the Final SEIS.

Cumulative Effects

We are concerned with potential cumulative effects on fish and wildlife trust resources in Berners Bay. Section 4.21, Cumulative Effects (Draft SEIS page 4-116) briefly describes several reasonably foreseeable future developments in the vicinity of the project area. Appropriate information from project-related reports should be included in the cumulative impacts analysis in the Final SEIS. For example, technical reports on wetlands, anadromous and resident fish, and wildlife related to the Juneau Access Road are in various stages of development by URS, Inc. These reports summarize field studies and offer important information on fish and wildlife resources and potential impacts to the Berners Bay area. PB-9

Reagent and Fuel Spill Prevention and Response

Berners Bay and its freshwater tributaries support valuable anadromous, resident, and marine fisheries, numerous species of waterfowl, seaducks, shorebirds, and marine mammals that could be adversely impacted by an oil discharge and/or hazardous substance release. We believe a comprehensive Spill Prevention Control and Countermeasures Plan (Draft SEIS page 2-30, section 2.3.14) should be developed for all chemicals and reagents shipped and handled by the project to help eliminate or minimize potential adverse effects to these resources from oil discharges and/or hazardous substance releases. In addition, we recommend inclusion in the Final SEIS of a method or technology (e.g., a valve system at specific intervals) that would isolate sections of the 3.5-mile tailings slurry pipeline to help minimize potential adverse effects from a pipeline leak or break (Draft SEIS page 2-20, section 2.3.5). PB-10

We believe the Final SEIS should include a discussion of potential effects from oil discharges on birds, marine mammals, and coastal mammals (e.g., river otters) (Draft SEIS page 4-57, section 4.11.1). In addition, we recommend expanding the discussion in the Final SEIS of the potential effects of a diesel spill on aquatic resources and marine organisms, especially in low flushing areas such as at Cascade Point or Echo Cove (Draft SEIS page 4-42). PB-11

Biota Contaminant Issues

The Draft SEIS states that 8.1 percent of the ore samples taken had the potential to produce acid (Draft SEIS page 3-6, section 3.3.2). We recommend that the first sentence of the fourth paragraph be changed in the Final SEIS to read: "Low acidification potential of over 90 percent of the ore tested is also supported by..." PB-12

The Draft SEIS states that comparisons are difficult to make between the data collected by Kline Environmental Research, Earthworks Technology, Aquatic Science, and Tetra Tech on fish tissue, macroinvertebrates, and sediment (Draft SEIS page 3-32, section 3.9.3). We suggest that a comparison of levels of detection (LOD) for each trace element from the various data sets be PB-13 used in the Final SEIS to address compatibility of data sets across years. Even with changes of analysis methods, if LODs are similar, data may be comparable across years.

We believe the microinvertebrate discussion (see Draft SEIS page 3-33, section 3.9.3) in the Final SEIS should address other factors that could contribute to variation in metal concentrations among sites. There is a differential exposure of invertebrates to metals, particularly based on feeding strategies, predators' diets, and invertebrate body size. Data in Table 3-19 do not explain variability; weight of invertebrates is not a standard metric for invertebrate community analysis. In addition, without discussion of mesh size used in sampling, the reviewer cannot determine if other small invertebrates, such as chironomids, were included in sampling efforts. PB-14

Future Coordination

We appreciate the opportunity to comment on this document. We look forward to continuing our dialogue with you on this project and request that you include the FWS Juneau Field Office in any upcoming meetings and field work related to these comments. If you have any questions, please contact Bruce Halstead, FWS Juneau Field Office Field Supervisor at 907-586-7240.

Sincerely,

Pamela Bergmann

Pamela Bergmann
Regional Environmental Officer - Alaska

Responses to Comments

Affiliation	Comment ID	Response
USFWS	PB-01	Comment noted.
USFWS	PB-02	Alternative C (marine terminal in Echo Cove) has been carried through the Final SEIS. The Final SEIS does not include a ferry from Auke Bay as an alternative transportation component. The terminal in Echo Cove would eliminate the placement of fill and avoid impacts on herring spawning habitat. The Cascade Point Access Road has been approved by the Forest Service and permitted by the U.S. Army Corps of Engineers (USACE); its impacts are discussed in terms of cumulative impacts, but it is not included as part of any of the alternatives. The alternative location for the crew shuttle dock at Echo Cove was included in the analysis based on comments from NMFS voiced during IDT meetings. Auke Bay was not included in the analysis at the time because most of the concerns focused around herring spawning at Cascade Point, which the Echo Cove location would address. One of the significant issues identified during scoping was that mine-related transportation would cause impacts to resources in Berners Bay. A crew shuttle that originated in Auke Bay would not address the concerns about potential impacts to resources in Berners Bay because the shuttle would still need to traverse the bay to reach Slate Creek Cove.
USFWS	PB-03	Modification of the old growth reserves within the project area is discussed in Appendix F and has been adopted as part of the decision on this project.
USFWS	PB-04	A survey conducted in June 2004 failed to locate goshawks within the project area. The nest identified during the 2000 survey could not be located during the survey. Annual goshawk surveys to be conducted through the third year of operation have been included in the Final SEIS as a monitoring requirement in Table 2-7.
USFWS	PB-05	Section 3.11.3 has been modified to provide a summary table and additional discussion on the distribution of birds within Berners Bay. A figure based on the report provided by the USFWS (USFWS, 2003) is not completely representative of the situation in Berners Bay. The report acknowledges that data from the shallows at the head of Berners Bay was not collected because of limitations in the survey methods. Since that area supports a large number of birds, particularly in the spring, the report does not provide a "complete picture" of the distribution of birds within Berners Bay. We feel that the description of the distribution of birds in Section 3.11.3 is adequate.
USFWS	PB-06	The Final SEIS includes Coeur Alaska's preliminary reclamation plan as Appendix D. Reclamation of the TSF, should it be selected, would be refined over time based on additional testing of the tailings themselves as well as studies on habitability and establishment of benthic organisms. As a condition of the plan of operations, Coeur Alaska would be obligated to work with the Forest Service and ADNR to develop a final plan that results in meeting the criteria established in the SEIS in terms of reestablishing a viable population of fish and benthic organisms within the reclaimed lake.
USFWS	PB-07	The establishment of minimum instream flows is the responsibility of the ADNR. The proposed minimal instream flows have been included in the Final SEIS in Tables 4-6 and 4-7, and in the text in Section 4.5.
USFWS	PB-08	The extent of disturbance of the dredged area at Cascade Point (1.6 acres) is insignificant considering the extent of habitat available within Berners Bay and Lynn Canal. Additional discussion of this topic has not been included in the Final SEIS.
USFWS	PB-09	Information from the wildlife, anadromous fish streams, essential fish habitat, wetlands and water quality technical reports developed for the Supplemental Draft Juneau Access Improvements EIS has been incorporated into Sections 3 and 4. We have noted within the text where we disagree with the findings in the draft reports and explain the discrepancies.

Affiliation	Comment ID	Response
USFWS	PB-10	Coeur Alaska has submitted a preliminary Spill Prevention, Control, and Countermeasures plan (included in Appendix E) that will be finalized after a selected alternative is identified in the Record of Decision (ROD). The Final SEIS presents best management practices for operation of the marine terminals in Section 2.3.18. The applicable measures have been included in the SPCC plan. The tailings pipeline would include pressure sensors and check valves that would limit the amount of tailings lost in the case of a pipeline rupture. Generally, the location of the pipeline would make it unlikely that any spill would reach any of the waterbodies in the project area (with the potential exception of Spectacle Lake).
USFWS	PB-11	The SEIS includes a discussion in Sections 4.11.1 and 4.11.2 of small leaks and spills that could reasonably be expected with operation of such a facility. A large-scale spill would be inconsistent with normal operations and would not be considered reasonably foreseeable; it is therefore not included.
USFWS	PB-12	The text in Section 3.3.2 has been revised per the commenter's request.
USFWS	PB-13	Unfortunately, we cannot provide the requested comparison of LODs among the various data sets because LODs are not available for the data sets in question. Laboratories routinely do not report levels of detection when the constituent being analyzed is “detected,” as are most of the metals data reported in this section of the SEIS. The statement referred to in this comment was intended to convey the concept that, because many factors could have contributed to the variability of metals concentrations measured at specific locations and between locations, interpretations regarding the data need to be made with considerable caution. Section 3.9.3 summarizes the metal data for fish and invertebrates while noting uncertainties that could account for some of the observed variability.
USFWS	PB-14	We agree that the presentation of information on metals concentrations in macroinvertebrates in Section 3.9.3 lacks information that would make it easier to determine whether changes in concentrations shown in Table 3-18 are due to site-specific differences in exposure or uptake of metals or whether they are due to differences in the taxonomic composition of macroinvertebrates at different sites. Table 3-19 provides weight percentages of macroinvertebrates in different orders collected from the five locations. As noted by the commenter, invertebrates may have different exposure to metals based on their feeding strategies, and some authors (e.g., Smock, 1983b) have suggested that differences in food selection may contribute to differences in whole body metal concentrations among species – with concentrations being higher in species that ingest sediment and detritus than in predators. However, several authors have suggested that species-specific differences and the bioavailability of metals are the important factors needed to interpret differences in macroinvertebrate concentrations. This information is not available for the Aquatic Sciences (2001a) study.

Section 3
Environmental Groups
Comment Letters and Responses

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Cascadia Wildlands Project
Alaska Field Office

POB 853
Cordova, AK 99574

April 7, 2004

Steve Hohensee
Tongass Minerals Group
8465 Old Dairy Rd.
Juneau AK 99801

Dear Mr. Hohensee,

Please accept the following comments of Cascadia Wildlands Project, and myself as an individual, regarding the Kensington Mine DSEIS.

GS-1

The potential public benefit of this proposal is far outweighed by its costs. We urge adoption of the "No Action" alternative, and oppose operation of the mine.

GS-2

There is no need for this project. Of what use is gold? Enough damage has been caused already in reckless pursuit of this silly, yellow rock.

Berners Bay is a valuable area for recreation, especially for Juneau residents but also for many of the rest of us as well. The proposed action would destroy semi-remote and peaceful recreation opportunities.

GS-3

Given its history, we question Coeur d'Alene Mines Corp's good character, and ability to sincerely safeguard the ecosystems it operates in. I happen to know Coeur d'Alene lake, at their corporate headquarters in Idaho, very well. I spent most of my childhood summers there. That lake is a dead zone because of the mining. I caught a fish there, once (a stocked rainbow trout). It was only later I learned you weren't supposed to eat the fish, because they were poison. It makes me shudder to think the same company that helped kill Coeur d'Alene lake now demands permission to kill another lake in Alaska, and some people actually believe them when they say not to worry.

Repeatedly, in dealing with the consequences of their profit-making ventures, Coeur d'Alene Mines Corp. prefers to dodge responsibility through aggressive litigation and lobbying, rather than deal straight with the public in the first place. Even the U.S. EPA has been forced to file suit to force cleanup of their messes. Private parties and classes of people have been forced to file suit to reclaim damages. Investors have been forced to file suit against Coeur to enforce securities laws.

The Forest Service should not be doing business with these corporate criminals, period. And to the degree that you do, we DEMAND that you disclose and consider their record in the EIS. Giving public land away to them is bad enough—at least have the courage to admit they haven't earned any trust.

Coeur d'Alene Mines Corporation hasn't demonstrated the financial ability (let alone will) to take responsibility for the consequences of what they propose. Their most recent annual report to shareholders discloses years of heavy losses, and raises the prospect of bankruptcy. Their March 9, 2004 10-K filing shows continuing financial troubles, and a lack of long-term assurance that the company is stable. What basis is there for believing they will stick this project out? What protection would there be against a cut-and-run operation, which declares bankruptcy after the resource has been liquidated (into the executives' pockets), then leaves taxpayers to bear the burden of cleanup? GS-4

Personally I find it distressing the Forest Service is even talking to these people. But, given that you apparently intend to give them what they want, it is imperative that adequate bonds be posted against the reclamation and long-term monitoring that will be necessary. This bond should not be less that $100 million, and should be held in escrow, or some other secure location.

Even just the recent project history is a clear indication that Coeur probably won't do what they say they will. This is the third time the Forest Service has reviewed their proposal to develop this mine. The previous two times (1992, 1997) Forest Service approval was an utter waste of time and effort, due to the fact that Coeur didn't do what they said they were going to. What makes you think this time is any different? They have changed their plan several times already to "improve efficiency" (read: increase profit margin). Recent Coeur press releases show that their plans for this and other mines remain up in the air, and their estimates fluctuate wildly. A new feasibility study is apparently due to be completed later this year, which will drop their estimated cost to build the mine in half. On what basis are you taking this current proposal seriously? GS-5

Due to the virtual certainty of further changes to the operating plan to "improve efficiency," it is important now to establish guidelines for reviewing proposed changes. We suggest that, if approval is given, it is made contingent on 1) prompt execution of the plan (e.g. within three years), and 2) no substantial changes to the plan. GS-6

Please evaluate, as an alternative, taking away Coeur's permit to operate the mine. We advocate this alternative. This action is justified by: GS-7

- Coeur's abysmal corporate record
- Failure to perform on previously approved operating plans
- Unacceptable impacts to fish, wildlife, water quality and recreation.

Even if the alternative is not selected, it would provide the necessary baseline against which to evaluate action alternatives. Comparing one mining plan to another doesn't tell you the impact of the mine. Comparing many mining plans to no mine does.

The 31.5-acre and 4.8-acre permanent waste rock dumps will have unacceptable impacts. The SDEIS, rather than disclose the impact, jumps right in to claim the potential for GS-8 acidification and metal release is "low." (SEIS 4-10) An EIS is supposed to disclose what the impacts *will* be, not what they won't. So you've told us the chance of something bad is low. The chance of what? If that "low" chance comes to pass, what would the effect be?

§4.4 GEOTECHNICAL STABILITY

When you say "the operator has committed to stringent operational and monitoring protocols that would diminish the likelihood of a catastrophic failure of the DTF," what do you mean? "Committed" can mean anything from signed in blood, to someone mentioned once in an email. Usually it means something in between. How are commitments being made in this case, and how binding are they? GS-9

Burying the pipeline carries with it some environmental risk. Leaks could go undetected. Repair and maintenance would be more difficult, and require far more ground disturbance. Please disclose these impacts in the FSEIS. GS-10

By how much do these measure diminish the risk of catastrophic failure of the DTF? GS-11

The danger of an avalanche rupturing the tailings delivery pipeline is alarming. The SDEIS fails to disclose the impact of such a rupture. Please do so in the final. GS-12

The SDEIS also makes the vague disclosure that an avalanche "could endanger project components and result in environmental impacts." (SEIS @ 4-11) What project components? What environmental impacts? GS-13

We aren't reassured by the statement that the tailings embankment site "should be geotechnically stable." (SEIS @ 4-11) What does this mean? We induce from the statement of "need for foundation grouting to alleviate seepage," (SEIS @ 4-11) that seepage is going to occur. What would the impacts of that be? GS-14

While the State of Alaska is responsible for ensuring dam safety and maintenance, you are responsible for disclosing and considering potential impacts from the dam. The fact that the state has jurisdiction over something does not mean all environmental problems of that thing have been resolved. What is the risk of dam failure, and what are the impacts if it does? GS-15

Why haven't foundation conditions for the diversion embankment under Alternative C been investigated? GS-16

§4.5 SURFACE WATER HYDROLOGY

We are concerned that dewatering of the underground mines will affect flow in streams of the Sherman Creek watershed, especially given that "the interconnection of bedrock groundwater with surface water is not well known." (EIS @ 4-12) Why weren't studies done? What will happen if your assumption proves incorrect, and groundwater *is* a major source of recharge? GS-17

It is clear that Alternative A will screw up the Sherman Creek watershed. Sudden artificial discharge of 4.0 cfs, or higher, into Sherman Creek is significant. Moving Ophir Creek over to Ivanhoe is a drastic step. Removing whole segments creeks from the watershed for periods of time cannot help but severely intrude on natural evolution of area hydrology. GS-18

§ 4.5 SURFACE WATER QUALITY

It is ludicrous to claim "there would be no downstream water quality effects" from Lower Slate Lake. (SEIS @ S-6) GS-19

We are concerned with pollution caused by supposedly treated mine water into Sherman Creek, at a rate of 600 to 1,000 gallons a minute. That is an incredible volume of potentially polluted water, and yet the SDEIS says "Impacts to Sherman Creek are not expected as a result…" (EIS @ 4-16). The analysis and evidence presented do not back up this assertion. GS-20

The EIS should include a clear statement of the water quality of discharges. We appreciate table 4-9, but please also give us a straight statement. Would you drink untreated mine water? What happens if you do? Are these things poison? How poison? GS-21

What is the risk of mine water bypassing the treatment system and being discharged directly? GS-22

The presence of ammonia and nitrate above permit limits during blasting, duly noted in the SDEIS, proves that permits alone do not insure appropriately mitigated discharges. Yet the Forest Service is relying almost entirely on the NPDES permit to mitigate impacts. GS-23

What potential impacts do the soluble and insoluble metals in mine water have on aquatic life? GS-24

What is the significance of the fact that aluminum is allowed to be discharged untreated and unregulated? GS-25

The fact that the state promulgated site-specific water quality criteria to allow discharge into Sherman Creek only raises the Forest Service burden to analyze water quality impacts in this EIS. GS-26

We are concerned with impacts to the fish in Sherman Creek, and seaward. The conclusion that "no TDS-related adverse effects on anadromous fish are anticipated" is groundless. What about when equipment breaks down? What if the treated stuff washes down at some future date? What if the company walks away? What if some employee turns the wrong knob, and nobody notices for a few days? The SDEIS entirely fails to disclose potential impacts to fish, excepting one reference to the literature showing "TDS GS-27 levels of 250-500 mg/L *may* cause chronic effects on anadromous fish fertilization and emergence." GS-28

What are the potential impacts of suspended solid? Why are there limits on that in the NPDES permit? What solids get suspended, and what mischief can they cause? Please tell us the impacts, not reference some obscure permit. GS-29

What is polymer dosing streams all about? (SDEIS @ 4-19) Are there potential impacts associated with this? GS-30

The section on DTF Effluent Quality is very difficult to understand. This is a strictly scientific discussion of technical compliance with the NPDES permit, not a disclosure of the impacts.

That you for the section on Accidental Spills. However, there is no basis for saying impacts would be short-lived because material would be cleaned up or "simply pass through the system." (SDEIS @ 4-21) At Coeur d'Alene lake the water quality is still downright poison, 100 years after most of the mining poisons accidentally ended up there. We all "simply pass through the system," but that doesn't mean we don't leave lasting impacts. GS-31

Please include a discussion of potential long-term contamination from accidental petroleum and solvent spills, related to operating and maintaining tons of heavy machinery over a period of many years. Experience with construction and mining projects clearly shows that contamination builds up over time. GS-32

What are floation reagents and scale inhibitors, and what would the impact of a spill of them be? How are we so certain that "any spill would be cleaned up and would therefore be of limited duration and size?" (SDEIS @ 4-22) GS-33

§4.6.5

We are concerned that effluent from the TSF (currently known as Slate Creek) will impact critters downstream. GS-34

The conflict with 40 CFR Part 440 is strange. You're telling us doing this is illegal, but you found a tricky way to do it anyway? What is the significance of net precipitation into a tailings impoundment? GS-35

The EIS should not rely on the situation model to show potential impacts of the TSF. Showing that the TSF system *can* work without killing things downstream, is not the same as showing that it *will*. The equation might work out on a computer, but it is shaky in the real world. The output depends on the amount of rain, for example, and assumes a smooth, average year of rainfall. What if there's a dry summer, and heavy work on the mine? What about cold winter months, when water is frozen in place? If anything in this world in unpredictable, it is the weather. GS-36

We aren't confident that solids from tailings discharge will settle the way you hope they will. The EIS says, " settling tests show that compliance with the TSS limits could be achieved at the TSF discharge." (SDEIS @ 4-24) What does it mean that it *could* be achieved? Presumably then those limits also might not be met, yet those impacts are not disclosed. What do the TSS limits have to do with water quality impacts to living things? GS-37

None of the water quality sections provide analysis of cumulative effects. What are the impacts of past, present, and foreseeable discharges? Is water quality good now? How much worse than if no mining had ever happened? How would these impacts change if Coeur does more, or less, mining in the future? GS-38

It seems clear that this mine would dump a bunch of poison stuff into the water, and that stuff will eventually end up in the creeks and the bay. The SDEIS should give us a clear picture of what that stuff is, how much of it there will be, where it will end up, and what impact it will have. GS-39

§4.7 GROUNDWATER HYDROLOGY, and §4.8 GROUNDWATER QUALITY

Again, no clear statement of impacts is given. Please provide this in the final. Or is your conclusion really that there is "no adverse effect." None at all? This statement is clearly misleading. GS-40

Elevated levels of TDS, sulfate, nitrate and metals are cause for concern. The SDEIS simply notes the presence of these poisons then tells us not to worry. The mitigation measures are unexplained and unjustified. What does it mean that "testing shows very low potential for poor-quality leachate..." (ADEIS @ 4-28) What does it mean that "the water quality would be monitored to determine the need for seepage water quality-control measures after final reclamation." (ADEIS @ 4-28) What monitoring, who would do it, what measures might be taken, how effective would they be, and with what impact? How long are we going to have to monitor this stuff, and who is going to pay for it? The fact that long-term monitoring is needed, testing has been done, and water quality-control measures are anticipated suggests that there is a risk of something bad happening. Yet the SDEIS is entirely silent on what this risk is. GS-41

The SDEIS says quantities of fuel and chemicals being transported at the mine "would not be large (i.e., tens to several hundreds of gallons) and should not adversely effect groundwater..." Won't they be using standard 10,000-gallon fuel tanks? Spills of thousands of gallons are entirely foreseeable, though they are also preventable. GS-42

These sections entirely ignore the risk of slow, undetected leaks of chemicals, fuel, or contaminated mine discharges. They also entirely ignore the cumulative impact of many accidental discharges spread out over time. Many small spills are often much worse than one big one, because the big ones at least get noticed and cleanup is attempted. Please analyze and consider these impacts in the Final SEIS. GS-43

§ 4.9 AQUATIC RESOURCES: FRESHWATER

The amount of discharge into Sherman Creek seems very large—at least 4.0 cfs for the first year or two of this operation. What is the peak, maximum likely discharge? Could it be much higher, or much lower? GS-44

Analysis of cumulative impacts is entirely lacking. There have to be impacts from diverting and changing water flows, accidental spills, dumping tons of tailings, etc. over time. Every mistake in discharge over the whole life of the mine is going to end up in the water, yet no analysis is given to accumulation of toxins. No explanation is given of the cumulative impacts on the ecosystem from such severe disruption, even assuming it is temporary. Please analyze cumulative impacts to aquatic life in the final. GS-45

It is troubling that Dolly Varden downstream from previous sediment ponds have elevated metal levels in their tissue. This should be cause for caution. Optimistic projections based perfect execution of permits, mitigation and testing do not tell the whole story. We don't need specific studies in every instance to know that mines tend to poison fish. These kind of warning signs should be taken much more seriously. GS-46

How do you figure the probability of a tailings pipeline accident, and amount of maximum discharge? (SDEIS @ 4-31) What impact would the maximum discharge of 270,000 gallons of tailings slurry have on aquatic resources? GS-47

It is sad to think the Forest Service would willingly allow somebody to kill Lower Slate Lake outright. The impacts of doing this could be far-reaching, yet the SDEIS does a poor job of disclosing the impacts. Gross calculations of area capable of supporting living organisms don't reflect the reality of impacts to this living, dynamic ecosystem. Little explanation is given of upstream and downstream impacts, but again we're told not to worry because of numerous, unspecified BMPs, permit stipulations and mitigation measures. GS-48

It is unreasonable to assume the lake and creek will be fully restored, even improved, after closure. Who will pay for that? If the lake is full of poisons, long-term, negative impacts to aquatic life are likely. With Coeur's history, it is foolish to depend on total restoration in the future, based only on the corporation's goodwill. GS-49

§4.10 AQUATIC RESOURCES: MARINE

Impact to the marine ecosystem warrants an end to mining here. Impacts to herring and eulachon are or particular concern, especially with ferry access. Berners Bay appears to be increasingly significant habitat for this depressed stock of herring, yet you intend to destroy spawning habitat outright. All the gold in the hills isn't worth killing off the herring in the bay. GS-50

The SDEIS appears to ignore impacts of mine discharges, including accidents, on the marine environment. These chemicals and metals would tend to accumulate in the marine environment. Please disclose the impact. GS-51

Impacts would be cumulative over time. Cumulative pollution of the marine environment is much more significant that the little bit of digging in marine gravels. Please analyze cumulative impacts in the Final. GS-52

The SDEIS completely ignores potential sub-lethal impacts that have cascading impacts as they move through the system. Impacts to herring, for example, also impact sea lions, also impact orcas, on down the line. The SDEIS mentions that a spill could "taint the flesh" of eulachon, "and subsequently have a negative impact on Steller sea lions" (SDEIS @ 4-49), yet fails to tell us what those impacts *are*. GS-53

§ 4.11 WILDLIFE

All alternatives would have unacceptable impacts to wildlife, which are not adequately disclosed and analyzed in the SDEIS. Analysis is cursory, with only a short paragraph devoted to most species. This is not the thorough analysis the critters. GS-54

Will mine workers be hunting up there? That would likely have major impacts to deer, bear, moose, goats etc. GS-55

Habitat impacts, especially in terms of fragmentation and disturbance, are not given a hard look. Digging up and filling in hundreds of acres, diverting streams, running equipment at all hours for years, spilling poisons, etc. will add up to ruin the place for the deer, bear, wolves, goats, eagles, furbearers, birds, and marine mammals. GS-56

The SDEIS gives no consideration to ecosystem impacts resulting from impacts to fish and water quality. When you pollute the base of the food chain, there are apt to be impacts farther up, too. GS-57

The SDEIS refers blindly to mitigation measures and monitoring. For example, regarding goshawks you say "prior to project implementation, goshawk nest surveys will be conducted in areas with potential nesting habitat, and avoidance/protection measures adopted." (SDEIS @ 4-55) Project components don't seem especially flexible. If a goshawk nest is found on the shore of Lower Slate Lake, do you mean to say Coeur is going to re-do their whole plan? The EIS should disclose impacts, not put off dealing with them. GS-58

Please impose seasonal restrictions on clearing to avoid killing nesting migratory birds. GS-59

§ 4.14 VISUAL RESOURCES

Thank you for the simulation pictures (figures 4-1, 4-2, etc). This type of graphic is very useful. GS-60

§4.21CUMULATIVE EFFECTS

Thank you for the listing of other major projects. You have generally done a good job of disclosing foreseeable actions, though the analysis of what impact those actions will have is greatly lacking. GS-61

The Cape Fox land exchange could greatly change the nature and type of regulations and oversight of the mine, yet the SDEIS relies extensively on the current regime to mitigate damage. Please disclose the impact the exchange would have on operation of the mine. GS-61

The impact of developments at Cascade Point, Echo Cove, and the Juneau Access Road would have very large cumulative impacts with the project. It is crazy to assert that most wildlife "would not be impacted by proposed construction associated with any of the projects considered…" (SDEIS @ 4-124) A highway through here, with lots of private land development, and associated roads, waste, etc., wouldn't impact any of the wildlife? It is entirely foreseeable that this set of projects would result in an industrial park at Berners Bay, of virtually no use to wildlife. GS-62

The cursory discussion of potential mine expansion is alarming. A dam nearly twice as high, a lake nearly three times as large, and an additional 12.5 million tons of tailings, could be a nightmare. It would obviously cause additional impacts to water quality, yet these are not even discussed. Please stop letting the mining companies permit their project piece by piece. Demand a comprehensive mining plan to start with, and include discussion of the maximum foreseeable amount of mining. GS-63

In conclusion, we are greatly saddened that the Forest Service is apparently putting its trust in this corporation. Our land deserves much, much better than this. Please do not permit mining at Berners Bay. GS-64

Thank you for thoughtfully considering these comments. Very truly yours,

Gabriel Scott
Alaska Field Representative
Cascadia Wildlands Project

Responses to Comments

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-01	Comment noted. Please be aware that the No Action Alternative does not reflect a no mine alternative but would result in maintaining the status quo for the project which would allow the proponent to construct the mine facilities within the Sherman Creek and terrace area drainages as approved following the 1997 Final SEIS.
Cascadia Wildlands Project	GS-02	The purpose of and need for the project is explained in Section 1. The area is open to mineral entry under the 1872 Mining Law and the Forest Service is mandated to manage National Forest lands for multiple use. Mineral extraction must be accommodated under the multiple use management objectives just as recreation or wildlife use are accommodated.
Cascadia Wildlands Project	GS-03	Comment noted. It is beyond the scope of the NEPA process for the Forest Service to comment on the overall corporate history of the project proponent. The SEIS addresses in detail potential impacts on water quality and aquatic resources, provides for mitigation, and establishes monitoring requirements to document actual effects. The Forest Service would further require that Coeur Alaska provide financial assurance to ensure adequate resources for mine reclamation.
Cascadia Wildlands Project	GS-04	See the response to comment GS-03.
Cascadia Wildlands Project	GS-05	The Forest Service is obligated to consider any reasonable proposal for changes to approved operating plans. Coeur Alaska submitted the proposed revisions of the Plan of Operations to the Forest Service. The Forest Service is evaluating the proposal in the form of this SEIS.
Cascadia Wildlands Project	GS-06	The Forest Service has no mechanism or precedent to incorporate the suggested constraints/conditions.
Cascadia Wildlands Project	GS-07	The Forest Service has no mechanism to include an alternative to revoke Coeur Alaska's approved Plan of Operations for the Kensington Gold Project. The No Action Alternative, in the case of an SEIS, reflects the status quo. Chapter 2 notes that the operation as permitted following the 1997 SEIS represents the status quo for this project regardless of what has or has not been built to date.
Cascadia Wildlands Project	GS-08	The SEIS discloses that there will not be acid generation from the waste rock dumps. It is not the purpose of the SEIS to speculate about impacts that will not occur.
Cascadia Wildlands Project	GS-09	Coeur Alaska would be legally obligated to post financial assurance for reclamation as well as for long-term maintenance of the DTF or TSF dam as a part of the Plan of Operations. The Forest Service will establish the amounts of the financial assurance with input from the state based on the selected alternative.
Cascadia Wildlands Project	GS-10	The tailings pipeline would occur within the footprint of the access road, which would consolidate linear disturbances. Burying the tailings pipeline under Alternatives B, C, and D minimizes the risk of a tailings release resulting from pipeline damage caused by an avalanche. Burying the pipeline would prevent damage to or loss of habitat within the Johnson Creek drainage. The likelihood of a failure in the buried area is extremely low. In addition, the pipeline would include pressure sensors that would alert Coeur Alaska to any change in conditions, such as a leak, and would allow for an immediate shutdown of the system.
Cascadia Wildlands Project	GS-11	Engineering measures incorporated in the DTF design are documented in the 1997 SEIS and supporting engineering documents, and include intermediate drainage layers, moisture monitoring, contingency operation plans, and as a result of the 1997 public participation process, a stabilizing compacted earthen berm. Engineering analyses indicate that these measures reduce the likelihood of catastrophic failure to below those limits established by law/regulatory standards. Such limits and standards are similar to those applicable to dam and building construction for ensuring public safety.

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-12	The proposed design of the tailings pipeline includes burial of the pipeline through the avalanche-prone reach of the alignment.
Cascadia Wildlands Project	GS-13	Section 4.4.4 of the Final SEIS has been revised to clarify that the primary risk of avalanche damage on the Jualin side is to the tailings pipeline. Potential effects are disclosed. As noted in the response to comment GS-12, however, burying the pipeline eliminates the potential for a rupture due to an avalanche, and the environmental impact of damage to the road as a result of an avalanche would be inconsequential.
Cascadia Wildlands Project	GS-14	The purpose of the siting studies and conceptual design of the TSF is to identify a suitable location and approach for designing an appropriate facility. The final design would entail sufficient investigation and engineering input to produce a detailed plan that would be subject to all the required technical approvals before the facility could be constructed and subsequently operated. These studies would include detailed foundation investigations, stability analyses, and seepage analyses, and they would be conducted under the oversight of a professional engineer possessing a valid registration issued by the State of Alaska. The final design would be subject to review and approval by the State Engineer pursuant to requirements of 11 AAC 93.150 - 11 AAC 93.201. Dam foundation seepage is one mechanism that can lead to eventual instability of the dam. The design and installation of appropriate seepage cutoff measures, such as foundation grouting, addresses this mechanism. No environmental consequences would result from seepage into the foundation.
Cascadia Wildlands Project	GS-15	The environmental impacts of dam construction are addressed in the discussions of each individual resource and include the incremental loss of soils, vegetation, and habitat. Given the identified site and design approach, the expected risk of dam failure is very low. With engineering conducted to the profession's current standard of care, an acceptable structure can be designed, constructed, and operated in a manner that is protective of the public and the environment. Structures of this type have been constructed and operated responsibly and in a safe manner throughout the United States. Failure is extremely rare. The catastrophic failure of a properly designed impoundment would not be expected as part of normal operating conditions and could not be justifiably considered a reasonably foreseeable event. NEPA does not require a worst case analysis.
Cascadia Wildlands Project	GS-16	Foundation conditions for the diversion dam under Alternative C were not necessary to proceed with the NEPA analysis. Surface reconnaissance indicates the likelihood of foundation conditions for the diversion berm to be generally similar to that of the TSF. In addition, final design would entail a foundation investigation as part of detailed engineering analysis and design of the structure. Like the TSF, the diversion structure would be under the jurisdiction of the State Engineer, requiring permit review before approval for construction and operation. See also responses to comments GS-14 and GS-15. Section 2.3.1 of the Final SEIS provides a general description of the location, width, depth, and capacity of the diversion ditch, which is all that is necessary to disclose environmental effects.
Cascadia Wildlands Project	GS-17	As indicated in the Draft SEIS and Final SEIS, the zone of influence of the underground mine workings would be limited and local because of the low permeability of the rock and steep topography in the area. Figures 2-13 and 3-14 have been added to provide a representation of the proposed underground workings in relation to the ground surface. Local stream flows would not be impacted.
Cascadia Wildlands Project	GS-18	The SEIS discloses potential impacts on hydrology from all alternatives.
Cascadia Wildlands Project	GS-19	The Final SEIS has been revised to say that there would be no adverse effects on downstream water quality under Alternative D. The SEIS analysis shows the expected quality of the water discharged from the TSF under this alternative in comparison with applicable water quality standards intended to protect human health and the environment.

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-20	The SEIS describes the current and projected discharge of mine drainage to Sherman Creek, which forms the basis for demonstrating that there would be no adverse impact on water quality.
Cascadia Wildlands Project	GS-21	The Final SEIS includes a discussion of projected discharge quality with respect to applicable water quality standards intended to protect human health and the environment. This includes potential (although unlikely) future use of the receiving waters as water supplies.
Cascadia Wildlands Project	GS-22	The treatment system is designed to treat the maximum volume of projected mine drainage. Bypass of the treatment system is generally prohibited under the NPDES permit.
Cascadia Wildlands Project	GS-23	As discussed in the SEIS, the NPDES permit will require continued implementation of blasting BMPs, such as use of insoluble explosives. Note that these BMPs have been used since 1997 without any evidence of elevated ammonia and nitrate in the discharge.
Cascadia Wildlands Project	GS-24	There is a wide range of metal-specific effects on aquatic life. They include both direct mortality and longer-term chronic effects on fish health and reproduction. These are considered in the development of the state's water quality standards. Applying those standards to the treated mine water discharge ensures the protection of aquatic life from soluble and insoluble metals exposure. As shown in Section 4.6, the discharge would meet all applicable standards. In addition, the NPDES permit will require that the operator conduct toxicity testing, i.e., periodically expose test organisms to treated drainage and demonstrate no acute or chronic effects on the organisms.
Cascadia Wildlands Project	GS-25	Under the revised draft NPDES permit, aluminum will be regulated in the discharge. To date, there have been no discernible impacts on aquatic life downstream of the discharge (although the data are difficult to evaluate due to natural variability). Note also that the discharge has routinely been monitored for overall toxicity to aquatic organisms. This testing is intended to take into account the combined effects of all pollutants in the discharges. No toxicity has been observed since monitoring began in 1997.
Cascadia Wildlands Project	GS-26	The site-specific criteria for TDS and sulfate were adopted by the State of Alaska after extensive evaluation and public comment. They are considered protective of the receiving waters.
Cascadia Wildlands Project	GS-27	As documented in the SEIS, TDS levels downstream in the anadromous sections of Sherman Creek are expected to be well below 250-500 mg/L. This does not depend on the performance of the treatment system.
Cascadia Wildlands Project	GS-28	See the response to comment GS-27.
Cascadia Wildlands Project	GS-29	The TSS limits are included in the permit primarily because they are nationally applicable effluent limitation guidelines based on the use of best available technology; see Appendix A of the SEIS for the detailed rationale. Solids are generally nontoxic material found in most wastewaters. Excessive sedimentation can cause degradation of aquatic habitat in receiving waters, and this is prohibited by Alaska's water quality standards. The limits, however, will ensure that such impacts do not occur. Note that habitat impacts have not been observed to date downstream of the existing mine drainage discharge. It is unclear what "obscure" permit the commenter is referring to.
Cascadia Wildlands Project	GS-30	Nontoxic polymers are often added to water treatment ponds, such as those at the TSF, DTF, and mine drainage treatment facility, to enhance settling. The discharges from each of these units will be required to be tested for aquatic toxicity and must meet toxicity limits.
Cascadia Wildlands Project	GS-31	The impacts from historical mining in Coeur d'Alene are associated with long-term metals releases. They are unrelated to potential spills of diesel at the Kensington Mine site.

Affiliation	*Comment ID*	*Response*
Cascadia Wildlands Project	GS-32	These impacts generally occur through exposure to stormwater. A discussion has been added to the Final SEIS indicating that Coeur Alaska will be required to apply for and obtain coverage under EPA's general permit for stormwater discharges. This then requires the facility to develop and periodically update a storm water pollution prevention plan. The plan will include specific best management practices to avoid or minimize pollutant loadings to stormwater discharges. Implementation of the plan will be protective of water quality and aquatic life. This will be verified through ongoing aquatic resource monitoring in Sherman Creek under all alternatives and Slate and Johnson creeks under Alternatives B, C, and D.
Cascadia Wildlands Project	GS-33	The process chemical list is identified in Table 2-4 of the Final SEIS. None of these compounds are toxic to aquatic life. Best management practices include "good housekeeping" among other things, to remain in compliance with storm water aspects of the Clean Water Act. Failure to employ and maintain these BMPs, including cleaning up spills, could result in fines and potentially enforcement action. The NEPA analysis assumes compliance with applicable State and Federal laws. Any analysis of activities in violation of those laws would be purely speculative.
Cascadia Wildlands Project	GS-34	The discharges from the TSF under Alternative D will meet water quality standards protective of downstream aquatic life.
Cascadia Wildlands Project	GS-35	The exception from 40 CFR Part 440 for discharges in excess of net precipitation was included in the Draft SEIS for Alternative C only in anticipation that the company might pursue authorization by EPA. This has not occurred; therefore, a recycle system must be included in the TSF design, as shown in Alternatives B and D.
Cascadia Wildlands Project	GS-36	The model results represent over 1,000 iterations of possible monthly precipitation conditions throughout the life of the mine. The Forest Service believes this takes into account both typical and extreme weather conditions at the TSF.
Cascadia Wildlands Project	GS-37	The Forest Service has undertaken modeling to determine compliance with the TSS limits and found that compliance cannot be ensured at this time without treatment for Alternatives B and C. Additional treatment for solids removal using reverse osmosis has now been incorporated into Alternative D.
Cascadia Wildlands Project	GS-38	The comment is unclear. At all times, Coeur Alaska will have to meet water quality standards in the discharges. These will always be protective of downstream water quality. If Coeur Alaska pursued additional mining, it would have to demonstrate (through additional NEPA and permitting analysis) similar compliance.
Cascadia Wildlands Project	GS-39	See the responses to comments above.
Cascadia Wildlands Project	GS-40	Yes, the conclusion is no adverse effect.
Cascadia Wildlands Project	GS-41	The first comment refers to the naturally occurring concentrations of TDS, sulfate, and metals in mine water, i.e., the project will have no impacts. Nitrates will be (and are) controlled through the blasting BMPs. As documented in the Final EIS and in SAIC 1997, leachate from the tailings does have very low concentrations of pollutants. The leachate quality is generally comparable to background ground water quality. This information, combined with the lack of use of ground water in the area, supports the conclusion of no adverse impacts on ground water. The remaining comment relates to surface seepage from the DTF that will be managed in a pond and discharged through an NPDES-permitted outfall during operations. Coeur Alaska will continue to monitor seepage quality at closure until effluent limits can be met without further care and maintenance. This is expected to be a condition of the release of the facility's financial assurance by the Forest Service.
Cascadia Wildlands Project	GS-42	The reference to small volumes has been deleted from the Final SEIS. The risk of a spill affecting ground water is low because of the low risk of a fuel truck accident and the applicable BMPs. The risks are further reduced under Alternatives B, C, and D by the use of isotainers.

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-43	See the response to comment GS-32.
Cascadia Wildlands Project	GS-44	The exact volumes of mine drainage are difficult to predict. The maximum projected discharge is predicted to be approximately 3,000 gpm (6.7 cfs), and this has been added. As noted, levels below 1 cfs are expected under steady-state conditions during later years of mining.
Cascadia Wildlands Project	GS-45	The Final SEIS discloses all the potential impacts on freshwater resources. Overall, the Final SEIS demonstrates that water quality standards will be met, BMPs used, and instream flows maintained to protect water quality throughout the life of the mine. Under the alternatives, no effects on aquatic life are predicted in the drainages except at the TSF (under Alternatives B, C, and D) and from an unanticipated spill event of diesel or tailings (under all alternatives). The potential for spills and related impacts is described in the Final SEIS; risks associated with diesel are lower under Alternatives B, C, and D with the use of isocontainers. In the Slate Creek drainage, the likelihood of any “cumulative” effects associated with a tailings transport spill is minimal because only a small portion of the pipeline is in the Slate Creek drainage, any spill would primarily be contained by the berm along the road/pipeline corridor, automatic pressure sensors would shut off flow in the pipeline immediately, and, because of the inert composition of the tailings, only short-term, sediment- and possibly localized aluminum-related effects on habitat could occur (prior to cleanup and flushing of tailings through the system). Ongoing aquatic resource monitoring will be used to ensure that impact predictions are verified.
Cascadia Wildlands Project	GS-46	It is unclear what the commenter is referring to in terms of “downstream from previous sediment ponds.” The fish tissue data presented in the Final SEIS reflect sampling in Upper and Lower Slate lakes. The lakes have not been affected by past mining, and as noted in the Draft SEIS, it is not uncommon for metals to be found naturally in fish tissue. Note that the natural levels in Upper and Lower Slate lakes are generally above the concentrations observed earlier in Sherman and Ophir creeks (as shown in Table 3-10 of the 1997 Final SEIS). The Final SEIS and Ecological Risk Assessment provide a comprehensive assessment of all potential impacts on aquatic life from tailings disposal under Alternatives B, C, and D.
Cascadia Wildlands Project	GS-47	The projected tailings pipeline failure rate is based on data from similar pipelines throughout the country. The maximum volume is estimated based on the size of the pipeline and assumption of automatic shutoff when a pressure drop is measured. The estimate is very conservative in that it considers the entire volume of material in the pipe and assumes that all of it would reach the stream, which is very unlikely. Because of the inert nature of the tailings, it is noted that the impacts would largely be solids/sediment-related (and possibly localized aluminum effects). Under the conditions of the facility’s Spill Prevention, Control, and Countermeasures Plan (see Appendix E), Coeur Alaska would have to clean up the spilled materials from the ground and streams.
Cascadia Wildlands Project	GS-48	As documented in the Ecological Risk Assessment, the Forest Service has determined that Lower Slate Lake will be restored to equivalent or better habitat at closure. The Forest Service also believes that it has taken a conservative approach in assuming no tailings habitability. The Forest Service agrees with the commenter that the lake is a dynamic environment that will be altered significantly. Monitoring required by the ROD during operations will yield additional information about this environment and help to refine the closure plan prior to cessation of tailings placement.
Cascadia Wildlands Project	GS-49	The Forest Service will require financial assurance from Coeur Alaska to ensure successful reclamation before the company is allowed to begin mining.
Cascadia Wildlands Project	GS-50	Comment noted. Additional discussion related to potential impacts on eulachon and herring has been added to the Final SEIS.

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-51	The only marine discharges associated with the operation involve the placement of fill for construction of the marine terminals. Impacts of these discharges are considered as part of the sections on marine aquatic resources and wetlands. The impacts that would result from the small types of spills to the marine environment that might reasonably be expected as a result of operating two marine terminals have been included in the Aquatic Resources, Marine, section. The document does not include an assessment of a catastrophic spill. The likelihood of a catastrophic spill is small and is not considered reasonably foreseeable.
Cascadia Wildlands Project	GS-52	Cumulative impacts are discussed in Section 4.21.
Cascadia Wildlands Project	GS-53	The potential effects of hydrocarbons on marine wildlife, in particular Steller sea lions, are discussed under Section 4.10, under Marine Mammals and Spills, and in the BA/BE. In the BA/BE (Appendix J), potential effects of herring impacts on marine mammals are also addressed.
Cascadia Wildlands Project	GS-54	Text has been added in the Final SEIS, however, we believe enough detail has been given to offer adequate comparisons of the alternatives discussed in this document.
Cascadia Wildlands Project	GS-55	Mitigation measures include the operator prohibiting employees from hunting at the site. This has been added to Section 4.11.
Cascadia Wildlands Project	GS-56	The effects of habitat fragmentation are discussed in Section 4.11, but are not expected to be significant considering the relatively small size of the project (less than 300 acres in a project area of over 17,000 acres). The Forest Service respectfully disagrees that any of the alternatives would “ruin the place” for wildlife. As part of the decision on this project, the Forest Supervisor has decided to adopt the recommendation of an interagency panel to increase the size and configuration of three old-growth reserves within the project area.
Cascadia Wildlands Project	GS-57	Because the discharges under all alternatives would have to meet water quality standards protective of aquatic life, the fish would not be "polluted" downstream, and therefore, no ecosystem effects are predicted. This would be verified through ongoing chemical and aquatic life monitoring throughout the life of operations as described in Table 2-7 of the Final SEIS. With respect to the TSF, the Ecological Risk Assessment (Appendix C of the Final SEIS) specifically demonstrates that there are no risks to terrestrial or bird species during operations or after closure. Further, the Dolly Varden char population in Lower Slate Lake is small enough that its loss as a food source is not expected to have an effect on local wildlife populations.
Cascadia Wildlands Project	GS-58	The Forest Service has performed a goshawk survey of the Jualin side of the project. The results of this survey have been incorporated into the Final SEIS. No nest sites are currently found at the site. The Forest Plan Standards and Guidelines for threatened, endangered, and sensitive species allow for flexibility in determining appropriate mitigation if a nest site is found in the future, based on nest location and nature and proximity of potential disturbance. The required surveys according to Forest Service protocols would ensure that any new nests are identified during mine construction and operation. It is, however, premature to determine what might be found and how it would be addressed in the future.
Cascadia Wildlands Project	GS-59	Restrictions on clearing activities are not included in permitting actions, unless there are potential impacts on a listed species.
Cascadia Wildlands Project	GS-60	Comment noted.
Cascadia Wildlands Project	GS-61	If the Cape Fox land exchange were enacted, the Forest Service would lose oversight of the operation; however, the regulatory framework would not change significantly because the operation would need to comply with all permits issued by the state, EPA, and USACE. The oversight role would be fulfilled by ADNR. Additional discussion has been provided in the text to describe the change in oversight roles. At present, the land exchange legislation has not been referred out of committee and would need to be re-introduced. The ultimate fate of this legislation is unknown.

Affiliation	Comment ID	Response
Cascadia Wildlands Project	GS-62	The discussion of cumulative impacts has been revised to indicate that ADNR and EPA would assume responsibility for the oversight of operations and reclamation should Congress pass the Cape Fox land exchange legislation.
Cascadia Wildlands Project	GS-63	Impacts on water quality are not expected under any future mining or tailings disposal scenario because any discharge from the operations would have to occur in compliance with the Clean Water Act. Any proposal to expand a tailings disposal facility would require additional NEPA analysis and permit modifications.
Cascadia Wildlands Project	GS-64	Comment noted.

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March 5, 2004

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Re: Comments on the Kensington Gold Project Draft Supplemental Environmental Impact Statement (SEIS)

INTRODUCTORY REMARKS

The **CENTER for SCIENCE in PUBLIC PARTICIPATION** provides technical advice to grassroots groups, non-governmental organizations, regulatory agencies, businesses, and indigenous communities on natural resource issues, especially those related to mining. Our comments on the Kensington Gold Project SEIS focus on the technical mining-related issues, and on the potential environmental impacts from mining operations.

There are two major technically-related concerns in the SEIS.

The first is the concern is the lack of a reclamation and closure financial surety calculation. Environmental impact statements for mines should include a calculation for the financial surety. Since the Alaska Department of Environmental Conservation will not be issuing a Solid Waste Permit that includes mine tailings or waste rock, there will be no ADEC financial assurance calculation for mine closure, so the Forest Service should have included its financial assurance calculation. DMC-1

The Forest Service does have a responsibility to require a financial assurance for the closure of this Project, yet no calculation of this significant amount of money is presented. The public is at considerable financial risk if the company is not financially able to meet its reclamation and closure obligations, yet there is no disclosure in the SEIS what this amount will be.

The second concern is the absence of a draft NPDES Permit for the Project. It is important to know how EPA, which is listed as a cooperating agency in this SEIS process, might condition their permit for these alternatives. There is also the issue of contingencies that would be employed if the effluent in the tailings pond does not meet projected discharge standards. In a draft NPDES Permit it would be expected that reasonably foreseeable problems (e.g. for an exceedance of water quality standards in the tailings pond) would be recognized, and requirements for addressing these problems specified. By not including a draft NPDES Permit in the SEIS, we do not know how these issues will be addressed. DMC-2

There is also the question of the legal status of the two principle alternatives – Alternatives B and C. Both involve procedures that are at least questionable under present EPA policy. Alternative B will require the conversion of a natural lake to a waste disposal facility. Alternative C will allow an undiverted stream to flow into a waste facility. Without a Draft NPDES Permit, there is still a question of how, or if, EPA will sanction the proposed Alternatives. DMC-3

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SECTION-SPECIFIC COMMENTS

Section 2.3.19 Reclamation and Closure

There are only 2 pages of discussion devoted to reclamation and closure. It is important to understand the major elements of reclamation, so that the cost of these items can be calculated for the financial surety. The amount of this financial surety is likely to be $10 - $20 million. DMC-4

(1) The amount, how it was calculated, and the form of the financial assurance should be disclosed to the public as a part of the SEIS. It is ultimately the taxpayer who will be liable for cleanup of the mine if the company is bankrupt, or if the Forest Service does not require a financial surety that is adequate to cover all the costs of reclamation – which has unfortunately happened many times in the past.

It is also stated in this section:

> "… the tailings would be deposited to an elevation of 704 feet with a water cover of at least 9 feet. At closure, the lake level would be raised to an elevation where the TSF would create/inundate at least the same acreage of natural sediment in shallow areas that support plant life and macroinvertebrates…" (p. 2-34)

and:

> "The project operator would be required to establish a funding mechanism to ensure the stability of the dam in perpetuity." (p. 2-34)

In order to meet the requirement above of at least 9 feet of water cover, the dam will be required to impound water for the foreseeable future. This permanent dam will not only require maintenance, but at some point it will likely need major repair, upgrading, or replacement, since the concrete slab face of the dam appears to be the impermeable barrier that protects the dam from saturation. (Figure 2-15, p.2-25) Given the cost for maintenance and replacement of the dam, it is important that a sufficient amount be placed in escrow to accomplish these tasks. DMC-5

(2) Because of the probable size of the financial surety, and complexity in calculating the costs of monitoring, maintaining and eventually replacing the dam, it is important that this be done when the public can review and comment on the procedure. These calculations and costs should be disclosed as a part of the SEIS.

Section 3.3 Geology and Geochemistry

It is noted:

> "No description of the geology in the Johnson or Slate creek drainages is available, except limited information on the area in the vicinity of the proposed tailings storage facility (TSF)." (p.3-5)

and;

> "No specific groundwater information is available for the area surrounding Lower Slate Lake." (3.7.3 Lower Slate Lake, p. 3-24)

and;

> "Since the 1997 SEIS a limited amount of freshwater aquatics-related data has been gathered on the Slate and Johnson creek drainages." (Freshwater Biota – Resident Fish: Slate and Johnson Creek Drainages, p. 3-28)

(3) It is a somewhat surprising that, in a Project of this size and importance, it is not possible – even necessary – to collect, compile, or extend basic data on local geology (e.g. for potential landslides), groundwater (e.g. for potential contamination), or freshwater aquatics in potentially impacted streams. Dmc-6

Section 4.6.5 Effects of Alternative C – TSF Effluent Quality

Under Alternative C, East Slate Creek would be diverted around the tailings impoundment, and the flow from the creek would not be available for dilution of tailings impoundment effluent. (p. 4-25) The flow of East Slate Creek is estimated to be "… typically more than 10 times the volume of the tailings slurry from the mill." (App. A, p. A-58) Dmc-7

In this section, it is stated:

> "The model results show that mixed TSF water quality would meet water quality-based effluent limits and discharges would be allowed during almost all the months of the mine life." (p. 4-25)

There are no modelling data/results presented in this section of the SEIS as there are for Alternative B in Table 4-11. Similarly, in Appendix A – Water Quality Analysis – there are no data/results presented for Alternative C, other than a short discussion in Appendix A, Attachment 4 – Summary of TSS Analysis, where again no quantitative data/results are presented.

(4) It is not clear why the Coeur or the Forest Service has not presented modeled water quality results for Alternative C, either in SEIS Chapter 4 or Appendix A. Alternative C is one of the major alternatives presented in the SEIS. Since diversion of East Slate Creek around the tailings impoundment may be required in order to protect the creek from unpredicted contamination, it should have been important to present this information.

Section 4.9.3 Effects Common to Alternatives B and C – Sedimentation

It is stated: Dmc-8

> "It is possible that macroinvertebrate and fish populations would survive in the TSF during operations and after closure, and the lake would provide better habitat and support higher macroinvertebrate and fish populations than current conditions." (p. 4-36)

and;

> "At closure, the availability of shallow aquatic habitat that is not covered by tailings should support near term restoration of the macroinvertebrate and fish populations in the lake. Modeling shows that the tailings would not generally resuspend and redeposit over the natural sediment areas (Appendix C)." (p. 4-36)

There does not appear to be any discussion of formal "modeling" for resuspension or redeposit of tailings over natural sediment areas in Appendix C. Furthermore, it will probably be difficult to prevent the deposit of some fine tailings in any area of a relatively shallow tailings pond.

(5) Since there does not appear to have been any formal modeling conducted for resuspension or redeposit of tailings over natural sediment areas in Slate Lake in the SEIS, and given the known toxicity of the tailings to macroinvertrebrates (see pp. 4-35 & 4-36), it may be premature to conclude that lake habitat may be the same or better after mine closure. Dmc-9

APPENDIX A: WATER QUALITY ANALYSIS

Page A-9: Aluminum

With regard to the natural background levels of aluminum in the East Fork of Slate Creek, it is stated:

> "Ambient aluminum levels in East Fork Slate Creek exceed the statewide criteria. Therefore, it assumed that the operator would apply for and the state would adopt, a site-specific criterion in accordance with 18 AAC 17.235 (b). As a result, the limits for aluminum in the discharge from outfall 002 would not be allowed to exceed the background level immediately above the inlet to the TSF, as measured concurrently with discharge sampling." (p. A-9)

(6) What does "concurrent sampling" mean? How can sampling of natural background be accomplished in a timely manner to provide feedback to the pump system which will insure that the level of aluminum in the discharge does not exceed natural background? DMC-10

Pages A-50 & A-51: Acid Generation Potential

It is planned that the gold grade to be mined in the alternatives considered in the SEIS will be higher than that in the presently approved Kensington Gold Project. (p. A-50) Since the gold is associated with sulfide mineralization (SEIS p. 3-5), the percentage of sulfide in the tailings will increase over that projected for tailings for the presently approved Project. DMC-11

While it has been recognized in this section the sulfide content of the tailings will increase, and a predicted sulfur concentration 0.31% calculated (Table 10, p. A-50), it is then stated that: DMC-12

> "Material with a total sulfur concentration of 0.3 weight percent (or below) will not produce acid rock drainage (Jambor et al. 2000)." (p. A-51)

It is generally accepted that a level of 0.1% is a rough cutoff value below which acid generation will not occur, because there is generally enough neutralizing material in the host rock to neutralize any acid generated. The "Jambor et al, 2000" reference cited in this section is not listed in the References at the end of Appendix A, so the source for 0.3% cannot be verified.

<u>Moreover, using sulfur level to predict the absence of acid generation is not an accepted method, especially when the level is close to, or above, the accepted cutoff level as is the case here.</u> Prediction of potential ARD should be done, at a minimum, on the basis of Acid Generating Potential, or the ratio of acid generating to acid neutralizing material in the tailings. If the results of this data still show the material to be in the "possible acid generating" range, then further tests (e.g. humidity cell testing) would be warranted. DMC-13

(7) At a minimum, the conclusion that acid generation will not occur should be based on the results of acid-base accounting. Since the total sulfur is at, or above, a generally accepted cutoff (utilizing either standard discussed above), the conclusion in the SEIS that the tailings will be non acid generating, based on sulfur content alone, is inappropriate.

Page A-59: Copper

Table 11 lists the minimum modeled discharge as 3 gpm in September. This number does not appear to be in line with the minimum modeled discharge for other large flow months. DMC-14

(8) Please explain why this number is so much lower that the other minimum discharge numbers.

Attachment 4 – Summary of TSS Analysis

Page A-63: TSS Compliance Assessment

It is stated that:

> "… particle size distribution shows that approximately 90 percent of the tailings are less than 125 microns diameter and 10 percent of the tailings are less than 4 microns in diameter. Such small particles can be very difficult to settle naturally." (p. A-63)

Settling tests for controlling Total Suspended Sediment (TSS) were not conducted for the Kensington tailings. Predictions for removing/settling suspended sediment at Kensington were made on the basis of a comparison to the material deposited in the tailings pond at Coeur's Galena Mine in Idaho. To quote from the SEIS:

> "The settling of Kensington tailings was compared with tailings settling at Coeur's Galena Mine in Northern Idaho. The Galena Mine generates a comparable, or slightly greater, percentage of tailings that are smaller than 30–40 microns. Although the specific distribution of tailings particle sizes smaller than 30–40 microns has not been determined at Galena, it is reasonable to assume that the distribution of tailings particle sizes at the Kensington Mine would be similar." (p. A-64)

However, it is not clear from this discussion whether backfill of tailings is also used at the Galena Mine, as is planned at Kensington. The backfilling process at Kensington will require separation of the "coarse fraction" from the tailings "fines." (p.2-24) In order to separate the coarse fraction the tailings material is run through a cycloning process. The fines from this cyclone will be combined with the remaining 60% of the tailings that will not be used for backfill. This will result in an elevated level of fines in the material that will be deposited in the tailings pond.

(9) If the Galena Mine does not utilize cycloned tailings for backfill, or if the grain size and ratio of cycloned to non-cycloned tailings is not the same as proposed at Kensington, then the comparison of settling at the two mines would not be appropriate. There is not enough discussion in the SEIS of the Galena Mine backfill situation. Dmc-15

(10) Since it is proposed that East Slate Creek be allowed to run through the tailings impoundment during operation of the mine, it would not be possible to contain contaminated water in the impoundment for long before a discharge will be required in order to keep the dam from overtopping. The possibility of water in the tailings impoundment exceeding discharge standards for TSS or any other contaminant – at least temporarily, and in spite of water quality predictions, especially since tests with actual tailings were not conducted – is a strong argument for requiring the diversion of East Slate Creek around the impoundment during operation. Then, if unpredicted contamination occurs, this contamination could be confined to the tailings impoundment. Dmc-16

APPENDIX B: ECOLOGICAL RISK ASSESSMENT OF AQUEOUS TAILINGS DISPOSAL AT THE KENSINGTON GOLD MINE

Table 3.1 – Comparison of Decant Water Chemistry with Risk-Based Criteria

The data in this Table for the decant water chemistry was taken from the analytes measured in nine samples of tailings test water. (App. B, p. 21) In Table 11 the maximum value for copper is listed as less than 2 ug/l. However, in Appendix A – Water Quality Analysis, the maximum Dmc-17 expected value for copper (95th percentile) from modelling is 10.11 ug/l (App. A, Figure 14, p. A-57), which is significantly higher than the maximum assumed in the Risk Assessment. A similar situation appears to exist at least for iron – although data is presented only for copper in Appendix A, so it is impossible to determine the model-predicted maximum and minimum values for process water constituents other than copper

(11) Even though this information might not have been available when the Risk Assessment was done, since the modelling data is producing contaminant estimates that are in at least a couple of cases significantly higher than the maximum contaminant levels used for the risk assessment, this issue should be re-analyzed for the final SEIS. DMC-18

Section 5.2.3 – Recovery of Macroinvertebrates

In this section it is stated: DMC-19

> "As indicated in Appendix D *(Review of TSS Toxicity to Aquatic Life)*, macroinvertebrate communities generally have a high recovery potential, especially if there are nearby sources of organisms for recolonization." (App. C, p. 59)

This conclusion appears to be based on analysis of the smothering effects of the tailings. However, the tailings sediments themselves were found to have impacts on macroinvertrebrates:

> "The tailings sediment sample caused a statistically significant reduction in the survival of Hyalella azteca when compared with the control lake sediments and Lower Slate Lake shallow and deep sediments. Specifically, the survival of Hyalella azteca was as follows:
>
> - 83 ± 13 percent in control lake sediments
> - 76 ± 22 percent in Lower Slate Lake deep sediments
> - 62 ± 28 percent in Lower Slate Lake shallow sediments
> - 5 ± 8 percent in tailings sediments
>
> The suggested USEPA minimum survival rate Hyalella azteca for a 28-day sediment exposure is 80 percent. The effect of the tailings sample on Hyalella azteca reproduction could not be determined because of low survival in the tailings sample after 28 days.
>
> Results of the habitability tests on Chironomus tentans indicated that the control lake sediments, Lower Slate Lake sediments, and tailings supported acceptable 20-day growth as defined by dry and ashed weight. Samples from shallow Lower Slate Lake and deep Lower Slate Lake and tailings samples supported emergence rates of 85 percent, 53 percent, and 43 percent, respectively, causing a statistically significant reduced emergence rate of Chironomus tentans when compared with the control lake sample and shallow Lower Slate Lake sediments. USEPA recommends a minimum endpoint of 50 percent for emergence.
>
> These results indicate that direct effects of mortality and reduced reproduction of rates would occur as a result of subaqueous tailings deposition in the TSF. It is likely that similar effects on other macroinvertebrates and aquatic insects Hyalella azteca and Chironomus tentans could occur." (SEIS, pp. 4-35, 4-36)

(12) This information, and its attendant implications, does not appear to have been taken into consideration in the Risk Assessment.

Thank you for the opportunity to comment on the SEIS. If you have any questions about my comments, please feel free to call or e-mail.

Sincerely;

David M. Chambers, Ph.D.

cc: Bill Riley, EPA
Kat Hall, SEACC
Bruce Baker, Lynn Canal Conservation
Sue Schrader, SEACC
Demian Schane, Earthjustice

Responsese to Comments

Affiliation	Comment ID	Response
Center for Science in Public Participation	DMC-01	The Forest Service is obligated to establish financial assurance for both reclamation and the long-term integrity of the TSF. Financial assurance would be established based on the final plan of operations, which would not be completed until after the ROD is completed. There is no requirement under NEPA to include the actual bond calculation in the SEIS.
Center for Science in Public Participation	DMC-02	The draft NPDES permit was released to the public for comment in June 2004 and is included in the planning record. This Final SEIS reflects the comments received on the draft permit.
Center for Science in Public Participation	DMC-03	As summarized in Section 1.7.1 and documented in USEPA 2004 (EPA May 17, 2004, memo) and the draft NPDES permit fact sheet, the “conversion” of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notice for the USACE permit and the draft NPDES permit were released to the public for comment.
Center for Science in Public Participation	DMC-04	The Final SEIS notes in Section 2.3.19 that Coeur Alaska would be required to post financial assurance to cover unforeseen issues associated with dam stability and closure.
Center for Science in Public Participation	DMC-05	See response to comment DMC-04.
Center for Science in Public Participation	DMC-06	The referenced language in Section 3.3 is misleading and has been removed from the Final SEIS. In some cases, the characterization work has been extensive in the Johnson and Slate Creek drainages (e.g., for aquatic resources in East Fork Slate Creek). In other cases, the analysis relies on a combination of drainage-specific information and analogous data from the Sherman Creek drainages. The Forest Service has determined that for all resources Section 3 fully describes the baseline conditions and allows for a detailed and accurate evaluation of effects.
Center for Science in Public Participation	DMC-07	Sections 4.6.5 and 4.6.6 have been renumbered correctly. A table has been added to Section 4.6.6 describing the TSF water quality under Alternative C.
Center for Science in Public Participation	DMC-08	Additional detail has been added to Section 4.9.3 to describe TSS levels in the lake and the discharge. This includes the incorporation of a reverse osmosis treatment system into Alternative D to ensure compliance with the applicable TSS limits during operations. Tetra Tech 2003 provides the results of modeling to show that sediment will not resuspend in the lake after closure.
Center for Science in Public Participation	DMC-09	See the response to comment DMC-08.
Center for Science in Public Participation	DMC-10	Coeur Alaska may pursue a site-specific criterion based on background conditions in the future, but the SEIS analysis and draft NPDES permit are now based on the statewide criteria.

Affiliation	Comment ID	Response
Center for Science in Public Participation	DMC-11	It is true that Coeur Alaska plans to mine a subset of the original deposit, by focusing on higher grade ore with a gold cutoff of 0.14 ounces per ton (opt). Previous work characterizing the deposit has shown that gold grade correlates generally with total sulfur content, so it is likely that sulfur content will be incrementally higher in tailings generated through flotation of higher-grade ore. The increase in grade cutoff from 0.09 opt to 0.14 opt gold will increase average total sulfur in ore from 2.69 percent to 3.08 percent. This was recognized and addressed in the Draft SEIS, which relied more on the baseline characterization of the ore than on the analysis of tailing samples generated through metallurgical testing. The assertion that Coeur Alaska has "not done any laboratory analysis on samples that reflect the new composition of the tailings" is not true. Based on the design flotation efficiency of 98 percent for the proposed flotation process, the total sulfur content in tailings will increase only slightly, from an average of 0.05 percent to 0.06 percent. These values are very close to the measured total sulfur values of 0.04 percent reported by Montgomery Watson (1996) and 0.06 percent reported by Rescan (2000) for tailings generated from composites in metallurgical tests. At this sulfide removal efficiency, using the baseline ore geochemistry data, the total sulfur content of tailings placed in Lower Slate Lake will range from 0.0006 percent to 0.44 percent under the modified plan. Virtually all of the tailings samples (n=144) are expected to have less than 0.3 percent residual sulfur. The sulfur chemistry of the ore is based on acid base account and total sulfur analysis of 144 samples (with gold grade greater than the 0.14 opt cutoff), which are a subset of the 583 samples studied to characterize the overall deposit originally (Geochemica, 1993). The applicability of the individual sample geochemistry does not change as a result of the change in grade cutoff. As a sensitivity analysis, the residual sulfur content of tailings was also calculated under the assumption that sulfide removal efficiency could drop as low as 90 percent in an operational upset condition. In that case, average sulfur content would be 0.31 percent, with a range from 0.003 percent to 2.2 percent sulfur. Acid base accounting analyses have been completed for all of the ore samples included in the analysis provided in the Draft SEIS, but along with sulfide removal, changes in neutralization potential (NP) that result from grinding (thus, increasing surface area and reactivity of neutralizing minerals) and flotation (addition of alkalinity for processing purposes) will change the relative proportion of NP/AP in the spent ore. Acid base accounting analyses could not be completed for individual samples of spent ore, because tailings were generated through metallurgical analysis of composited bulk samples. Because flotation of composites in metallurgical tests produces a relatively small number of tailings samples, it was not possible to evaluate the range of chemistry that will exist in the tailings following flotation using acid base accounting analysis of the tails themselves. For these reasons, analysis of potential changes in acid generation potential resulting from the change in grade cutoff focused on the total sulfur concentration described for individual samples, using the guidelines provided by Jambor et al, 2000. If one holds the measured NP constant with preprocessing values measured in ore, for the designed rate of 98 percent sulfide removal, the NP/AP ratio calculated using ABA data for the 144 samples of ore meeting the new grade cutoff would shift from an average ratio of 3 to 136; at 90 percent efficiency of sulfide removal, the NP/AP ratio would be 27. In all cases, the average value meets relevant regulatory criteria. It is important to note that use of total sulfur as a criterion for material classification very conservatively estimates potential acid generation risk, as all sulfur is assumed to be present as sulfide and all sulfide is assumed to fully oxidize. It is very unlikely that all sulfide will oxidize in a subaqueous impoundment, where oxygen is not available to drive the oxidation reaction. Classification of material based on total sulfur also neglects the inherent alkalinity of the mesothermal ore deposit,

Affiliation	Comment ID	Response
		which has significant association carbonate mineralization that provides neutralization potential (Geochemica, 1994). Finally, this classification also neglects the alkalinity of the tailing itself, which requires that high pH conditions (typically 9 or better) be created through lime addition and maintained to support efficient ore recovery during flotation.
Center for Science in Public Participation	DMC-12	The work by Jambor, Blowes, and Ptacek (2000), Mineralogy of Mine Wastes and Strategies for Remediation, EMU Notes in Mineralogy, Vol. 2, Chapter 7, pp. 255–290, states "…most mineral assemblages containing <0.3 weight percent sulfide are unlikely to be acid generating; rates for assemblages with sulfide >0.3% are dependent on NP/AP ratios as determined by static tests." This study has been added to the References section in the Final SEIS.
Center for Science in Public Participation	DMC-13	Section 3.3.4 of the SEIS discusses acid-base accounting data for the tailings. Certainly, the use of the total sulfur concentration to predict acid generation potential, in the absence of other acid-base accounting or kinetic test data, would be questionable for marginal samples with no neutralization potential that would be placed into oxidizing conditions. Under the proposed action, rock with neutralization potential would be placed into subaqueous conditions where sulfide oxidation is not expected to occur; an acid generation potential test, which assumes complete reaction of all sulfide and neutralizing minerals, provides a very conservative measure of acid generation potential for this situation.
Center for Science in Public Participation	DMC-14	As noted in the paragraph following Table 11 in Appendix A, the minimum was based on a month with extremely low precipitation. The model randomly picks each monthly precipitation from regional precipitation curves and produces results for 1,000 "life of mine" conditions. It is, therefore, reasonable to get one month with little or no precipitation. Note that the average was generally consistent with low-flow months. The model results are now considered in conjunction with the treatment system included in Alternative D, i.e., water quality-based effluent limits are met under all conditions for this alternative. Finally, please note that the new model results reflect a different distribution of monthly precipitation values: they are selected randomly in each model run.
Center for Science in Public Participation	DMC-15	There is no backfill at the Galena Mine. This has been noted as a difference. It is, however, reasonable to assume that there is some applicability to Kensington because a significant volume of small particles must be settled at both mines. The intent was only to cite the Galena example as one set of evidence to be considered in conjunction with other information presented. Although there is some uncertainty about meeting TSS limits under Alternatives B and C, the inclusion of the treatment system in Alternative D ensures that TSS limits can be met under that alternative.
Center for Science in Public Participation	DMC-16	With the treatment system, water quality-based effluent limits will not be exceeded and water will not need to be held in the TSF under Alternative D. Both Alternatives C and D include a diversion of East Slate Creek around the impoundment.
Center for Science in Public Participation	DMC-17	The differences noted are due to the values listed in Table 3.1 (Appendix C) being dissolved concentrations versus the total concentrations listed in Appendix A. EPA directs that dissolved concentrations are most applicable for evaluating potential risk to aquatic life. This is different from evaluation of compliance with water quality-based permit limits, which are expressed as total or total recoverable values. Language has been added to the Ecological Risk Assessment (Appendix C) to indicate that dissolved values are listed in Table 3.1.
Center for Science in Public Participation	DMC-18	See the response to comment DMC-17.

Affiliation	Comment ID	Response
Center for Science in Public Participation	DMC-19	The Forest Service disagrees with the commenter's interpretation of the risk assessment. The results of the tailings toxicity tests on macroinvertebrates are discussed in detail in Appendix C, Ecological Risk Assessment of Aqueous Tailings Disposal at the Kensington Gold Mine, and form the basis for the conclusions about impacts on aquatic life in the risk assessment and Section 4.9 of the Final SEIS. Alternative D now requires capping of tailings at closure unless subsequent testing demonstrates to the USACE, the Forest Service, and the State of Alaska (ADNR) that the tailings are not toxic.

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Re: Comments on the Kensington Gold Project Draft Supplemental Environmental Impact Statement (SEIS)

The **CENTER for SCIENCE in PUBLIC PARTICIPATION** provides technical advice to grassroots groups, non-governmental organizations, regulatory agencies, businesses, and indigenous communities on natural resource issues, especially those related to mining. Our comments on the Kensington Gold Project SEIS focus on the technical mining-related issues, and on the potential environmental impacts from mining operations.

General Comments:

There are several key problems that the EIS did not adequately address.

TSS settlement and re-colonization predictions are inadequate:

The EIS asserts that TSS will settle in Slate Lake, but the analysis supporting this assertion is very limited. The EIS states that there will be at least 9 feet of water covering the tailings, but does not present any analysis of the effects of wave fetch or particle re-suspension. The risk assessment asserts that sediments will be recolonized by plants and macroinvertebrates, but gives very little support for this. An in-depth analysis of TSS non-settling or re-suspension and effects on habitat, similar to the analysis done by EPA in the Technical Assistance Report for the AJ Mine should be conducted. AC-1

Subaqeaous disposal of toxic sediments is not allowable

Section 4.9.3 discloses that 95% of the test organism Hyalella azteca died when exposed to tailings. The extreme toxicity of the tailings is downplayed in the EIS. There is very little discussion of the effects of compaction of tailings and the difficulties this causes with re-colonization of invertebrates. The toxicity of the tailings and physical challenges to re-colonization contradict the conclusions in the EIS that re-colonization of tailings by benthic organisms will occur. The entire reclamation strategy for Slate Lake relies on predictions of re-colonization that are based on supposition, not site-specific analysis. AC-2

Allowing subaqueous disposal of toxic tailings contravenes the Clean Water Act and is counter to both the sediment and toxic and deleterious substances water quality criteria in 18 AAC 70.020. Allowance of this harmful practice sets a bad precedence and should not be allowed under a 402 or 404 permit. AC-3

The EIS is incomplete without the inclusion of a NPDES permit:

An NPDES permit is not included in the EIS review, thus all the analysis presented about compliance with water quality standards and effluent limits is based on assumptions. The primary purpose of this EIS, to analyze water quality impacts and accurately and adequately disclose adverse effects to the environment and civil society, is compromised. AC-4

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Effluent limits in the final NPDES permit could differ from those used in the EIS, resulting in underestimation of environmental impacts. Conclusions drawn about compliance with regulations and needed levels water quality treatment could be faulty. A great deal of uncertainty is introduced by not including the NPDES with the EIS. This places the public at a disadvantage, and seriously compromises the adequacy of the EIS.

Here's a specific example of this problem. The EIS uses the previous NPDES permit effluent levels as a basis for prediction of compliance with water quality standards and necessary treatment levels. Aluminum concentrations in the effluent are projected to exceed Alaska water quality standards. However, the previous NPDES permit does not include an effluent limit for aluminum, and there has been no monitoring of aluminum levels in the treated discharge (page 4-17 and 4-20). Thus, the EIS discussion of this water quality problem is based on conjecture, and introduces uncertainty in the conclusions that water quality standards will be met. The EIS stated that additional effluent treatment for aluminum may be necessary (page 4-17 and 4-20), but the financial bond for this mine project does not include that provision. Actually no financial analysis of the necessary bond amount is included in the EIS which is also a significant inadequacy in the EIS (see David Chambers comments for more information). AC-5 AC-6

The EIS says that there will need to be a site-specific criteria developed for aluminum. The NPDES permit and State 401 Certification containing the details of the development of the site-specific criteria must be included in the EIS. A revised draft of the Supplemental Environmental Impact Statement containing the revised NPDES permit and associated water quality impact analysis should be issued for public review in order to adequately comply with the NEPA requirements for full disclosure of environmental and social impacts. AC-7 AC-8

Specific comments on the EIS:
Table 2-6 Mitigation and Control Measures:
Mitigation and control measures for some activities contained in this table were not adequately described in the EIS, including;
1) All precautions must be taken to prevent transfer of heavy metals and other contaminants into the environment around the mine operation. If there are going to be conveyor belts used to transport ore they must all be fully enclosed to reduce the release of dust, particulate matter and ore. AC-9

2) A thorough groundwater and seep monitoring program must be developed and implemented under and below the TSF, borrow site and pit walls, and all waste rock disposal sites to monitor for contaminant release. This needs to be a requirement of the NPDES permit.

3) Full itemization and disclosure of all herbicide application sites, including a list of herbicides used.

4) An underwater noise abatement and monitoring program from mining operations, including transportation, in Berners Bay.

Specific comments on the Risk Assessment:
The risk assessment is very limited in scope and only projected effects in Slate Lake, while ignoring other impacts from the mine project. In order to fully evaluate the impacts from the various project alternatives and comply with the NEPA requirement to identify and disclose all impacts including cumulative, the risk assessment needs to be comprehensive and include an analysis of all risks to the environment and human health from proposed mine activities. AC-10

Several risk producing activities were not analyzed and disclosed in the Risk Assessment. The Forest Service needs to expand the Risk Assessment to include and disclose risk from all aspects of the mine proposal. The Cooperating federal agencies have an obligation under NEPA, The Clean Water Act, Essential Fish Habitat Act, Migratory Bird Act, Marine Mammal Protection Act, etc. to ensure that all risks to the environment are identified and disclosed in an EIS. AC-11

Additions to the risk assessment must include the following at a minimum (this is not meant to be a comprehensive list): AC-12

1) An estimation of effects and an analysis of the toxicity of the chemicals and materials used in the milling process (table 2.4) and other mine operations. The EIS states they are non-toxic (page 2-2), but does not provide any data to support this assertion. This could result in an underestimation of risk to biota and the ecosystem.

3) An estimation of any impacts to marine fish or mammals and their spawning and rearing areas from chronic discharges, or major spills of hydrocarbons or other pollutants and waste material.

4) An estimation of any impacts to marine fish or mammals and their spawning and rearing areas from an increase in underwater noise, dredging, or other disturbances from increased activities in Berners Bay or other areas affected by mine operations.

5) The potential loss of fish and wildlife habitat (fresh and marine), wetlands, and impacts to water quality from stream crossings, channelization, erosion, sedimentation, and habitat loss during and after the mine operations.

6) A discussion of projected downstream TDS levels, and an evaluation to determine that these levels of TDS will not be harmful to sensitive species of salmon using the area to spawn, rear and reside.

7) A discussion of the cumulative effects of exposure to all the pollutants at once. This is what really happens to organisms in the ecosystem. Instead, the existing risk analysis looks at risks from each pollutant individually, but never addresses the effects of the total pollutant load on the ecosystem.

<u>Conceptual site model</u>: Boreal toads should be included as a species of concern because they are very susceptible to pollution, and amphibian populations are declining in Southeast Alaska and world wide due to habitat loss and pollution loading. The FS should provide more information on the survey effort used to locate boreal toads in the area. Unless efforts were exhaustive, boreal toads should be included in the risk assessment due to their unique place in the ecosystem, sensitivity to pollutants and enhanced risk because of declining populations. AC-13

<u>Review of data and COPEC determination</u>: The EIS needs to clearly state the basis or guidance used to determine how pollutants were screened out. The EIS screened out potential heavy metal toxins (lead and cadmium) based on the maximum measured concentration requiring less than a three fold dilution to meet chronic water quality criteria. What protocol or standard procedures is this method based on? Procedures used in the risk assessment need to be well documented. AC-14

The maximum measured value for TDS in Table 3.1 of 1160 mg/l is close to the levels documented to affect Dolly Varden Char (Stekoll 2003). Yet, TDS was screened out as a COPEC. More information should be provided on the probability and frequency of TDS levels reaching these levels through out the mine operation and post closure. This information is especially important since TDS at this level affects the spawning success of Dolly Varden Char and the EIS asserts that a population of Dolly Varden will persist in the TSF during and after mine operations.

The screening method for several heavy metal COPECs on pages 26-7 is not conservative. Several of the contaminants were screened out from future consideration because there are no screening values available in the literature. Very little information was given on the types of sites that were used as a comparison (were they uncontaminated with similar geology, etc). Some were screened out because there was only one measurement (thallium). Just because there are no established screening values for a contaminant or very limited sampling, does not mean there is no risk. Inappropriate screening out of COPECs results in lower risk estimation than may really exist.

Adding the effects of these non-conservative procedures together results in possible underestimation of risk by falsely screening out COPECs that should have been fully evaluated. This results in a severe limitation of the risk assessment process and reduces confidence in the conclusions. AC-15

4.2.3. Bioaccumulation Factors and Exposure Point Concentration Derivations:
The EIS states that reduction of pH levels will result in precipitation of aluminum into the sediments. What will be the long-term effects of this? Will aluminum build up in the sediments? What risks does this pose to the ecosystem? The risk assessment needs to fully quantify this risk. AC-16

Table 4.8 Summary of Protective TSS levels:
The risk assessment does not adequately address the possible impacts to sensitive life stages of Dolly Varden from projected TSS levels in the tailings impoundment. AC-17

Specific comments on the Water Quality Analysis:
Appendix A, pages A-8-9. Table 5 shows effluent limitations for ammonia. The text says that effluent limits would be more stringent for outfall 001, but table 5 shows them being less stringent. AC-18

Appendix A, page 25. Alternative C does not include recycling of water from the TSF. This is contrary to NPDES requirements. This would have been more clearly explained if the NPDES permit were included in the EIS. AC-19

Appendix A, page 25-6. The @RISK model inputs used average volumes for recycling water and probable maximum precipitation event. The extreme condition for both of these parameters should have been included in the modeling input to accurately predict all possible operating scenarios. AC-20

Appendix A, page 56. The limitations in the quality and consistency of the data set used to predict TSF water quality is discussed. The amount of variability in previous datasets of projected TSF water quality varied considerably, in some cases by orders of magnitude. The data set sizes were also limited for several parameters. These factors introduce uncertainty into model inputs and can produce results of questionable quality. These uncertainties should be better quantified and discussed in the EIS along with appropriate cautions about model output interpretations and applicability. AC-21

Appendix A, page 58. The model results predict that several months of low precipitation could limit dilution of the TSF effluent enough to cause exceedances of permit limits. The mine must be designed, built, and operated to provide for enough effluent holding capacity so that no discharge is required until the effluent meets all water quality standards. AC-22

Appendix A, pages 59-61. The data handling procedures are inconsistent between contaminants. A high measured concentration of copper (30 ug/l) was rejected as an outlier in the derivation of projected mill water copper concentrations. This had the effect of lowering the average copper concentration in the projected effluent and improving it's projected quality. AC-23

However, a high background level of aluminum in East Fork Slate Creek was allowed to be kept in the database. Having the result of raising the average background concentration of aluminum and resulting in less of a difference in projected effluent concentrations of aluminum and measured background concentrations of aluminum. This will result in a less restrictive effluent limit in the NPDES.

Data must be used consistently and within predetermined rules. Data outliers cannot be included or excluded in different manners according to what benefits the project proponent. All data handling methods used in the effluent quality projections and background metal concentrations should be peer reviewed by the Federal and State cooperating agencies for consistency and accuracy.

Appendix A, page 65. The possible need for an ultra-filtration system to remove TSS from the TSF outlet needs to be disclosed in the body of the EIS and included in the bond calculations for the mine operation. AC-24

Thank you for the opportunity to comment on the SEIS. If you have any questions about my comments, please feel free to call or e-mail.

Sincerely;

(Faxed copy signed)

Amy Crook

cc: Bill Riley, EPA
Kat Hall, SEACC
Bruce Baker, Lynn Canal Conservation
Sue Schrader, SEACC
Demian Schane, Earthjustice

Responses to Comments

Affiliation	*Comment ID*	*Response*
Center for Science in Public Participation	AC-01	Additional detail has been added to Section 4.6 to describe TSS levels in the lake and the discharge. This includes the incorporation of a reverse osmosis treatment system into Alternative D to ensure compliance with the applicable TSS limits during operations. Tetra Tech 2004 provides the results of modeling to show that sediment will not resuspend in the lake after closure.
Center for Science in Public Participation	AC-02	Comment noted. The Forest Service respectfully disagrees with the comment that the Final SEIS downplays the results of the habitability test. In fact, these data are the primary rationale for the conclusion in the Final SEIS and Ecological Risk Assessment that the tailings would not be recolonized at closure. They also form the basis for preserving areas in the lake that would not be covered with tailings and would support macroinvertebrates immediately after closure.
Center for Science in Public Participation	AC-03	As summarized in Section 1.7.1 and documented in USEPA 2004 (EPA May 17, 2004, memo) and the draft NPDES permit fact sheet, the “conversion” of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notice for the USACE permit and the draft NPDES permit were released to the public for comment.
Center for Science in Public Participation	AC-04	The draft NPDES permit was released to the public for comment in June 2004 and is included in the planning record.
Center for Science in Public Participation	AC-05	The reverse osmosis treatment system for the TSF discharge that is included in Alternative D will ensure compliance with the aluminum limits based on the statewide criteria. As for the existing discharge, Coeur Alaska must meet the applicable limits or risk noncompliance with its permit requirements. It is unclear whether the current treatment system provides adequate treatment for aluminum; however, this should become clear as additional monitoring is performed. At that point, a decision on further treatment will have to be made. This will occur well in advance of the mine's beginning full-scale operations.
Center for Science in Public Participation	AC-06	The Forest Service is obligated to establish financial assurance for both reclamation and the long-term integrity of the TSF. Financial assurance would be established based on the final plan of operations, which would not be completed until after the ROD is completed. There is no requirement under NEPA to include the actual bond calculation in the SEIS. The financial assurance will be reviewed on a periodic basis throughout mine operations. The Forest Service would specifically require additional financial assurances, as necessary, if the need for further water treatment is determined.
Center for Science in Public Participation	AC-07	Coeur Alaska may pursue a site-specific criterion based on background conditions in the future, but the SEIS analysis and draft NPDES permit are now based on the statewide criteria.
Center for Science in Public Participation	AC-08	There is no requirement under NEPA to include an NPDES permit as part of a draft EIS. The impacts discussed in the Draft SEIS reflected the limits that would have been established in the permit. The draft NPDES permit was released to the public for review and comment in June 2004. The limits established in the permit have been used as the basis for the analysis of impacts on the aquatic environment, including water quality.

Affiliation	Comment ID	Response
Center for Science in Public Participation	AC-09	As discussed by the commenter in each point, (1) The mitigation for air quality has been updated, as appropriate, to be consistent with the Plan of Operations and draft air quality permit, as appropriate. This will ensure that the predicted air emissions and impacts in the Final SEIS are accurate and consistent with applicable air quality regulations. Specifically, under the proponent's Plan of Operations, all ore conveyors would be enclosed or located inside other structures. (2) EPA does not have the authority to require ground water monitoring in the NPDES permit. Furthermore, the Forest Service has determined that such monitoring is not necessary because the tailings, waste rock, and borrow areas have very low potential to affect ground water quality. As for seepage, any discharges to surface water of runoff/seepage from the borrow areas will be addressed through the facility's storm water permit. Runoff/surface seepage from the waste rock pile on the Kensington "side" will be collected and discharged through the permitted mine drainage outfall. Runoff/surface seepage from the 4.8-million-ton pile on the Jualin property would be discharged to undisturbed areas. The Forest Service does not anticipate surface seepage from below the TSF dam. Note that there are no "pit walls" under any alternative. (3) Herbicides would not be used on National Forest land. The text in the Final SEIS has been modified to reflect this situation. (4) Mitigation measures as described in the BA/BE (see Appendix J) have been included to minimize underwater noise during construction and avoid impacts on marine mammals. Monitoring of marine mammals during operations is included Table 2-7.
Center for Science in Public Participation	AC-10	The Forest Service decided to complete a risk assessment for the TSF to specifically allow comparison of tailings disposal alternatives. This is not required under the NEPA process. The SEIS fully evaluates the impacts of other project elements of each alternative.
Center for Science in Public Participation	AC-11	See the response to comment AC-10.
Center for Science in Public Participation	AC-12	See the response to comment AC-10 related to the recommendation to complete a site-wide risk assessment. Assuming that item 7 in the comment refers to the TSF, there are several possible interactions between constituents. Certain constituents can (1) counteract the effect of each other, (2) cause independent effects, (3) cause additive effects, or (4) act synergistically. Ideally, the scientific literature would provide information to allow the type of cumulative analysis requested. Unfortunately, there is insufficient information, especially for aquatic organisms, to effectively allow this type of analysis.
Center for Science in Public Participation	AC-13	Boreal toads have only recently been observed in the vicinity of Lower Slate Lake. No studies have been undertaken to determine the extent of their presence in the Slate lakes nor are any studies planned. The decline of amphibians worldwide is well documented although the reasons for the decline are not. The southern Rocky Mountain population of boreal toads is a possible candidate for listing under the endangered Species Act; however, the Alaska population is not part of the candidate population. Since boreal toads on the Tongass are not considered a special status or management indicator species, the Forest Service has not added them to the analyses in the Final SEIS. Some additional information on boreal toads has been incorporated into the Ecological Risk Assessment (Appendix C).

Affiliation	Comment ID	Response
Center for Science in Public Participation	AC-14	The screening method is described in Section 3.0 (Appendix C, Vol. II). With respect to the threefold dilution, that value was selected to conservatively reflect that the daily input of tailings water into Lower Slate Lake and it is significantly less than the existing volume in Lower Slate Lake, and the incoming flow from East Fork Slate Creek. The TDS value of 1160 mg/L would occur only within the immediate vicinity of the tailings outfall. The Stekoll work looked at effects on fertilization and reported a lowest observed effect concentration (LOEC) of 1,875 mg/L. Because tailings will be placed at depth and fertilization occurs in the near-margin shallows, the TDS concentrations at the point of exposure would be much lower than the reported LOEC. Furthermore, at closure the TDS concentrations in Lower Slate Lake will be much lower than those near the outfall and should not pose risk to Dolly Varden char. The values used to compare concentrations when no screening values were available were from the scientific literature for uncontaminated sites. Where available, additional information has been included to clarify these comparisons.
Center for Science in Public Participation	AC-15	Aluminum is a very common element in soils and sediment. As indicated in Table 3.2 (Appendix C, Vol. II), the concentration of aluminum in the tailings is less than the concentrations in the existing LSL sediments. Precipitated aluminum, therefore, will not result in a long-term increase in the existing aluminum concentrations in LSL sediments.
Center for Science in Public Participation	AC-16	The risk assessment concludes that there is sufficient uncertainty on the overall effect of operations to project that sensitive life stages of Dolly Varden char will be present while the TSF is used for tailings disposal. After closure, modeling has shown that there will not be re-suspension of TSS from wind or wave action and, therefore, TSS levels will be protective of these stages at that time.
Center for Science in Public Participation	AC-17	See response to comment AC-15.
Center for Science in Public Participation	AC-18	The commenter is correct. The text of Appendix A has been revised to state that the limits for outfall 001 are slightly less stringent than the current limits.
Center for Science in Public Participation	AC-19	No. Coeur Alaska is no longer actively seeking the exemption.
Center for Science in Public Participation	AC-20	The modeling effort uses an average recycling rate because it is expected to be generally consistent throughout the life of the mine. It is also relatively low in comparison to the natural inflows and discharge rates. As for precipitation, the model considers the range of potential precipitation scenarios (including dry, average, and wet months) in the 1,000 “life of mine” runs.
Center for Science in Public Participation	AC-21	As the commenter notes, the uncertainties are discussed in Appendix A. The Forest Service, however, has determined that by modeling more than 1,000 “life of mine” scenarios, choosing reasonable, maximum potential constituent concentrations, and incorporating the reverse osmosis treatment system into Alternative D, the TSF discharge should meet water quality-based effluent limits under Alternative D.
Center for Science in Public Participation	AC-22	As discussed in the response to comment AC-21, the treatment system ensures compliance with permit limits and water does not have to be held under Alternative D. Under this alternative, the TSF has far more capacity than needed under all flow conditions.

Affiliation	Comment ID	Response
Center for Science in Public Participation	AC-23	As discussed in Appendix A, the value of 30 ug/L was statistically determined to be an outlier and eliminated from the analysis. The aluminum levels might be outliers, but unlike copper, several background levels exceed the criteria. This is no longer relevant because no site-specific criteria have been adopted and the discharge must meet limits based on the statewide criteria. The Forest Service agrees with the commenter that consistency in the analysis is generally important, but does not agree all data must be handled in the same way.
Center for Science in Public Participation	AC-24	The Forest Service performed modeling to determine compliance with the TSS limits and found that compliance cannot be ensured at this time without treatment. Additional treatment for solids removal using reverse osmosis has now been incorporated into Alternative D (see Sections 4.2.5 and 4.6.7).

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Berners Bay Alaska

Keep it WILD

Friends of Berners Bay

FRIENDS OF BERNERS BAY
16445 Point Lena Loop Road
Juneau, AK 99801

Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
Juneau, AK 99801

Subject: Kensington Gold Project DSEIS

Dear Mr. Hohensee

Friends of Berners Bay (FOBB) is a grassroots organization consisting of people who use Berners Bay and its surrounding lands for hunting, fishing, boating, kayaking, hiking, camping, and other outdoor activities. Our members place tremendous value on Berners Bay due to its accessibility, its remarkable scenic beauty and solitude, its wildland/roadless character, and its geological and ecological richness. Since 1985, FOBB has worked to protect these values from various threats. We are therefore concerned that the Kensington Gold Project will adversely impact the wildland character, solitude, and health of this productive ecosystem. JH3-1

In general, FOBB opposes Alternatives B and C of the DSEIS because we feel these alternatives would unnecessarily jeopardize the cultural, recreational, and ecological values of Berners Bay for current and future generations. Our comments, concerns, and recommendations on the Kensington Draft Environmental Impact Statement (DSEIS) are as follows:

Of greatest concern to FOBB is the promotion of the preferred alternative (Alternative B) as more environmentally "friendly" than other alternatives. For example, on page S-2 under Purpose and Need for Action, the DSEIS states: JH3-2

"The purpose of the proposed action is to consider certain changes to the 1998 approved Plan of Operations for the Kensington Gold Project regarding access, tailings disposal, and support facilities. The proposed action is needed to improve efficiency and <u>reduce the area of surface disturbance and other environmental impacts</u>." (emphasis added)

An important issue identified during the public scoping process was the potential for adverse impacts on users of and natural resources in Berners Bay. FOBB fails to understand how the new revised Plan of Operations, a plan that would scatter mining related infrastructure throughout an ecologically sensitive area (Berners Bay and its surrounding lands), could reduce the extent of disturbance and environmental impact of the approved project. JH3-3

We would like to point out the approved project would be confined to an area that has already experienced more than a decade of environmental disturbance and impact from prospecting activities associated with reopening the Kensington Mine, activities that have had considerable impact on the environment and the Lynn Canal viewshed. It makes more sense to restrict mining activities and resulting environmental and visual impacts to an area that already has experienced extensive site clearing for the construction of roads, various buildings, a waste rock dump, settling ponds, and an adit.

In summary, Alternatives B and C would unnecessarily <u>expand</u> mining related environmental disturbance to Berners Bay with great potential for harm to the area's well known ecological and recreational resources. For example, Alternatives B and C would require constructing a <u>new</u> pipeline access road through intact forests and wetlands, a <u>new</u> millsite (mill, warehouse buildings, maintenance shop, administrative offices, and laboratory), a <u>new</u> tailings storage facility in a natural lake, a <u>new</u> dam, <u>new</u> borrow areas, and two <u>new</u> marine transport facilities, all scattered throughout the greater Berners Bay area. While the DSEIS notes Alternatives B and C will disturb fewer acres of land than would Alternative A (a statement we disagree with), Alternatives B and C would disturb a variety of currently pristine habitats (lake, forest, wetlands, and beaches) from Cascade Point to the Johnson Creek millsite, a distance of 15 miles. The No Action Alternative (Alternative A) best protects the ecological, cultural, and recreational values of Berners Bay because mining activities would take place in an area already disturbed by mining related activities. JH3-4

Land Disturbance

Table 2-2 (Comparison of Alternatives by Disturbance) on page 2-3 of the DSEIS is misleading. The acreage of surface disturbance for Alternatives B and C should include existing disturbance resulting from prospecting activities. The disturbance associated with Alternatives B and C should also include the acreage disturbed by marine transport facilities and the roads necessary to access them. Finally, it is our understanding that disturbed areas reclaimed following operations are not included in the total disturbed JH3-5 acreage. We believe all lands and water bodies impacted by mining activities should be considered disturbed regardless of whether they will be reclaimed since reclamation may fail to restore the original condition or require decades to do so.

Tailings Storage Facility

The DSEIS says that even if tailings are not colonized by invertebrates in the short term following closure, over time the natural accumulation of sediment will provide invertebrate habitat. We suggest that a study is conducted to determine the rate of natural sediment production in Lower Slate Lake so that recovery times can be more accurately predicted. JH3-6

On page 60 of Volume 2, the DSEIS discusses two case studies that demonstrate recovery of benthic communities after cessation of tailings disposal. The DSEIS states: "As noted in these cases, the available evidence indicates that lakes used as tailing repositories can recover after the cessation of mining activities." While these case studies are intriguing, they are nonetheless just case studies and do not represent scientifically sound and rigorous research. For example, the Benson Lake study utilized a single control lake while the Anderson Lake study utilized internal controls. JH3-7 Furthermore, we would like to point out an expert review of MEND studies that was not mentioned in the DSEIS. JH3-8

A CRITICAL REVIEW OF MEND STUDIES CONDUCTED TO 1991 ON SUBAQUEOUS DISPOSAL OF TAILINGS MEND, Project 2.11.1d, July 1992 (http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111d-e.htm)

EXECUTIVE SUMMARY

MEND (Mine Environment Neutral Drainage) studies on the subaqueous disposal of tailings material (outlined under MEND project 2.1 1. 1) were subject to critical review by a group of experts, under the direction of the Rawson Academy of Aquatic Science, Ottawa. The review had two objectives. In summary, these were:

To provide technical and scientific assessment of MEND studies on subaqueous disposal of tailings (presented in Part I of this report).

To outline additional requirements necessary for the MEND studies on subaqueous disposal **to maintain a credible scientific approach.** (presented in Part H of this report)

The following key points were established during the review and subsequent discussions between the scientific review team (SRI) and representatives of MEND.

Technical and Scientific Assessment

Subaqueous disposal of tailings appears to offer physics-chemical advantages over terrestrial disposal, particularly with respect to sulphur oxidation and generation of acid waters.

The process of tailings disposal is potentially highly disruptive of lake ecosystems and normally it would take several decades (possibly centuries in some lakes) before natural sedimentation provided sufficient cover to insulate the lake ecosystem from the influence of the tailings (both the metals flux and substrate effects). However, remedial measures may be applied to reduce the extent of impact and accelerate recovery.

The MEND literature review of geochemical processes controlling metals release is excellent, it is well written and comprehensive (at the time of completion).

The background limnologies of the MEND case-study lakes (Anderson, Buttle and Mandy) are suitable only for gross comparisons. They do not support clear interpretation of cause and effect associated with tailings disposal.

Field studies were designed to obtain limited information, specifically to assess whether or not the reactivity of tailings disposed of underwater (in the real environment) remained low. For this purpose the data are sufficient; however, the data are neither useful to address effects which occur during the process of disposal nor long term ecosystem adjustments to the introductions of tailings. Limitations inherent in chemical extraction techniques may restrict the extent to which available data are used to address study objectives.

Additional Requirements

Suggestions have been made for more detailed field studies of (metals) fluxes in the case-study lakes, rates of accumulation and for measurements of **whole lake ecological response** and references are provided in the report. The reviewers' comments and recommendations, and further documentation are available from the MEND Secretariat.

A more extensive but selective literature review has been suggested to cover aspects of toxic effects, particle behavior in response to in-lake hydrodynamic conditions, improved field and analytical techniques and methods, and biological indices of whole lake effects.

The general view of a joint meeting between the SRT and representatives of MEND was that sites pecific preferences for subaqueous disposal of tailings would include:

- infilling of a small headwater lake;
- disposal in an artificial structure; and
- **in-lake disposal (in which tailings represent only a small part of the total lake volume).**

It was recognized that in-lake disposal was not a usual practice and may not be acceptable. To some extent, this view could modify future development of subaqueous disposal studies under the MEND program. (emphasis added in bold)

(End Executive Summary)

The expert review of these case studies identified several issues: 1) recovery can take decades, 2) the case studies lacked scientific rigor, 3) the primary focus was metal toxicity and not whole-lake ecological responses both during and after tailings disposal, and 4) limitations in the study design. The Kensington DSEIS should discuss the implications of this critical review of MEND studies on the potential for recovery of benthic invertebrates in Lower Slate Lake after mine closure.

We are also concerned that the DSEIS is overly reliant on sedimentation studies conducted in streams. If available, we would like to know more about studies that have examined the impact of sediment on lake ecosystems. JH3-9

Tailings Habitability Tests

Page 2-34 of the DSEIS states: "The tailings might not provide suitable habitat for some aquatic macroinvertebrate species."

The amphipod *Halella azteca* had poor survival (5%) in Kensington tailings habitability tests conducted by AScI Corp. These troubling results were dismissed, in part, because the amphipod abundance in Lower Slate Lake is considered low (October 15, 2003 memo from Ed Kline to Ron Rimelman and Steve Ellis). The memo suggests that because amphipods are only a small component of the invertebrate community, the high observed mortality rates in tailings (95%) are of no concern. It is interesting to note that in another memorandum (Ed Kline to Erik Klepfer, February 3, 2003, page 4) amphipods are considered common in Lower Slate Lake. This statement is used to justify the extrapolation of marine tailings habitability results to freshwater. These conflicting statements indicate an effort to dismiss negative results instead of confronting the implications of tailings habitability test results. JH3-10

Considering the high mortality of amphipods and low egg production and emergence of chironomids exposed to tailings, the habitability of Kensington tailings by freshwater invertebrates warrants further study. It is currently assumed that Lower Slate Lake tailings will be habitable by invertebrates based on marine in-situ experiments. The physical and biological characteristics of Lower Slate Lake sediment invertebrates are likely very different from sediment and invertebrates found Auke Bay. Thus, we recommend an in-situ habitability experiment be conducted in Lower Slate Lake contrasting the abundance and diversity of invertebrates that colonize lake sediments and tailings. We fail to understand why such a potentially illuminating experiment was not conducted in the first place.

Page S-2 of the DSEIS states: "Tailings disposal would require a smaller area of disturbance under the proposed action compared to the approved plan and would be more cost-effective." JH3-11

While this statement may be true on an acre for acre basis, the biological losses and risks associated with subaqueous tailings disposal (Alternatives B and C) in a natural lake supporting fish and wildlife populations, and draining into a salmon spawning stream should be directly compared to the biological losses and risks of dry-land tailings disposal (Alternative A) on forested wetlands. In other words, the DSEIS fails to analyze the relative environmental impacts of dry-land and subaqueous tailings storage options. Furthermore, we are troubled that in the interest of cutting cost and improving profits, a more environmentally harmful and untested technique for the disposal of mine tailings is preferred. JH3-12

On page S-6 (Environmental Consequences), the DSEIS asserts Alternative B would not affect water quality in Slate Creek downstream of the Tailings Storage Facility (TSF). However, the combination of enlarging the lake surface area, increasing turbidity levels (turbidity from suspended tailings), and reducing the depth of the lake would potentially increase summer water temperatures in the lake and lower East Fork Slate Creek. An increase in water temperature in the impoundment and creek could reduce dissolved oxygen levels or exceed thermal tolerances of fishes and macroinvertebrates. During potential low oxygen/high water temperature episodes, fishes and invertebrates living in Lower Slate Creek between the barrier and saltwater would not have access to temporary or permanent refugia (unless they can tolerate high salinity in Slate Cove), and fishes in the embryonic stage would be especially vulnerable to high temperature/low oxygen conditions. Models should be developed to predict the summer temperature regime of the TSF during and post-operation. JH3-13

Figure 2-14 on page 2-23 of the DSEIS depicts the post-closure TSF and the areas where benthic invertebrates and rooted plants <u>might</u> exist in the post closure impoundment. This depiction is speculative and the figure should be labeled in such a way that the reader understands that although this is what the lake is <u>intended</u> to look like post-closure, the distribution and community composition of plants and invertebrates in the lake may be much different depending on physical/chemical conditions in the post-closure impoundment. Indeed, we believe there is insufficient evidence that invertebrates and plants will recolonize the lake. JH3-14

Lower Slate Lake – Invertebrates

JH3-15

Biological assessments of Lower Slate Lake have examined the lake ecosystem at a very cursory level, especially the benthic macroinvertebrate fauna (BMI). BMI communities are a critical component of aquatic food webs and are well known to be variable in space and time. BMI sampling in Lower Slate Lake consisted of only 3 samples at two depths in two years. Such limited sampling very likely failed to accurately reflect the true abundance and diversity of BMI taxa in Lower Slate Lake. Furthermore, BMI data in the DSEIS should be given in meaningful units (e.g. number/unit volume or area) rather than numbers of individuals per sample. Otherwise, the reader has no means of making comparisons with other studies.

JH3-16

The focus of BMI sampling in Lower Slate Lake was overly concerned with the depth distribution of BMI at the expense of more meaningful abundance and diversity information. We strongly suggest additional sampling be conducted within the productive littoral zone and that all available habitats and substrate types (mud, detritus, gravel, aquatic macrophytes) be identified and sampled according to their relative occurrence. In this way, a more accurate picture of the BMI community can be derived. The limited data presented in the DSEIS represent only a snapshot in space and time and are thus of limited value.

JH3-17

BMI collected in Lower Slate Lake were identified to a very gross taxonomic level (Class, Order, and Family). Within these broad taxonomic categories, there is likely considerable diversity in habits, habitats, trophic level status, life histories, and sensitivity to environmental change at the genus and species taxonomic levels. The most abundant and ecologically important invertebrate group in most aquatic ecosystems, the Chironomidae, is especially diverse. It is only through a thorough understanding of the BMI community a genus and species level, that we can fully understand how invertebrates will respond to the radical change in the physical, chemical, and ecological environment during and after tailings disposal. For example, of the numerous chironomid species that likely inhabit Lower Slate Lake, only a few, if any, will likely thrive and persist in the post-closure impoundment. While a few taxa may tolerate post-closure conditions, the loss of other taxa will have ramifications throughout the terrestrial and aquatic food web.

JH3-18

On page 3-27 of the DSEIS, the littoral zone of Lower Slate Lake is described as relatively small (3.9 acres). The reader is not provided with a means of comparing Lower Slate Lake's littoral zone to other lakes. Likewise, the BMI community is portrayed as limited (in size) throughout the DSEIS even though the authors admit the BMI community was not compared to other lakes in Alaska. For example, on page 3-31 the DSEIS states: "Grab samples collected at a depth of 12 feet in Lower Slate Lake indicated limited benthic invertebrate populations." The reader is left wondering: to what standard is Lower Slate Lake being measure against? These are just a few of the examples of how the DSEIS focuses on presenting Lower Slate Lake as a less than productive or ecologically unimportant water body. Considering the rareness of lakes in the greater project area, Lower Slate Lake could have considerable ecological value regardless of its perceived level of productivity. As mentioned earlier, sufficient data are not available to quantify the lake's productivity. In a larger context, the lake may produce many more invertebrates, including adults consumed by birds and other wildlife, than the surrounding forest produces.

Page B-8, Vol. II of the DSEIS, states that discharges from the TSF will meet NPDES permit requirements for water quality. We recommend additional intensive baseline studies of the invertebrate community in Slate Creek (downstream of the proposed TSF and the receiving estuary to more fully describe the abundance and biodiversity of invertebrates. Studies conducted to date have not produced data sufficient to monitor water quality impacts on the invertebrate community. JH3-19

At the top of page 55 (Vol II) of the DSEIS and elsewhere, BMI communities are linked to light penetration. The assumption is that BMIs in Lower Slate Lake depend solely on autochthonous production. No data are provided in the DSEIS that establish a relationship between BMI distributions in Lower Slate Lake and light penetration. Certain types of BMIs also rely on allochtonous organic matter and associated bacteria and fungi as a source of food. More in-depth studies of Lower Slate Lake food web dynamics are needed to better understand the trophic pathways that support the BMI community. Only then can accurate predictions be made concerning what types of BMI will recolonize the post-closure impoundment. JH3-20

On page 55 (Vol. II) the DSEIS states: "Even if there are limitations to the short-term habitability of the tailings, even marginal colonization in tailings would result in a more substantial benthic population in the impoundment than in the existing lake." Again, given the limited knowledge of the ecology of and BMI abundance in Lower Slate Lake combined with the uncertainty that tailings will be habitable by invertebrates, the above statement makes is a huge leap in faith. We ask: where are the data to support such a conclusion? JH3-21

On page 55 (Vol. II) the DSEIS states in reference to Kline's (1988) in-situ tailings habitability experiments: "Differences between the reference sediment and tailings assemblages were <u>generally insignificant</u>, including total abundance, total biomass, number of taxa, average size of individuals, numerically dominant taxa, abundance by ecological guilds, and overall communtiy composition." (emphasis added) We take issue with the term generally insignificant. Here the term is used to suggest invertebrate communities were similar in tailings and marine sediments. Indeed, a reader looking at Fig. 5.1 on page 56 might come to the same conclusion. However, the logarithmic x-axis tends to minimize differences. We point out that data provided in Table 5.4 show that invertebrate abundance was 14 to 24% lower, biomass 4 to 30% lower, and individual size 11 to 21% lower in tailings than in natural marine sediment. These are ecologically "significant" reductions and deserve critical analysis in the DSEIS. JH3-22

Roads

On page 2-15 (Section 2.2.3, Alternative B: Proposed Action), the DSEIS states: "Alternatives B and C would require upgrading a 5-mile-long access road, constructing a 3.5-mile pipeline access road, and constructing a 1-mile cutoff road connecting the other two roads." The DSEIS should consider eliminating the 1-mile cutoff road which appears to be redundant because the pipeline access road can be accessed at the millsite from the Jualin Mine road. The DSEIS should consider the benefits of reduced environmental disturbance and preservation of wildland character by eliminating the cutoff road from Alternatives B and C. JH3-23

Reclamation

The DSEIS is not clear about how vegetation will be restored in reclaimed areas. The ability to effectively reclaim decommissioned roads and the millsite area will depend on the establishment of native vegetation after mine closure. Native seed should be used to establish vegetative cover on stored growth media (i.e. topsoil) and any other areas where seed is used to restore vegetative cover. Reclaimed areas should also be planted with native trees and shrubs. JH3-24

Seeding of erosion prone areas could introduce non-native invasive plant species to the area because invasives can often exist as contaminants in so-called native seed mixes. Invasive plant seeds could also be introduced by vehicles. The DSEIS should address the prevention of invasive plant introductions. The risks of introductions of non-native plants to the project area should be analyzed as well as direct and indirect affects of introductions on fish and wildlife. JH3-25

Noise

In table 2-9 on page 2-64, the DSEIS states: "Ferry would be audible at 2,000 feet depending on background conditions." This distance seems low. As tourism has grown in Juneau, catamarans are a common site on area waters. These large and fast vessels produce considerable engine noise that is audible for great distances, especially during calm days when engine noise is audible from catamarans from a distance in excess of two miles away (John Hudson, personal experience). The DSEIS should reexamine the 2,000 foot figure. Considering the high level of use of Berners Bay by people using non-motorized means of travel in an area appreciated for its solitude, the distance at which catamarans are audible under the most ideal conditions for noise transmittance should be reexamined. JH3-26

Marine Mammals

On page 3-38 of the DSEIS (section 3.10.4 Marine Mammals) it should be noted that harbor seals haul out on sand bars in the mouths of the Antler and Lace rivers in July and August (John Hudson and Andrew Eller, personal observation). JH3-27

Page 4-44 of the DSEIS states humpback whales generally feed on the western side of Berners Bay. There is no mention of the source of this observation. It is our experience that whales feed throughout the bay. We would also like to note that whales feed within 100 feet of the shoreline near Cascade Point (John Hudson, personal observation). JH3-28

On page S-6 under Environmental Consequences, the DSEIS states "Alternatives B and C could affect individual marine mammals, although there would not be population-level impacts". This statement ignores studies that are documenting large concentrations of Stellar Sea lions associated with eulachon spawning runs. In April, up to nearly 1,000 sea lions enter Berners Bay to feed on eulachon. On several occasions, scientists have observed hundreds of sea lions cooperatively foraging on eulachon. Under Alternatives B and C, the use of high speed catamarans to transport workers would potentially interfere with groups of cooperatively foraging sea lions and could very well have population-level impacts considering the evidence that eulachon provide them with an abundant and energy-rich food source prior to entering an energetically costly pupping period. JH3-29

Slate Cove

Construction of the marine transit facility in Slate Creek Cove would require filling intertidal habitats. Studies should be conducted to understand how this area is utilized by juvenile salmonids from Berners Bay tributaries. The Berners, Lace, Antler, and Gilkey Rivers are important spawning streams for salmon. Salmon leaving these systems for the saltwater portion of their life history may utilize the protected nearshore areas of Slate Creek Cove for important feeding areas prior to moving towards the Gulf of Alaska. JH3-30

Alternatives B and C would require constructing roads, pipelines, and a dam on public lands designated semi-primative non-motorized. Considering the high level of use of Berners Bay by the public for a variety of activities, avoiding disturbance to LUD II lands inconsistent with this designation and that would alter the pristine natural environment or create noise should be a major consideration of the DSEIS. We must strive to maintain the high integrity of wildland recreation opportunities that the public is accustomed to in Berners Bay. JH3-31

Fish

Page 3-41 of the DSEIS (3.10.5 Fish) incorrectly states the average coho run size into the Berners River is 30,000 fish. Average annual escapement of coho into the Berners River JH3-32 is nearly 10,000 fish; on average 20,000 coho that would have returned (escaped) to the Berners River are taken in the fishery each year.

The DSEIS suggests (page 3-43) that eulachon only spawn in the Antler River. Eulachon also spawn in the Berners/Lace rivers (see Marsten et al. 2002, cited in DSEIS) JH3-33

Page 4-33 of the DSEIS states: "It is expected all aquatic life will be lost during operations." We do not support a mining project that would eliminate the aquatic community of a lake in Berners Bay, both during operations and for several decades following closure. JH3-34

Oil toxicity

From Volume I, page 4-44 of the DSEIS:

"Marine fish take up petroleum hydrocarbons from water and food: however, within a few days after exposure, aromatic hydrocarbons are oxygenated into polar metabolites and excreted. For this reason, most fish do not accumulate and retain high concentrations of petroleum hydrocarbons, even in heavily oil-contaminated environments. They are, therefore, not likely to transfer them to predators (Neff, 1990)."

"Marine carnivores generally are inefficient assimilators of petroleum compounds in food. Since primary prey species are able to release hydrocarbons from their tissue (Neff and Anderson, 1981), biomagnification does not occur. There is no direct correlations between a marine mammal's trophic level and the concentration of residues that it might consume. In fact, top carnivores, such as polar bears and killer whales that feed on large pelagic fish and seals, are less likely to be exposed to petroleum in their food than are species, such as baleen whales and walrus, that feed on zooplankton and benthic invertebrates (Neff, 1990)."

Oil toxicity studies cited above provide an incomplete and outdated view of oil toxicity on fishes. In addition to the discussion of oil spill effects on pages 4-49 and 50 of the DSEIS, we would like discuss other studies that have examined the impacts of polycyclic aromatic hydrocarbons (PAHs) on fish. There is a growing body of research demonstrating that very low concentrations of PAHc can have significant chronic effects on fishes. JH3-35

Due to their high lipid content, fish eggs and the eggs of other aquatic species retain and accumulate PAHs. For example, tissue burdens in herring or salmon embryos can be 150-fold greater than the concentrations in water (Carls et al. 1999, Heintz et al. 1999), and because embryonic and larval tissues are undifferentiated, sublethal effects acquired during these life stages may translate to lethal effects later on (Heintz et al. 2000). Irreversible damage incurred at the earliest developmental stages is the result of the metabolism of the acquired PAHs. Embryos are capable of metabolizing those compounds (Binder and Stegeman 1980) and most tissues are capable of demonstrating some capacity for metabolizing PAHs (Carls et al., NMFS Auke Bay Lab, In preparation). However, PAH metabolites are capable of causing a variety of effects in developing embryos and larvae. In herring these include teratogenesis, clastogenesis, death, and impaired swimming behavior (Carls et al. 1999). This accounts for the observations of increased mortality during incubation of herring, salmon, fathead minnows, and mummichogs embryos exposed to aqueous PAH concentrations lower than the Alaska water quality criteria for wild populations (Carls et al. 1999, Heintz et al. 1999, Couillard 2002).

This new approach to risk is particularly important because PAHs that were considered not bio-available under the approach used by Neff and others are, in fact extremely toxic. The outdated approach to oil toxicity studies focuses on compounds that are volatile, abundant and relatively soluble in water (e.g. benzene, toluene, xylene and ethyl-xylene or BTEX compounds). Compared to other PAHs (with more benzene rings) the BTEX compounds are not particularly toxic, but their relative solubility and abundance means that they can be bio-available in sufficient quantities to cause acute toxic effects. In contrast, napthalenes, phenanthrenes, and chrysenes (among many others) have not been considered to be very bio-available because they are not readily soluble in water and are generally less abundant. Consequently, these compounds are not typically associated with acute toxic effects, but the most recent data indicate that acute effects are not the greatest concern.

These less soluble compounds are capable of exerting extreme effects on populations at concentrations that are not acutely toxic. For example, pink salmon incubated in water contaminated at the Alaska State water quality criteria experienced a 50% decrease in survival between fertilization and maturity relative to an unexposed population (Heintz et al. 2000).

We are concerned that sensitive life stages of herring and other intertidal species near marine transport terminals will be chronically exposed to low concentrations of PAHs. The likely presence of PAHs near Marine Transport Facilities would expose herring and other organisms to these toxic oil constituents slowly eroding the population due to a constant reduction in survival. Preliminary data indicate that exposing a pink salmon population to the Alaska State water quality criteria for PAHs for 30 generations increases its probability of extinction by a factor of 50. If these effects are combined with a second equally toxic exposure then extinction is guaranteed (Heintz, NMFS Auke Bay Lab, in preparation).

Construction of marine transport terminals near herring spawning sites may have a direct impact on the Lynn Canal herring stock. Also, recent observations by NMFS Auke Bay Lab personnel of large aggregations of larval eulachon rearing in Berners Bay in February also suggest the potential vulnerability of an important prey base for apex predators in Lynn Canal. However the sensitivity of eulachon larvae to oil is unknown as is their behavior and distribution in Berners Bay following emigration from the river. Finally, construction of a road (e.g. Juneau Access Project) along Berners Bay will introduce highway runoff containing hydrocarbons. It is not known how this will add to the PAH exposures experienced following construction of marine transport terminals. Therefore, the cumulative contributions of hydrocarbons to Berners Bay from a Juneau

JH3-36 JH3-37 JH3-38

Access road and marine transport terminals should be considered in the DSEIS. Finally, unpublished data for Auke Lake in Juneau shows that low levels of recreational boating in the lake in summer has a measurable effect on the PAH concentrations in the lake's surface waters (Carls, NMFS Auke Bay Lab, In preparation). Consequently increased recreational use resulting from improved access will also impact the bay. Thus, marine transfer sites, road building and increased motor traffic should not be considered in isolation because contaminant loads are additive. Finally, baseline herring population data (egg abundance surveys) should be constructed prior to construction of marine transport terminals so than any adverse impacts from oil toxicity on early life stages of herring can be measured. JH3-38

Recreation

Berners Bay is valued by many people for its remarkable recreational opportunities in such close proximity to a large urban community. Alternatives B and C of the DSEIS would do irreparable harm to the scenic character and solitude of Berners Bay. The DSEIS should give more consideration to the impacts of constructing two marine transport facilities on the near-pristine shoreline of Berners Bay. Receptionists leaving Echo Cove by a variety of water craft are accustomed to the undeveloped nature of the Berners Bay coast. Constructing marine terminals at two locations in the bay will alter the wild character of this place in great disproportion to the size of these facilities. JH3-39 Furthermore, the multiple catamaran crossings of Berners Bay every day, and at night, will severely diminish the quality of the outdoor experience. Imagine awaking in your tent to the sounds of a 3 a.m. catamaran run to Slate Cove. The DSEIS should consider quantitative studies that analyze the impact of Alternatives B and C on the quality of backcountry recreation in Berners Bay. JH3-40

In closing, FOBB appreciates the opportunity to comment on the Kensington Gold Project DSEIS.

John Hudson
Friends of Berners Bay

Literature Cited

Carls, MG; Hose, JE; Thomas, RE; Rice, SD. 1999. Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval Pacific herring (Clupea pallasi). Environmental Toxicology and Chemistry. Vol. 19, no. 6, pp. 1649-1659.

Couillard, CM. 2002. A microscale test to measure petroleum oil toxicity to mummichog embryos. Environmental Toxicology [Environ. Toxicol.]. Vol. 17, no. 3, pp. 195-202.

Heintz, RA; Short, JW; Rice, SD. 1999. Sensitivity of fish embryos to weathered crude oil: Part II. Increased mortality of pink salmon (Oncorhynchus gorbuscha) embryos incubating downstream from weathered Exxon Valdez crude oil. Environmental Toxicology and Chemistry. Vol. 18, no. 3, pp. 494-503.

Heintz, RA; Rice, SD; Wertheimer, AC; Bradshaw, RF; Thrower, FP; Joyce, JE; Short, JW. 2000. Delayed effects on growth and marine survival of pink salmon Oncorhynchus gorbuscha after exposure to crude oil during embryonic development. Mar. Ecol. Prog. Ser. Vol. 208, pp. 205-216.

Stegeman,J.J.; Binder,R.L. 1980. High benzo[a]pyrene hydrolase activity in the marine fish Stenotomus versicolor. Biochem. Pharmacol., 28(10), 1686-1688.

Responses to Comments

Affiliation	*Comment ID*	*Response*
Friends of Berners Bay	JH3-01	Comment noted.
Friends of Berners Bay	JH3-02	The SEIS discusses the potential impacts from each of the alternatives on a broad range of resource areas. The document does not present one alternative over another as being environmentally “friendlier” since each of the alternatives presented would result in environmental impacts. The purpose and need statement is a requirement of NEPA and is based in part on the reasoning behind the proponent’s submittal of the revised Plan of Operations. The SEIS was developed in response to the revised plan. The statement that the revised plan would reduce the area of surface disturbance refers to physical impacts on the land–Alternatives B, C, and D would directly impact fewer acres than Alternative A.
Friends of Berners Bay	JH3-03	Historically, mining has occurred on both the Kensington and Jualin claims. Extensive exploration has also occurred on both claims over the past 10 to 15 years. Under all alternatives, the tailings disposal facility would be located on previously undisturbed land. The ROD at the beginning of the Final SEIS explains the rationale for selecting the chosen alternative and addresses the issue of facilities spread across multiple watersheds including the north and south shores of Berners Bay.
Friends of Berners Bay	JH3-04	See the response to comment JH3-03.
Friends of Berners Bay	JH3-05	The acreages impacted presented in any of the calculations in the Final SEIS include the areas of existing disturbance under all alternatives since most of these disturbances would remain in place or be expanded under all alternatives. The figures represent the maximum extent of disturbance— without reclamation—and include Upper and Lower Slate lakes (as applicable) as well as the disturbance associated with the marine terminals at Slate Creek Cove and Cascade Point. The Cascade Point access road is not included in the acreage impacted because the Forest Service and the USACE have already approved/permitted it.
Friends of Berners Bay	JH3-06	While a study of the rate of sediment production would reduce the uncertainty in the estimate of the time required to cover the tailings, the operational plan for the TSF creates an area of natural sediment equal to the existing productive area in Lower Slate Lake. As sediment covers the tailings, potentially productive areas will increase so that the ultimate productive area is greater than currently exists. Because successful reclamation of Lower Slate Lake does not require colonization of the tailings, there is no need for a study of sedimentation rates.
Friends of Berners Bay	JH3-07	The case studies mentioned are presented as part of a “weight-of-evidence” approach that was directed at looking at a variety of information that would allow for an assessment of potential risk. The conclusions of the risk assessment are not dependent on the case studies, which are strictly included as another line of evidence used in the evaluation. The ecological risk assessment (Appendix C) has been modified to include the information from the cited critical review of the MEND work.

Affiliation	Comment ID	Response
Friends of Berners Bay	JH3-08	As discussed in the response to comment JH3-07, the case studies were presented as part of a “weight -of-evidence” approach used for the risk assessment. The conclusions of the risk assessment, therefore, rely on several different evaluations and available information. The case studies are presented because they have some relevance to the use of Lower Slate Lake as a TSF. There are however, several important differences between the case studies and Lower Slate Lake. One of the more important differences is that the Benson Lake tailings were pyrite-rich and therefore acid generation and metal leaching were of concern. This is not the case for the Kensington tailings, which have a different geology and pose low risk of acid generation and metal leaching. A second important difference is that the tailings will be placed such that there is an equivalent spatial area of native substrate available for recolonization at closure as currently exists. This plan will expedite recovery of the system, since the habitability of tailings is not required.
Friends of Berners Bay	JH3-09	The Final SEIS describes in detail in Section 4.6, the impacts of tailings disposal on Lower Slate Lake during operations and after closure. It is true that much of the available data on total suspended solids levels in surface water and related impacts on aquatic species have been obtained from streams rather than lakes. The Final SEIS, including the risk assessment, assumes no aquatic life during operations when tailings input and settling would occur. Modeling further shows that after closure no re-suspension will occur and TSS levels will approximate natural conditions. The bottom areas of the lake that would not be covered with tailings are also expected to provide habitat comparable to the current lake bottom.
Friends of Berners Bay	JH3-10	Given the uncertainty of the habitability of tailings by at least some types of macroinvertebrates, the operational plan specifies that a productive (i.e., sufficient light) spatial area of native substrate equal to that which currently exists would be created at the time of closure. In addition, Alternative D requires that a native substrate cover be installed over the tailings unless the operator can demonstrate during operations that uncovered tailings will not cause toxicity throughout the lake.
Friends of Berners Bay	JH3-11	The comment states “the Draft SEIS fails to analyze the relative impacts of dry-land and subaqueous tailings storage options.” The commenter is referred to Chapters 2 and 4 for lengthy discussions of the differences between the two tailings disposal options and the subsequent environmental impacts generated by each.
Friends of Berners Bay	JH3-12	The Draft SEIS did not put forth a preferred alternative. Alternative B, the proposed action, reflected the proponent’s proposal. The proponent is entitled to submit a proposal as it sees fit whether it is based on economics, profit, or environmental concerns.
Friends of Berners Bay	JH3-13	Temperature profiles from Lower Slate Lake indicate that there is thermal stratification of the lake in the summer, with the warmest water occurring near the surface, primarily due to water coloration, which limits light penetration into the lower depths of Lower Slate Lake. By October, stratification is lost, with the lake demonstrating only limited temperature differences with depth. Currently, Slate Creek receives water discharged from the surface of Lower Slate Lake. This will continue to be the case during TSF operation and at closure. For that reason, changes in the thermal profile of Slate Creek are not expected.

Affiliation	Comment ID	Response
Friends of Berners Bay	JH3-14	Text in Section 2.3.5 was edited per the comment. The text was modified to reflect that the figure is predictive in nature. As documented in Appendix C, Ecological Risk Assessment, there is sufficient evidence to show the tailings will recolonize. ADNR participated as a cooperating agency in this analysis and provided review comments and agreed that recolonization will occur.
Friends of Berners Bay	JH3-15	We agree that biological communities are highly variable in time and space. The characterization completed on Lower Slate Lake is sufficient to characterize productivity zones and limitations, as well as relative diversity and productivity. The resident fish are opportunistic and will use a wide-variety of prey species. Additional information on the macroinvertebrate sampling was included so that comparisons with other studies can be made.
Friends of Berners Bay	JH3-16	See the response to comment JH3-15.
Friends of Berners Bay	JH3-17	See the response to comment JH3-15.
Friends of Berners Bay	JH3-18	The description of Lower Slate Lake as having limited productivity is primarily associated with the lake bathymetry, nutrients, and water color. These factors combine to limit the area of Lower Slate Lake that receives sufficient light to allow for primary production. The littoral zone (where primary production occurs) is approximately 25 percent of the lake. Its bathymetry does not lend itself to large shallow flats where primary production typically occurs. The dark color of the water (attributed to the amount and type of dissolved solids) also limits the depth at which phytoplankton production occurs in the lentic zone. Lower Slate Lake is classified as oligotrophic, or nutrient-limited, which is directly related to the amount of run-in it receives. Because of the lack of primary production, the resident Dolly Varden fish are smaller than those from surrounding areas, which limits their food sources. This typically leads to the fish being in poorer condition, which can affect growth, size, and reproduction. Oligotrophic, mesotrophic, and eutrophic are limnological terms that are widely accepted and used to describe the range of production in a system from poor to rich, respectively.
Friends of Berners Bay	JH3-19	See the response to comment JH3-15. The draft NPDES permit, which was distributed for comment in June 2004, requires sampling in Slate Creek during facility construction (to further define the baseline) and annually during operations. This has been incorporated into the Final SEIS.
Friends of Berners Bay	JH3-20	The collected empirical data demonstrates that there is low production at depth. The discussion in the ecological risk assessment (Appendix C) further discusses the relationship between the empirical productivity data and the light penetration data.
Friends of Berners Bay	JH3-21	The statement as listed reflects the uncertainty of the habitability of the tailings. As discussed in previous responses, the operational plan results in a spatial area of natural substrate that is of equal size to the currently existing conditions. If there is colonization of the tailings, the overall spatial area that is productive will be greater than presently exists.
Friends of Berners Bay	JH3-22	The data needed to make comparisons between tailings and native substrate are provided in Table 5.4. As listed in this table, some of the results in the tailings are lower (poorer) than those in marine sediments, while some are essentially the same or higher (better) than those in the native marine sediments. The overall comparison of the different studies is provided in Figure 5.1, which shows that most of the marine tests resulted in comparable results in tailings and sediment. Additional text has been included to clarify these comparisons.

Affiliation	Comment ID	Response
Friends of Berners Bay	JH3-23	The 1-mile-long cutoff road would be required for safe transport and access to the TSF in the winter when maintaining the road across Snowslide Gulch would be a threat to safety. Although its removal would reduce some impacts on vegetation and wildlife habitat, the road needs to be included for safety reasons. The road is also intended to provide access to Lower Slate Lake following mine closure and reclamation of the pipeline road.
Friends of Berners Bay	JH3-24	Coeur Alaska has submitted a reclamation plan included in Appendix D that provides details on reestablishing vegetation. The reclamation plan has been considered in developing clarifications and revisions throughout discussions in Sections 2 and 4.
Friends of Berners Bay	JH3-25	The potential impacts of introduced species are discussed in Section 4.12.2. The potential for the introduction of invasive species by vehicles, while possible, would be relatively low since vehicles would not be brought to the site on an ongoing basis. The Forest Service would require the control of invasive species on National Forest lands, and as a result, impacts on fish and wildlife are not expected. See also the response to comment JH3-24.
Friends of Berners Bay	JH3-26	The discussion of noise in Section 4.18 was revised to clarify the distances from which mine-related noise (including the crew shuttle boats) would be heard. To place things in context, the crew shuttle boats would be significantly quieter than an airboat. The original proposal to use a high-speed catamaran for a crew shuttle has been modified. Goldbelt has indicated that it will use a monohull vessel approximately 75 feet in length with a passenger capacity of 145 persons and an operating speed of 12-18 knots.
Friends of Berners Bay	JH3-27	The Final SEIS describes harbor seal populations in Berners Bay and the potential impacts on harbor seals from Alternatives B, C, and D in Section 4.10.3.
Friends of Berners Bay	JH3-28	The statement indicating that humpback whales feed in the western portion of Berners Bay has been removed from the text.
Friends of Berners Bay	JH3-29	Section 4.10 of the Final SEIS and the BA/BE (see Appendix J) include discussions of the potential effects of three to five vessel trips per day (2–3 trips per day during the eulachon run) on foraging sea lions. The conclusion is that the reduced speed and noise of a monohull vessel would not create population-level impacts on sea lions.
Friends of Berners Bay	JH3-30	The SEIS notes that juvenile salmon are likely to be rearing near this facility, and the types of impacts are discussed in Section 4.10. ADNR has participated in this analysis and provided input to the analysis and conclusions related to Slate Creek Cove.
Friends of Berners Bay	JH3-31	None of the proposed project's features lie within Land Use Designation II. The proposed project's pipelines, dams, and most of the roads would be constructed on land that has been inventoried as being Semi-Primitive Non-Motorized, but has a land use designation of Modified Landscape with a Minerals Overlay. This designation allows for future resource activities such as mining to alter the recreational character of the area from Semi-Primitive Non-Motorized to Roaded Modified. This land use designation emphasizes multiple use objectives for National Forest lands. Approximately 1.5 miles of the proposed project access road would lie outside the Modified Landscape designation, but within the Semi-Primitive Non-Motorized area. Because the road already exists, the Forest Service would change the road corridor to a Semi-Primitive Motorized setting during the next inventory.
Friends of Berners Bay	JH3-32	Comment noted.

Affiliation	*Comment ID*	*Response*
Friends of Berners Bay	JH3-33	Section 3.1 of the Final SEIS has been revised to indicate that eulachon spawn in the Lace and Berners rivers as well as the Antler River.
Friends of Berners Bay	JH3-34	Comment noted.
Friends of Berners Bay	JH3-35	The SEIS acknowledges that low levels of PAHs may have harmful effects. However, since PAH concentrations are higher in crude oil than in diesel fuel (which would be the hydrocarbon source at the site), the likely levels of PAHs should remain very low based on the best management practices that would be implemented as part of normal crew boat operations. The proponent has entered into an agreement with The Nature Conservancy and NMFS to conduct a long-term monitoring plan, including the collection of data beginning in spring 2004 to establish a baseline of hydrocarbon concentrations in the vicinity of Echo Cove, Cascade Point, and Slate Creek Cove and continue monitoring during operations.
Friends of Berners Bay	JH3-36	Sections 3.10 and 4.10 discuss herring and the impacts that would be associated with construction of the Cascade Point facility. The text has been supplemented to provide additional information on noise and the nature and extent of the threat from hydrocarbons. Table 2-6 describes mitigation measures that would minimize impacts on herring spawning.
Friends of Berners Bay	JH3-37	Section 3.10.5 includes a reference to the presence of larval eulachon in the vicinity of Slate Creek Cove. Impacts on aquatic resources in the vicinity of the Slate Creek Cove marine terminal from oil are discussed in Section 4.10 but are expected to be minimal as the opportunities for hydrocarbon contamination near the facility would be limited.
Friends of Berners Bay	JH3-38	NMFS and ADNR have proposed a monitoring plan for impacts on herring and other marine resources at Cascade Point. The program would be initiated in 2004 and would continue through the construction and operational phases of the facility.
Friends of Berners Bay	JH3-39	The visual impact of both terminals has been simulated and discussed on page 4-84 of the Draft SEIS. The Slate Creek Cove simulation is presented in Section 4.14, and the Cascade Point facility is simulated in the EIS prepared for Cascade Point Access Road (USFS, 1998). The Final SEIS describes the expected impacts from the mine-related operation of the marine terminals. However, it is important to recognize that most of the lands from the boat ramp in Echo Cove to Cascade Point are privately owned and would not require any further NEPA action to be developed. The Forest Plan identifies a road corridor that would accommodate the Juneau Access Road across National Forest land should that project move forward.
Friends of Berners Bay	JH3-40	See the response to comment JH3-26. The impacts of crew shuttle traffic on campers are discussed in Section 4.13.3. The Final SEIS provides a quantitative analysis of existing recreational activities in Section 3.13 based on available information. Impacts on recreational activities due to noise and wakes generated by the crew shuttles are also quantified in Section 4.13. A quantitative study of the quality of the recreation experience and the future behavior of recreationists would be difficult, except through visitor preference surveys.

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F.E.E.D.

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March 5, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group
USDA Forest Service
8465 Old Dairy Road
Juneau, AK 99801

Reference: Letter of Support

Dear Mr. Hohensee;

SN-1

The Foundation for Environmental Education Development (F.E.E.D.) favors the selection of **Alternative B** by the U.S. Forest Service and Cooperating Agencies as the environmentally preferred course of action for the following reasons:

- Alternative B will meet applicable water quality standards.
- Alternative B will result in the smallest amount of land disturbances.
- Alternative B offers the best long-term reclamation proposal.

F.E.E.D. is committed to conservation and preservation projects in the field of mining and its related industries. Our mission statement strongly supports programs that bring scientific methods and balance to issues of Natural Resource Industries and their interaction with, their impact on, and their vital necessity to civilized society.

Feel free to contact me for further discussion.

Sincerely,

Sharon Nipp
Executive Director

Responses to Comments

Affiliation	*Comment ID*	*Response*
Foundation for Environmental Education Development	SN-01	Comment noted. The Forest Service has considered the Foundation's views and comments in preparing the ROD.

Juneau Audubon Society
PO Box 21725
Juneau, AK 99802

Steve Hohensee
Tongass Mineral Group
8465 Old Dairy Rd.
Juneau, AK 98101

March 6, 2004

Re: Kensington Gold Project Draft Supplemental Environmental Impact Statement

Dear Mr. Hohensee,

SS-1

Members of the Juneau Audubon Society wish to express their concern regarding the potential ramifications of Coeur Alaska Inc.'s proposed gold mine north of Juneau. We are particularly concerned about impacts on the aquatic and adjacent terrestrial habitat of Berner's Bay, and associated wildlife species. This area has been of special interest to the Juneau Audubon Society for over 10 years. The proposed development action, Alternative B, poses undesirable levels of direct loss of habitat, degradation (e.g., fragmentation) of remaining, terrestrial habitat, and disruption to aquatic habitats and wildlife. In addition to the potential loss of inherent values of the Bay, Juneau Audubon is disturbed by the likely decline of recreational and educational values of the Berner's Bay area.

<u>BERNER'S BAY UNIQUE HABITAT</u>

SS-2

Berner's Bay is ecologically unique in the Juneau area and of regional importance for avian and wildlife species within Southeast Alaska. The congregation of birds and wildlife that inhabits and visits Berner's Bay is an extraordinary phenomenon that is limited to major mainland rivers of Southeastern Alaska. Berner's Bay, along with other major mainland rivers of southeastern Alaska, supports one of the most diverse assemblages of breeding birds in Alaska (Johnson et al., in press). Movement corridors to the interior are infrequent in Southeast Alaska and represent a vital habitat component for breeding land bird species. 92% of southeastern Alaska's breeding land bird species (Armstrong and Gordon 2001) are found in these areas, including Berner's Bay. The members and associates of Juneau Audubon have recorded 135 species using this area (see attached list). Johnson et al. noted 70 species breeding within habitats associated with the Antler River, which flows into Berner's Bay. These authors also indicated the importance of major mainland rivers, such as the Antler, to breeding birds. The importance of these rivers may be attributed to several ecological factors including habitat heterogeneity, (including structural and compositional complexity of vegetation at

SS-2 (cont'd)

both local and landscape scales), high primary productivity, presence of surface water (Kessel 1998), and unique connectivity to other regional populations of birds.

Adjacencies of riparian and upland systems with freshwater and marsh ecosystems create diverse habitats for birds in Berner's Bay. These river delta landforms are distinct from and uncommon relative to the spruce-hemlock forests that dominate southeastern Alaska uplands. Dynamic river processes maintain habitats such as deciduous shrublands and freshwater marshes within this area. These varied ecosystems support the coexistence of both ground-nesting terrestrial species and breeders which are dependent on aquatic habitat. Estuaries of large rivers provide water and food sources for foraging waterfowl and piscivorous birds, moulting waterfowl, and nesting loons and grebes. Species uncommon to southeast Alaska, like Common Yellowthroat, Northern Waterthrushes, Red-winged Blackbirds, Rusty Blackbirds, and Song Sparrows find habitats in areas like Berner's Bay.

Berner's Bay is unique in the northern panhandle of Alaska for supporting large yearly runs of eulachon, herring, and salmonids (including sockeye, pink, chum, coho, Dolly Varden and cutthroat trout) within the watersheds. This source of food is extremely important not only for migrant species such as Thayer's gulls and shorebirds, but also for breeding success in our resident Bald Eagles. These anadromous fish provide one of the most important food resources for a variety of animals (Willson and Halupka 1995). Anadromous fish also enrich riparian areas which results in increases in the abundance of aquatic and terrestrial invertebrates. This may, in turn, result in relatively high densities of breeding birds near salmon streams compared to non-salmon streams in southeastern Alaska (Gende and Willson 2001). Eulachon provide an important food source for birds at Berner's Bay. More than 46,000 avian predators, composed primarily of gulls but also including 34 additional species of seabirds, shorebirds, waterfowl, and land birds, were observed foraging on both live and dead eulachon (Marston et al. 2002, Johnson et al., in press). Eulachon are high in lipid content and provide an abundant, early spring food resource for birds; this fish may be an important factor in determining the reproductive success of Bald Eagles and other species of piscivorous birds in the region.

USE OF INDICATOR SPECIES TO DETERMINE EFFECTS OF DEVELOPMENT ALTERNATIVES

SS-3

The Draft Supplemental Environmental Impact Statement (DSEIS) lists Management Indicator Species (MIS), Sensitive Species, and threatened and endangered species, and species of concern (Table 3-24), and attempts to outline the potential threats to these species under different alternatives. However, there is not sufficient documentation to link the ecological information provided regarding these species and the habitat analysis done for each alternative. For example, the document provides limited information on the habitat requirements, dispersal abilities, current population levels, and local or regional numbers necessary to maintain viable populations of these species. Thus it is difficult to compare the outcomes of different alternatives with respect to wildlife over the immediate or long term. A more substantial risk analysis must be provided. Uncertainty regarding the ecological requirement of species and the ability to evaluate

SS-3 (cont'd)

effects on habitat or populations should be explicit. The MIS list does not include some important species, such as the Western Wood-Pewee, that have been recorded singing in the Berner's Bay area and are considered by working groups such as Boreal Partners in Flight (1999) to be of conservation concern.

TERRESTRIAL HABITAT

SS-4

The analysis of terrestrial habitat in the DSEIS is misleading. The vegetation categories (Table 3-29) provide primarily timber volume information. The DSEIS attempts to link these categories to the habitat needs of MIS or other species. The document should provide clearer definitions of categories of old growth, including the compositional, structural, or functional attributes the categories provide beyond timber production (e.g., as habitat). These may be the best data available for the analysis but the shortcomings should be clear in relating habitat needs to the MIS.

The patch size analysis is similarly incomplete. The current state of the project area is shown to consist of 18 patches (Table 3-26), though the "one remaining patch" of 13, 883 acres (p. 3-47) is not listed here. Thus, when examining Table 4-13, it appears that, regardless of the alternative chosen, the number of large patches (>1000 acres) always increases. This must be at the expense of the one remaining patch which is now, presumably, dissected into smaller pieces, representing an overall loss and degradation of habitat for some species. An examination of the resultant adjacencies of habitat types under different alternatives would be appropriate. This would allow for examination of the gain or loss of different ecotones, and the potential for dispersal of species with specific habitat requirements among patches of their preferred habitat type. The DSEIS notes that "increased level of edge effect from fragmentation would occur under all alternatives" (p. 4-51). A map of edge-influenced habitat for each alternative, based on expected depth of edge influence for each species and activity of concern, could provide more insight on amounts and spatial distribution of remaining, suitable habitat.

SITE MONITORING

SS-5

Bird communities in species-rich landscapes like Berner's Bay must be monitored to identify when activities affecting communities occur. Riparian areas contain unique ecological communities that are sensitive to both human and natural disturbances. Any periodic assessment of the status of bird populations or response to habitat alteration will require designs that address the complex mosaic of habitats and the unique and diverse assemblages of bird taxa along these mainland river systems.

Any development alternative chosen should include a monitoring protocol. Monitoring should not be implemented merely to determine the effectiveness of mitigation measures (p. 2-42) but also to foresee harm. There is no mention of statistical power of monitoring activities or how critical effect sizes will be determined. Given the limited baseline data on species, community ecology, and effects of this type of development in Southeast Alaska, one would expect design of a monitoring scheme to be prioritized. Although monitoring procedures would be developed more fully if or when an alternative is selected, there should be explicit recognition that this component of management would also be tailored to the development alternative. The ability to implement effective monitoring with control points and feedback to further management activities should be one criterion for choosing a preferable Alternative. There is no indication that Coeur Alaska considers monitoring an integral component of their extraction and management activities in the area.

CUMULATIVE IMPACTS

SS-6

Berner's Bay has not been designated as a protected area meriting special attention by the federal or state government, and may thus be subject to cumulative impacts from mining, road construction, and increased urban development. Such activities could drastically alter or destroy riparian habitat quality and its value to a regionally-unique avifauna. The DSEIS document should not underestimate these activities and their combined impact, with potential mine development, to Berner's Bay. A major road development is proposed for Lynn Canal. Thus, rivers of Berner's Bay (Berner's, Lace, and Antler) and the unique habitats they form are in the direct path of several proposed activities at the same time. The effects of these projects on the wildlife and avian communities may be cumulative not only in space but over time.

The document is insufficient in the discussion of direct and indirect cumulative impacts of roads associated with the Juneau Access Project Alternatives and of other developments (e.g., in Echo Cove south of Berner's Bay), with respect to hydrology, movement of native species, or invasion of exotic species into adjacent habitats. It is clear from Figure 4-4 that hydrological impacts and fragmentation by the Juneau Access roads should be considered concurrently with that imposed by the Kensington Mine projects and should be included in assessment of edge effects and any patch analysis. Currently, only "blowdowns, slope erosion, and firewood collection" are mentioned as indirect effects of the compounding road projects (under Vegetation, p. 4-125). Other ecological ramifications of fragmentation are not indicated and are only listed as "likely to be minor" for wildlife (4.21.10 *Wildlife*). More explicit mention of the cumulative ecological effects of these roads, and the analysis by which they were determined to be minor would aid in evaluation of the proposed development alternatives.

Potential cumulative effects on functional properties of wetlands in the project area are not addressed adequately. The current adjacencies, i.e., spatial distribution, of multiple habitat types allow Berner's Bay to support the diversity of ecological communities that it does (see above). This suggests that distributing effects across a number of wetland types regionally could be more rather than less disruptive functionally. To note that these impacts "would not result in a significant loss in diversity or function…" (p. 4-124) implies a statistical analysis has been conducted, that this analysis had sufficient power to detect an effect size of concern, and that no effect was detected. Yet no citations of a statistical design or analysis are provided to support this statement.

JUNEAU AUDUBON'S USE OF BERNER'S BAY

SS-7 For the past ten years, Juneau Audubon Society has offered spring tours of Berner's Bay to the community of Juneau. These tours are dependent on the scenery and abundance of wildlife. The timing of our tours coincides with the arrival of the eulachon runs and spring migrating birds. Over the years we have brought hundreds of birders and naturalists to witness the special character of Berner's Bay. This activity is an on-going educational and fundraising event. We have a vested interest in the maintenance of the recreational opportunities, visual integrity and "wildness" of Berner's Bay.

GENERAL COMMENTS

SS-8 We encourage the Forest Service to require Coeur Alaska, Inc. use adaptive management approaches that proceed with the best interest of both human and nonhuman ecological communities in mind. These management strategies should be presented to support public confidence in the wise use of Berner's Bay resources. In regions such as Southeast Alaska where natural dynamics of ecosystems and management impacts at local and regional scales are not well understood, the precautionary principle should prevail. The proponent of the development must demonstrate that risk is not exceptional or, in the absence of full scientific knowledge and proof of absence of harm, act to avoid such potential harm. We do not believe that Coeur Alaska, Inc. has met the burden of proof that development of the Kensington Mine will be done in a prudent manner and that pro-active approaches will be used to prevent impacts. The vitality and viability of any social and economic community are directly linked to its ecological sustainability. Although the *Irreversible and Irretrievable Commitment of Resources* section (4.22) lists most commitments as minor or localized, the data provided were inadequate for the reader to reach these same conclusions comfortably. The DSEIS of the proposed development options is insufficient to allow a choice for, against, or among alternatives using wellbeing of the Juneau community as the criterion of acceptance.

Thank you for the opportunity to submit our comments regarding the DSEIS document and the development alternatives for the Kensington Gold Project.

Sincerely,

Sari Saunders
Chair, Conservation Committee
Juneau Audubon Society

References Cited

Armstrong, R.H. and R.A. Gordon. 2001. Birds of southeastern Alaska: an annotated checklist. Juneau Audubon Society and U.S.D.A. Forest Service, Juneau, AK.

Boreal Partners in Flight Working Group. 1999. Landbird conservation plan for Alaska biogeographic regions, v. 1.0. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK. (cited in Johnson et al., in press).

Johnson, A.A., B.A. Andres., and J.A. Bissonette. In press. Distribution, abundance, and associations of birds along major mainland rivers of Southeastern Alaska. GTR-XX. US Fish and Wildlife Service, Anchorage, AK.

Gende, S.M. and M.F. Willson. 2001. Passerine densities in riparian forests of southeast Alaska: potential effects of anadromous spawning salmon. Condor 103: 624-629.

Kessel, B. 1998. Habitat characteristics of some passerine birds in western North American taiga. University of Alaska Press, Fairbanks, AK.

Marston, B.H., M.F. Willson, and S.M. Gende. 2002. Predator aggregations during eulachon (*Thaleichthys pacificus*) spawning runs. Marine Ecology Progress Series 231: 229-236.

Willson, M.F. and K.C. Halupka. 1995. Anadromous fish as keystone species in vertebrate communities. Conservation Biology 9: 489-497.

Birds Identified at Berner's Bay (supporting list for JAS comments on Kensington Gold Project DSEIS, March 2004)

This working list has been compiled by Sari Saunders from lists by Mary Willson, Jeff Nichols, Paul Suchanek, and USFWS surveys, which were initially provided to John Hudson and Liz Blecker.
The area covered by this list includes the mouth and drainage of Cowee Creek, which drains into Berner's Bay, and areas along Berner's R. (within 1-2 miles upstream).

Red-throated Loon
Pacific Loon
Common Loon
Yellow-billed Loon

Horned Grebe
Red-necked Grebe

Double-crested Cormorant
Pelagic Cormorant

Great Blue Heron

Greater White-fronted Goose
Snow Goose
Canada Goose
Brant

Trumpeter Swan

Gadwall
Eurasian Wigeon
American Wigeon
Mallard
Blue-winged Teal
Northern Shoveler
Northern Pintail
Green-winged Teal
Ring-necked Duck
Lesser Scaup
Unidentified Scaup spp.
Harlequin Duck
Surf Scoter
White-winged Scoter

Long-tailed Duck
Bufflehead
Common Goldeneye
Barrow's Goldeneye
Hooded Merganser,
Common Merganser
Red-breasted Merganser
Osprey
Bald Eagle (Adult and Immature)
Northern Harrier
Sharp-shinned Hawk

Northern Goshawk
Red-tailed Hawk
Golden Eagle
Kestrel
Merlin

Blue Grouse

Sandhill Crane

Black-bellied Plover
American Golden-plover,
Semipalmated Plover
Killdeer

Black Oystercatcher
Greater Yellowlegs
Lesser Yellowlegs

Spotted Sandpiper
Whimbrel
Hudsonian Godwit
Ruddy Turnstone
Black Turnstone
Surfbird
Semipalmated Sandpiper,
Western Sandpiper
Least Sandpiper
Baird's Sandpiper
Pectoral sandpiper
Rock Sandpiper
Dunlin
Unidentified dowitcher spp.
Common Snipe
Red-necked Phalarope

Pomarine Jaeger
Parasitic Jaeger
Bonaparte's Gull
Mew Gull
California Gull
Herring Gull
Thayer's Gull
Glaucous-winged Gull
Glaucous Gull
Black-legged Kittiwake
Arctic Tern

Common Murre
Pigeon Guillemot
Marbled Murrelet
Unidentified Puffin spp.

Great-horned Owl
Northern Pygmy-owl
Short-eared Owls

Common Nighthawk
Vaux's Swift

Rufous Hummingbird

Belted Kingfisher

Red-breasted Sapsucker

Downy Woodpecker
Hairy Woodpecker

Western Wood-Pewee

Northern Shrike

Black-billed Magpie
Northwestern Crow
Common Raven

Horned Lark
Violet-green Swallow
Tree Swallow

Chestnut-backed Chickadee

Red-breasted Nuthatch
Brown Creeper
Winter Wren

Golden-crowned Kinglet
Ruby-crowned Kinglet

Mountain Bluebird
Townsend's Solitaire

Swainson's Thrush
Hermit Thrush
American Robin
Varied Thrush

American Pipits

Cedar Waxwing

Orange-crowned Warbler
Yellow-rumped Warbler (Myrtle and Audubon's)
Townsend's Warbler
Common Yellowthroat
Wilson's Warbler

American Tree Sparrow
Savannah Sparrow
Lincoln's Sparrow
Fox Sparrow
Song Sparrow
White-throated Sparrow
White-crowned Sparrow
Golden-crowned Sparrow
Dark-eyed Junco
Lapland Longspur

Red-winged Blackbird
Brewer's Blackbird

Brown-headed Cowbird

Pine Siskin

Responses to Comments

Affiliation	*Comment ID*	*Response*
Juneau Audubon Society	SS-01	Comment noted.
Juneau Audubon Society	SS-02	Comment noted.
Juneau Audubon Society	SS-03	The habitat requirements for the species listed in Table 3-24 have been adequately defined relative to the potential impacts that may result from the considered actions. Much of the analysis the commenter suggests involves a landscape-level approach, which was done forest-wide under the revised 1997 Forest Plan (e.g., viability analysis for many species occurring on the Tongass National Forest). Such analysis is not appropriate at the project level. The modification of specific habitat components and the potential effects are discussed in sections 4.11 and 4.12. The MIS list of species is not meant to include all species, but species that are most associated with, or obligated to certain habitat types. The western wood-pewee is noted under the migratory species section as a species of conservation concern (see Appendix H).
Juneau Audubon Society	SS-04	Table 3-29 has been dropped from the document; please refer to the revised Tables 3-25 and 3-27 for relevant habitat types within the project area and Table 4-18 for affects to these habitats under the various alternatives. The discussion in Section 3.12.2 describes the character of the various types of productive old-growth forests (high-, medium- and low-volume old-growth) that occur within the study area. The functional characteristics of the various habitat types have been defined relative to types of habitat that may be of use by important wildlife species (see Section 3.12). Also, the patch analysis has been corrected (the 13,883 acre patch was incorrect). The two patches of productive old-growth forest greater than 1,000 acres consisted of 1,624 acre and 5,216 acre patches. Under Alternatives B, C, and D, one of these patches is fragmented into two patches. A map of edge effects influence on species would add little to the analysis of effects, and is not required to determine impacts of each of the alternatives.
Juneau Audubon Society	SS-05	We agree that large riverine systems provide important and various habitats for many wildlife species. Very little riparian area will be affected by any of the alternatives, and will be mostly restricted to road crossings of local tributaries. The major riparian areas of the region, those along the major rivers entering the bay (e.g., Antler, Lace, and Berners Rivers), will be unaffected under any alternative. Therefore, the level of potential impacts to these habitats does not warrant the level of detailed monitoring requested. Further, there is no statutory requirement for monitoring of bird populations under the current regulatory framework. The Forest Service and other permitting authorities will require extensive monitoring, mitigation, and conservation measures that will be implemented as part of this project (see Mitigation and Monitoring – Section 2.5). All forest-wide Standards and Guidelines will be followed, and the monitoring methods proposed are adequate for the types of activities that will occur and are commensurate with the types of monitoring that occurs on National Forest System lands as part of forest-wide monitoring plan.

Affiliation	Comment ID	Response
Juneau Audubon Society	SS-06	The cumulative effects discussion in the SEIS includes an assessment of the cumulative impacts of the Kensington Gold Project in combination with other reasonable foreseeable actions. The analysis includes information presented in the technical reports recently prepared for the Juneau Access Improvements Supplemental Draft EIS. The Kensington Gold Project would have minimal effects on hydrology or the quality of riparian habitat within the Johnson and Slate creek drainages. Disturbances in the riparian corridor within the Johnson Creek drainage consist of upgrading two existing bridges, which are upstream of the anadromous portions of the river. Water rights permits and minimum instream flow values established and administered by ADNR would limit impacts to flows in these creeks. The Kensington Gold Project would not directly, indirectly, or cumulatively affect the habitat quality of the Berners, Lace, and Antler rivers and would contribute little to cumulative effects on water quality. Section 4.21.10 discusses the cumulative impacts of wildlife, including birds. Assuming that construction and operation of a road option described in the Juneau Access Improvements Supplemental Draft EIS were to occur during the life of the Kensington Gold Project, there would be cumulative impacts. A detailed assessment of fragmentation, edge effects, or patch analysis is not possible since it would depend on the final alignment of the road. However, Section 4.21.10 acknowledges that the road would cause additional fragmentation, patches, and edge effects than just the mine operation alone. The discussion further acknowledges that Juneau Access Road would create an additional barrier to travel by large mammals. Ultimately, the life span of the mining operation would be short in the time frame of the development of an old-growth forest (150 years); therefore, the cumulative impacts contributed by the mining operation over the long-term are expected to be minor. There is no reason to believe that the diverse ecological communities will not generally continue to function in the project area's wetlands, particularly the palustrine and lacustrine wetlands and open water habitat, including Upper Slate Lake and Spectacle Lakes during operations. Fill would be removed from wetlands within the pipeline access road and wetland vegetation and hydrology are expected to return quickly after reclamation. The reference to significant has been removed from the text regarding wetland impacts.
Juneau Audubon Society	SS-07	Comment noted.
Juneau Audubon Society	SS-08	The Forest Service will use an adaptive management approach in dealing with operations at the Kensington Gold Project. Section 2.5 discusses monitoring and mitigation that would apply to each of the alternatives. In adaptive management, monitoring and evaluation are used to assess the effects of management decisions and identify new information. For example, reclamation of the TSF (should one of those alternatives be selected) would be refined based on the success of habitability studies of the tailings conducted during the operation. The monitoring program for hydrocarbons near the marine terminals could result in the need for additional BMPs or a change in operating procedures should results indicate that the practices initially approved were not effective. The Forest Service, EPA, USACE, and the state as the main permitting authorities will work together to ensure that the appropriate mitigation measures are being successfully implemented, minimizing the level of risk to the extent possible.

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Lynn Canal Conservation, Inc.
Post Office Box 964
Haines, Alaska 99827

February 24, 2004

Steve Hohensee, SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
Juneau, AK 99801

RECEIVED
FEB 27 2004
Juneau Ranger District

Subject: 2004 Kensington Gold Project DSEIS

Dear Mr. Hohensee:

We appreciate the opportunity to comment on the 2004 Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed Kensington Gold Project. Lynn Canal Conservation, Inc. (LCC) is a non-profit, volunteer grassroots conservation organization based in Haines, Alaska that works to protect the environment of the Lynn Canal area. LCC was founded in the 1970s and has approximately 100 members. Our members utilize the area in which the proposed Kensington Gold Project is located and have an interest in its protection. We have been actively engaged in commenting on the mine since the 1990s.

GENERAL COMMENTS ON DSEIS

SC-1 LCC is opposed to the proposed mine and maintains that the DSEIS fails to meet the requirements of the National Environmental Policy Act (NEPA).

SC-2 **LCC Opposition to the Mine.** We oppose the mine because it would result in considerable harm to public interest natural resources that our membership and others in Haines utilize. The way the DSEIS is written leaves it up to Alaskans and their fellow Americans to absorb the costs, both monetary and non-monetary, of having their natural resource use opportunities in the area significantly degraded.

SC-3 **DSEIS Non-Compliance with NEPA.** When deciding what actions to include in an EIS, NEPA regulations require the Forest Service to consider several kinds of actions, including connected, similar, and cumulative actions (40 CFR 1508.25(a)). NEPA regulations require agencies to consider cumulative actions "which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement." (40 CFR 1508.25(a)(2)) (emphasis added) NEPA also requires the Forest Service to evaluate "the incremental impact of the action when added to other past, present, and reasonably foreseeable actions" (40 CFR Section 1508.7) in the Berners Bay-Lynn Canal area.

We contend that the DSEIS violates these NEPA provisions because it fails to adequately describe the impacts of the proposed mine itself and because it denies the reader an opportunity to adequately consider the mine's incremental impacts in the broader context of cumulative impacts likely to occur from <u>all</u> projects that have been initiated or actively promoted in the Berners Bay-Lynn Canal area. The DSEIS mentions some other foreseeable actions but fails to thoroughly describe the cumulative adverse environmental, economic, and social impacts resulting from the proposed action in combination with other actions.

SC-4 As just one example, on **page 3-37**, the DSEIS states that "There is considerable overlap in the biological communities between Lynn Canal and Berners Bay." On **S-6**, the DSEIS makes the totally unsubstantiated leap of faith that "Alternatives B [proposed action] and C could affect individual marine mammals, although there would not be population-level impacts." These two statements fail to fully describe the degree to which biological impacts in Berners Bay also constitute or trigger biological impacts in nearby Lynn Canal, and how it can be reasonably concluded that adverse impacts on individual members of a population would not have an effect on the population itself.

SC-5 These statements also do not fully describe what the combined or cumulative effects would be in both Lynn Canal and Berners Bay resulting from the proposed Kensington project and other anticipated or actively pursued projects such as development of Goldbelt Corporation's property at Cascade Point, Senator Murkowski's bill in Congress providing for the conveyance of more than 12,000 acres of National Forest land in and adjacent to the Kensington project site to private ownership, the Governor's proposed road between Juneau and Skagway that would transect the Berners Bay area (Alaska 2004), Temsco's proposal for commercial heli-hiking on Berners Bay ridges, and future development of the Jualin Mine.

SC-6 **<u>Alternative B vs. Alternative A.</u>** The DSEIS fails to adequately demonstrate how Alternative B, the proposed action, is less environmentally damaging than the already approved Kensington mine design on the Comet Beach side of Lynn Canal (Alternative A in the DSEIS and Alternative D in the 1997 EIS). The public needs to have the benefit of such a comparison so that it can determine whether Alternative A or B poses the least harm to the environment.

SC-7 On **page S-2** of the DSEIS, the Forest Service states that a revised mine plan is needed to "reduce the area of surface disturbance and other environmental impacts." There has already been considerable habitat disturbance on the Comet Beach side of Lions Head Mountain. Based on a scant four-page analysis, the Forest Service allowed, in 1988, the construction of a production-size adit. The company has since received agency approval to use the adit for full mine development. Associated with the adit are site clearing, a rock dump clearly visible from Lynn Canal, settling ponds, roads, and a work camp. To the extent that <u>any</u> of these existing disturbances would remain in place if Alternative B were approved, they need to be considered as environmental impacts under <u>both</u> Alternatives A and B, as well as Sub-Alternative C.

SC-8 Again on **page S-2**, the Forest Service contends that "Tailings disposal would require a smaller area of disturbance under the proposed action compared to the approved plan . . ."

This is an overly simplistic statement because the biological losses and risks associated with discharging mine tailings into an undisturbed natural lake (Alternative B and Sub-Alternative C) that supports fish and which drains into a salmon spawning stream should be directly compared to the biological losses and risks associated with the dry tailings disposal plan that Coeur proposed and was granted agency approval of under Alternative A. The SEIS needs to feature a far more thorough and realistic comparison of the biological impacts of these two tailings discharge options.

SC-9

Finally, while we firmly believe that the Forest Service must strengthen its comparison of environmental impacts between Alternatives A (including Sub-Alternative A1) and B (including Sub-Alternative C), there remains the following central issue:

<u>It is difficult to understand how the Forest Service's DSEIS can possibly be in conformance with NEPA when the only indicated alternatives to Alternative B (proposed action) are Sub-Alternative C, already approved Alternative A, and Sub-Alternative A1.</u>

SC-10

The Forest Service has conveniently described Alternative A as the no-action alternative, apparently because the company is already permitted to implement Alternative A even though it does not choose to do so with today's spot commodity gold prices running as high as $400 or more per ounce. If Coeur has no intent to implement Alternative A, then the same must be assumed for Sub-Alternative A1.

SC-11

This raises a serious question as to Coeur's credibility because its public statements at the time when federal, state, and borough governments were going through the expense of reviewing and approving what is now Alternative A, suggested that they would be able to operate the mine at a profit once gold prices reached today's level.

SC-12

As for Alternative B and Sub-Alternative C, LCC contends that neither is legal under state law (see subsequent section of this letter on water quality and state law).

SC-13

<u>The upshot is that by our review, the DSEIS contains *no* decision options that are both legal and considered by Coeur to be economically viable.</u>

SC-14

<u>Unsubstantiated Optimism.</u> Contrary to the intent of NEPA, the DSEIS presents a narrow view of potential adverse impacts, fails to explore them thoroughly and in the context of impacts from other actions, and tends to come down on the side of unsubstantiated optimism rather than on the side of caution regarding the protection of renewable natural resources and their use by people.

A reader of the DSEIS is left with the impression that it has been written to make approval of Alternative B look possible rather than to objectively describe the environmental impacts that are likely to result from the proposed action and to present a realistic assessment of whether various forms of mitigation can be expected to achieve an adequate level of protection for non-mineral natural resources.

1997 Record-of-Decision Shortcomings Persist. Concerns raised in the Southeast Alaska Conservation Council's (SEACC) October 2, 1997 appeal of the Forest Service's August 1, 1997 Record of Decision for the Kensington mine still apply. A prime example is contained in the following quotation from SEACC's 1997 appeal.

> "In Chapter 4 of the 1997 FSEIS, the Forest Service justifies its restricted cumulative impact analysis by stating:
>
> 'The Kensington Gold Project is not located within the Berners Bay watershed and, for most resources, is not expected to produce either direct or indirect impacts on the Berners Bay area. This cumulative impact analysis considers existing and reasonably foreseeable projects occurring with[in] the Berners Bay watershed. <u>However, it only addresses effects of these projects where the Kensington Gold Project would contribute to such impacts. An analysis of the potential impacts of other projects to resources in Berners Bay that are not affected by the Kensington Gold Project is beyond the scope of this Final SEIS and by definition do not contribute to the cumulative effects of the Kensington Gold Project.</u>'" (emphasis added)

SC-15

The language underscored above is a convoluted argument that contradicts the intent of NEPA. NEPA requires that cumulative impacts be analyzed. It is irrelevant whether, as stated above, "potential impacts of other resources in Berners Bay are affected by the Kensington project" or by some other projects. For environmental impact assessment purposes, the lower Berners Bay watershed and estuary, the uplands on the west side of Lions Head Mountain, and the marine waters of adjacent Lynn Canal constitute a logical ecosystem. NEPA asks the federal government to identify and assess the combined effects of various projects, as independent from one another as they might be. Combined (cumulative) impacts from all projects are likely to be greater than those from any one of them alone. There can even be a synergistic effect in which the combined impacts resulting from different projects have a greater adverse environmental impact than the sum of individual impacts would suggest. In its response to the 1997 SEACC appeal, the Forest Service has missed the point entirely.

The above quote from the 1997 FSEIS is more than an historic curiosity because that SEIS is described by the Forest Service as the foundation for the 2004 DSEIS. In other words, the two documents must be considered together by both the public and the Forest Service official who signs the next Record of Decision for this mine.

SECTION-SPECIFIC COMMENTS ON DSEIS

MARINE ENVIRONMENT

SC-16

Overview. The statements on **page S-6** indicate that large numbers of seabirds, shorebirds, sea lions, humpback whales, and other marine mammals "enter Berners Bay for limited periods in the spring" and that "[t]hey feed on eulachon that congregate in the areas surrounding Slate Creek Cove prior to spawning in the Antler and Berners rivers."

These statements downplay the occurrence of these animals and salmon during other times of the year. They also downplay the disturbance these animals are likely to experience from 3 to 5 round trips per day, year-round, through Berners Bay by a high-speed 149-passenger ferry (**page 2-29**), as well as by frequent barge shipment of mine supplies and product through the bay area.

SC-17 Although it said on **page 3-37** that "There is considerable overlap in the biological communities between Lynn Canal and Berners Bay," the DSEIS fails to emphasize that connection throughout the document. For example, there is no defensible analysis of how disturbance of fish within the bay would be likely to affect the health and vigor of the dense populations that are commercially fished outside the bay in nearby Lynn Canal and elsewhere.

SC-18 **Marine Mammals in General.** On **page S-6** of the DSEIS Summary section is the unsubstantiated declaration that "Alternatives B and C could affect individual marine mammals, although there would not be population-level impacts." This statement is typical of many in the document.

SC-19 It is conceded on **pages 4-44 & 45** that vessel and helicopter pose potential risks to marine mammals. The DSEIS states that "[e]xcessive noise can place marine mammal populations at risk by displacement of animals from optimal feeding areas, inducing undue stress (leading to autoimmune diseases), masking communication, causing hearing injury and loss, and even in some cases causing mortality." The DSEIS goes on to say (**page 4-43**) that harbor porpoises tend to move away from vessels and that sea lions and harbor seals generally vacate haul-out sites when approached too closely. This is an important topic among marine mammal research scientists, and the SEIS needs to be SC-20 comprehensive in its presentation of results from such research. There is a growing body of literature suggesting that vessel noise also affects the distribution and behavior of schooling pelagic fishes (Ona and Thoresen 1988, Freon et al. 1993, Valbo et al. 2002). Again, the SEIS needs to reflect such research and explain not only Alternative B's potential direct implications for fish schools using the Berners Bay area but its potential secondary effects on the marine mammals that feed on these schools as well.

SC-21 **Steller Sea Lions.** The SEIS needs to describe the temporary haulout that sea lions sometimes establish at the south side of the entrance to Slate Creek Cove during the eulachon run. The document also needs to describe the impacts that Alternative B would have on this haulout and whether there is mitigation that would be effective in avoiding such impacts.

SC-22 The DSEIS mentions the abundance of sea lions in the Berners Bay area and even mentions their habit of rafting up in mid-bay to rest. The document also recognizes their threatened status under the federal Endangered Species Act. It states on **page 4-44** that if sea lions abandon the bay during a critical feeding period (such as the spring eulachon run) it may have a significant negative impact on the population. What the DSEIS does not do is impart a sense of urgency to protect local sea lions by not disturbing them with significantly increased vessel traffic and a significantly increased likelihood of toxic spills, even if that requires disapproval of Alternative B or Sub-Alternative C.

Currently, there is no research that directly connects the ephemeral spring eulachon runs with individual or population fitness parameters of sea lions such as increased growth rate, survival, and reproductive success. However, there is mounting evidence suggesting
SC-23 that eulachon runs in the bay are important to population fitness. The size of the aggregation (as many as 900 sea lions, the largest such concentration noted for sea lions at eulachon runs in Southeast Alaska - Womble et al.), the timing of the runs (just before breeding), and the nutritional benefits (high lipid composition) all suggest a potential link between utilization and fitness. It is misleading to omit the suggestive evidence for such linkage.

On **page 3-40** it is noteworthy that the number of sea lions reported in the bay some years has far exceeded the peak counts at Benjamin Island. This suggests that the eulachon run
SC-24 in the bay is of greater regional importance for the Southeast Alaska population than just those using Benjamin Island. By way of omission, the DSEIS understates the potential importance of Berners Bay eulachon to Southeast Alaska sea lions that do not use Benjamin Island.

Also on **page 3-40**, we question the accuracy of the statement that most sea lion at
SC-25 Benjamin Island are juveniles between 10 and 11 months of age. This statement comes as a surprise to those of us who have spent time observing sea lions on the island.

Harbor Seals. We see no mention in the DSEIS of the harbor seal haulout on the rocky point on the north side of the entrance to Slate Creek Cove. At times there are several dozen seals there, including very tiny pups (possibly newborns). Any vessel traffic past
SC-26 the point or disturbance near it, especially before, during, and after the spring eulachon run could disturb the seals. The SEIS needs to recognize this haulout, describe the impacts that Alternative B or Sub-Alternative C would have on it, and indicate what if any mitigation would be effective in preventing such disturbance.

The population structure of harbor seals (**page 3-41**) is currently under review, but mitochondrial DNA (mtDNA) data suggest far more extensive population structure than is assumed under current management. There appear to be as many as 12 unique stocks
SC-27 (Westlake and O'Corry-Crowe 2002; O'Corry-Crowe et al. 2003). The implication is that smaller populations may have regionally specific trends. Thus influences of Berners Bay may be relatively greater because effects are directed at a smaller population (e.g. Lynn Canal stock) as opposed to a larger region-wide population throughout Southeast Alaska.

Migratory Birds. The SEIS needs to indicate the degree to which there could be an environmental issue with migratory birds as a reflection of fish runs in the bay area.
SC-28 Thousands of Thayers Gulls migrate through the bay during the eulachon run on their way to the Canadian High Arctic. The SEIS needs to fully explain the degree to which Berners Bay eulachon provide essential energy for these birds' successful onward

SC-28 northbound migration. The SEIS also needs to fully describe how large numbers of scoters feed on Berners Bay herring spawn before migrating to breeding grounds in the Interior. The SEIS needs to make clear how disturbance to herring runs (in the years when this occurs in the bay) could have an impact on scoters, a bird already known to be declining in numbers. Bald eagles that come to the bay to feed on eulachon are migrants as well, either adults moving to nesting areas or immatures moving north from wintering areas farther south. Here again, the SEIS needs to explain this fact and describe how human-caused disturbance can impact this behavior.

SC-29 **Eulachon (and capelin).** **Page 3-43** mentions only one location of spawning from radio tagged fish, yet they may spawn far more extensively in the lower Berners Bay watershed. The SEIS needs to be far more comprehensive than it is on the distribution and life cycle of eulachon throughout the year in the Berners Bay area.

SC-30 For example, in early February 2004 a National Oceanic and Atmospheric Administration (NOAA) field crew detected on their depth sounder a large school of fish at 50-70 meters. They towed on the school and caught what were later identified as larval eulachon mixed in with large schools of larval capelin. This indicates two things: First, the DSEIS needs to depict the seasonal distribution and abundance of eulachon, and capelin, within and adjacent to Berners Bay throughout the year. Second, the document needs to pay much greater attention than it has to describing potential adverse impacts on these species from the substantially increased vessel traffic that will result from transportation of crews, equipment, supplies, and mine product across Berners Bay and adjacent marine waters under Alternative B or Sub-Alternative C.

SC-31 **Herring.** **Page 3-44** describes the suppressed state of herring populations in the Lynn Canal-Auke Bay area and commercial fishing is mentioned on **page 3-75**. However, the DSEIS falls short in making the connections between the strength and recovery of the herring population, the effect a suppressed herring population is likely to have on commercial fishing of predatory salmon in the Berners Bay-Lynn Canal area, and the potential exacerbation of the suppressed stock problem by Kensington mine related impacts such as disturbance of fish schools by vessel traffic and toxic material spills. This is a good example of the DSEIS's failure to choose on the side of caution in protecting and rebuilding herring stocks and, in turn, protecting the salmon stocks that prey on the herring, and the livelihoods of fishermen who depend upon the salmon for their livelihoods.

SC-32 **Other Commercially Valuable Fish Species.** **Pages 3-45 & 46** describe which commercial fish species occupy Berners Bay and adjacent Lynn Canal marine waters. Haines fishermen are among those who participate in the halibut, sablefish, salmon, Dungeness crab, or shrimp fisheries there. The SEIS needs to feature a more detailed description of the degree to which direct and indirect adverse impacts to these fisheries are possible or likely as a result of mine related activities and other reasonably foreseeable actions in the Berners Bay area. Examples of direct effects are changes in fish behavior or survival due to increased vessel traffic or toxic material spills. An example of an indirect impact is a serious reduction in feed fish, notably eulachon or herring due to resource development activities, not only along the shorelines where facilities are sited, as indicated in the DSEIS, but out in open water as well.

SC-33 The following is an *example* of information needed in the SEIS if the public and agency decision-makers are to be fully informed of commercial fisheries values in Berners Bay and adjacent marine waters, and the potential risks to these fisheries that could result from Kensington mine related activities

SC-34 Other than the chum salmon, which are primarily a DIPAC/NSRAA* fish, the majority of the salmon caught in Lynn Canal from the latitude of Little Island, north of Lincoln Island, to the latitude of Seduction Point, at the south end of the Chilkat Peninsula, are destined for either the Chilkat or the Chilkoot rivers. The majority of these fish tend to migrate across Lynn Canal somewhere between Mab Island and Pt. Sherman. They tend to mill just off Mab Island and along the Point St. Mary shoreline. They circle in huge schools, moving up and down the coast with the tides, swimming in the giant eddies caused by the movement of water in and out of Berners Bay. Often the wind and the tides will push these fish into Berners Bay, even though their eventual destination is farther north. Therefore, it not just the fish that eventually spawn in the Berners Bay rivers that may be affected by Kensington mine related activities within or outside the bay. The entire Lynn Canal population of salmon could potentially be impacted by mine related activities that are conducted as far north as Point Sherman and the Comet Beach shoreline.

SC-35 Due to the intensive chum salmon fishery just outside Berners Bay, commercial salmon gillnet fishermen are allowed only limited opportunity to directly target the Berners Bay sockeye salmon. The Berners Bay sockeye are harvested along with the chum salmon. The harvest and escapement of the Berners Bay sockeye are closely monitored by ADF&G (Alaska Department of Fish and Game) to assure that this important stock of sockeye remains healthy. In the fall, commercial gillnetters are allowed to fish within Berners Bay to harvest the strong run of coho returning to the productive rivers of this area.

SC-36 The Pt. Sherman area has traditionally been an area of intensive sockeye fishing. ADF&G tends to manage the fishery by closing the area south of Pt. Sherman all the way down to Pt. Bridget. This creates a protected zone, with Pt. Sherman being the first place that fishermen get a chance to catch the fish as they move north. It is a very competitive fishery, run around the clock with fishermen taking 20 minute turns on the inside set. North of this line, fishermen disperse themselves at ¼-mile increment along the beach, sometimes 2-3 boats deep. Without question it is the shoreline along which the majority of the fish move. No one fishes more than a mile offshore, and very few more than 1/2 mile. The migration patterns of these fish could be impacted by nearshore activities, and when mining related pollution occurs it could affect the majority of fish destined for Lynn Canal rivers.

SC-37 Of particular note on **page 4-46** of the DSEIS is lack of attention to adverse impacts on fish from operation of the Slate Creek Cove marine terminal. The vicinity of the terminal is a rich area for rearing fish and is a milling area for adult sockeye.

**Douglas Island Pink & Chum/Northern Southeast Regional Aquaculture Association*

UPLAND ENVIRONMENT

SC-38 Members of LCC have a long-standing interest in the protection of upland as well as marine resources in the Berners Bay area. While the bay area is not the closest place to Haines for LCC members to experience upland outdoor pursuits, it is one they have utilized in the past and would like to be able to utilize in the future. On **pages 4-58 & 59**, one gains the impression that mammals such as goats, bears, wolves, and river otter are likely to avoid contact with humans or the noise, commotion, or other habitat disturbance associated with the mine. This is another case of the document's tendency to understate the importance of significant adverse impacts.

SC-39 What is evident from the DSEIS is that except for bears that could be attracted to unattended garbage generated by mine related activities, several wildlife species should not be expected to utilize the area occupied by mine related facilities at levels to which they have become accustomed in past decades. In other words, these animals can be expected to decline in numbers around mine facilities and may be displaced entirely from these sites. The DSEIS falls into a common trap by making no mention of the fact that there may not be sufficiently unoccupied habitat niches where displaced animals can re-establish themselves. In other words, one cannot assume surrounding land provides habitat sufficient for animals already there plus those which are displaced by mine related development and activity.

SC-40 Nor does the DSEIS explain how displacement of these animals, as well as small mammals and birds, combines with similar displacements or reductions in numbers that would likely result from paving over a ribbon of road around Berners Bay or implementing Goldbelt Corporation's plan for extensive development of its Cascade Point land, or any other reasonably foreseeable upland development actions. An example of the later is the heli-hiking that Temsco Helicopters has said, at least as early as 1997, that it intends to pursue in the Berners Bay area.

SC-41 The DSEIS needs to fully describe the use of salmon by upland wildlife. There is undoubtedly predation of salmon by bears, wolves, and other wildlife along lower Slate Creek, below the barrier to fish migration, as well as along the main rivers flowing into the bay. The SEIS needs to describe in some detail the impacts that Alternative B is likely to have on bears and other predators feeding on salmon in lower Slate Creek and how these impacts would combine with impacts on their predation on salmon along other rivers in the bay area where other reasonably foreseeable actions are being actively pursued.

SC-42 It is just this sort of comprehensive cumulative effects analysis that NEPA requires. Instead the DSEIS simply takes a blinders-on approach to habitat disturbance and passes it off as nothing more than an incidental and short-term animal behavioral modification in the immediate vicinity of mine facilities and activity. A mine life of 10 years, very likely longer, is hardly short-term, and there is no question that land used for roads, material and equipment lay-down areas, dams, and similar permanent disturbances significantly reduce the amount of productive habitat that is available for wildlife.

SC-43 The DSEIS also makes a big point that a minority of the forest land in the project area is not of the high-volume timber so often recognized for its special habitat values. The way this is presented in the document has the effect of understating the habitat importance of lower volume forest stands and intermingled muskegs, streams, and lakes. All of these provide the habitats that support wildlife populations. To the extent that development of these habitats for mine activity displaces or reduces animal numbers, that is a significant environmental impact, especially when combined with similar impacts from other actions in the Berners Bay area.

SC-44 A prime example is Senator Lisa Murkowski recently introduced bill, S. 1354, the Cape Fox Land Entitlement Adjustment Act of 2003. Under this bill, more than 12,000 acres of prime national forest waterfront land along the Berners River and the Lynn Canal shoreline would be lost from public to private ownership. Historic public access could be denied. The conveyed land would no longer be subject to federal laws, regulations, and administrative decisions regarding the protection of national forest lands and the public's right to utilize them. There is no provision in the bill preventing private owners from logging and further developing the land. Senator Murkowski's bill should be considered a "reasonably foreseeable action" as defined by NEPA and the potential primary, secondary, and tertiary adverse impacts on wildlife habitats and populations (as well as other renewable resource values) need to be fully analyzed in the SEIS in combination with anticipated effects from the Kensington mine. That is the only way to fully inform both the public and decision makers in land management or regulatory agencies before the Forest Service or any other agency official signs another Record of Decision or permit for the Kensington mine.

SC-45 A telling indication of the DSEIS's inadequacy in portraying adverse impacts to wildlife from Alternative B or Sub-Alternative C is underscored by the tabular summary of potential impacts of each alternative by resource which starts on **page S-7** and is repeated on **page 2-56**. The <u>only</u> mention of wildlife impacts under these alternatives is an 18-"word" statement on the number of acres affected by construction and operation. People in the lower 48 states who no longer have wildlife species still present in the Kensington project area often devote far more of their environmental impact analyses to what few upland wildlife species they have left. That makes the scant reference to upland wildlife in this SEIS an embarrassment.

<u>WETLAND ENVIRONMENTS</u>

SC-46 As SEACC indicated in its April 7, 1997 letter to the Forest Service on the previous DSEIS, the 2004 DSEIS fails to reasonably quantify the level of wetland impacts or their effect on fish and wildlife in the Berners Bay area. It is not enough to simply compare wetland loss acreages between DSEIS decision alternatives. As SEACC indicated, "The Forest Service can not simply shift responsibility for analyzing these impacts to the Corps of Engineers' Section 404 [Clean Water Act] permitting process. It is the Forest Service's responsibility to consider the effects on the region's wetlands from all reasonably foreseeable cumulative actions in this DSEIS. Its failure to do so violates NEPA."

WATER QUALITY – Compliance with Federal Clean Water Act

SC-47 The Forest Service has failed to complete a comprehensive review of all "reasonable alternatives." The inconsistent nature of the information Coeur has distributed about tailings facilities in the past makes this review essential. Each time the company has promoted a new tailings disposal design, the public has been given the impression that it was an environmental improvement over the previous one. The Forest Service has failed to demonstrate why discharging tailings into a pristine mountain lake is less environmentally damaging than other alternatives.

SC-48 **Section 404 Permit.** There is no mention in the DSEIS of the degree to which Alternative B or Sub-Alternative C would comply with the federal Clean Water Act (CWA). We are advised that the act does not allow for the conversion of significant bodies of water, such as Lower Slate Lake, that support drinking, recreation, or growth and propagation of fish uses into waste treatment facilities. Moreover, it is our understanding that Lower Slate Lake requires approval under several significant federal authorities:

SC-49 Coeur would need a Section 404 permit from the U.S. Army Corps of Engineers (USACE) to use waste rock to construct a dam at the downstream end of Lower Slate Lake. We understand that this rock needs to be benign, yet the DSEIS says it would be "mine-run" rock. If this rock is highly mineralized, say with high sulfur concentration, then the dam itself could be toxic to aquatic life in both the lake and downstream Slate Creek.

SC-50 Moreover, when drafting a Section 404 permit, the USACE must consider the Section 404(b)(1) guidelines, and that requires that Coeur's permit proposal meet the following test under 40CFR 230.10: " . . . (a) Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem . . ." A practicable alternative exists in the form of the already approved dry tailings facility under Alternative A.

SC-51 There is no discussion of these aspects of a Section 404 permit in the SEIS, and there needs to be in order for both the public and the Forest Service official responsible for signing that agency's Record of Decision to be fully informed to the degree intended by NEPA.

SC-52 **Section 402 Permit.** Even if Coeur were allowed to dump mine tailings into Lower Slate Lake, the company would need a Section 402 (CWA) permit from the federal EPA (Environmental Protection Agency) to discharge effluent downstream of the lake. A Section 402 permit would in turn need to be certified by the state for compliance with all state water quality standards (WQS) via the Section 401 (CWA) process. (In Alaska, NPDES (National Pollution Discharge Elimination System) permits issued under authority of the federal CWA are drafted and administered by the federal EPA under Section 402 for regulating waste disposal and by the USACE for regulating fill placement under Section 404.)

SC-53 State WQS would have to be met at the point of discharge, since the state mixing zone rule prohibits mixing zones in waters used for fish spawning, and the state's zone of deposit rule does not contemplate the use of zones of deposit in fresh waters. Without a zone of deposit, the state residue standard (18AAC 70.020) would prohibit deposition of any material on the bed of Slate Creek downstream from the tailings impoundment.

SC-54 Our understanding is that no analysis has been done on Kensington mine tailings to demonstrate that the state's total suspended solids (TSS) water quality standard would be met. It is also our understanding that the expectation or prediction that Coeur could manage the tailings storage facility (TSF) in a way that would control TSS is based upon a speculative analysis submitted by Earthworks, a private consulting business that we understand has been operated by Rick Richins, who has also worked for Coeur Alaska.

SC-55 Here again, the DSEIS has been less than fully forthcoming in explaining to the public and agency decision makers the detailed implications of applying federal and state law to the project.

WATER QUALITY – Compliance with State Law

SC-56 **Legality of Alternatives.** It is unclear from the DSEIS how Alternative B or Sub-Alternative C, which would require the use of Lower Slate Lake as a storage facility for mine tailings, could be in compliance with Alaska state law. If they are not, then there is also the question of how the DSEIS can be legal under NEPA, given that these alternatives constitute the proposed action.

SC-57 **Alternative B, Sub-Alternative C, and Water Quality.** The table of NPDES effluent limitations on **page 4-23** includes limits dependent upon the State granting the mine Site Specific Criteria (SSC). It is unclear how the DSEIS can include an alternative that is dependent on changes to state WQS not yet contemplated since the SSC process could take at least a year to accomplish and would be subject to public review and possible legal challenge. Similarly, the DSEIS calculations incorporate a state arsenic standard that has been overruled by federal regulation. We understand that the state has been ordered to adopt the federal arsenic regulation (a value of 1/5 the current state criterion) by January 2005.

SC-58 Aside from the matter of SSC, a plain reading of the state's WQS, anti-degradation policy, and statutory definitions of "waters of the State" and "treatment works," appears to preclude any legal legitimacy of Alternative B or Sub-Alternative C. The federal EPA has stated publicly there are significant statutory and regulatory difficulties in permitting the use of Lower Slate Lake as a STF on the basis of existing federal law and regulation.

SC-59 **Tailings Discharge into Lower Slate Lake.** The SEIS needs to explain if and why filling up of pristine Lower Slate Lake is legal under state law and regulation. If it is not legal to do so, then Alternative B is not a legally viable option and should not, under NEPA, appear in the DSEIS as a proposed action. In the DSEIS summary, under Environmental Consequences, the Forest Service states:

> "Under Alternatives B and C, the water quality of Lower Slate Lake would be adversely affected during operations but there would be no downstream water quality effects." **(page S-6)**

Stating that the lake would be "adversely affected" implies some state level of regulatory analysis to reach that conclusion, yet there is no evidence of that in the DSEIS.

SC-60 In the table entitled Summary of Potential Impacts of Each Alternative by Resource, under the heading Aquatic resources: freshwater, the DSEIS states:

> "Loss of all habitat (20 acres) in Lower Slate Lake during operations . . . " **(page S-9)**

> "100 percent mortality (estimated 996 Dolly Varden char) in Lower Slate Lake during operations of the TSF." **(page S-10)**

Again, there is no discussion or analysis in the DSEIS supporting the legality of such an action. These quotations confirm the existing beneficial use 18AAC70.020(1) – growth and propagation of fish, shellfish, other aquatic life, and wildlife) in a public waterbody which is prohibited under state regulation and federal law (40CFR131.3(e) and 40CFR131.1(h)).

SC-61 **National Pollution Discharge Elimination System (NPDES) Permit**. Nowhere in the DSEIS is the language to be included in an NPDES permit. As a result, the document is deficient in not describing potential discharge standards and mixing zones for either Sherman Creek or Slate Creek. This inadequacy needs to rectified in the FSEIS. Otherwise, neither the public nor the Forest Service official responsible for signing the next Record of Decision can have any assurance as to how the discharges will be regulated to avoid pollution. This is too important an aspect of the Kensington mine to take as an article of faith and defer to a later step in the mine approval process.

WATER QUANTITY – INSTREAM FLOW RESERVATIONS

SC-62 The DSEIS mentions the reservation of sufficient water quantities and levels in fresh waterbodies, but it lacks sufficient data and other information as to what these quantities and levels would be for various streams. The SEIS also needs to describe for the public and federal decision makers the state's history of conducting instream flow reservation analyses and in actually finalizing instream flow reservations. It is our understanding that a very small percentage of Alaska's streams and rivers have finalized instream flow reservations in place, and that the state has required years of streamflow data from the stream in question or from a sufficiently similar stream before assigning an actual instream flow reservation to a water body. The SEIS needs to be candid in accurately explaining the state's track record on instream flow reservations so that everyone has a common and realistic expectation as to how and how soon such reservations would be in place.

GEOTECHNICAL AND RELATED CONSIDERATIONS

SC-63 LCC hereby adopts by reference the geotechnical and related comments that Dr. David Chambers of the Center for Science in Public Participation expects to submit to the Forest Service regarding the DSEIS. We expect Dr. Chambers' comments to address the following topics:

INTRODUCTORY REMARKS

Reclamation and Closure Financial Surety Calculation
National Pollution Discharge Elimination System (NPDES) Permit
Legal Status of Alternatives B and C

SECTION-SPECIFIC COMMENTS

Reclamation and Closure, **Section 2.3.19**
Geology and Geochemistry, **Section 3.3**
Effects of Alternative C – TSF Effluent Quality, **Page 4-25**
Effects Common to Alternatives B and C – Sedimentation, **Section 4.9.3**

APPENDIX A: Water Quality Analysis

Aluminum, **Page A-9**
Acid Generation Potential, **Pages A-50 and 51**
Copper, **Page A-59**
Summary of TSS Analysis, **Attachment 4**
TSS Compliance Assessment, **Page A-63**

APPENDIX B: ECOLOGICAL RISK ASSESSMENT OF AQUEOUS TAILINGS DISPOSAL AT THE KENSINGTON GOLD MINE

Comparison of Decant Water Chemistry with Risk-Based Criteria, **Table 3.1**
Recovery of Macroinvertebrates, **Section 5.2.3**

SOCIOECONOMIC CONSIDERATIONS

SC-64 **Economic Region of Influence.** Lynn Canal Conservation takes issue with the overly narrow geographic scope of the following statements on **page 3-86:**

"The socioeconomic environment evaluated for this draft SEIS encompasses the CBJ, Alaska. The CBJ forms the economic region of influence (ROI) and defines the geographic area in which the predominant social and economic impacts from the proposed mine would be likely to take place."

"Although the economic effects of the proposed mine would to some extent ripple throughout the Alaskan economy as a whole and reach other jurisdictions such as the Haines Borough, the preponderance of socioeconomic impacts would likely be localized, given the geographic isolation of the mine and the CBJ." (emphasis added)

SC-64 (cont'd)

Lynn Canal Conservation members and other commercial fishermen who reside in Haines and actively gill net for salmon in the marine waters immediately offshore from the Kensington mine site receive a direct economic benefit from the fisheries resource there. It is inaccurate for the Forest Service to call this immediate and direct, on-site economic benefit a "ripple effect throughout the Alaskan economy as a whole that reaches other jurisdictions such as the Haines Borough." In fact, these Haines fishermen spend more time in the area from Berners Bay north to Sherman Creek and Comet Beach than the majority of Juneau residents do.

It is upon the mistaken assumption in the above quotation that the Forest Service's entire socioeconomic section of the DSEIS is predicated. The FSEIS needs to include in its socioeconomic analysis a description of the economic benefits that Haines fishermen realize from fishing offshore of the Kensington mine site.

SC-65

The following data serve as an *example* of the kind of information an economic evaluation of commercial fisheries values in the Berners Bay-Lynn Canal area needs to be built upon and featured in the SEIS:

Average Annual Berners Bay-Lynn Canal Gillnet Salmon Harvest, 1994-2003 (numbers of fish) *

Area	Chinook	Sockeye	Coho	Pink	Chum
Lat. of Little Is. to lat. of Pt. Sherman	469	33,396	32,869	18,124	305,128
Lat. of Pt. Sherman to lat. of Seduction Point	165	51,483	13,635	16,511	49,070
Berners Bay**	-	665	9,684	-	1,726

* Calculations based on ADF&G data.

** Average based on only 5 years for which data are available: '94, '95, '99, '02, '03. (Ave. number of fishing days is 8.8, with 19 days in '03.)

Our understanding from ADF&G data is that average prices per pound paid for Lynn Canal gillnetted salmon in 2003 alone were as follows and that average prices have been higher in other years:

Chinook	$0.6995	Pink	$0.0699
Chum	$0.2724	Sockeye	$0.9569
Coho	$0.4605		

With these kinds of catch and price data, the Forest Service needs to obtain average weights, by species, of salmon harvested in the Berners Bay-Lynn Canal area and describe the economic value of the wild salmon gillnet fishery there.

SC-66 In addition to determining the economic values of wild salmon stocks in the Berners Bay–Lynn Canal area, the Forest Service must also factor in the value of DIPAC-produced salmon. It is our understanding that DIPAC's cost recovery on chum salmon that return to Amalga Harbor was worth about $1.5 million last year. This adds to the value of salmon in the Berners Bay–Lynn Canal area.

SC-67 Similar analyses should also be conducted for other commercial fisheries in the area, and all such information should be presented in the SEIS in order to convey to the reader the significance of commercial fisheries in the Berners Bay-Lynn Canal area.

SC-68 **Quality of Life Considerations**. The DSEIS fails to recognize the monetary and non-monetary benefits that Haines citizens realize from the area extending from Berners Bay to Sherman Creek. The following quotation on Quality of Life (QOL) considerations appears on **page 3-92** of the DSEIS:

> "Quality of life encompasses those attributes or resources (man-made or naturally occurring) of a region that contribute to the well-being of its residents. The relative importance of these attributes to a person's well-being is subjective (e.g., some people consider the availability of outdoor recreational opportunities critical to their well-being, whereas others regard access to cultural institutions as essential to their quality of life). NEPA quality of life analyses typically address issues relating to the potential impacts of the proposed action on the availability of public service and leisure activities in the ROI that contribute to the quality of life of an affected region's inhabitants. For purposes of this study, quality-of-life affected environment includes public schools, law enforcement, medical facilities, and fire protection." (emphasis added)

The Forest Service starts out by acknowledging the range of QOL considerations that an average reader can relate to quite well, but then, in a single stroke of convenience, the agency unjustifiably narrows the scope of its QOL analysis to four municipal services. NEPA requires more than this, and QOL considerations need to be expanded in the SEIS to recognize Haines citizens as residents of northern Southeast Alaska who make considerable use of the Berners Bay and adjacent Lynn Canal area. The SEIS also needs to expand the scope of its QOL analysis to include commercial and non-commercial activities of Haines citizens in the area. Haines fishermen have for years fished the waters on the Point Sherman side of Lions Head Mountain. Their quality of life, both monetary and non-monetary, is directly linked to their success in catching abundant and healthy fish in the area. Abundance and health of the fish they harvest depend, in turn, on the health of the Berners Bay estuary and the uplands and wetlands that drain into it.

MITIGATION & BEST MANAGEMENT PRACTICES

SC-69 **Mitigation Definition.** The Council of Environmental Quality's definition of mitigation appears on page 2-40: "avoidance, minimization, and reduction of impacts and compensation for unfavorable impacts" (CFR 1509.20). We welcome this standard by which mitigation measures are to be developed. The DSEIS emphasizes that its purpose is to reduce disturbance, but the reader is left with the impression that while the Forest Service considers a 113-acre, 20 million-ton pile of mine tailings (Dry Tailings Facility or DTF) in Alternative A to be a disturbance, it thinks that filling Lower Slate Lake up with tailings (Tailings Storage Facility or TFS) is not.

SC-70 **Herbicide Use.** A shortcoming of the DSEIS is that it provides for only 100-foot riparian buffers during herbicide application (**page 2-44**). The document does not indicate what herbicides would be used, and we are opposed to the use of any compounds for which there is no defensible scientific evidence that they are safe to humans, wildlife, or aquatic organisms that use or inhabit the area. Furthermore, it is a leap of faith to assume that regardless of the herbicide applied, a one-size-fits-all, 100-foot setback from a water body would provide an adequate safety buffer. It is also cavalier to assume that even with calm air or air movement less than 3 miles per hour, an aircraft could accurately target the pesticide to within 100 feet of a water body. Even if such precision application could be counted on, a 100-foot, categorical buffer ignores the realities of slope steepness, the myriad continuously flowing or intermittent streams and very small creeks so characteristic of the coastal rain forest. Water moving down these slopes could carry the pesticide directly into a larger downstream water body in less time than it would take the aircraft to return to its base for another load of herbicide.

In short, the proposal to provide 100-foot riparian spray buffers is a desk-top academic exercise which bears little relation to actual on-the-ground realities and which could directly jeopardize the Berners Bay-Lynn Canal area's rich and diverse freshwater and marine life. Depending on the herbicide used, these impacts could be exacerbated by bioaccumulation in the food chain.

SC-71 **Dock Construction Timing.** The DSEIS indicates that dock construction will be limited to avoid in-water work during critical times of the year such as the "eulachon run" and "herring spawning." **(page 2-44)** However, the DSEIS does not demonstrate that there is enough information available on the distribution and seasonal behavior of either eulachon or herring to ensure that this measure will protect their populations.

SC-72 **Toxic Material Spills.** Petroleum spills are given cursory treatment on **pages 2-29, 2-44, 4-41, 4-44, and 4-49**. For example, statements are made on **page 4-44** that ". . . most fish do not accumulate and retain high concentrations of petroleum hydrocarbons, even in heavily oil-contaminated environments. They are, therefore, not likely to transfer them to predators." It is further stated that "Marine carnivores generally are inefficient assimilators of petroleum compounds in food. Since primary prey species are able to release hydrocarbons from their tissues, biomagnification does not occur." This DSEIS oil spill section continues on the next page and essentially downplays the potential adverse effects that spilled or leaked oil can have on either fish or pinnipeds.

SC-93 First, it seems rather unscientific to say so categorically that "biomagnification does not occur." Second, and more important, it is our understanding that the two references the above statements are based upon typify an outdated approach to spill-related risks that considers only the potential for acute exposure through consumption or absorption. In addition to susceptibility of adult fish or marine mammals to acute exposure to oil, a potentially greater threat may be chronic exposure of younger life stages to low concentrations of PAHs (polycyclic aromatic hydrocarbons). The DSEIS comes up short in its analysis of petroleum effects on fish and marine mammals – be they adult or juvenile - both within Berners Bay proper and in adjacent waters of Lynn Canal.

SC-94 The document reveals that 6.5 million gallons per year of diesel fuel would be needed for Alternative A, yet we have been unable to find a corresponding statement of the number of gallons per year needed for Alternative B. Moreover, the DESIS fails to adequately describe either the *probability of occurrence* or the *potential magnitude of consequences* of various size spills of oil or other toxic materials resulting from vessels serving the mine. These two projections need to be made not only for the Berners Bay area but for all the waters of Southeast Alaska through which these Kensington mine support vessels would pass.

SC-95 If we learned anything from the catastrophic 1989 *Exxon Valdez* oil spill, it is that *probability of occurrence* of various size spills and *potential magnitude of consequences* from a spill must be projected prior to any approval of a resource development project the size of the Kensington mine or larger. It is also essential that before the Kensington mine is approved a second time, the overall terms of financial compensation to Alaskans and other Americans in the event of a toxic spill need to be specified in the SEIS. Again, Exxon-Mobil's ongoing legal fight to avoid making such payments in the wake of its *Exxon Valdez* spill underscores the essential need to make it very clear up-front to everyone what financial obligations Coeur or whomever it sells the Kensington mine to is liable to the American public for. The place to make these conditions clear is in the SEIS, before another Record of Decision is signed by the Forest Service.

SC-96 In our review of the DSEIS, we have found no tactical or even strategic toxic spill prevention, containment, and cleanup contingency plan for the Berners Bay-Lynn Canal area (marine, freshwater, or upland) or for other Southeast Alaska routes used by these vessels. Neither the Forest Service nor other responsible government officials can make an informed decision to approve this project until such a plan is in place for all parts of Southeast Alaska that are used in connection with the Kensington mine. Again, it is not good enough to defer the development of a toxic spill contingency plan until after the

Forest Service's next Record of Decision is signed. The details of a strategic, if not tactical, spill contingency plan for all areas used by Kensington mine support vessels need to be very clearly laid out before then. Otherwise the public and the responsible agency are taking a shot in the dark regarding potential consequences of a spill resulting directly or indirectly from this mine.

SC-77 **Employee Education Program in Wildlife Management**. It is unclear on **page 2-47** what is intended by this program, so it is not possible to judge whether it would be adequate to protect wildlife populations or not.

SC-78 **Restoration of Mountain Goat Herd.** There is nothing in the DSEIS that indicates that restoration of mountain goats would be effective, and the Forest Service needs to disapprove of any mine related activities that would be likely to deplete a herd in the first place (**page 2-47**).

SC-79 **Helicopter Disturbance of Bald Eagles.** The Haines economy receives direct benefits from the annual congregation of bald eagles from northern Southeast Alaska and beyond. The Forest Service must not approve of any mine related actions that will cause a significant impact to Berners Bay area bald eagles (**page 2-47**).

Instream Flow Reservations. See above discussion on this subject (**page 2-45**).

SC-80 **Marine Mammal Protection.** The DSEIS provides little in the way of specific mitigation measures for protecting marine mammals. Once again, the reader is expected to accept as an article of faith that governmental agencies will do the right things and thereby avoid serious disturbance to these populations (**page 2-44**).

RECLAMATION & CLOSURE

SC-81 Although Lynn Canal Conservation strongly supports the broadly stated reclamation standards outlined on **pages 2-32 through 34**, we believe just as strongly that the Forest Service should not sign another Record of Decision until both the public and the agency have had an opportunity to review and understand a more detailed description of the legally binding reclamation provisions that Coeur or its successor would be held to under Alternative B or Sub-Alternative C.

SC-82 **Page 2-33** indicates that "Coeur has submitted conceptual plans for reclamation and restoration of the TSF [tailings storage facility or tailings discharge in Lower Slate Lake] as part of the supporting documents describing the Proposed Action." (emphasis added)

In order for the Forest Service to comply with NEPA requirements and be able to make an informed decision in its next Record of Decision, the SEIS needs to include more than an outline of what Coeur has conceptually submitted.

SC-83 The Forest Service needs to require Coeur to provide an estimate of the financial assurance needed to protect the public interest. This estimate would provide a basis for developing the basic reclamation plan. Both the reclamation plan and the background data used to calculate the estimate need to be included in the SEIS.

SC-84 The SEIS also needs to include a discussion of whether a reclamation plan could be amended at time of mine facility closure to accommodate yet-to-be proposed alternative uses of the facilities mentioned on **pages 2-32 through 34**. If such amendments are legally possible, they could result in a very different set of long-term environmental impacts than are suggested by the DSEIS. Alternative and continued use of mine facilities for other alternative purposes could also result in more irreversible and irretrievable decisions than are laid out in the DSEIS.

SC-85 For more detailed comments on this section, please refer to Dr. David Chambers attached comments (adopted here by reference).

IRREVERSIBLE & IRRETRIEVABLE COMMITMENT OF RESOURCES

SC-86 The DSEIS section on irreversible losses (loss of nonrenewable resources and resources renewable only over long periods) and irretrievable losses (renewable resources loss that is not irreversible) is woefully deficient (**pages 4-130 through 4-133**). The reader gets very little sense of the direct and indirect incremental impacts that this proposal is likely to have in changing the Berners Bay area's landscape, the human pressures that will be exerted on its fish and wildlife populations and their habitats, and the land and natural resource development actions that are likely to follow in the wake of Kensington related land area development.

SC-87 There is no better example than Senator Murkowski's Congressional bill to lock up 12,000 acres of prime fresh and marine waterfront land by converting it from public land owned by all Americans to private land that will be unavailable for public use. This private land would no longer be subject to land management protections, such as they are, that are ensured by public ownership. There is absolutely no mention of this irreversible and irretrievable loss of public accessibility and protection in the DSEIS, yet it is clearly a predictable outcome of a reasonably foreseeable action in the project area and the larger Berners Bay area.

SC-88 In short, the DSEIS is deficient, in both a spatial and a temporal sense, in its portrayal of the irreversible and irretrievable commitment of resources.

IN CLOSING

SC-89 Once again, Lynn Canal Conservation, Inc. appreciates the opportunity to review and critique the 2004 Kensington mine DSEIS. We oppose the mine because on balance, its potential financial benefits to Coeur Alaska are far outweighed by the harm it would cause or trigger to natural resource use opportunities that have historically been available to residents of northern Southeast Alaska and to other Americans. We also maintain that the Forest Service has prepared the DSEIS without fulfilling the letter or spirit of the National Environmental Policy Act.

Sincerely,

Scott Carey
President

Attachment: Partial List of References Cited

Attachment: Partial List of References Cited

Alaska, State of. 2004. Southeast Alaska Transportation Plan – Draft Update for Public Review. AK. Depart. Trans. & Public Facil. January 2004.

Freon, P., Gerlotto, F., and M. Soria. 1993. Variability of *Harengula spp* school reactions to boats or predator in shallow water. ICEA Mar. Sci. Symp. 196: 30-35.

Murkowski, L. 2003. S. 1354, Cape Fox Land Entitlement Adjustment Act of 2003. U.S. Senate.

O'Corry-Crowe, G. M., K. K. Martien, and B. L. Taylor. 2003. The analysis of population genetic structure in Alaskan harbor seals, *Phoca vitulina*, as a framework for the identification of management stocks. Pages 53. Southwest Fisheries Science Center, National Marine Fisheries Service, NOAA, La Jolla, California.

Ona, E., and R. Thoresen. 1988. Reactions of herring to trawling noise. ICES C. M. 1988/B:36, 8 pp.

U.S. Environmental Protection Agency. 2002. October 15 letter to U.S.D.A. Forest Service.

Vabo, R., Olsen, K., and I. Huse. 2002. The effect of vessel avoidance of wintering Norwegian spring spawning herring. Fisheries Research 58: 59-77.

Westlake, R. L., and G. M. O'Corry-Crowe. 2002. Macrogeographic structure and patterns of genetic diversity in harbor seals (Phoca vitulina) from Alaska to Japan. Journal of Mammalogy 83: 1111-1126.

Responses to Comments

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-01	Comment noted.
Lynn Canal Conservation	SC-02	The Forest Service manages the Tongass National Forest for multiple use. The forest is open to mineral entry under the 1872 Mining Law and the process area has a mineral prescription in the Forest Plan. Coeur Alaska's mining operation under consideration in this SEIS falls within this multiple use objective along with wildlife habitat and recreation uses. Neither Alaskans nor the public would be asked to bear any of the financial costs of the project because they would be borne by the proponent. Regardless of the alternative selected, the Forest Service would establish financial assurance for reclamation of mining-related disturbances and facilities and long-term maintenance of the TSF dam. The proponent would be required to post adequate financial assurance prior to being provided final authorizations and permits. The Final SEIS illustrates the extent of expected environmental impacts and the mitigation that would be in place to address such impacts. Therefore, Coeur Alaska is not expected to produce non-monetary costs that would result in significant degradation of the environment.
Lynn Canal Conservation	SC-03	The discussion of cumulative effects in Section 4.21 has been expanded to provide greater detail concerning other past and potential activities in the project area and to refer to mitigation in the CBJ, USACE, and state permits.
Lynn Canal Conservation	SC-04	As the commenter notes, the SEIS discloses that the operation could affect marine mammals but that effects would not occur at the population level, should Alternatives B, C, or D be selected. A biological assessment/biological evaluation (BA/BE), included as Appendix J, has been submitted to NMFS jointly by the Forest Service and USACE, and recommendations from NMFS will form the basis for mitigation to be included in USACE permits and State Tidelands Leases.
Lynn Canal Conservation	SC-05	The cumulative impact assessment does not include Temsco's proposal for heli-hiking tours because no formal proposal has been submitted to the Forest Service for consideration. Likewise, the SEIS discusses an expansion (extension) of mining operations but does not discuss the Jualin property in particular because there is no exploration activity being conducted at the site, nor are there any proposals to initiate such activities. There is no description of the extent of reserves that might or might not be associated with the Jualin property; therefore, its inclusion in the cumulative effects discussions would be speculative. The cumulative effects of the Juneau Access Road and the land exchange are described in Section 4.21.
Lynn Canal Conservation	SC-06	The CEQ regulation at 40 CFR 1505.2(b) requires identification of the environmentally preferable alternative, the description of which is provided in the ROD and Final SEIS. However, decisionmakers are not obligated to select the least damaging alternative and may take other factors into consideration in making a final decision.
Lynn Canal Conservation	SC-07	The existing impacts on the Kensington side of the project area, including the work camp, access road, and waste rock pile, have been considered in the discussions of all alternatives to the extent they are applicable. The waste rock pile outside the 850-foot adit, for example, would be expanded under alternatives B, C, and D and it is this expanded version that is included in the analysis. A smaller disturbance footprint in which little to no waste rock would be managed in the waste rock pile was considered for Alternative A1. The other existing facilities (i.e. worker camp, settling ponds) are included within the footprint of existing disturbances under all alternatives.

Affiliation	*Comment ID*	*Response*
Lynn Canal Conservation	SC-08	Information has been added to Section 4.9 to allow an easier comparison of the impacts on aquatic resources. Note that under Alternatives B, C, and D, no adverse impacts are projected on the lower sections of Slate and Johnson creeks, which support anadromous fish populations.
Lynn Canal Conservation	SC-09	Significant issues are the driving factor for developing alternatives within the NEPA process. The significant issues identified as a result of scoping focused on impacts on Berners Bay and the freshwater and upland resources in the surrounding watershed. Alternative A addresses each of the significant issues because its operations would not affect Berners Bay. Alternative B reflects the proposed action as submitted by the project proponent. Alternative C was developed to address concerns about herring at Cascade Point under Alternative B. Alternative D was developed in response to comments on the Draft SEIS to include additional water treatment. It addresses the need to protect water quality and aquatic life in Slate Creek. Alternative A1 reflects a potential (although highly unlikely) outcome of selecting the no action alternative (Alternative A) involving a mining scenario similar to the proposed action alternative. Because this is an SEIS, the no action alternative represents the currently permitted operation resulting from the 1997 Final SEIS. The alternatives are consistent with the spirit and intent of NEPA.
Lynn Canal Conservation	SC-10	See the response to comment SC-09. Alternative A1 is included as a potential mining scenario if Alternative A is selected. It involves mining rates comparable to those under Alternatives B, C, and D.
Lynn Canal Conservation	SC-11	The plan of operations under consideration in this SEIS was submitted to the Forest Service in 2001, at which point the price of gold was significantly less than $400 per ounce. This revised mine plan therefore reflected a lower operational cost than that proposed under the approved project. Because Coeur Alaska did not have access to the Jualin mining claims in 1997, the option of using State lakes for tailings disposal was not available at that time. The alternative selected in the 1997 ROD was also identified as the environmentally preferable alternative in comparison with other feasible alternatives considered at that time. The use of State lakes is now a feasible alternative.
Lynn Canal Conservation	SC-12	See the response to comment SC-48, which indicates that tailings disposal is legal under the Clean Water Act. EPA, USACE, and the State of Alaska have been cooperating agencies in the preparation of the SEIS.
Lynn Canal Conservation	SC-13	Comment noted.
Lynn Canal Conservation	SC-14	The SEIS evaluates and uses the same criteria to assess the extent and nature of the impacts of each alternative for each resource area. The intent of the document is to present a concise comparison between the alternatives. Summaries have been added to the end of each resource section to provide a more direct comparison between alternatives.
Lynn Canal Conservation	SC-15	This SEIS addresses direct, indirect, and cumulative effects of project components on resources within the Berners Bay watershed, as required by NEPA (40 CFR 1508.7): "'Cumulative impact' is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [Federal or non-Federal] or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The 1997 SEIS remains part of the planning record because that analysis and the comments on the 1997 SEIS will be included in the planning record for this Final SEIS.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-16	Data were collected during May 2000 and 2002 (USFWS, Preliminary Report 2003). Sigler et al. (2003) documented that Steller sea lions peak in mid-April to late-April and then decrease to near zero by early May. The above studies indicate that marine mammal and marine bird use peaks during April and early May. Few marine birds and mammals were recorded during other months of the survey periods. Mitigation measures to reduce or eliminate the potential impacts of crew shuttle and barge operations on marine mammals have been included in the Final SEIS in Section 2.5. Note that a high-speed catamaran is no longer proposed for the crew shuttle. The crew shuttle would be a monohulled vessel traveling at 12 to 18 knots.
Lynn Canal Conservation	SC-17	Section 4.10 (Aquatic Resources Marine) indicates that the anticipated adverse effects would be small and localized within the immediate vicinity of project operations. Although Berners Bay has important resources, they remain a small part of the entire Lynn Canal region. The current plan also includes timing windows for construction, use of BMPs, and ongoing monitoring to ensure that adverse effects remain low in magnitude and duration. Considering the mitigation and monitoring that will occur, adverse effects on the Lynn Canal commercial fishery are not expected.
Lynn Canal Conservation	SC-18	The Final SEIS, including the BA/BE (see Appendix J), indicates that there is a potential for operations to affect individual Steller sea lions in the conduct of day-to-day activities. There is nothing in the literature to suggest that effects on a small number of individuals would translate to effects on the health, fitness, or fecundity of the population as a whole. The BA/BE submitted to NMFS will serve as a basis for mitigation to be included in subsequent State and Tidelands Leases and USACE permits for marine facilities and operations.
Lynn Canal Conservation	SC-19	The operation would need to comply with the Marine Mammal Protection Act and the Endangered Species Act. Although harbor porpoises have not been documented as regular users of the vicinity of Slate Creek Cove, the crew shuttle operations would need to be conducted to avoid harassment of harbor porpoises, Steller sea lions, harbor seals, and humpback whales. The BA/BE submitted to NMFS, included as Appendix J, provides additional detail on mitigation measures to avoid impacts on marine mammals.
Lynn Canal Conservation	SC-20	The discussion in Section 4.10 includes the impacts of vessel noise on herring, which would be minimal.
Lynn Canal Conservation	SC-21	This information has been included in the Final SEIS in Section 4.10.3.
Lynn Canal Conservation	SC-22	See the response to Comment SC-19.
Lynn Canal Conservation	SC-23	Additional text has been provided in the Final SEIS in Section 4.10.3. This information comes from the BA/BE (see Appendix J). We agree that eulachon are important prey for Steller sea lions and that large numbers of Steller sea lions use the run in Berners Bay prior to breeding. However, there is no scientific literature from which to draw information regarding population-level fitness. Because there is only anecdotal information concerning the types and frequency of vessel use in Berners Bay, it is not possible to conclude whether or not three to five additional trips (2–3 trips during the eulachon run) is a significant increase. The BA/BE submitted to NMFS concluded that the effects of this increase would not be significant. Although statistically possible, there is no evidence to suggest that a toxic spill of any kind is likely to occur.
Lynn Canal Conservation	SC-24	See the response to comment SC-23.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-25	The statement about 10- to 11-month-old pups being present at Benjamin Island referred to one point in time when peak numbers of adult and juvenile sea lions were observed in Berners Bay. It is not a generalization about the year-round population at the Benjamin Island haulout.
Lynn Canal Conservation	SC-26	The presence of harbor seals on the point north of Slate Creek Cove has been incorporated into the Final SEIS in Section 4.10.3.
Lynn Canal Conservation	SC-27	The literature notes that the limited size of the analyses done to date does not provide a definitive answer on the subpopulations of harbor seals or how it would affect management of the species. The information presented in the studies has been incorporated into Section 3.10.4.
Lynn Canal Conservation	SC-28	Please see Section 3.11.3 for a discussion on migrating water birds.
Lynn Canal Conservation	SC-29	Some additions have been made to Section 3.10.5 that describes larval eulachon capture and the river systems in which eulachon are found in the Berners Bay drainage.
Lynn Canal Conservation	SC-30	Additional impact assessment is provided relative to boat traffic in Berners Bay in Section 4.10. Note the information on tow net catch in Berners Bay.
Lynn Canal Conservation	SC-31	The discussion of the herring stock status has been expanded in Section 3.10.5. The herring stock has remained depressed for at least 20 years, independent of the proposed project. The likely effects of the proposed action are discussed in detail in Section 4.10. The State of Alaska, which is responsible for managing stock, has been a cooperating agency in the preparation of the SEIS.
Lynn Canal Conservation	SC-32	The Final SEIS describes in detail in Section 4.10 the potential effects on important marine species, including commercial fisheries that may be most affected. The SEIS also discusses effects on nearshore habitat and organisms. Large-scale spills of toxic materials are not reasonably foreseeable. The minor leaks and spills that could occur as part of regular operations are addressed in the analysis.
Lynn Canal Conservation	SC-33	See the response to comment SC-34.
Lynn Canal Conservation	SC-34	The SEIS addresses the direct and indirect effects on major fish stocks in Section 4.10. The nearshore activities associated with the operation are slight compared with the whole shoreline area. There is no information to suggest the project would produce any major changes in fish migration patterns. As noted, due to design and the use of best management practices, the potential for adverse effects of spills is very low (in terms of both potential occurrence and magnitude). Consequently, the potential for effects on all adult migrating fish is extremely low (see Section 4.10).
Lynn Canal Conservation	SC-35	Comment noted.
Lynn Canal Conservation	SC-36	Comment noted. See the response to comment SC-34. This valuable commercial fishery was of major concern for facilities located at Comet Beach.
Lynn Canal Conservation	SC-37	Sections 3.10 and 4.10 of the Final SEIS have been revised to discuss fish rearing within Slate Creek Cove.
Lynn Canal Conservation	SC-38	The fact that the wildlife species would be likely to avoid contact with humans or project-related noise does not correlate with significant adverse impacts. The wildlife discussion in Section 4.11 has been expanded in the Final SEIS.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-39	Bears, wolves, and goats are wide-ranging species, and local displacement is not likely to have significant effects. The Final SEIS notes in Section 4.11 that the loss of habitat within the approximately 200 acres of mine-related disturbance is unlikely to affect wolf distribution in Game Management Unit 1. It also notes that mountain goats primarily use areas higher than the area that would be affected by this project. The Final SEIS notes in Section 4.11, however, that the loss of old-growth trees in the Johnson and Slate creek drainages could adversely affect river otters during bridge construction.
Lynn Canal Conservation	SC-40	The cumulative effects discussion in Section 4.21 has been revised to include additional information obtained from draft technical reports developed for the Juneau Access Improvement Supplemental Draft EIS. Heli-hiking is not included in the cumulative effects analysis because it is not considered reasonably foreseeable. The Forest Service currently permits helicopter landings only on glaciers. Berners Bay heli-hiking therefore would be outside the range of activities currently permitted by the Forest Service. Furthermore, Temsco has not applied to the Forest Service for a special use permit.
Lynn Canal Conservation	SC-41	The wildlife discussion in Section 3.11 has been revised to discuss the use of salmon by upland species. Mining operations are not expected to have any effect on upland species feeding in the anadromous portions of Slate Creek or Johnson Creek.
Lynn Canal Conservation	SC-42	The SEIS discloses that impacts on wildlife would occur during mine operation. The Cumulative Effects section (Section 4.21) indeed notes the limited duration of effects over the long term. Although the commenter might not view a 10-year mine life as short-term, the Forest Service considers impacts at a scale applicable to the ecosystem. Considering that old growth is defined as timber more than 150 years old, an operating life of even 20 years is still relatively short-term with respect to the development of a forest. The recovery of disturbed forests to a pre-mining condition might take 100 years; however, the habitat value would not be diminished for that entire period and wildlife would begin using the areas in the vicinity of the disturbances either during (for species that become acclimatized) or shortly after the completion of operations. The resiliency of the landscape is demonstrated by the recovery of the area surrounding the historical mining operations where the land was cleared at the turn of the last century. The extent of impacts would be relatively small (less than 200 acres following reclamation for all alternatives) considering the amount of habitat available in the 100-foot to 1,000-foot elevation within which most of the operations would occur. The Forest Service respectfully disagrees that the disturbance footprint would be permanent or “significantly reduce the productive habitat available for wildlife.”
Lynn Canal Conservation	SC-43	The Draft SEIS recognized that lower-volume habitat is important to many species; however, this habitat is of less value to management indicator species (because of its relative abundance) compared with high-volume stands. Therefore, the analysis did not focus on low-volume stands.
Lynn Canal Conservation	SC-44	The Cape Fox land exchange is included in the cumulative effects discussion in Section 4.21 of the SEIS. Currently, no proposed land uses have been suggested by Cape Fox other than the Kensington Gold Project. Including any other activities under the cumulative effects analysis would be speculative; therefore, no other land uses have been considered.
Lynn Canal Conservation	SC-45	The comment regarding the lack of summary information regarding wildlife in the summary table on page S-7 and Table 2-9 on page 2-62 is noted. Additional information has been provided in Section 2.3.20 of the Final SEIS.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-46	The SEIS does quantify the extent of impacts on wetland resources in terms of acreage and presents a qualitative discussion of the loss of or changes to wetland functions associated with the different wetland types under each alternative. The qualitative discussion on functional impacts includes fish and wildlife habitat. The SEIS incorporates the projected extent of wetland, upland, and aquatic impacts in the analyses of impacts on fish and wildlife. In the cumulative impacts discussion, the SEIS also includes available information on wetland impacts from other reasonably foreseeable projects. The effects of these wetland impacts were considered in developing the discussions of the cumulative effects on fish and wildlife. The impacts on wetland habitat are not mentioned separately in the discussions of impacts on fish and wildlife resources. USACE has been a cooperating agency in the preparation of the SEIS and has reviewed all wetland analyses.
Lynn Canal Conservation	SC-47	Table 2-9 summarizes the effects of each alternative. The environmentally preferable alternative is identified in the ROD.
Lynn Canal Conservation	SC-48	As summarized in Section 1.7.1 and documented in EPA's May 17, 2004, memo (USEPA, 2004) and the draft NPDES permit fact sheet, the “conversion” of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notices for the USACE permits and the draft NPDES permit were released to the public for comment in June 2004. The draft notices and permits are part of the planning record and were considered in this analysis.
Lynn Canal Conservation	SC-49	As documented in Section 3.3.3, the waste rock will not be acid-generating or a source of metals releases to the environment. See also SAIC 1997.
Lynn Canal Conservation	SC-50	Comment noted.
Lynn Canal Conservation	SC-51	The 404(b)(1) analysis will be reflected in the USACE's permit decisions. The public notices for the 404 permits were issued in June 2004, and, as a cooperating agency for the SEIS, the USACE has participated in the preparation of the Final SEIS.
Lynn Canal Conservation	SC-52	The statement about the need for a 401 certification is correct.
Lynn Canal Conservation	SC-53	No tailings are proposed to be discharged downstream of the TSF and no mixing zone is proposed.
Lynn Canal Conservation	SC-54	The results of the TSS modeling of the TSF discharge have been incorporated into the Final SEIS in Section 4.6.5. There is some uncertainty regarding the ability to meet TSS limits under Alternatives B and C. With the reverse osmosis treatment system, the TSS limits would always be met at the discharge point under Alternative D. Note that the TSS limits are based on application of best available technology. They do not represent a “water quality standard.”
Lynn Canal Conservation	SC-55	Comment noted.
Lynn Canal Conservation	SC-56	See the response to comment SC-48. The State of Alaska is following EPA’s guidance in determining that use of Lower Slate Lake for tailings disposal is legal.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-57	A site-specific criterion has not been adopted, i.e., the limits for the TSF discharge are based on the statewide criteria. The treatment system under Alternative D will ensure compliance with the limits. The commenter is correct that EPA has requested that the State of Alaska adopt a Maximum Contaminant Level (MCL) of 10 ug/L for arsenic in 2005. At that time, the NPDES permit may be reopened to include water quality-based arsenic limits of 10 ug/L as a monthly average and 20 mg/L ug/L as a daily maximum. This information has been added in footnotes to the respective tables. Even if the criterion was lowered to 10 ug/L, the projected arsenic levels in all discharges would be below the limits.
Lynn Canal Conservation	SC-58	See the response to comment SC-48. The State of Alaska is following EPA's guidance in determining that use of Lower Slate Lake for tailings is legal.
Lynn Canal Conservation	SC-59	See the response to comment SC-48. The findings of the risk assessment indicate that fish populations in the TSF are likely to be lost during operations, leading to the conclusion of adverse effect.
Lynn Canal Conservation	SC-60	See the response to comment SC-48. During operations, the TSF would become a waste treatment unit not subject to the water quality criteria that apply to the discharge.
Lynn Canal Conservation	SC-61	The draft NPDES permit was released to the public for comment in June 2004. This Final SEIS reflects the conditions included in the draft permit as well as comments received on the draft permit.
Lynn Canal Conservation	SC-62	The Forest Service understands that the state will establish in-stream flow requirements for each of the streams affected by the project to protect downstream uses. The proposed minimum in-stream flows have been incorporated into the Final SEIS. The State of Alaska (ADNR) has been a cooperating agency, and has provided input regarding in-stream flow requirements.
Lynn Canal Conservation	SC-63	Comment noted.
Lynn Canal Conservation	SC-64	This comment is predicated on the assumption that the proposed action could adversely affect commercial fisheries in Lynn Canal, an industry important to the economy of Haines. The commenter thus argues that the region of influence (ROI) should be expanded to include the Borough of Haines. None of the analyses performed for the Draft SEIS or any of the predecessor documents indicate adverse impacts on the commercial fisheries industries through damage to the chinook, sockeye, coho, pink, or chum salmon species. Hence, the economic impacts are primarily limited to economic activity associated with the operation of the mine, including inter-industry transactions, and the impacts of the labor force on demand for goods and services. The preponderance of these impacts would be limited to the CBJ area.
Lynn Canal Conservation	SC-65	See the response to SC-64.
Lynn Canal Conservation	SC-66	See the response to SC-64.
Lynn Canal Conservation	SC-67	See the response to SC-64.
Lynn Canal Conservation	SC-68	Because of the unique characteristics of the region, the Draft SEIS included recreation as a separate subsection (Section 3.13) under land use. It is this section that provides detailed descriptions and analyses of recreational activities and impacts from the alternatives. Often recreation is treated in a cursory manner under the quality of life section. It is precisely because recreation is uniquely important to the affected population that a more detailed analysis was conducted for this SEIS.

Affiliation	Comment ID	Response
Lynn Canal Conservation	SC-69	The linkage between mitigation and disturbance is unclear in this comment. The SEIS considers all physical impacts on waters and land disturbance. The extent of disturbance from the DTF under Alternative A would be greater than the impact of tailings placement in the TSF under Alternatives B, C, or D. However, in all cases, the Forest Service considers tailings placement to create a disturbance, as reflected in the discussions in Chapters 2 and 4.
Lynn Canal Conservation	SC-70	Herbicides would not be used on National Forest Service land. The text in Section 2.5 of the Final EIS has been modified to reflect this situation.
Lynn Canal Conservation	SC-71	The construction timing windows have been suggested by NMFS in response to avoiding impacts on Essential Fish Habitat. ADNR has also concurred that these dates encompass a window wide enough to avoid impacts on herring and eulachon spawning.
Lynn Canal Conservation	SC-72	As discussed in the SEIS (Section 4.10), the small leaks and spills that could occur on a day-to-day basis as part of operations are unlikely to produce hydrocarbon concentrations in the water column that could affect marine species. As noted previously, large-scale spills, although statistically possible, have a low probability of occurring. Therefore, the impacts of a catastrophic spill are not discussed in great detail as part of the analysis.
Lynn Canal Conservation	SC-73	See Section 4.10 for an expanded discussion of the effects of hydrocarbons and the response to comment SC-72. The State of Alaska (ANDR), as a cooperating agency, has assisted in the preparation of this analysis. NMFS also provided input and relevant technical reports.
Lynn Canal Conservation	SC-74	Fuel consumption under Alternatives B, C, and D has been clarified in the text. There is no component of the proposed action or Alternatives B, C, or D that calls for the large-scale transportation of oil. The largest potential source of hydrocarbons would be diesel fuel, which would be delivered to the site in individual 6,500-gallon containers specifically designed to withstand the rigors of transport (under Alternatives B, C, and D). The SEIS discusses the impacts of low-level leaks and small spills of diesel fuel that could reasonably be expected as part of day-to-day operations; however, determining the size, location, and conditions leading to a large spill of hydrocarbons or other toxic material would be entirely speculative. Further information regarding fueling operations, fuel use, storage, and spill control has been added to the text in Section 2.3.13. The company has submitted a Spill Prevention, Control, and Countermeasures Plan (included in Appendix E of the SEIS). ADEC's Geographic Response Strategies has also been noted in the discussion on spills (Section 4.6), and the applicable plans for Echo Cove and Berners Bay have been included in the planning record.
Lynn Canal Conservation	SC-75	See the response to comment SC-74. NEPA does not require an assessment of impacts that are not reasonably foreseeable, nor does it require a "worst case" analysis. The NEPA process does not provide for or encourage speculation, which would be necessary to project the extent of culpability and liability should a spill occur in the future. Neither NEPA nor any of the Forest Service approvals would provide a mechanism to establish liability for a speculative event such as a large spill.

Affiliation	*Comment ID*	*Response*
Lynn Canal Conservation	SC-76	The spill response discussion in Chapter 2 has been revised to include discussions of the Spill Prevention, Control, and Countermeasures Plan submitted by the proponent, as well as information from the State of Alaska's Prevention and Emergency Response Program Geographic Response Strategies. The Spill Prevention, Control, and Countermeasures Plan has also been included in Appendix E.
Lynn Canal Conservation	SC-77	Coeur Alaska would be required to develop a training program instructing employees on avoiding encounters with and minimizing the potential for adverse impacts on wildlife. Coeur Alaska would not be required to develop such a program until after the ROD is finalized, therefore, documentation would not be available for review at this time.
Lynn Canal Conservation	SC-78	The Forest Service does not anticipate that any of the alternatives would result in the elimination of the mountain goat herd on Lions Head Mountain.
Lynn Canal Conservation	SC-79	None of the alternatives under consideration are expected to result in significant impacts on eagles within the project area.
Lynn Canal Conservation	SC-80	Details on the mitigation measures for the protection of marine mammals have been included in Sections 2 and 4.10 and the BA/BE (Appendix J) in the Final SEIS.
Lynn Canal Conservation	SC-81	Coeur Alaska has submitted a reclamation plan, which has been included in the Final SEIS as Appendix D. The reclamation plan has also been incorporated into the impact analyses for applicable resources. The plan describes reclamation monitoring and discusses financial assurance requirements.
Lynn Canal Conservation	SC-82	See the response to comment SC-81.
Lynn Canal Conservation	SC-83	The Forest Service is obligated to establish financial assurance for both reclamation and the long-term integrity of the TSF. Financial assurance would be established based on the final plan of operations, which would not be completed until after the ROD is completed.
Lynn Canal Conservation	SC-84	The reclamation of all facilities on National Forest lands will need to be conducted according to the reclamation plan submitted by Coeur Alaska. Any change in the use of the buildings would require an application to the Forest Service and, potentially, additional NEPA analysis. Facilities occurring on private or state lands would not be subject to the same reclamation commitments.
Lynn Canal Conservation	SC-85	Comment noted.
Lynn Canal Conservation	SC-86	Additional discussion has been added to the introduction in Section 4.2.2, The Irretrievable and Irreversible Commitment of Resources.
Lynn Canal Conservation	SC-87	The proposed Cape Fox Land Exchange is not a related action when considered with the Kensington Gold Project. Its outcome is independent of the Forest Service's decision on the Kensington project. Therefore, the Final SEIS addresses the proposed Cape Fox Land Exchange only in terms of cumulative impacts.
Lynn Canal Conservation	SC-88	See the responses to comments SC-86 and SC-87.
Lynn Canal Conservation	SC-89	Comment noted.

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APR 07 2004
Juneau Ranger District

April 7th, 2004

To: Steve Hohensee
SEIS Team Leader
Tongass Mineral Group
8465 Old Dairy Road
Juneau AK 99801

Re: Kensington Gold Project Draft Supplemental Environmental Impact Statement

Mr. Hohensee,

These comments on the Kensington SDEIS are on the behalf of the Juneau Group of the Sierra Club (JGSC) and replace our March 8th comments. The Sierra Club is a volunteer led national grassroots conservation organization with a membership of over 750,000 individuals. The Sierra Club has a history of interest in S.E. Alaskan conservation issues that dates from the late 19th century to the present. In Southeast Alaska the Sierra Club is represented by the Juneau Group of the Sierra Club (JGSC). JGSC and the Sierra Club have members who reside in nearly every community of Southeast Alaska and these members derive enjoyment and benefits from the Tongass National Forest. JGSC has a particular interest in matters concerning Berners Bay. JGSC was formed, in large part, to respond to Forest Service plans to establish a third pulp mill in S.E. Alaska, located at Echo Cove, as well as various Forest Service logging proposals effecting the Berners Bay area. JGSC is also a member group of the Southeast Alaska Conservation Council and incorporates by reference their comments on the Kensington SDEIS.

Significant Issues

Significant issues under NEPA include those issues that have generated a high level of controversy amongst the public and the scientific community, including resource agency scientists and decision makers. **40 CFR 1502.12** requires that these issues be part of the EIS. One of the most controversial aspects of Coeur's new proposal for the Kensington Gold Project is whether Lower Slate Lake can legally be converted into a tailings impoundment and what the environmental effects of this conversion of a pristine lake into a waste dump will be. **40 CFR 1508.27(b)(10)** defines "Significantly" in the context of Environmental Impact Statements as to "Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment". Coeur must identify this part of their new proposal as a 4th significant issue. MR2-1

Alternatives

- The SDEIS repeatedly tiers to the 1997 SEIS, which in turn tiers to the 1992 FEIS. These documents are in turn 8 and 12 years old. NEPA requires both a reasonable range of alternatives and a hard look at them **(40CFR 1502.14(a))**. Relying on an operating plan that is 8 years old as the no action alternative does not meet these requirements. Tiring to information that is 12 years old, (the 1992 FEIS), is even worse. These documents are stale. Without a thorough look at an up-dated operating plan, that places the mine facilities at the Alt A Comet Beach/Kensington site, it is impossible to evaluate Coeur Alaska's claim that Alternative B or C is preferable for economic and environmental reasons. MR2-2
- Coeur claims that the use of isotainers for delivery of hazardous materials under Alternatives B & C contribute to making these alternatives environmentally preferable to Alternatives A and A1. There is no explanation as to why isotainers could not be used under Alts A and A1. MR2-3
- Coeur claims that the reason they included Alternative C is that they are seeking an exemption to regulations that require the re-cycling of ore processing waste water. Yet MR2-4

Alternative C also includes a diversion of freshwater sources around the TSF. There is no explanation as to why this diversion is not also part of Alternative B. JGSC will address this issue further in following sections of these comments.

- Coeur claims that the rational for their new operating plan is not only cost savings, but that it is environmentally preferable. This is an important claim as Coeur already has a permitted mine plan, and minimizing disturbance is part of the Purpose and Need statement for this SDEIS. Yet Alternatives B and C do not meet this stated Purpose and Need for the SDEIS. A reading of the SDEIS's Table 2-9, Summery of Potential Impacts of Each Alternative by Resource, amply demonstrates this. Highlights from this table are listed below. MR2-5

1) Air Quality: Alt A borrow areas = 54 acres, Alt A1 borrow areas = 36.3 acres, Alt B borrow areas = <u>7.2 acres</u>. Access roads under Alt A and A1 = 3 miles, under Alt B they = <u>10 miles.</u>
2) Tailings Generated: Same under Alt A1 and Alt B
3) Spills: Potential consequences of spills at the Cascade Point and Slate Creek Cove Marine Terminals are much greater then those at the Comet Beach facility. This is do to the presence of more sensitive intertidal habitat, and less wave action to produce dispersal of contaminates, at the Cascade Point and Slate Creek Cove sites in comparison to the Comet Beach site.
4) Freshwater Habitat loss: More temporary habitat loss under B and C then under A and A1. Potential permanent consequences to lake and stream habitat due to toxicity of tailings under Alt B & C's sub-aqueous tailing disposal plan. JGSC will address this issue further in following section of these comments.
5) Steam Crossings: Same number of stream crossings under each Alt but Alts B's and C's crossings impact Johnson Creek which has the largest spawning runs of Salmon amongst the project areas streams.
6) Fish Mortality: Higher loss of Dolly Varden under Alts B and C. Potential permanent loss of habitat values due to toxicity of tailings in Alt B and C's TSF.
7) Intertidal and Subtidal fill: More area dredged or filled under Alt B.
8) Aquatic Water Quality during construction: More impact to sensitive areas under Alts B and C.

9) Nearshore Organisms: Permanent loss of habitat under Alt B at Cascade Point.

10) Marine mammals: Significant potential of adverse impacts to Steller Sea Lions (SSL) and Humpback Whales under Alts B and C. JGSC will address this issue further in following sections of these comments.

11) Fish: Temporary impacts to higher value EFH under Alts B and C, and permanent impacts and loss of habitat at Cascade Point under Alt B.

12) Wildlife Habitat Impacted: More Old Growth impacted under Alt B and C then Alt A.

13) Wetlands: Temporary and permanent loss of high value wetlands only occurs under Alts B and C.

14) Land Use/Recreation: Alt B not consistent with Land Use Designations.

15) Change in Land Use Patterns: Impacts on a highly valued recreation area under Alts B and C but not under Alts A and A1.

16) Visual Resources: Alts B and C effect a highly valued recreation area, including the views from Pt. Bridget State Park, Echo Cove, Forest Service cabins, and from the vantage point of recreational boaters and kayakers. JGSC notes that the Lynn Canal view shed is already effected and would be further affected under all Alts. Additionally we note that there is no simulation of the Cascade Point Marine Facility in the SDEIS and that the simulation of the Slate Creek Cove facility is misleading as it doesn't include barge and ferry boats or the activities and equipment that would be associated with the loading and un-loading of freight and passengers.

17) Cultural Resources: There are more sites affected under Alt B and C then Alt A and A1. Additionally JGSC notes the close proximity of Auk Kwan village sites to the mining facilities and marine terminals under Alts B and C. We will not list their precise location here but note for the record that we are aware of these locations. Also of note is that there is no record of consultation with the Auk Kwan in the SDEIS in regard to these sites and the development of lands they consider sacred. JGSC will address this issue further in following sections of these comments.

18) Employee Transportation: Under Alt B and C there is much more boat traffic through Berners Bay then under Alts A and A1.

19) Vehicle trips/accident rate: There is a near doubling of the accident probability rate under Alt B and C as compared to Alt A.

There are also environmental consequences associated with Alternatives B and C that Table 2-9 either minimizes or neglects to list altogether. Any reasonable reviewer of the SDEIS can only conclude that Coeur's new operating plan is far worse environmentally then their permitted operating plan and does not meet the stated purpose and need of the SDEIS. JGSC also notes that while Coeur claims there is a significant advantage in reducing the total acreage of disturbance that occurs under their new operating plan, they contradict this claim on SDEIS page 4-72 by saying that "Overall, the extent of losses under any of the project alternatives for each of the wetlands types would not be expected to produce noticeable effects on a watershed or regional basis." MR2-6

Sub-aqueous disposal of Mine Tailings into Slate Lake

- According to past correspondence between the EPA and Coeur, Coeur needs to demonstrate, under the Clean Water Act (CWA), that their new operating plan's proposal for sub-aqueous deposition of the mines tailings is environmentally preferable to Alt A's and A1's dry tailing facility if they are to be allowed to use a lake as a tailing storage facility. The EPA also expresses doubt that this goal can be achieved[1] *(see Exhibit 1)* The EPA, in this same letter, also demands that Coeur "demonstrate that the project will meet all State of Alaska water quality criteria with a reasonable degree of certainty". There is no evidence provided in the SDEIS that Coeur has met this requirement. There is however much evidence that any interpretation of State of Alaska Water Quality Standards (WQS) that allows the elimination of an existing use, or the conversion of a lake to a treatment works, would be legally controversial. The legal issues surrounding MR2-7

[1] Correspondence from Bill Riley to Jeff DeFreest dated October 15th 2002. Mr. Riley states "Coeur will need to demonstrate, consistent with the CWA section 404(b)(1) Guidelines, that their proposal to construct a mine waste treatment facility in lower Slate Lake represents the least environmentally damaging practicable alternative for managing mine wastes (i.e. the tailings slurry) from the project. In EPA's view, the previously permitted dry tails facility near Comet Beach is a practicable alternative that would appear to be, absent further detailed analysis, a less damaging practicable alternative.

this proposal are controversial enough on their own that Coeur's failure to include any mention of them violates NEPA's requirement that potential conflicts with State, Local, or Federal law be revealed and discussed as significant issues **(40 CFR 1508.27 (b)(10)).**

- The SDEIS fails to discuss how a decision to use a lake as a TDF could set a new precedent for future actions that may have significant effects **(40 CFR 1508.27(b)(6)).** MR2-8

- For the record JGSC believes the conversion of Lower Slate Lake into a waste treatment and tailings disposal site does violate the CWA and current State of Alaska WQS's. MR2-9

- Coeur's new operating plan targets a higher grade of ore. As the gold in the Kensington ore body is directly associated with sulfide mineralization, the tailings Coeur plans to deposit in Lower Slate Lake will be higher in sulfide content than those of the approved project. Yet Coeur has not done any laboratory analysis on samples that reflect the new composition of the tailings but instead relies on lab work done on samples reflecting the tailings composition of the old operating plan. As the new plans predicted sulfur content (not verified) of 0.31% is right at Coeur's claimed cutoff point for acid neutralization it is even more important that appropriate lab work be performed on a new set of samples. Under NEPA, this information should be presented at the draft stage, and not put off for public review until a decision has already been made. MR2-10

- Coeur relies on a un-peer reviewed 1988 (Kline) in-situ study of the effect of mine tailings on Benthic organisms. This study used tailings of lesser sulfide content and was performed in a marine environment, not a freshwater one. Coeur needs to do in-situ studies in Slate Lake or that replicate the environment of Slate Lake. MR2-11

- Coeur claims that there is little risk of acid generation from the tailings in the Slate Lake TSF. Yet they cite as a reason for Alternative C's diversion of freshwater around the Slate Lake TSF, SDEIS page 2-16, "The purpose of the diversion would be to minimize the volume of fresh water in contact with the tailings" and again on SDEIS page 2-26, "The TSF diversions would be built to minimize contact between the tailings and fresh water and to enhance conditions for settling within the facility." If the tailings aren't toxic, and the discharges from the lake will meet water quality standards, why the need for the diversion? MR2-12

- Why are the Alt C diversions only a component of Alt C, rather then both B and C? If it is because Coeur is depending on freshwater inflows to provide for dilution of Slate Lake's waters, in order to meet NPDES discharge levels, this may be inconsistent with the CWA 404(b)(1) Guidelines and such a potential conflict has to be disclosed in the DSEIS. MR2-13

- If settling conditions need to be enhanced, (see quote from SDEIS page 2-26, noted above), again, why aren't Alt C's diversions included in Alt B? MR2-14

- Coeur on SDEIS page 4-23 admits that discharges of tailings water from a tailings impoundment is not allowed, under 40 CFR Part 440, except for an exception (they have yet to be granted) for discharges equaling the amount of precipitation received by the lake. Coeur apparently is interpreting precipitation to mean the inflow from Lower Slate Lake's source streams. This may not be an interpretation of the regulations that could withstand legal challenge. MR2-15

- There is no discussion of how Coeur's tailing disposal plan, which increases the lakes surface area, will effect water temperatures, and by extension aquatic life, both within Slate Lake and downstream of it. MR2-16

- Coeur's Table 4-11 reveals that they are relying on the State of Alaska formulating a new site specific criteria for Aluminum for the Kensington Project. This process of changing the WQS's of the State could take as long as two years, would be subject to public review and legal challenge, and may not happen at all. Yet Coeur claims they intend to start construction work this summer. MR2-17

- Coeur claims that discharges from the TSF at Slate Lake will meet NPDES discharge requirements. Yet when discussing TSF effluent quality for Alt C, the SDEIS says (*page 4-25*), "For this alternative, the key factor is that the operator would not be required to "hold" too much water in the TSF when the dilution from natural inflows is not sufficient to ensure compliance with water quality-based effluent limits". This is not only an admission that Coeur is depending on dilution to achieve acceptable levels of discharge toxicity, but it also makes clear that under ALT B the TSF will not always meet in-stream flow requirements without exceeding NPDES permit requirements. MR2-18

- Currently no NPDES permit exists for the TSF. This SDEIS should not have been issued until the permit's requirements are known and available for reviewers to comment on. MR2-19

- Coeur claims that there will be financial mechanisms in place to insure for the care and maintenance of the TSF and its dam in perpetuity. Yet there is no estimate of the amount of money this will entail. This is critical information and as such must be provided at the draft stage, not left for parties to review after a decision has already been made. MR2-20

The EPA has an extensive public record of concern over Coeur's new operating plan's proposal for a TSF in Slate Lake. They also have an extensive public record of concern about development proposals for Berners Bay *(see Exhibit 2, letter from EPA to Sheldon L. Jahn, Corp of Engineers, dated 4-20-1998)*. These concerns have led the EPA to give both Goldbelt Corporation's previous proposals for Cascade Point, and the Juneau Access project's road to Skagway proposal, an Environmentally Objectionable (EO-2) rating. EPA concerns have also led to them elevating Berners Bay to an Aquatic Resource of National Importance (ARNI) *(see Exhibit 2, plus Exhibit 3, letter from EPA to Jennette de Leeuw, U.S. Forest Service, dated 2-12 1998, and Exhibit 4, EPA comments on the Juneau Access project, dated 12-18-1997)*. MR2-21 They have also suggested that a management plan for Berners Bay be formed, and suggest that this plan might include designation of Berners Bay as a National Marine Sanctuary and its rivers as Wild and Scenic. MR2-22 JGSC is aware that politicians, including Alaska's Governor and Senators, have exerted pressure on the politically appointed heads of Federal resource agencies to override the objections of the career staffers and scientists of these agencies, including those of the EPA, in regards to the Kensington Gold Project. The possibility that the EPA and other agencies will be forced by their administrators to give approval to Coeur's new operating plan and issue permits for it, including a NPDES discharge permit for Alt B and C's TSF, does not erase the public record that already exists. It also does not relieve the Forest Service and Coeur from NEPA's obligation to disclose potential conflicts with the law at the DSEIS stage and beyond. MR2-23

Wildlife

- The SDEIS discusses the effects of small amounts of hydrocarbons on Pacific Herring reproductive success, i.e. egg hatching, but not on Eulachon reproductive success. While the studies sited used herring eggs only, Eulachon are closely related to Pacific Herring, and the probability of similar effects of hydrocarbon contamination on both species is high. This is noted in the several studies involving Berners Bay's Eulachon spawning runs and should have been discussed in the SDEIS. MR2-24

- The SDIES notes that Pacific Herring stocks have been eliminated or depressed, and have failed to recover along the Juneau road system. However the SDEIS fails to note that the public record of resource agency comments on this subject suggest that the failure of the stocks to recover may be due to chronic hydrocarbon contamination associated with development along the road system including storm water runoff *(see Exhibit 5, letter from NMFS to Corp of Engineers)*. JGSC notes that any observer can visit any of the areas harbors and docking facilities and be virtually certain of viewing hydrocarbon sheens on the waters surface. Observers can also note sheens on the areas roadways and parking lots on any wet day. As these hydrocarbons eventually make their way down to intertidal areas, there is no doubt that chronic contamination is occurring on an on-going basis. Such chronic hydrocarbon contamination is also a near certainty at the Slate Creek Cove and Cascade Point Marine Facilities under SDEIS Alts B and C. MR2-25

- There is no discussion of the insidious effects of hydrocarbon toxicity on successive generations of Salmon and their prey species. Recently published and on going studies that deal with this issue are available from the NMFS's Auke Bay Lab. One example, **" Long-Term Ecosystem Response to the Exxon Valdez Oil Spill" (see end of pg. 2083 through 1st column of pg. 2084)**, is attached to these comments as *Exhibit 8*. MR2-26

- The SDEIS minimizes the effects any interruption of the Steller Sea Lion's (SSL) ability to access the Eulachon prey source would have on the SSL's population level fitness. There is mounting evidence that the timing of the spawning runs of the Eulachon prey resource, and the high energy nutritional pulse they provide, may be the single most important reason that the Eastern population of SSLs has not declined as the endangered western population has. JGSC notes that the NMFS's SDEIS on the Alaskan Groundfish MR2-27

Fishery lists the lack of high energy content prey sources, mainly Eulachon, as a suspected contributing cause to the Western SSL population's collapse and its failure to recover *(see Exhibit 6, pages 3.3-48 through 3.3-51 and page 3.3-64 from January 2001 Draft Programmatic SEIS).* A conservative assessment of the current scientific information would conclude that there is a significant possibility that any diminishment of the SSL's ability to access the Eulachon resource would affect the population level fitness of the Eastern population of SSLs.

- The SDIES does not disclose the regional nature of the SSL aggregation during the spring Eulachon run with SSLs coming from all over Northern S.E. Alaska to feed in Berners Bay. MR2-28

- The SDEIS does not discuss the implications of a possible decline in the population level fitness for the Eastern population of SSLs. The result of such a decline, i.e., a listing of the population as endangered, could be catastrophic to region's economy. The failure of the Kensington Gold Project SDEIS to adequately reveal and discuss this information and its implications is a violation of NEPA's disclosure requirements **(40 CFR 1502.22(b),** ***"reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability is low).*** MR2-29

- There is no mention in the SDEIS of a SSL haulout at the entrance to Slate Creek Cove. There is no discussion of the probability that SSLs will be displaced from the haulout by the proposed Slate Creek Cove Marine Terminal Facility. MR2-30

- There is no mention of a Harbor Seal haulout/nursery areas existing in close proximity to the Slate Creek Cove Marine Terminal Facility. There is no discussion of the probability that the Harbor Seals and their pups will be displaced from the haulout by the Slate Creek Cove Marine Terminal Facility. The information on the existence of the haulout was readily available from the 1997 Juneau Access DEIS. MR2-31

- The SDEIS does not reveal that the Slate Creek Cove area has large seasonal congregations of birds. Several years of survey information is available from the USF&WS's office in Juneau (personal notes from inter-agency monitoring meeting on Berners Bay, March 30th 2004. MR2-32

- The SDEIS does not discuss the possibility of loosing future options for Herring recovery if a terminal is built at Cascade Point. Herring spawning is now limited to the MR2-33 eastern shore of Berners Bay, in the vicinity of Cascade Point, and rebound could be jeopardized by a facility being built there (*see Exhibit 5*).

- The SDEIS does not discuss the importance of the timing of the spring Eulachon spawning run to migrating shorebirds and waterfowl. The Eulachon run coincides with the northward migration of these birds and attracts upwards of a hundred thousand birds to Berners Bay. In addition the 2nd largest concentration of Bald Eagles in North America occurs in Berners Bay at this time. The timing of the Eulachon run may be critical for the successful migration of several species as it provides a high energy nutritional pulse that re-fuels the migrating species for the next leg of their journey north. MR2-34

- There is no evidence in the SDEIS that any survey of bear and bird predation on the salmon runs in Johnson Creek, or elsewhere, have taken place. There is no discussion of TLUMP's Standards and Guidelines for Important Brown Bear Foraging Habitat to be found in the SDEIS. There is no evidence that the Standards and Guidelines have been met, not only for Brown Bear, but for other wildlife species for which specific guidelines and survey protocols exist as well. MR2-35

- Coeur relies heavily on the prompt clean-up of major hydrocarbon spills as their rational for asserting that the potential impacts to freshwater and aquatic organisms is low. There is no recognition that some spills, such as those in wetlands, may not be possible to contain and that hydrocarbons would inevitably be transported into stream and river environments. There is currently no clean up plan in place. This plan should already be in place at this stage of the NEPA process and available to reviewers for evaluation. While Coeur maintains that the probability of any major spills occurring is extremely low, they admit that chronic spills of small amounts of hydrocarbons, and the resulting runoff of contaminated stormwater, are a distinct possibility at the Marine Terminals. The SDEIS however fails to provide any detailed discussion of stormwater runoff from roads, and the possibility of this runoff producing the same kind of chronic low level contamination of wetlands and streams that may exist at the marine terminals. MR2-36

- The Summery of Mitigation and Control Measures, Table 2-6, repeatedly relies on plans and permits that are not in place, and consequently are unable to be evaluated by reviewers. MR2-37

- Potentially important and available information has not been utilized in the SDEIS. This information includes both the USF&WS surveys mentioned above, recent studies produced by the Auke Bay Lab, and the habitat mapping and biological assessments DOT has produced for the Juneau Access SDEIS. MR2-38

Social-Economics

- Coeur's analysis of the social-economic impacts of their Preferred Alternative, Alt B, fails to note Goldbelt Corporation's agreement with Coeur to provide much of the housing needed for the Kensington Gold Project's miners (it is noted in a single sentence under the analysis of Alternative A). This agreement has serious implications for Juneau's construction industry, particularly in regards for who may be hired to do the construction. JGSC notes for the record that we believe this to be a deliberate de-emphasizing of this issue for public relation purposes. MR2-39
- Coeur throughout most of the SDEIS, emphasizes the total jobs created, rather then the amount of jobs and payroll likely to go to the existing workforce in the area. This is evident in the SDEIS's tables and in the fact that they never calculate the number of jobs that would go to Juneau residents but only give percentages. JGSC notes that in all of their public pronouncements Coeur has totally avoided the issue of 80% of the jobs going to people who do not currently reside in Juneau. The total number of jobs the operational phase of the mine will generate for Juneauites is approximately 45, a number that appears nowhere in the SDEIS. JGSC notes that we believe this extreme bias of the SDEIS is deliberate and that it is attributable to Coeur's public relations campaign. MR2-40
- Coeur's SDEIS fails to make the obvious connection between their agreement with Goldbelt Corporation to build housing for miners and the fact that Goldbelt Corporation's Master plan for development at Cascade Point calls for miner's housing to be built at that site. Instead the SDEIS mentions the Cascade Point Master Plan only briefly and passes it off as conceptual. If Alternative B goes forward and a road and dock are built at Cascade Point, the probability that Cascade Point will be the site of housing for the Kensington Gold Project's miners moves from being conceptual to being a near certainty. As such this development needs to be considered a reasonable and foreseeable MR2-41

indirect effect under NEPA, and the impacts need to be assessed as part of Alternative B at the SDEIS stage and beyond **(40CFR 1508.8(b)).**

- Coeur's SDEIS fails to mention the agreement between Goldbelt Corporation and Coeur to provide training and workers for the Kensington Gold Project. This implies that the 45 jobs that are predicted to go to Juneau residents may in fact be given preferentially to a further subset of workers, shareholders of Goldbelt and other Native Corporations. JGSC notes that we believe the reason that this potentiality is never discussed in the SDIES is because of Coeur's public relation goals and that the omission is deliberate (*see Exhibit 7, a newspaper article from the Juneau Empire and a press release from Coeur d' Lane).* MR2-42

JGSC maintains that the preceding points demonstrate a deliberate glossing over of some of the most essential questions the Social-Economic section of an Environmental Impact Statement is designed to answer. The questions of who will be likely to receive the economic benefits of a project, and what those benefits are likely to be. MR2-43

Cultural Resources

- The SDIES fails to mention that Coeur's new operating plan only increases the concerns of the Auk Kwan about the potential desecration of burial sites, and other areas that they hold sacred, that exist within the project area's boundaries. MR2-44
- The SDEIS fails to mention the extensive public record of opposition to the Kensington Gold Project by the Auk Kwan. MR2-45
- There is no evidence in the SDEIS, or the planning record, that any consultation has taken place with the Auk Kwan's Tribal leader, Rosa Miller, about the Kensington Gold Project's new operating plan's impacts on the burial sites of the Auk Kwan's ancestors or on areas they hold to be sacred. Under The National Historic Places Act (NHPA) these consultations have to take place at an early stage. That they haven't taken place with the Auk Kwan is a violation of the act. MR2-46
- JGSC also notes that in addition to being a violation of the NHPA, the failure of the parties involved with the Kensington Gold Project, including Goldbelt, Sealaska, and Cape Fox Corporations, to consult with the Auk Kwan and their leader, Rosa Miller, MR2-47

shows a gross lack of respect on their part towards one of Juneau's most respected native elders.

Reclamation and Bonding

There is no information on the amount of bonding that Coeur will be required to put in place to insure reclamation of the mine when it closes, whether this is because the mine has finished working the mine's ore body or because Coeur runs into financial difficulties. There is no information on the financial mechanism Coeur will establish, or the amount of funds Coeur will need to put in trust, to insure that the dam at Slate Creek Lake is maintained in perpetuity. This is information that should already be available to reviewers. Given Coeur's history of financial problems, of irresponsible mining practices in the Coeur de Lane Valley of Idaho (which resulted in the establishment of a superfund site), and of impoundment dam failure at their mine workings in New Zealand, this information is critical. MR2-48

Cumulative Impacts

- The SDEIS's discussion of the probable effects of a land exchange between the Forest Service, Sealaska Corporation, and Cape Fox Corporation is inadequate. It only notes that the effects will primarily be on the Kensington Gold Project's mine reclamation, not what the facilities that would otherwise be removed are. Indeed it is extremely un-likely that any usable structure at all would be removed if the exchange takes place. This includes both the Marine Facility at Slate Creek Cove and any roads and mine buildings the corporations may find useful for future development projects. MR2-49
- Coeur does not mention that a probable effect of the Cape Fox Land Exchange is that Cape Fox shareholders from Saxman would receive preferential access to the jobs generated from the Kensington Gold Project. MR2-50
- The SDEIS Cumulative Impacts section states on page 4-123 that the Kensington Gold Project would not affect Marine Resources as a part of mining operations except for dredging operations at the Marine Terminals during construction. The SDEIS then goes MR2-51

on to contradict itself in the following sentence by saying there is a potential for impacts from fuel spills during operations at these same terminals. Additionally this section of the SDEIS ignores the impacts at the terminals from chronic low level spills of hydrocarbons that will only be manifest in stormwater runoff *(see Exhibit 8, reprint from December 19 2003, Volume 302 of Science Magazine, Page 2085)*. A foreseeable impact of an extension of the mines life would be a continuation of chronic impacts from hydrocarbon contaminated stormwater as well an increased risk that a major spill will happen at some point during the useful lifetime of the Slate Creek Marine Facility. The SDEIS fails to reveal these impacts.

- The previous bullet's argument applies as well to the impacts to be expected from the Cape Fox Land Exchange as it is unlikely the Slate Creek Marine Terminal would be reclaimed if the exchange takes place. MR2-52

- There is a lack of significant discussion of the probability that the Marine Terminal at Cascade Point may be used as a docking facility for vessels other then those associated with operation of the Kensington Mine. These vessels include additional catamaran type tourist vessels as well as the fishing vessels mentioned in the SDEIS's Cumulative Impacts section. This probability is high as Goldbelt Corporation has included this function as part of their Purpose and Need statement for their prior proposal for a dock at Cascade point. MR2-53

- There is no discussion of the probable effects of fishing boats in particular on the Pacific Herring spawning habitat adjacent to Cascade Point. Fishing boats are notorious leakers of hydrocarbon contaminated bilge water, and this use merits special attention as Goldbelt's Master Plan includes facilities for commercial fishermen. MR2-54

- There is no discussion of the possibility of the Alaska Marine Highway Terminal at Auke Bay being moved to Cascade Point if a marine facility is built there. This is under active consideration by DOT (personal notes from March 30th 2004 interagency meeting on Berners Bay monitoring). MR2-55

As discussed by JGSC in our comments on the Social-Economic impacts of SDEIS, the implementation of Alternative B is almost certain to lead directly to additional development at Cascade Point. Rather then casually listing the Cascade Point Master Plan's proposed developments in the Cumulative Impacts section of the SDEIS, the MR2-56 impacts of these developments should have been thoroughly studied as connected actions under the SDEIS's analysis of Alternative B, as required by NEPA. In light of the agreements between Coeur and Goldbelt Corporations, the probability that a large residential development for miners employed by the Kensington Gold Project will be built at Cascade Point cannot be ignored. Such a development would necessitate other aspects of Goldbelt Corporation's Master Plan being built as well. These developments include electrical generating capacity, fuel storage, a gas station, and a convenience store.

Conclusion

Many of the inadequacies of Coeur's SDEIS that JGSC has noted can only be remedied by a withdrawal of the document, or by stopping the clock on the NEPA process, and issuing supplements to it, as more detailed work is produced. JGSC requests that this be done. It is however, already evident that Coeur's new operating plan is far worse environmentally then the permitted Alternative A. This is also true for Coeur's semi-updated variation of Alternative A, Alternative A1, which at least partly fulfills the goal of reducing impacts. However, as JGSC has noted, both of these alternatives tier to out of date and therefore stale information. It is evident throughout the SDEIS that Coeur has not given serious consideration to modifying or up-dating these alternatives to achieve the goals of the SDEIS in regards to its Purpose and Need of reducing costs and minimizing impacts. MR2-57

Regards,

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Responses to Comments

Affiliation	Comment ID	Response
Juneau Group of the Sierra Club	MR2-01	Significant issues define the impacts that will be the focus of the NEPA analysis and are not intended to address the “legality” of specific project components. The legality of the TSF has been addressed by EPA, as discussed in the response to comment SC-48. Issue 2 in the Final SEIS specifically addresses impacts of the project, including the TSF on the Johnson and Slate creek drainages as well as Berners Bay. This is the subject of extensive analysis throughout the Final SEIS.
Juneau Group of the Sierra Club	MR2-02	The 8-year-old mine plan referred to in the comment was approved by the Forest Service and could be implemented by the proponent at any time (assuming it renewed its NPDES permit). The plan is therefore not stale since the 1992 EIS and 1997 SEIS baseline information has been updated for most resource areas, including freshwater and marine resources, water quality, recreation, and wildlife. Information presented in the 1992 EIS, such as the numbers of birds occurring in Berners Bay, remain valid for the purposes of assessing potential impacts.
Juneau Group of the Sierra Club	MR2-03	Coeur Alaska proposed using isotainers as part of its proposed modifications of the plan of operations. The plan approved following the 1997 SEIS called for the use of ship-to-shore fuel transfers and reflected Coeur Alaska’s proposal. Since the scenario presented under Alternative A has already been approved, the Forest Service did not consider the use of isotainers as part of this assessment. One reason Coeur Alaska prefers to use a marine facility at Slate Creek Cove is the reliability of barge shipments. Approximately nine 6,500-gallon isotainers would be delivered to the site weekly under Alternatives B, C, and D. The time between deliveries to Comet Beach could be delayed by weather for 6 weeks or more. Therefore a greater fuel storage capacity is required and subsequently a larger number of isotainers would need to be transferred at any one time to ensure an adequate fuel supply. The difference in fuel storage capacities between the two sets of alternatives reflects this situation.
Juneau Group of the Sierra Club	MR2-04	Comment noted.
Juneau Group of the Sierra Club	MR2-05	Section 4 of the Final SEIS has been revised to allow easier comparison of impacts between the alternatives. Regardless of the claims of the applicant regarding the environmental benefits of its proposed changes to the plan of operations, the Forest Service's purpose and need for this action, as presented in Section 1.2 of the Draft SEIS, is simply to consider those proposed changes which are intended to improve efficiency and reduce the area of surface disturbance. As shown in Table 2.2, the action alternatives all result in less surface disturbance than Alternative A and relocate much of that disturbance to private land rather than public land. Whether or not the results of these changes are environmentally preferable is the subject of this analysis and will ultimately be determined in decisions to be made by the Forest Service, EPA, USACE, and the State of Alaska on the basis of this analysis. The Forest Service has documented its rationale for its decision in the ROD.
Juneau Group of the Sierra Club	MR2-06	The commenter should be aware that Coeur Alaska does not make any claims in the Draft or Final SEIS. The proposed action reflects a plan of operations submitted by Coeur Alaska. However, the Forest Service conducts the NEPA process and is the agency responsible for the decision whether to approve the proposed action, approve the action with changes, or select the No Action Alternative. The statement quoted in the comment is accurate and not contradictory to the fact that each alternative creates a different amount of surface disturbance.
Juneau Group of the Sierra Club	MR2-07	As summarized in Section 1.7.1 and documented in EPA's May 17, 2004, memo (USEPA, 2004) and the draft NPDES permit fact sheet, the “conversion” of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notices for the USACE permits and the draft NPDES permit were released to the public for comment. The USACE, through its permitting process, will make a determination under the 404(b)(1) guidelines.
Juneau Group of the Sierra Club	MR2-08	The regulatory explanation for the TSF is discussed in Chapter 1 (Water Quality Act) and in the reference EPA, 2004.

Affiliation	Comment ID	Response
Juneau Group of the Sierra Club	MR2-09	As summarized in Section 1.7.1 of the Final SEIS and documented in USEPA 2004 (EPA May 17, 2004, memo) and the draft NPDES permit fact sheet, the “conversion” of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notices for the USACE permits and the draft NPDES permit were released to the public for comment.
Juneau Group of the Sierra Club	MR2-10	It is true that Coeur Alaska plans to mine a subset of the original deposit, by focusing on higher grade ore with a gold cutoff of 0.14 ounces per ton (opt). Previous work characterizing the deposit has shown that gold grade correlates generally with total sulfur content, so it is likely that sulfur content will be incrementally higher in tailings generated through flotation of higher-grade ore. The increase in grade cutoff from 0.09 opt to 0.14 opt gold will increase average total sulfur in ore from 2.69 percent to 3.08 percent. This was recognized and addressed in the Draft SEIS, which relied more on the baseline characterization of the ore than on the analysis of tailing samples generated through metallurgical testing. The assertion that Coeur Alaska has “not done any laboratory analysis on samples that reflect the new composition of the tailings” is not true. Based on the design flotation efficiency of 98 percent for the proposed flotation process, the total sulfur content in tailings will increase only slightly, from an average of 0.05 percent to 0.06 percent. These values are very close to the measured total sulfur values of 0.04 percent reported by Montgomery Watson (1996) and 0.06 percent reported by Rescan (2000) for tailings generated from composites in metallurgical tests. At this sulfide removal efficiency, using the baseline ore geochemistry data, the total sulfur content of tailings placed in Lower Slate Lake will range from 0.0006 percent to 0.44 percent under the modified plan. Virtually all of the tailings samples (n=144) are expected to have less than 0.3 percent residual sulfur. The sulfur chemistry of the ore is based on acid base account and total sulfur analysis of 144 samples (with gold grade greater than the 0.14 opt cutoff), which are a subset of the 583 samples studied to characterize the overall deposit originally (Geochemica, 1993). The applicability of the individual sample geochemistry does not change as a result of the change in grade cutoff. As a sensitivity analysis, the residual sulfur content of tailings was also calculated under the assumption that sulfide removal efficiency could drop as low as 90 percent in an operational upset condition. In that case, average sulfur content would be 0.31 percent, with a range from 0.003 percent to 2.2 percent sulfur. Acid base accounting analyses have been completed for all of the ore samples included in the analysis provided in the Draft SEIS, but along with sulfide removal, changes in neutralization potential (NP) that result from grinding (thus, increasing surface area and reactivity of neutralizing minerals) and flotation (addition of alkalinity for processing purposes) will change the relative proportion of NP/AP in the spent ore. Acid base accounting analyses could not be completed for individual samples of spent ore, because tailings were generated through metallurgical analysis of composited bulk samples. Because flotation of composites in metallurgical tests produces a relatively small number of tailings samples, it was not possible to evaluate the range of chemistry that will exist in the tailings following flotation using acid base accounting analysis of the tails themselves. For these reasons, analysis of potential changes in acid generation potential resulting from the change in grade cutoff focused on the total sulfur concentration described for individual samples, using the guidelines provided by Jambor et al, 2000. If one holds the measured NP constant with preprocessing values measured in ore, for the designed rate of 98 percent sulfide removal, the NP/AP ratio calculated using ABA data for the 144 samples of ore meeting the new grade cutoff would shift from an average ratio of 3 to 136; at 90 percent efficiency of sulfide removal, the NP/AP ratio would be 27. In all cases, the average value meets relevant regulatory criteria. It is important to note that use of total sulfur as a criterion for material classification very conservatively estimates potential acid generation risk, as all sulfur is assumed to be present as sulfide and all sulfide is assumed to fully oxidize. It is very unlikely that all sulfide will oxidize in a subaqueous impoundment, where oxygen is not available to drive the oxidation reaction. Classification of material based on total sulfur also neglects the inherent alkalinity of the mesothermal ore deposit, which has significant association carbonate mineralization that provides neutralization potential (Geochemica, 1994). Finally, this classification also neglects the alkalinity of the tailing itself, which requires that high pH conditions (typically 9 or better) be created through lime addition and maintained to support efficient ore recovery during flotation.

Affiliation	***Comment ID***	***Response***
Juneau Group of the Sierra Club	MR2-11	In addition to the in-situ studies mentioned, which have been peer-reviewed (Kline and Stekoll, 2001), the Draft SEIS also used other lines of evidence in the evaluation of tailings disposal. Central to the overall evaluation was the work conducted by Rescan (2000) on the metal flux from the tailings. This work is discussed in the Ecological Risk Assessment (Appendix C).
Juneau Group of the Sierra Club	MR2-12	During alternatives development (prior to completion of the SEIS analysis and supporting risk assessment), the Forest Service, with input from EPA, decided to incorporate diversions around the TSF into Alternative C. The subsequent analysis has shown that the tailings may not exhibit chemical toxicity. The Final SEIS clearly shows the relative impacts of Alternatives B, C, and D.
Juneau Group of the Sierra Club	MR2-13	The USACE, through its permitting process, will make a determination under the 404(b)(1) guidelines. There is no Clean Water Act requirement to divert water around the TSF. The State of Alaska, EPA, and USACE, as cooperating agencies, have participated in preparing the Final SEIS to ensure consistency with all applicable Clean Water Act requirements and state water quality standards.
Juneau Group of the Sierra Club	MR2-14	Use of diversions is not required by the Clean Water Act, and enhanced settling could occur with or without diversions. The Final SEIS indicates that the discharge under either Alternative B or C might not meet TSS limits without additional treatment. Alternative D includes a reverse osmosis treatment system to ensure compliance with the TSS limits.
Juneau Group of the Sierra Club	MR2-15	Under Alternatives B and D with the recycling system, the discharge from the TSF represents the natural inflows to and precipitation falling on the lake. This is consistent with 40 CFR Part 440.
Juneau Group of the Sierra Club	MR2-16	Temperature profiles from Lower Slate Lake indicate that there is thermal stratification of the lake in the summer, with the warmest water occurring near the surface, primarily due to water coloration, which limits light penetration into the lower depths of Lower Slate Lake. By October, stratification is lost, with the lake demonstrating only limited temperature differences with depth. Currently, Slate Creek receives water discharged from the surface of Lower Slate Lake. This will continue to be the case during TSF operation and at closure. For that reason, changes in the thermal profile of Slate Creek are not expected.
Juneau Group of the Sierra Club	MR2-17	The referenced table was developed for this SEIS and not provided by Coeur Alaska. A site-specific criterion has not been adopted, i.e., the limits for the TSF discharge are based on the statewide criteria. A treatment system is included under Alternative D to ensure compliance with the limits.
Juneau Group of the Sierra Club	MR2-18	It is allowable to use dilution to achieve effluent limits based on state water quality standards. The Final SEIS acknowledges, however, that the pond water under Alternative B will not always meet permit limits and this could affect the ability to meet minimum instream flow requirements. Under Alternatives C and D, continuous discharge is not required since instream flow will be maintained by the diversions.
Juneau Group of the Sierra Club	MR2-19	The draft NPDES permit was released to the public for comment in June 2004. This Final SEIS reflects the comments received on the draft permit.
Juneau Group of the Sierra Club	MR2-20	The Forest Service will establish the amount of financial assurance that Coeur Alaska would be required to post for reclamation, and long-term stability of the tailings disposal facility would be based on the final plan of operations. The financial assurance is not critical information for the NEPA process and public participation is not part of the process for establishing a reclamation bond.
Juneau Group of the Sierra Club	MR2-21	Comment noted.
Juneau Group of the Sierra Club	MR2-22	Comment noted. It is not appropriate to consider previous “suggestions” of potential management plans or designations when no specific proposals are currently under consideration.
Juneau Group of the Sierra Club	MR2-23	Comment noted. This Final SEIS specifically addresses consistency with all other existing laws and regulations.

Affiliation	Comment ID	Response
Juneau Group of the Sierra Club	MR2-24	Similar data are not available for eulachon, limiting the discussion to herring. It is, however, important to recognize that no fueling would occur at Slate Creek Cove. Given no fueling and the limited boat traffic, the likelihood of petroleum hydrocarbon impacts on eulachon is very low. Note that, considering expected mitigation requirements, the Final SEIS, including the BA/BE, predicts no petroleum-related effects on herring.
Juneau Group of the Sierra Club	MR2-25	The condition of the herring stock is explained in Sections 3.10 and 4.10. There is no documentation indicating why the stock has declined; attributing the continued depression of the population numbers to hydrocarbon contamination is purely speculative. Note that no fueling would occur at Slate Creek Cove. At Cascade Point, the state's Tidelands Lease is expected to prohibit vessel use during spawning as well as prohibit fueling from the time of pre-spawning aggregation through the time when eggs hatch. The CBJ Allowable Use Permit also requires that only fueling directly from trucks occur at Cascade Point, i.e., no on-site fuel storage is allowed.
Juneau Group of the Sierra Club	MR2-26	The effects and behavior of crude oil in the environment are very different from those of diesel fuel. The levels of hydrocarbons that could occur as a result of day-to-day operations are orders of magnitude less than those following the Exxon Valdez spill. The effect of hydrocarbons on marine species are discussed in Section 4.10.
Juneau Group of the Sierra Club	MR2-27	Information has been added to the text in both Chapters 3 and 4. The BA/BE (Appendix J) describes in detail the likelihood of impacts on Steller sea lions considering the required mitigation measures. No population level effects are anticipated.
Juneau Group of the Sierra Club	MR2-28	Information has been added to Section 3.10 to further describe the level and timing of Steller sea lion occurrence in Berners Bay. We agree that eulachon are extremely important for Steller sea lions and other marine wildlife during certain times of the year, and the BA/BE (Appendix J) discusses the most current information on the distribution of Steller sea lions in southeast Alaska and their use of Berners Bay. The BA/BE also describes in detail the likelihood of impacts on Steller sea lions considering the required mitigation measures. No population-level effects are predicted.
Juneau Group of the Sierra Club	MR2-29	See the responses to comments MR2-27 and MR2-28.
Juneau Group of the Sierra Club	MR2-30	The Final SEIS documents that Steller sea lions have been observed hauling out around Slate Creek Cove, but there is no documentation of a sea lion "haulout" within Slate Creek Cove. The BA/BE (Appendix J) identifies documented haulout sites in the area.
Juneau Group of the Sierra Club	MR2-31	The discussion of the distribution of Steller sea lions and harbor seals (Section 3.10.3) has been revised. Section 4.10.3 discusses the potential impacts on marine mammals, including harbor seals. Mitigation measures are discussed in Section 2.5.1.
Juneau Group of the Sierra Club	MR2-32	Marine birds are addressed in Section 3.11.3. The information is derived from the USFWS 2003 document.
Juneau Group of the Sierra Club	MR2-33	It is highly unlikely that the placement of the breakwater and subsequent operations at Cascade Point would in and of themselves jeopardize the recovery of the Lynn Canal Pacific herring stock. The potential impacts on herring spawning, considering mitigation measures, are discussed extensively in Section 4.10 and in the BA/BE (Appendix J). The State of Alaska, as a cooperating agency, has direct responsibility for managing the herring stock and participated in the drafting of the herring discussion in the Final SEIS.
Juneau Group of the Sierra Club	MR2-34	Please see Section 3.11.3.

Affiliation	*Comment ID*	*Response*
Juneau Group of the Sierra Club	MR2-35	No surveys of salmon predation by bears or birds were undertaken as part of the baseline studies for this SEIS. The Forest Plan Implementation Clarification for Brown Bear Foraging Sites calls for a minimum 500-foot buffer along salmon streams. Since the minimum distance between the existing Jualin access road and the anadromous portion of Johnson Creek is over 500 feet and in most cases exceeds 1,000 feet, the Clarification would be satisfied. Additional discussion has been added throughout the Final SEIS regarding consistency with Forest Plan standards and guidelines.
Juneau Group of the Sierra Club	MR2-36	Coeur Alaska has submitted a Spill Prevention, Control, and Countermeasures Plan, which is included as Appendix E of the Final SEIS. In addition, mitigation measures have been included that address fueling at Cascade Point or Echo Cove as well as fuel storage locations throughout the facility. The fuel storage locations are identified in Section 2, and the projected fuel use has been revised (downward) based on an optimization study completed by Coeur Alaska. Fuel spills are not expected within wetlands because storage and dispensing operations would occur in bermed and lined areas, and would be restricted to uplands on National Forest lands. Stormwater would be managed using best management practices designed to minimize the exposure of contaminants. Hydrocarbon-contaminated stormwater is not expected from any location and would be in general violation of the stormwater provisions of the Clean Water Act. As documented in the Final SEIS, Coeur Alaska would be required to develop and implement both a Spill Prevention, Control, and Countermeasures Plan and a Storm Water Pollution Prevention Plan to limit the potential for spills from petroleum-related storage and transportation under all alternatives. The Forest Service does not have the authority to require preparation of these plans for the NEPA analysis. They will, however, be developed under EPA requirements and subject to EPA verification of compliance. The Final SEIS documents that the likelihood of a major diesel fuel spill is low, especially with the use of isotainers under Alternatives B, C, and D. Moreover, even if a spill did occur, much of the transportation route is not immediately adjacent to streams. Finally, there is a clear distinction between chronic leaks and their possible effects at the marine terminals (where direct release to water and habitat would likely occur) and the potential for chronic leaks associated with transportation and storage at the mining site. At the mining site, to reach aquatic resources, pollutants would have to contaminate runoff that would be further subject to control and discharge under the facility's Storm Water Pollution Prevention Plan. The Forest Service has determined that such effects are highly unlikely and that a detailed analysis is not warranted. The Forest Service is not aware of related impacts at other, existing mining projects.
Juneau Group of the Sierra Club	MR2-37	NEPA does not require that permits be in place prior to completion of an EIS. However, the draft NPDES permit, the public notices for the Section 404 permits, and the State Tidelands Leases were made available to the public for comment and comments have been considered in the Final SEIS as appropriate. The reclamation plan and Spill Prevention, Control, and Countermeasures Plan are included in the Final SEIS in Appendices D and E, respectively.
Juneau Group of the Sierra Club	MR2-38	ADNR participated in the development of the SEIS as a cooperating agency, whose responsibility includes providing relevant data and expertise. Although not a formal cooperating agency, NMFS also participated throughout the development of the document, and interdisciplinary team members have met with a number of scientists at the Auke Bay Labs. The Forest Service requested relevant information from the USFWS, which provided information that was incorporated into the SEIS. The Alaska Department of Transportation and Public Facilities provided a number of draft technical reports developed for the Juneau Access Improvements Supplemental Draft EIS, including those addressing wetlands, wildlife, and water quality. The Forest Service is unaware of any other relevant documents that have not been included in the development of the Final SEIS.
Juneau Group of the Sierra Club	MR2-39	The formal proposal for Alternative B does not contain an agreement on what organization would perform construction; therefore it is not considered in the NEPA analysis. The analysis estimates total job creation for construction and operation based on cost data and labor requirements provided by project proponents. There was no deliberate emphasis of the point raised by the commenter.

Affiliation	***Comment ID***	***Response***
Juneau Group of the Sierra Club	MR2-40	The economic impact analysis was performed using a very conservative assumption of the proportion of workers in-migrating from outside the CBJ. In fact, as considered in the Final SEIS, a 50 percent in-migration rate is the more likely scenario. The Draft SEIS analysis, if anything, provides a pessimistic view of the ability of the mine to generate local benefits (through local hires) and is not the result of a public relations campaign.
Juneau Group of the Sierra Club	MR2-41	Such an agreement is not incorporated into the proposal and therefore cannot be assessed within the framework of the socioeconomic assessment. From strictly a housing point of view, construction of housing anywhere within the CBJ region would mitigate housing market impacts.
Juneau Group of the Sierra Club	MR2-42	If in fact the mining company were to train local workers, fewer workers would need to in-migrate, resulting in more local jobs. The commenter implies that such training would be conducted to further reduce the local hires to a subset of workers employed by the Goldbelt Company. In any case, training of local workers to supplant in-migrating workers would benefit the local economy regardless of the trainees' origin. Contrary to the commenter's statement, an offer by the mining operation to train local workers would appear to facilitate acceptance of the project. Nonetheless, because such an agreement is not part of the proposal it was not formally evaluated in the Draft SEIS.
Juneau Group of the Sierra Club	MR2-43	Comment noted. The Forest Service disagrees with the commenter's characterization of the Draft SEIS. The Draft SEIS sufficiently addressed socioeconomic issues as defined under NEPA. Explanations have been clarified and additional scenarios completed for the Final SEIS.
Juneau Group of the Sierra Club	MR2-44	See the responses to comments BL2-31, BL2-32, and BL2-33.
Juneau Group of the Sierra Club	MR2-45	See the responses to comments BL2-31, BL2-32, and BL2-33.
Juneau Group of the Sierra Club	MR2-46	See the responses to comments BL2-31, BL2-32, and BL2-33.
Juneau Group of the Sierra Club	MR2-47	See the responses to comments BL2-31, BL2-32, and BL2-33.
Juneau Group of the Sierra Club	MR2-48	The Forest Service will establish the amount of financial assurance that Coeur Alaska would be required to post for reclamation, and long-term stability of the tailings disposal facility would be based on the final plan of operations. The final operations plan cannot be developed until an alternative is selected. The financial assurance is not critical information for the NEPA process and public participation is not part of the process for establishing a reclamation bond.
Juneau Group of the Sierra Club	MR2-49	The cumulative effects discussion reflects actions that are reasonably foreseeable. The current proposal is for the marine facility at Slate Creek Cove to be reclaimed at the completion of mining. There is no information available to suggest what changes in land use may occur should Congress pass the Cape Fox land exchange legislation. The likelihood that the mining operation would continue as planned is considered reasonably foreseeable. However, determining what facilities would remain following the completion of mining and for what purpose is purely speculative and therefore is not considered reasonably foreseeable.
Juneau Group of the Sierra Club	MR2-50	The Forest Service has no knowledge of agreements between Coeur Alaska and Cape Fox regarding employment of shareholders at Kensington. Coeur Alaska has provided a letter of commitment to the Forest Service regarding its intent to hire locally to the extent practical with a goal of 80 percent local hiring.
Juneau Group of the Sierra Club	MR2-51	Chronic hydrocarbon exposure from stormwater coming from either marine terminal would be in violation of the Clean Water Act since both facilities would be subject to the stormwater regulations established at 40 CFR 122. The SEIS does not address a major spill because of the low probability of such an event. NEPA does not necessarily exclude considering the impacts of a low probability event if it is reasonably foreseeable. However, the Forest Service does not consider a catastrophic spill of hydrocarbons as a reasonably foreseeable event.

Affiliation	*Comment ID*	*Response*
Juneau Group of the Sierra Club	MR2-52	See the response to comment MR2-49.
Juneau Group of the Sierra Club	MR2-53	The Forest Service is unaware of any proposals for using the Cascade Point marine terminal for any other uses beyond those required for mining operations. In fact, Coeur Alaska has requested that ADNR restrict public use of the access road for safety reasons during operations. The use of the Slate Creek Cove marine terminal for any other purposes would therefore be speculative and not considered reasonably foreseeable. The Conditional Use Permit (see Appendix I) issued by CBJ allows the use of the dock only for mine-related transportation.
Juneau Group of the Sierra Club	MR2-54	See the response to comment MR2-53 related to allowable use of the Cascade Point dock facility. The facility is permitted by CBJ only for mining-related use, not commercial or recreational fishing.
Juneau Group of the Sierra Club	MR2-55	The Forest Service is unaware of any formal proposal to move the ferry terminal currently located at Auke Bay. Until a formal proposal has been presented by the ADOT&PF, the consideration of such a move would be entirely speculative.
Juneau Group of the Sierra Club	MR2-56	The Forest Service considers the development of Cascade Point a cumulative effect rather than a connected action, in part because of the current zoning of Goldbelt's land at Cascade Point. The current zoning of the area is RR (recreation reserve). Goldbelt could apply to the CBJ for a conditional permit that would allow marine commercial facilities including fisheries support, commercial freight, passenger traffic, and similar uses in the RR zone. Goldbelt would have to apply to CBJ for a change in land use to move forward with the housing and associated infrastructure proposed in the Echo Cove Master Plan. Since the Forest Service, through CBJ, is unaware of any such request by Goldbelt, there is no reason to consider the action as connected at this time. The Echo Cove Master Plan is part of the public domain; therefore, considering it as reasonably foreseeable in terms of cumulative impacts is justifiable.
Juneau Group of the Sierra Club	MR2-57	The Forest Service would like to note that it, not Coeur Alaska, is responsible for the SEIS. The Forest Service respectfully disagrees with the need to stop the clock on the NEPA process or to supplement the existing analysis. The rationale used by the Forest Supervisor is presented in the ROD at the beginning of the Final SEIS.

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Southeast Alaska Conservation Council

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March 8, 2004

Steve Hohensee
SEIS Team Leader
Tongass Minerals Group
8465 Old Dairy Road
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RECEIVED
MAR 08 2004
Juneau Ranger District

RE: Comments on the Kensington Gold Project Draft Supplemental Environmental Impact Statement

Dear Steve:

The following comments are submitted on behalf of the Southeast Alaska Conservation Council (SEACC), the Northern Alaska Environmental Center, the Auk Kwaan, and the Mineral Policy Center on the Kensington Gold Project Draft Supplemental Environmental Impact Statement (DSEIS). This document evaluates the potential environmental consequences associated with the proposed modifications of the 1998 Plan of Operations developed by Coeur Alaska, Inc. The proposal will substantially impact the incredible resources and values of the Berners Bay watershed.

Berners Bay encompasses a wide range of ecosystems, including snow-capped alpine peaks, old-growth Sitka spruce and hemlock forest, cottonwood floodplains, freshwater marshes, and saltwater estuaries. Thousands of coho and sockeye salmon support local commercial and sport fisheries, and commercial catches of king, tanner, and Dungeness crab, and shrimp are maintained. Berners Bay contains the last healthy spawning population of herring in the greater Lynn Canal region, while the spring eulachon run forms the base of a productive food chain supporting eagles, gulls, seals, sea lions, and humpback whales. Brown and black bears, wolves, wolverines, deer, moose, and mountain goats are found in lands surrounding Berners Bay. Berners Bay is also culturally significant to the Auk Kwaan, the original settlers of Juneau. The Auk Kwaan consider Lions Head Mountain sacred because it contains the spirits of their shamans and several ancient village sites are located at Berners Bay; where there are villages, there are also burial sites. Opportunities for recreational hunting, fishing, gathering, kayaking, airboating, and camping abound, and commercial tourism in Berners Bay has mushroomed in recent years. Development of this mine is the first step in the industrialization of the Berners Bay watershed: the first of a multitude of projects that threaten the Bay's ecological, cultural, and recreational values.

Any activity allowed in Berners Bay must be designed and conducted in a manner that sustains and safeguards this spectacular watershed's unsurpassed abundance and diversity of renewable living resources, along with its capacity to continue to provide food, income, and enjoyment to local residents and visitors. All of us believe it is our responsibility to ensure that future generations can enjoy the same opportunities and uses of Berners Bay's incredible riches that we now enjoy.

SEACC is a coalition of eighteen volunteer conservation groups in fourteen communities across Southeast Alaska, from Yakutat to Ketchikan. SEACC's membership includes commercial fishermen, Alaska Natives, small-scale timber operators and value-added wood product manufacturers, tourism and recreation business owners, hunters and guides, and Alaskans from many other walks of life. SEACC is dedicated to safeguarding the integrity of Southeast Alaska's unsurpassed natural environment while providing for balanced, sustainable use of our region's resources.

The Northern Alaska Environmental Center promotes conservation of the environment in Interior and Arctic Alaska through advocacy, education, and sustainable resource stewardship. Their interest in this proposed action centers on the similarity between the mine tailings disposal method proposed for this project and mining projects in the Interior and Arctic regions of Alaska.

The Auk Kwaan are the original settlers of Juneau. They recognize their territory:

> as starting on the mainland at Berners Bay, including all that bay and following south along the mainland to approximately the location of Thane on Gastineau Channel, including the northern and western portion of Douglas Island around as far as Point Hilda. On Admiralty Island they include in their territory Oliver Inlet and the Seymour Canal, but not the outside of Glass Peninsula. They include in their territory Hawk Inlet and the whole of the Mansfield Peninsula. The west coast of Lynn Canal from St. James Bay south to the Point Howard area is sometimes included by them in their territory.
>
> . . .
>
> Berners Bay was used by the Aukquans as a source of food and Indian medicine.
>
> . . .
>
> Berners Bay was also a burial site known to be sacred, due to the Shaman's (sic) that are buried there. There is a mountain located at Berners Bay [Lions Head Mountain] that is known to have all their Shaman spirits dwell in it up to the present.[1]

The Mineral Policy Center is a non-profit organization dedicated to protecting communities and the environment against the adverse impacts of mining. The center is

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[1]*See* Exhibit 1: *The History of AukQuan* at 3. *See also*, Exhibit 2: Goldschmidt and Hass, *Possessory Rights of the Natives of Southeastern Alaska* pp. 57-61 (Report to the Commissioner of Indian Affairs, U.S. Department of Interior)(1946).

headquartered in Washington, D.C. and has field offices across the country, including Missoula, Montana; Truckee, California; and Durango, Colorado.

I. INTRODUCTION

BL2-1

This DSEIS purports to consider the environmental effects of the Proposed Action under the National Environmental Policy Act (NEPA): changes proposed to the 1998 approved Plan of Operations for the Kensington Gold Project regarding access, tailings disposal, and support facilities. *See* DSEIS at 1-4. As pointed out by the U.S. Supreme Court, NEPA "ensures that the agency ... will have available, and will carefully consider, detailed information concerning significant environmental impacts; it also guarantees that the relevant information will be made available to the larger [public] audience. ... NEPA ensures that important effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise cast." Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989). The inadequate content and analysis provided in this DSEIS, in combination with the unreasonably shortened timeline and manner afforded for public comment, fail to fulfill either of these most basic purposes. Before addressing specific problems with the content and analysis in the DSEIS, we identify problems with the adequacy of the public process associated with this NEPA review.

A. Forest Service Unreasonably Truncates Public Comment Period.

BL2-2

Problems with the adequacy of this NEPA process became apparent from the moment the Forest Service provided legal notice of the availability of the DSEIS and calculated the comment period deadline. Instead of calculating the 45 days required by NEPA for public comment on this proposed action from the date of publication of notice in the *Juneau Empire*, a paper of general distribution, the Forest Service used the date the Notice of Availability was published in the Federal Register. This single factor unreasonably shortened the public comment period on the DSEIS by at least a week.[2]

In 1993, Congress enacted the Appeals Reform Act.[3] Congress plainly intended this law to increase the public's opportunity to participate in "proposed actions of the Forest Service concerning project and activities implementing land and resource management plans," such as the proposed modification to the previously approved Plan of Operations for the Kensington Gold Venture.[4] A critical component of this statutory reform required the Forest Service to provide notice of the availability of an action "implementing land and resource management plans" for public comment in a newspaper of general circulation.[5] This direction applies to all proposed actions implementing land

[2] The Notice of Availability for the DSEIS was published in the Federal Register on January 23, 2004. Notice of the availability of the DSEIS and comment deadline was published in the *Juneau Empire*, the newspaper of record, on January 29, 2004.

[3] *See* Section 322 of H.R. 503, Department of Interior and Related Agencies Appropriations Act, Pub. L. 102-381, 106 Stat. 1419 (1993).

[4] *See* Section 322(a) of the Appeals Reform Act.

[5] *See* Section 322(b)(1)(B)(ii) of Appeals Reform Act.

and resource management plans. The Forest Service's interpretation of the Appeals Reform Act, as expressed in recently revised regulations,[6] is unreasonable and exceeds the scope of the agency's authority because it actually narrows the time available for public comment on actions that implement land and resource management plans and are analyzed and documented in a draft EIS.

B. Lack of Public Hearing on DSEIS Impairs Public Review.

BL2-3

A second procedural problem that restricted the public's opportunity to comment and fully participate in this project planning effort was the agency's decision to not hold a public hearing on this project.[7] While taking oral testimony at a public hearing is not required by NEPA, we believe the Forest Service abused its discretion by not holding a public hearing where concerned citizens could comment on this controversial proposal orally. *See* 40 C.F.R. § 1506.6(c). At the February 24th Open House, hosted by the USFS, many Juneau citizens expressed concern and frustration that the format of this public event did not allow for formal public testimony or even the opportunity for the USFS to record the public's questions and comments. Several attendees at the Open House, after they became aware of the limitations of the event, circulated a quickly-drafted petition requesting a formal public hearing. This petition, containing more than 25 names, was presented to Acting District Ranger Susan Marthaller that same evening. SEACC requests that the petition be incorporated into the public record for this project.

BL2-4

Following the Open House, SEACC requested that the Forest Service extend the public comment period for this proposed action for several reasons, including the opportunity that such an extension would provide to hold a hearing where oral testimony could be provided.[8] As of this date, we received no response to this letter. As pointed out in the letter, granting such an extension is appropriate because neither EPA or the ACOE has explained how they plan to regulate the discharge of tailings into Lower Slate Lake, and draft state and federal permits are currently unavailable for review.

C. Planning Record was not Available at Start of Comment Period and Contains Many Errors.

BL2-5

In order to achieve NEPA's dual mission of requiring federal agencies to take a hard look at environmental effects and guaranteeing that information is readily available to the general public, the Forest Service is required to keep and make available all documents relied upon by the agency in preparing the EIS. *See* 40 C.F.R. § 1506.6(f). Despite the statement in the DSEIS that "[t]he planning record is available to the public from the Juneau Ranger District Office in electronic format," DSEIS at S-2, during a telephone communication on January 22, the SEIS Team Leader indicated the planning record (PR) was in Denver, and he wasn't sure if it were available on compact disk.[9] We

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[6] *See* Final Rule, 68 Fed. Reg. 33582 (June 4, 2003)(to be codified as 36 C.F.R. Part 215).

[7] *See* Exhibit 3: Aaron Brakel, Letter to Editor, *Comments were lost at mine meeting*, Juneau Empire (March 3, 2004)

[8] *See* Exhibit 4: Letter to Cole, Tongass Forest Supervisor from Lindekugel, SEACC (March 1, 2004).

[9] Pers. comm. between Hohensee, USFS and Schrader, SEACC (Jan. 22, 2004).

finally received the planning record on compact disk 10 days after the comment period began.

BL2-6 We have found the planning record to be exceedingly cumbersome to use; additionally, it contains multiple errors. Many of the links to documents do not work properly. In some cases, the link would open a different document than listed in the index (*see, e.g.*, 2.1.7., line 67). In other cases, the link would simply not open any document at all (*see, e.g.,* section 5.1, line 4). We were unable to access any of the seven documents containing meeting summary notes in section 2.1.1 of the index. These notes relate to status meetings that occurred from May 2003 through October 2003 and undoubtedly contain information helpful to the public's understanding of this project, yet not one of them could be accessed on the PR disk supplied by the Forest Service. Many of the documents were incompletely scanned into the planning record. Some multi-paged letters contained only the first page (*see, e.g.*, documents indexed at line 106 and 107, section 2.1.19), while other documents, particularly email messages, failed to include critical attachments (*see, e.g.*, 5.9, line 27). Another problem stems from the fact that those documents that are contained on the disk are not labeled in any manner to cross-reference back to the index. Each PR document should be clearly labeled with a unique identifying number.

BL2-7 All of the planning record documents, in hard-copy form, should be available to the public at the Juneau Ranger District. In particular, many of the documents indexed in section 6.0 References are quite lengthy; thus, only their cover pages are included on the disk. All these references, in their entirety, should be available to the public for review.

BL2-8 Lastly, we request that the Forest Service ensure that the planning record includes the more than 900 studies referenced by Dennis E. Wheeler, Chairman and CEO of Coeur d'Alene Mines Corp. in his letter to the Juneau Empire on February 26, 2004.[10] Our review of the "Reference" section of the PR for this project reveals only 223 studies. If these studies are as critical "to ensure the highest environmental standards and to protect Slate Lake and Berners Bay" as Mr. Wheeler states, why are they not contained in the planning record? BL2-9 Is Mr. Wheeler's definition of what constitutes a "study" consistent with the Forest Service's guidelines for the quality of regulatory and scientific information adopted pursuant to the Data Quality Act?[11]

II. THE FOREST SERVICE UNREASONABLY RESTRICTED THE SCOPE OF THE DSEIS TO PROPOSED MODIFICATIONS OF THE PLAN OF OPERATIONS FOR THE KENSINGTON GOLD PROJECT.

BL2-10 When deciding what actions to include in an EIS, NEPA regulations require the Forest Service to consider several kinds of actions, including connected, similar and cumulative actions. 40 C.F.R. § 1508.25(a). NEPA regulations require agencies to consider cumulative actions, "which when viewed with other *proposed actions* have cumula-

[10] *See* Exhibit 5: Dennis Wheeler, Letter to the Editor, *Mine proposal creates jobs, meets standards*, Juneau Empire (Feb. 26, 2004).

[11] *See* Treasury and General Government Appropriation Act of Fiscal Year 2001, Pub. L. No. 105-544, § 515 Appendix C, 114 Stat. 2763A-153 (2000).

tively significant impacts and should therefore be discussed in the same impact statement." *See* 40 C.F.R. § 1508.25(a)(2) (emphasis added). NEPA's "action-forcing" procedures require the Forest Service to have available and carefully consider detailed information concerning significant environmental impacts. This not only assures that important effects of a proposed action will not be overlooked or underestimated by the decision-maker, but guarantees that the relevant information will be made available to the public, state, and local decision-makers. While NEPA doesn't mandate particular results, it does prohibit uninformed agency action.

BL2-11 When it passed the Tongass Reform Law in 1990, Congress identified 46,000 acres of the Berners Bay watershed as one of 12 areas on the Tongass "to be managed in perpetuity in accordance with Land Use Designation II (LUD II)." This area was chosen for special management because of its high value fisheries habitat and the fact it is a very popular recreational destination for local residents. Recreational activities include kayaking, fishing, camping and hunting. Protection of these special values has been recommended and supported by the Alaska Department of Fish and Game (ADF&G), Alaska communities, and commercial fishermen.[12] By designating Berners Bay as a Legislated LUD II, Congress directed the Forest Service to manage this area primarily "in a roadless state to retain [its] wildland character."[13] This special management designation requires that any permitted development, such as mining on patented claims, be limited in scope to be compatible with the area's wildland character.

Although the Kensington Gold Project is located just outside the Berners Bay Legislated LUD II area, it is merely the first of a multitude of projects that could impact this special area's fish, wildlife, and recreational values. In scoping comments submitted in October 2002 on Coeur's Amended Plan of Operations, SEACC asked the Forest Service to consider the cumulative effects of the proposed action, taken with other "reasonably foreseeable" proposed actions. These proposed actions included the reopening of the Jualin Mine or the leasing of its holdings to Coeur for development, the proposed highway between Juneau and Skagway along the east shore of Lynn Canal, the Cape Fox Land Entitlement Adjustment Act (S. 1354) which would privatize roughly 12,000 acres of National Forest land surrounding the mine, and development of Cascade Point by the Goldbelt Corporation.

BL2-12 Because these "cumulative actions" will have effects on fish, wildlife, and the wilderness recreation uses in the Berners Bay Legislative LUD II area and Lynn Canal, the Forest Service should have assessed the individual and cumulative impacts of these projects in one comprehensive EIS. While the DSEIS acknowledges these proposed actions, it merely provides the public and decision-makers with a cursory analysis of the cumulative impacts of these proposed actions on the resources and uses on the Berners Bay and Upper Lynn Canal, including the Berners Bay Legislated LUD II. **The Forest**

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[12] In 1983, ADF&G recommended that this area be "reserve[d] permanently for protection of fish and wildlife." From 1987 to 1989, the communities of Juneau, Wrangell, Petersburg and Sitka supported protection of Berners Bay. In 1988, United Fishermen of Alaska included Berners Bay in a list of "priority fish habitat areas deserving protection."

[13] See H.R. REP. NO. 101-931, at 16 (1990), *reprinted in* 1990 U.S.C.C.A.N 6267, 6270.

Service's decision to restrict the scope of this DSEIS to the Kensington Gold Project prevents it from educating itself and others about the larger context in which environmental decisions regarding the Berners Bay watershed are being made, thereby reducing the quality of the decisions to be made. This treatment not only violates NEPA but fails to provide the "careful and prudent" management required by Congress in designating this area for special management.

III. FOREST SERVICE VIOLATED NEPA BY NOT INCLUDING A TRUE 'NO-ACTION' ALTERNATIVE IN THE DSEIS.

BL2-13

NEPA, and its implementing regulations, require the Forest Service to rigorously explore all reasonable alternatives to this proposed action, including a "no-action" alternative. *See* 42 U.S.C. §§ 4332(2)(C)(iii) & (E); 40 C.F.R. §§ 1502.14(c), (d). The Council of Environmental Quality (CEQ) has explained that the purpose behind consideration of the "no-action" alternative is to provide the public and agency decisionmakers with an accurate benchmark for comparing the environmental effects of taking no action with the effects of permitting the proposed action. *See* Forty Most Asked Questions Concerning CEQ's [NEPA] Regulations, 46 Fed. Reg. 18026, 18027 (1981).

The no-action alternative included in the DSEIS is the previous action approved in the August 1, 1997 Record of Decision for the Kensington Gold Project. While this alternative should certainly be considered one of the "action" alternatives for this proposal, it is unreasonable to rely upon it as a benchmark analysis because it has never been implemented and therefore fails to accurately reflect existing, real world conditions.[14]

In the DSEIS, the Forest Service claims that use of the previously permitted action as the no-action alternative is reasonable "[b]ecause this is an (sic) [Supplemental]EIS." DSEIS at 2-15. We acknowledge that both the earlier and present proposed action relate to approval of the plan of operations for the Kensington Gold Venture, and the current proposal considers modifications to the previously approved action. As acknowledged in the DSEIS, however, "Coeur has not yet constructed the mine." DSEIS at 1-1.

BL2-14

Additionally, the currently proposed action fundamentally differs in both the design and the location of mining operations from those considered and approved in 1997. For example, the earlier NEPA documents related to this mine reveal little, if any, information or analyses regarding benchmark conditions of the Johnson and Slate Creek drainages, both of which serve substantial and integral roles in the currently proposed action. Consequently, it is also unreasonable for the Forest Service to rely on the no-action alternatives previously considered for this project to satisfy the need to provide a benchmark for comparing the magnitude of environmental effects of the action alternatives considered in the DSEIS.

IV. ALTERNATIVE ANALYSIS IN DSEIS IS INSUFFICIENT.

BL2-15

NEPA requires the Forest Service to consider a reasonable range of alternatives. 42 U.S.C. § 4332(2)9C)(iii); *Alaska Wilderness Recreation v. Morrison*, 67 F.2d 723, 729 SEACC 15

[14] SEACC has urged the Forest Service to immediately withdraw this DSEIS and publish a revised DSEIS that includes a true no-action alternative. *See* Exhibit 6: Letter to Cole, Tongass Forest Supervisor from Lindekugel, SEACC (Feb. 12, 2004). As of this date, the Forest Service has not responded to this request.

(9th Cir. 1995); see 40 C.F.R. § 1502.14 (consideration of alternatives "is the heart of the [EIS]."). This DSEIS lacks a comprehensive review of all reasonable alternatives.

The range of alternatives should have also considered different sizes of TSF facilities for Lower Slate Lake. Coeur has specifically looked at ten and twenty million ton TSF facilities in Slate Creek Lakes.[15] As early as 1994, Coeur had also considered the feasibility of a thirty ton TSF facility.[16] Why were these alternatives not fully considered in the DSEIS or an explanation given for their elimination from detailed consideration?

BL2-16 The DSEIS should also have taken a hard look at alternative locations for the Cascade Point Marine Terminal. Although the DSEIS notes that essential information is unknown about the Yankee Cove alternative site, including basic design limitations for a year-round, all-weather facility, no explanation is given as to why this information was not collected and disclosed in the DSEIS, in violation of NEPA. *See* DSEIS at 2-39; 40 C.F.R. § 1502.22. Although Alternative C apparently would move the location of this dock to Echo Cove, the DSEIS also fails to study the components of this alternative location with the site-specificity required by NEPA.

BL2-17 As noted above, the lack of a true no-action alternative fails to provide the public and decisionmakers with an accurate benchmark for evaluating the effects of the action alternatives. There are substantial questions about the legality of the two principle action alternatives, Alternatives B and C, under both state and federal law. While it is permissible for the Forest Service to consider alternatives outside its jurisdiction, NEPA requires the Forest Service to analyze any inconsistency between the proposed action and state law. *See* 40 C.F.R. §§ 1506.2(d).

For example, although the DSEIS acknowledges that if mine tailings are dumped into Lower Slate Lake "all fish and most other aquatic life (such as macroinvertebrates, periphyton, and zooplankton) in Lower Slate Lake would be lost," DSEIS at 4-33, there is no discussion or analysis in the DSEIS regarding the consistency between this outcome and the State's antidegradation policy. *See, e.g.*, 18 AAC 70.015(a)(2)(C)(requires maintenance of water quality adequate "to fully protect existing uses of the water."). The state antidegradation policy also requires that all water quality criteria to be met, including the Whole Effluent Toxicity Limit. The DSEIS fails, however, to identify water quality impacts from dumping tailings into Lower Slate Lake on a pollutant by pollutant basis.

Under Alaska's water quality standards, Lower Slate Lake is protected for every fresh water use, including water supply, water recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife. *See* 18 AAC 70.020(a)(1). When more

[15] *See* PR 7.4, line 12, Nov. 2001 Amended Plan of Operations at 2-15. Citations in these comments to documents found in the Planning Record include the section number and line number for the document as shown in the Planning Record Index.

[16] *See* PR 7.4, line 13, April 2002 Addendum No. 1 to Plan of Operations, Attachment Report 1 "Slate Creek Lakes Tailings Storage Facility Conceptual Design and Water Balance (Ref. No. 31328/12-2) by Knight Piesold Consulting dated 9/9/2000 pages 1-2, "Previous studies of the Slate Creek Lakes TSF alternative included the design of a large earthfill dam to store 30 million tons of tailings in both Upper and Lower Slate Creek Lakes as described in the Knight Piesold Report no. 3289/1, 'Feasibility Study for Tailings Storage Facility – Slate Creek Lakes Site', dated June 10, 1994."

than one use is affected for any pollutant parameter, Alaska's water quality standards require the most stringent criterion for any of the applicable uses to be applied.

BL2-18 According to the DSEIS, "[t]he tailings discharge to the TSF would have high solids and turbidity levels." DSEIS at 4-24. Both the growth and propagation use and water recreation use prohibit any increase in turbidity in lake waters greater than 5 nephelometric turbidity units over natural background at the point of discharge. Clearly, dumping mine tailings into Lower Slate Lake under either Alternative B or C will exceed the state's turbidity standard. The failure to disclose this inconsistency with state law violates NEPA.

BL2-19 The Whole Effluent Toxicity standard prohibits an effluent from imparting chronic toxicity to aquatic organisms at the point of discharge. 18 ACC 70.030(a). As reported in the DSEIS, "[t]he tailings sediment sample caused a statistically significant reduction in the survival of *Hyalella azteca* when compared with the control lake sediments and Lower Slate Lake shallow and deep sediments. DSEIS at 4-35. The results of toxicity testing indicated that "direct effects of mortality and reduced reproduction" would occur if mine tailings are dumped into Lower Slate Lake. *Id.* at 4-36. Despite the clear evidence disclosed in the DSEIS that Alternatives B and C would result in violations of the Whole Effluent Toxicity standard, the DSEIS lacks any discussion of this inconsistency with state law, in violation of NEPA.

BL2-20 This lack of discussion in the DSEIS is also a violation of the Tongass Land Management Plan (TLMP). Under the revised 1997 TLMP, the Forest Service is required to manage watersheds within a Mineral LUD "for beneficial uses consistent with Alaska Water Quality Standards." TLMP at 3-156, S&W 112(B). From the information contained in the DSEIS it is clear that the proposed action conflicts with Alaska's water quality standards. The inability of the Forest Service to insure compliance with TLMP violates the National Forest Management Act.

BL2-21 In the discussion of the effects of the various alternatives, the DSEIS also fails to identify possible conflicts between the proposed actions and the objectives of federal law and policies, in violation of NEPA. *See* 40 C.F.R. § 1502.16(c). For example, under EPA's new source performance standards, gold mines such as this one are subject to a zero discharge limitation. 40 C.F.R. §§ 440.104(b), (d). The DSEIS completely fails to demonstrate how Coeur can meet this standard if either Alternative B or C is selected. BL2-22 In addition, before a Section 404 permit could be approved for the dam impoundment or dumping of mine tailings according to either Alternatives B or C, Coeur would need to show the dumping of tailings into Lower Slate Lake would comply with the Section 404 (b)(1) guidelines. These guidelines, however, require that the fill meet all water quality standards and that no practicable alternative exists. Although the DSEIS contains two practicable alternatives to the destruction of Lower Slate Lake, Alternatives A and A1, the DSEIS fails to address this issue in sufficient detail to respond to the requirements of the Section 404 (b)(1) guidelines, in violation of NEPA and the Clean Water Act.

V. DSEIS VIOLATES NEPA BY FAILING TO DISCLOSE SIGNIFICANT INFORMATION REGARDING HOW MINE TAILINGS WILL BE REGULATED UNDER ANY OF THE ACTION ALTERNATIVES.

BL2-23

Completely absent from the DSEIS is any discussion indicating how the Environmental Protection Agency (EPA) or the Army Corps of Engineers (ACOE) intend to regulate the discharge of mine tailings into Lower Slate Lake under Alternatives B or C. The above problem is compounded by the fact that none of the federal or state draft permits associated with implementation of this project is available for public review at this time. NEPA requires the Forest Service to supplement this DSEIS because the question of the exact regulatory framework to be applied by EPA and the ACOE is "relevant to environmental concerns and bear[s] on the proposed action or its impacts." See 40 C.F.R. § 1502.9(c)(1)(ii).

BL2-24

Information concerning the regulatory scheme applicable to this project is significant because it bears directly on what adverse environmental effects cannot be avoided if the proposed action is implemented, the extent to which the long-term productivity of affected resources will be enhanced or maintained, and the irreversible or irretrievable commitments of resources involved. *See* 40 C.F.R. § 1502.16. Additionally, the CEQ regulations require an EIS to discuss "[p]ossible conflicts between the proposed action and the objectives of Federal, regional, State, and local ... controls." *Id.* at § 1502.16(c); *see also* § 1506.2(d). The failure to identify or discuss the propriety of, or impacts from, following a specific regulatory framework in the DSEIS fails to facilitate meaningful public involvement in the decision in violation of NEPA. *Id.*, § 1500.2(d). This lack of information also fails to provide both the public and decisionmakers with a reasonable and clear choice among the proposed options. *Id.*, § 1502.14.

BL2-25

In addition, because the dumping of mining waste into Lower Slate Lake does not qualify as mining "operations" under Forest Service regulations, this activity is also subject to regulation under the Forest Service's special use regulations. *See* 36 C.F.R. Part 251. The "special use" of unpatented Tongass National Forest lands for waste disposal is therefore subject to an annual rental fee based on fair market value. *See* 36 C.F.R. § 251.57(a)(1). The DSEIS lacks any analysis assessing the fair market value of the lands and waters to be destroyed by the proposed TSF at Lower Slate Lake or estimates of the annual rental fee which Coeur must pay for the special use of these unpatented national forest lands.

VI. NPDES PERMITS ARE REQUIRED BOTH FOR THE DISPOSAL OF THE MINE TAILINGS AND DEVELOPMENT ROCK INTO LOWER SLATE LAKE AND SURROUNDING WETLANDS AND FOR THE PROPOSED DISCHARGES FROM LOWER SLATE LAKE

BL2-26

As noted above, the DSEIS fails to discuss exactly how the discharge of mine tailings into Lower Slate Lake under Alternatives B and C will be regulated. Based on informal discussions with various agencies, it appears there are two options under consideration for regulating these discharges: (a) allowing Coeur Alaska to construct a dam below the lake and then converting Lower Slate Lake from a "water of the United States" into a waste treatment facility; or (b) issuing a Section 404 permit on the grounds that the mine tailings are "fill material." Both of these regulatory approaches violate the Clean Water Act.

The purpose of the Clean Water Act "is to restore and maintain the chemical, physical, and biological integrity of the Nation's Waters." 33 U.S.C. § 1251(a). In order to fulfill this purpose, the Act prohibits the discharge of any pollutant into waters of the United States, except if done in compliance with the Act. 33 U.S.C. §§ 1311(a), 1342(a). The DSEIS indicates that Lower Slate Lake and its surrounding wetlands qualify as waters of the United States. *See* DSEIS at 3-28 to 3-30; 4-71. The mine tailings are pollutants. 33 U.S.C. § 1362(6). Therefore, the dumping of mine tailings into Lower Slate Lake and the subsequent discharges from the lake into the creek and wetlands are prohibited unless authorized by a National Pollutant Discharge Elimination System (NPDES) permit.

BL2-27

The DSEIS does not explain why the agencies are not regulating the discharge of mine tailings into Lower Slate Lake as a discharge of pollutants under Section 402 of the Clean Water Act. There is no provision in the Clean Water Act giving the EPA or the ACOE the authority to convert "waters of the United States" into a waste disposal facility. In fact, by enacting the Clean Water Act, Congress intended to end the practice of using waters for waste disposal. *See* S. Rep. No. 92-414, at 7 (1971) ("The use of any river, lake, stream or ocean as a waste treatment system is unacceptable.")

BL2-28

EPA's regulations also do not permit the use of waters of the United States for waste disposal. Those regulations prohibit the use of waters of the United States for the purpose of waste assimilation. 40 C.F.R. § 131.10(a). Furthermore, the fact that the ACOE will issue a Section 404 permit to impound Lower Slate Lake does not convert the waters and wetlands above the dam into a waste treatment facility or change their status as "waters of the United States." EPA's regulations provide that "[a]ll impoundments of waters otherwise defined as waters of the United States" are still "waters of the United States." 40 C.F.R. § 230.3(s)(4) (2002). *See also* 33 C.F.R. § 328.3(a)(4) (same).

BL2-29

The ACOE also cannot issue a Section 404 permit for the disposal of mine tailings in waters of the United States. Section 404 permits apply to activities involving "the discharge of dredged or fill material into the navigable waters at specified disposal sites." 33 U.S.C. § 1344(a). Notwithstanding the ACOE's recent rule change to the contrary, *see* 67 Fed. Reg. 31,129 (May 9, 2002), the Clean Water Act gives the ACOE jurisdiction under Section 404 to issue permits only where the discharge of fill material has a constructive purpose, not where its purpose is the disposal of waste. This is precisely how the ACOE has construed the Section 404 program since Congress enacted the Clean Water Act, until the Corps's 2002 rule change.[17] Accordingly, since the sole purpose of the disposition of the tailings Lower Slate Lake is to dispose of waste, the ACOE lacks jurisdiction to regulate that activity under Section 404.

[17] *See, e.g.*, 33 C.F.R. § 323.2(e), (f) (2001); Memorandum of Agreement Between the Assistant Administrators for External Affairs and Water, U.S. Environmental Protection Agency, and the Assistant Secretary of the Army for Civil Works Concerning Regulation of Discharge of Solid Waste Under the Clean Water Act, 51 Fed. Reg. 8,871 (Mar. 14, 1986).

BL2-30 Under Section 402 of the Clean Water Act, EPA has jurisdiction and must regulate the discharge of mine tailings into Lower Slate Lake. Under EPA's new source performance standards, gold mines such as this one are subject to a zero discharge limitation. 40 C.F.R. §§ 440.104(b), (d). Coeur has not demonstrated that it can meet this standard and, until it does so, neither the EPA nor the Corps may issue a permit for the disposal of mine tailings into Lower Slate Lake.

VII. THE FOREST SERVICE FAILED TO DISCHARGE ITS AFFIRMATIVE RESPONSIBILITY TO LOCATE, IDENTIFY AND EVALUATE IMPACTS TO CULTURAL AND HISTORIC PROPERTIES WHICH MAY BE IMPACTED BY THE PROPOSED ACTION.

BL2-31 The Forest Service is required to identify historic properties and gather sufficient information to evaluate the eligibility of such properties for the National Register. 36 C.F.R. § 800.4(b). The Forest Service is then required to apply the National Register criteria to historic properties that may be affected by agency action. 36 C.F.R. § 800.4(c). The criteria for determining eligibility is stated in regulation as well as standards and guidelines published separately in the form of National Register Bulletins. 36 C.F.R. § 60.4.

National Register Bulletin No. 38 is such a publication, specifically directed at providing "Guidelines for Evaluating and Documenting Traditional Cultural Properties." Bulletin No. 38 provides that a "traditional cultural property" is eligible for inclusion in the National Register if it is associated with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

BL2-32 The record shows that since at least 1991, Coeur has known of the extensive cultural and historical ties of the Auk Kwaan within the project area.[18] Additionally, Rosa Miller, Tribal Leader of the Auk Kwaan, specifically informed former Regional Forester Phil Janik in 1997 that:

> Many times I have told governmental agencies that our ancestors are buried at Berners Bay and the Lions Head Mountain is our sacred mountain. The Kensington Mine will operate at the base of this mountain where my people buried our Shamans. The Shaman's spirit never dies and at his death his spirit enters Lions Head Mountain and dwells in it up to the present. Therefore, the mountain is sacred and their spirits and graves are protected by the constant surveillance of the Eagle. There has been enough desecration of our burial sites.[19]

Despite this letter, the DSEIS does not mention the cultural significance of Lions Head Mountain to the Auk Kwaan or assess the effect of the proposed action on these cultural values or gravesites around village sites. This failure is a violation of the National Historic Preservation Act and NEPA.

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[18] *See* Hall & Lobdell (1991)(PR 6.0, line 92, at 7-8).

[19] *See* Exhibit 7: Letter from Miller, Tribal Leader of the Auk Kwaan to Janik, Alaska Regional Forester (Nov. 10, 1997)(with attachments).

In a letter to Senator Lisa Murkowski, Tribal Leader Miller reaffirmed the importance of Lions Head Mountain (Spirit Mountain) to the Auk Kwaan.[20] She points out the Lions Head Mountain "is sacred to us because all our Shaman spirits dwell in it. Many times I have told stories about our ancestors who are buried here. Spirit Mountain is a place that is important to the Tlingit of the past, the Tlingit of the present, and the Tlingit of the future."

BL2-33

According to the DSEIS, the "Forest Service conducted consultations with Alaska Native groups in April 2003 to comply with Executive Order 13175." DSEIS at 1-8. Remarkably, neither the DSEIS nor any documents in the project's planning record identify the Auk Kwaan as one of the Alaska Native groups consulted.[21] There are no documents of any kind in the planning record showing that the Forest Service or any of its contractors ever contacted Tribal Leader Miller regarding the effect of the substantial modifications proposed for the Kensington's Plan of Operations in this DSEIS on important cultural and historical resources in Berners Bay.

BL2-34

In carrying out its responsibilities under Section 106 of the National Historic Preservation Act (NHPA), the Forest Service must "consult with Indian tribes . . . and other interested parties." 16 U.S.C. § 470a(d)(1)(C). In identifying parties who have consultative roles in the section 106 process, agency regulations require consulting with tribes and "[c]ertain individuals and organizations with a demonstrated interest in . . . affected properties, or their concern with the undertaking's effects on historic properties." *See* 36 C.F.R. §§ 800.2(c)(2), (c)(5). Although the Auk Kwaan are not a federally-recognized tribe, they repeatedly have demonstrated interest in activities that could adversely affect their cultural and historical interests in Berners Bay. Other NEPA contractors hired by the Forest Service to prepare environmental analyses of other projects affecting lands within the traditional territory of the Auk Kwaan have contacted Tribal Leader Miller, and she has attended the meetings.[22] There is simply no excuse for failing to consult with Tribal Leader Miller regarding this proposed action. The failure to consult with Tribal Leader Miller about affected cultural, historical, and archeological properties within this traditional area of the Auk Kwaan violates the NHPA and the Forest Service's implementing regulations.

VIII. DSEIS CONTAINS AN INADEQUATE CUMULATIVE EFFECTS ANALYSIS

BL2-35

NEPA requires that where "several actions have a cumulative . . . environmental effect, this consequence must be considered in an EIS." *City of Tenakee Springs v. Clough*, 915 F.3d 1308, 1312 (9th Cir. 1990). " 'Cumulative impact' is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions . . . ." 40 C.F.R. § 1508.7. "To

[20] *See* Exhibit 8: Letter from Miller, Tribal Leader of the Auk Kwaan to Senator Lisa Murkowski (July 23, 2003).

[21] The Tribal Consultations list contained in the planning record (PR doc 2.1.3, line 46) does not contain any mention of the Auk Kwaan.

[22] *See* Exhibit 9: Letter from Dunn, Dunn Environmental Services to Rosa Miller (Mar. 3, 1997); Exhibit 10: Memo from Iwamoto, Forest Archaeologist to DeLeeuw, Project Manager (April 1, 1997)(reporting on Native Consultation Meeting).

'consider' cumulative effects, some quantified or detailed information is required." *Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F.3d 1372, 1379 (9th Cir. 1998).

The DSEIS fails to provide the Forest Service, other federal, state and local decisionmakers, and the public with a reasonably complete discussion of the cumulative impacts from the Kensington Gold Project and the host of other projects proposed in the Lynn Canal/Berners Bay area. Notwithstanding our contention that the Forest Service should have considered impacts from all reasonably foreseeable cumulative actions in the same EIS, *supra* at 5-7, the cumulative effects analysis contained in the DSEIS is inadequate in terms of considering the effect of these actions on the wildland character of the Berners Bay Legislated LUD II, and the enormous fish, wildlife, wetland, and recreational values of the entire Berners Bay watershed. Several examples will help demonstrate the inadequacy of the cumulative impact review contained in the DSEIS.

A. Cumulative Effects from Construction and Operation of the Jualin Project or Extension of Mining Operations

BL2-36 In assessing the cumulative effects of other reasonably foreseeable actions on Geotechnical Considerations, the DSEIS only notes that "[c]onstruction [of the Jualin Project] would require an analysis of the feasibility of tailings management options. Options could include the use of the existing Kensington mill and tailings management facility for wastes from the Jualin Project." DSEIS at 4-17. Postponing consideration of the cumulative impacts from using the Kensington mill and tailings management facility for storage of mine wastes from both the Kensington and Jualin Projects violates NEPA. Uncertainty alone does not excuse a failure to address this issue fully because reasonable forecasting and speculation is implicit in NEPA. Given that Coeur Alaska has consolidated ownership of the Jualin and Kensington mining projects and has acknowledged the production opportunities at the Jualin site,[23] this cumulative effects analysis must occur now to assure that important effects are not overlooked or underestimated.

BL2-37 The potential for expansion of the mining operation is of particular concern because the proposed action contemplates mining less than half of the proven and probable reserves at the Kensington alone. According to Coeur's 2002 annual report, it has 10.946 million tons of proven and probable reserves at Kensington.[24] Under Alternative A, over 20 million ton of tailings would be generated, as compared to the 7.5 million tons proposed for Alternatives B and C. If gold prices were high enough to support continued mining development, what are the effects from significantly enlarging the impoundment dam to nearly double its size under Alternatives B and C? The DSEIS advises that "construction methods, stability, and design criteria would have to be thoroughly investigated to determine the actual height, size, and construction requirements." DSEIS at 4-119. According to our review of the record, however, Coeur has specifically studied the feasibility of ten, twenty, and thirty million ton TSF facilities in Slate Lakes.[25] Why wasn't

[23] *See* Richins Memo (2003)(PR 5.14, line 14).

[24] *See* Coeur's Form 10-K, Annual Report at 17-18 (http://www.sec.gov/Archives/edgar/data/215466/000089706903000351/irm220.txt)

[25] *See supra* notes 15 and 16 and accompanying text.

this information disclosed and analyzed in the DSEIS? Why weren't these larger capacity facilities considered as alternatives for this project? Without this information, we must question whether the Forest Service actually provided the hard look required by NEPA at the consequences of expanding mining activities into the Jualin deposit or the effects of Coeur mining all the proven and probable reserves at Kensington.

B. Cumulative Effects on Wetlands from the Kensington Project and Other Reasonably Foreseeable Projects.

BL2-38 This discussion in the DSEIS acknowledges that wetlands within the region could be adversely impacted because of Goldbelt's proposed Cascade Point development, the Juneau Access Project, and the Jualin Project. The DSEIS, however, fails to reasonably quantify the level of these impacts or their effect on recreation, fish and wildlife in the Berners Bay area. The Forest Service can not simply shift responsibility for analyzing these impacts to the Corp of Engineers' Section 404 permitting process. It is the Forest Service's responsibility to consider the effect on the region's wetlands from all reasonably foreseeable cumulative actions in this DSEIS. Its failure to do so violates NEPA.

C. Cumulative Effects on Visual Resources from the Kensington Project and Other Reasonably Foreseeable Projects.

BL2-39 The Forest Service fails to take a hard look at the cumulative impacts to visual resources from Goldbelt's proposed development at Cascade Point. The absence of this analysis violates NEPA. Development at Cascade Point will include uplands structures and a breakwater, access dock, gangway, and float. DSEIS at 2-32. Additionally, ferries, while not in use, will be kept at the Cascade Point terminal. DSEIS at 4-84. Goldbelt Corporation, Inc., the owner of the uplands property at Cascade Point, has plans to use the dock at the terminal to accommodate fishing vessels off-loading catch and for the development of their tourism program.[26] Despite the significant changes that would occur to this currently undeveloped area, the DSEIS fails to analyze the impacts of these visual intrusions by stating that the terminal "would be located on private property" and thus, would not need to meet Forest Service visual quality objectives. DSEIS at 4-84. We must point out that the breakwater and dock proposed for Cascade Point will not be located on private property, but rather in state tidelands and public waters.

D. Cumulative Effects From Various Transportation Projects.

BL2-40 In evaluating the cumulative effects from other reasonably foreseeable projects on transportation development in the Berners Bay area, the Forest Service once again falls short. As noted above, NEPA does not permit the agency to ignore these impacts until later NEPA analysis is prepared or because some non-Federal agency is undertaking these actions. See 40 C.F.R. §§ 1501.2, 1508.7. In fact, Forest Service approval of this operating plan, the first major development project in the Berners Bay area, will constitute the condition precedent allowing or significantly encouraging further development by private interests or the State.

[26] Communication from Dave Goade, Goldbelt Executive Vice President to attendees at the Alaska Coastal Management Program Pre-application meeting, held at Alaska Dep't of Natural Resource's Juneau Office of Project Management and Permitting (January 6, 2004).

In discussing the additional impacts associated with road construction on wildlife, the DSEIS acknowledges "the potential to impact several wildlife species through habitat fragmentation ...; access-related disturbance, or direct mortality ...; ferry service; and commercial fishing access." DSEIS at 4-124. Beyond noting that the impacts "would be additive" and "would occur at a larger scale," the DSEIS fails to provide any quantitative or detailed information regarding these impacts. This violates NEPA.

BL2-41

When construction of the Cascade Point Access Road was permitted by the ACOE, the permit contained a stipulation requiring Goldbelt Corporation to conduct a wildlife monitoring study.[27] The DSEIS provides no information regarding the results of this study nor does the study appear in the Planning Record. This information is essential for evaluating the reasonably foreseeable impacts from construction of this road and a reasoned choice between selecting Cascade Point or Echo Cove as the location for the proposed marine terminal location. We further understand that a consultant hired by Goldbelt Corporation has completed this study. Consequently, the costs of obtaining the information is not exorbitant and evaluation of this relevant information should have been included in the DSEIS. The Forest Service's failure to include this information in the DSEIS violates NEPA.

BL2-42

Preparation of the Juneau Access SEIS is well underway, and we understand that draft technical reports are now available for wetlands, anadromous fish, essential fish habitat, and wildlife. These reports contain considerable updated information on resources and potential impacts to the Berners Bay area. This information should have been disclosed in this DSEIS.

In particular, we understand that information about Lynn Canal Pacific herring stocks is currently being collected and analyzed by the contractor preparing the Juneau Access SEIS. The review is likely to address what is currently known about the existing herring populations in and around Berners Bay and Auke Bay and how the cumulative impacts to Berners Bay will affect these populations. Given the very limited and incomplete discussion of Pacific herring in this DSEIS, the Forest Service should have undertaken a similar, thorough review of the herring issue or, at very least, delayed the release of the DSEIS until the data collection and analysis being done for the Juneau Access project are completed.

E. Cape Fox/Sealaska Land Exchange Legislation, S. 1354

BL2-43

The description of this proposed legislation is incomplete. The DSEIS fails to adequately compare the value of the corporate lands to be acquired in exchange for approximately 12,000 acres in the Slate, Johnson, Sherman and Sweeny creek drainages. In exchange for conveyance of 12,000 acres of valuable public lands with high multiple use values, the Forest Service would obtain about 3,000 acres of Cape Fox lands south of Ketchikan, most of which have been clearcut and roaded, all of which is remote and inaccessible from saltwater. In addition, Sealaska will convey about 9,000 acres of subsurface rights of dubious value.

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[27] *See* ACOE Permit No. 4-970245, Special Condition #14 at 2A (March 7, 2000); *see also* Memorandum from Kirkpatrick, ADF&G to Garland, Alaska Div. of Governmental Coordination (Feb. 17, 2000).

The lands subject to this so-called exchange were not derived via negotiations with the Forest Service. Instead, the lands to be conveyed to the Cape Fox and Sealaska Corporations, as well as the lands the corporations will transfer to the Forest Service, were selected by the corporations themselves. Moreover, the so-called exchange has not been subject to any Forest Service hearing or public comment, as would be required under NEPA for an administrative exchange.

No land appraisals have been done on any of the lands involved. Without this information, neither Congress nor the public can determine whether this exchange is of equal value or not. Without this information, it is impossible to conclude that this exchange is in the public interest.

BL2-44 According to the DSEIS, if the bill is enacted, "[t]he use of lands conveyed [to the corporations] would be subject to the same regulatory framework that governs any other private land in the state of Alaska. . . . The result of the exchange would be that the Forest Service would cease to be involved from a regulatory or land management standpoint." DSEIS at 4-120. Specifically, the Forest Service would no longer have regulatory oversight over reclamation. The DSEIS violates NEPA because the Forest Service failed to take a hard look at the differences between reclamation standards for private land under state law and Forest Service regulation.

BL2-45 The DSEIS notes that if the lands become privately owned, they "could be used for timber harvest or the development of recreation or housing." DSEIS at 4-120. General statements like this regarding possible effects do not qualify as consideration of cumulative effects under NEPA. The Forest Service claims such analysis is unwarranted because "these actions are not considered reasonably foreseeable in terms of cumulative effects." This conclusion is unreasonable because once these lands become private the corporations could proceed with any of the noted development projects at any time. Thus, this NEPA document must evaluate the reasonably foreseeable effects from possible development at Cascade Point on the resources and uses of the Berners Bay watershed. The failure to provide this analysis in the DSEIS violates NEPA.

IX. ANALYSIS OF IMPACTS TO WETLANDS IN DSEIS INSUFFICIENT.

BL2-46 Executive Order 11990 prohibits new construction in wetlands where practicable alternatives exist and requires that "all practicable measures" be implemented to minimize harm to wetlands. Executive Order 11990 imposes a duty on the Forest Service beyond those of NEPA and requires a specific finding that no practicable alternative exists. <u>See City of Carmel-by-the-Sea v. U.S. Dept. of Transp.</u>, 123 F.3d 1142, 1167 (9th Cir. 1997). In addition, Executive Order 11990 requires early public review of plans or proposals for new construction in wetlands. Executive Order 11990 § 2(b).

According to the DSEIS, "wetlands on the Kensington side of the project area were not mapped with the same level of detail as those on the Jualin side. The result is 100 percent of the 268 acres of disturbance under Alternative A would occur within wetlands." DSEIS at 4-69. The DSEIS does not provide a basis for this conclusion. Moreover, the acknowledged discrepancy in the level of mapping detail within the project area suggests that the Forest Service has actually over-estimated the number of acres to be disturbed under Alternative A. Such an over-estimation would make it look like Alternative A impacts more wetlands than it actually does. Consequently, it is impossible to objectively compare wetland impacts between alternatives to determine the existence of practicable alternatives.

BL2-47 When information is incomplete, the cost of obtaining the information is not exorbitant, and the information is essential for a reasoned choice among alternatives, NEPA regulations require the Forest Service to include this information. 40 C.F.R. § 1502.22(a). The agency has acknowledged it lacks comparable wetland data for the entire project area and this information is essential for objectively comparing the effects of the alternatives and determining whether a practicable alternative exists to the proposed action. After nearly 15 years of environmental review, we have to seriously wonder why this critical information was never collected for the Kensington side of the project area. The failure of the Forest Service to collect this data and disclose it in the DSEIS is another example of the Forest Service putting the interests of the applicant ahead of its most basic NEPA responsibilities.

BL2-48 An additional problem with the analysis in the DSEIS is the lack of a comparison of the functions lost by impacting the various wetland types. While forested wetlands are common in the region, lakes supporting native fish populations are exceedingly rare. Lower and Upper Slate Lakes are the only lakes in the area that support fish populations. Constructing a dry tailings facility (DTF) under Alternative A "would result in the permanent loss of over 100 acres of palustrine forest and palustrine scrub-shrub wetlands." DSEIS at 4-69. The functional loss of these wetlands, however, is relatively low compared to high level functions permanently loss under alternatives B and C. A review of the DSEIS suggests that the wetland impacts to functions important for fish and wildlife from Alternatives B or C are significantly greater than Alternative A. However, a direct comparison between the types of wetlands contained in Table 4-18 and discussed in section 4.12.3's text is impossible because DSEIS uses different names for the wetland types in the table and text. Consequently, we request the Forest Service present an analysis directly comparing not only the acreages of wetlands impacted by wetland type, but also the functions lost.

BL2-49 The biggest hurdle the public has in comparing practicable alternatives to the proposed action is the substantial difference between the currently permitted project and Alternatives B and C. Under Alternative A, Coeur can store 20 million tons of tailings at the DTF. DSEIS at 2-35, Table 2-5. With 25% percent of the tailings backfilled, a total of 25 million tons of tailings to be stored is evaluated. Under Alternative B and C, however, only 4.5 million tons of tailings is proposed for subaqueous tailings disposal (STD) in Lower Slate Lake. *Id.* With 40% backfill, only 7.5 million tons of tailings will need to be stored or dumped in Lower Slate Lake. While the Forest Service included Alternative A1 to bridge this significant analytical gap, the DSEIS contains no site-specific analysis regarding the number and function of the wetlands to be affected by the proposed DTF under this Alternative. The failure to provide this analysis violates NEPA.

X. DSEIS FAILS TO ADEQUATELY ADDRESS MAJOR ELEMENTS OF RECLAMATION OR DISCLOSE THE COST OF THESE ELEMENTS.

BL2-50 Forest Service regulations require an operator to reclaim, where practicable, surface disturbance to prevent onsite and off-site damage to the environment. *See* 36 C.F.R. § 228.8(g). Despite the significance of mining reclamation, the DSEIS directs little attention to exactly what reclamation is proposed. None of the appendices to the DSEIS contains a draft reclamation plan, and, although we found an update to the 1998 Reclamation Plan in the planning record,[28] we were unable to locate the 1998 Plan to which the update closely tiers. The lack of this information in the DSEIS and the planning record makes it exceedingly difficult for the public to evaluate or comment on the adequacy of proposed reclamation measures. As a result, this shortcoming violates NEPA.

BL2-51 The lack of specifics may explain why the Forest Service made no attempt to estimate the costs of reclamation activities. Such information is necessary for the public to assess the adequacy of any bond or financial surety imposed by the Forest Service. The DSEIS violates NEPA by failing to estimate how much the costs for reclamation and closure will be or how these costs were calculated.

XI. SOCIOECONOMIC ANALYSIS IS INADEQUATE

A. Narrow Description of Attributes Encompassed by 'Quality of Life.'

BL2-52 In describing the social and economic environment of the City and Borough of Juneau (CBJ), the DSEIS acknowledges the role that "quality of life" plays in the well-being of a community's residents. *See* DSEIS at 3-92. It then goes on to limit the quality of life analysis to public schools, law enforcement, medical facilities, and fire protection service. While all those attributes definitely contribute to a local resident's quality of life, the Forest Service inexplicably ignores the fact that people care where they live and act on those preferences. Experts opine that "the characteristics of a local area that allow it to attract and hold people are an important part of the area's economic base. If this is not recognized, that part of the economic base may be irreversibly damaged."[29] We contend that a significant reason why residents choose to live in Juneau is the level of access to the natural environment that we enjoy, and the breadth and quality of the recreation opportunities we have, particularly in Berners Bay.[30]

BL2-53 The discussion of income also misses an important factor. According to recent agency analysis, "[g]rowth in unearned income (government transfer payments and investment income) has far outstripped growth of the earned income sectors (including services) and now accounts for about a third of total personal income in the analysis area." *See* Shoreline/Outfitter Guide DEIS at 3-62. This analysis goes on to conclude "a significant proportion of the region's economic base is tied not to the local production of goods and services but to the choice of individuals to continue to live in the small communities [including Juneau]." *Id.* at 3-63. The DSEIS completely fails to mention this important distinction or to assess how the industrialization of Berners Bay will affect people's choices to continue living in Juneau.

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[28] *See* Reclamation Plan Update Summary (Oct. 2003) (PR 4.4, line 29).

[29] *See* Exhibit 11: Thomas Michael Powers, *The Role of Metal Mining in the Alaskan Economy* at 37 (Feb. 2002).

[30] *See* U.S. Forest Service, *Shoreline Outfitter/Guide Draft Environmental Impact Statement* R10-MB-425 at 63 (July 2002)(hereinafter "Shoreline Outfitter/Guide DEIS"). By this reference, this DEIS is incorporated into the Kensington DSEIS planning record.

BL2-54 Even more interestingly, the socioeconomic effects analysis fails to specifically analyze the effects of the alternatives on the very "quality of life" issues identified in the DSEIS, except in very general terms. This level of analysis does not satisfy NEPA.

B. Effects Analysis is One-Sided.

BL2-55 A significant deficiency in this socioeconomic analysis is the inadequate focus on the inherent costs of hitching a local economy to a liquidating industry, such as metal mining. An increased role of mining in a region's economy virtually always leads to increased instability, at least in the short and medium term, and usually in the long term. *See, generally*, Exhibit 11.

BL2-56 One issue not addressed in the DSEIS is the fact that metal prices are often unstable and could result in instability in both job levels and payroll. *See* Exhibit 11 at 18-20. The Greens Creek mine on Admiralty Island provides a good example of this. This mine opened in 1989 but shut down about 4 years later because of low metal prices, before reopening in 1996.

BL2-57 The DSEIS touts the benefits from increased property taxes accruing to the local government. DSEIS at 4-99. This assumption, however, ignores the adverse effect that the environmental degradation associated with industrialization of Berners Bay could have on people's willingness to live, work, and do business in Juneau. *Id.* at 18.

BL2-58 The estimates of employment increases associated with the Kensington mine do not take into account that technological advancements in mining constantly displace workers. *Id.* at 20-21. The DSEIS needs to specify the assumptions that the Forest Service and the applicant are making and the effect these assumptions have on employment estimates.

BL2-59 Finally, Coeur Alaska's Rick Richins has promised that 95% of the work force would be Southeast Alaskans.[31] Does he mean that, once hired, non-locals would move to the area and take-up residency? His statement is unclear because, according to the DSEIS, in both the construction and operation phases, only 20% of the mine workforce would be drawn from the City and Borough of Juneau, and 80% would in-migrate. *See* DSEIS at 4-96. In addition, this "operation-induced population change is quite substantial relative to the population of the CBJ. … the estimated population change induced by the mine operations would be large relative to average annual changes for the region." *Id.* at 4-97. This discrepancy between Coeur's statements to the press and the DSEIS needs to be reconciled.

XII. FOREST SERVICE FAILS TO ENSURE THE USE OF HIGH QUALITY INFORMATION OR THE SCIENTIFIC INTEGRITY OF THE ANALYSIS CONTAINED IN THE DSEIS.

BL2-60 In order to achieve NEPA's dual mission of requiring federal agencies to take a hard look at environmental effects and guaranteeing that information is readily available to the general public, NEPA regulations impose several interrelated requirements on the Forest Service. The Forest Service must use information of high quality, ensure the pro-

[31] *See* Exhibit 12: Kristin Bigsby, *Mine firm shares optimistic plans*, Chilkat Valley News (July 17, 2003).

fessional integrity of the discussions and analysis and identify the methodologies used, and independently evaluate the information submitted to it by the applicant or EIS contractor. *See* 40 C.F.R. §§ 1500.1(b), 1502.24, 1506.5(a).

BL2-61 In enacting the Data Quality Act, Congress further attempted to ensure that the information federal agencies use and disseminate meet certain quality standards.[32] As required by the Data Quality Act, the Office of Management and Budget issued its final guidelines that require each federal agency to adopt information quality guidelines ensuring and maximizing the quality, objectivity, utility, and integrity of information that it disseminates.[33] The Forest Service has adopted guidelines to comply with the Data Quality Act.[34]

We have serious questions about the quality, objectivity, utility and integrity of the information used by the Forest Service and its NEPA contractor in preparing this DSEIS. Below we note some examples of questionable data and unsupported premises presented in the DSEIS.

- BL2-62 To support the assumption that lakes used as tailing dumps can recover following cessation of dumping activities, Appendix D of the Ecological Risk Assessment of Aqueous Tailings Disposal at the Kensington Gold Mine (ERA) relies on two case studies. One of these studies is for Benson Lake on Vancouver Island; the other dealt with Mandy Lake in Manitoba. *See* ERA in volume 2, DSEIS, Appendix D at D-22, 23. Although these Mine Environmental Neutral Drainage (MEND) studies are listed in the both the references to the ERA and to Appendix D, neither study could be found in the planning record. More importantly, both the Forest Service and Tetra Tech, the NEPA contractor for this project, ignore a peer review of these MEND studies which concluded "the data are neither useful to address effects which occur during the process of disposal nor long term ecosystem adjustments to the introductions of tailings."[35] To support its conclusion that Lower Slate Lake will someday support aquatic life again, the Forest Service and Tetra Tech rely on the work that Kline did for Coeur and his PhD. Such reliance is misplaced because, to our knowledge, none of this work to date has been published in peer-reviewed journals.
- BL2-63 In situ habitability studies were limited to the marine environment and did not include the fresh water species found in Slate Lakes.
- BL2-64 The DSEIS contains a discussion on Pacific herring in Berners Bay, but the discussion is incomplete and lacks reference to important data showing the status of

[32] *See* Treasury and General Government Appropriation Act of Fiscal Year 2001, Pub. L. No. 105-544, § 515 Appendix C, 114 Stat. 2763A-153 (2000).

[33] *See Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*, 67 Fed. Reg. 8452-60 (Feb. 22, 2002).

[34] *See* http://www.ocio.usda.gov/irm/qi_guide

[35] *See* Exhibit 13: *Executive Summary, A Critical Review of MEND Studies Conducted to 1991 Subaqueous Disposal of Tailings* (July 1992). Available at: http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/2111d-e.htm.

the Lynn Canal herring stock and its importance to the Berners Bay ecosystem. We recommend the Forest Service incorporate ADF&G records relating to the importance of Berners Bay for spawning activity. Additionally, as noted above, we understand the State is conducting a review of the status of the Lynn Canal herring stock for the Juneau Access project. This essential information needs to be considered in this project analysis.

BL2-65
- In describing the vegetation resource, the DSEIS acknowledges that "volume class is not necessarily a good indicator of habitat values." DSEIS at 3-63. Despite this limitation, the Forest Service goes on to use its volume and age map categories to identify and assess wildlife habitat values. *Id.* at 3-61, Figure 3-7; *see also* Table 4-14 at 4-58. More detail is necessary to adequately identify and assess potential effects to the rarest and most valuable wildlife habitats in the project area from the proposed action.

BL2-66
- In describing the subaqueous tailings disposal method, the DSEIS asserts that polymers and flocculants to be used are non-toxic. DSEIS at 2-20. Specific data supporting this assertion is absent from the DSEIS or the ERA and could result in an underestimation of risk to biota.

BL2-67
- No settling tests for controlling Total Suspended Sediment (TSS) were conducted on the Kensington tailings. Instead, a comparison to material deposited at Coeur's Galena Mine in Idaho was used to estimate removal and settling of suspended sediments. Unfortunately, the DSEIS omits a detailed discussion of backfill at the Galena Mine. A comprehensive analysis focusing on the nature of this backfill is necessary in order to determine whether such a comparison between the two mines is indeed appropriate. In addition, the potential impacts to sensitive life stages of Dolly Varden from projected TSS levels in the tailings impoundment are not sufficiently addressed in the risk assessment.

XIII. CONCLUSION

BL2-68 Given the host of issues identified above, we believe the Forest Service must prepare a revised DSEIS for public review. In recognition of the substantial environmental controversy concerning this proposed action, as well as the serious questions regarding the regulatory regime applicable to the mine tailings disposal, we further request a public hearing be held in Juneau and Haines on a revised DSEIS. Such actions are essential for the Forest Service to achieve the purposes of NEPA and ensure "prudent and careful" management of the resources, values, and uses of Berners Bay for the benefit of this and future generations.

Best regards,

Buck Lindekugel
Conservation Director

Table of Exhibits

Exhibit No.	Description
1	The History of the AukQuan
2	Excerpt from Goldschmidt and Hass, *Possessory Rights of the Natives of Southeastern Alaska*
3	Aaron Brakel, Letter to Editor, *Comments were lost at mine meeting*, Juneau Empire (March 3, 2004)
4	SEACC Letter to Forest Supervisor Cole (March 1, 2004)
5	Dennis Wheeler, Letter to Editor, *Mine proposal creates jobs, meets standards*, Juneau Empire (Feb. 26, 2004)
6	SEACC Letter to Forest Supervisor Cole (Feb. 12, 2004)
7	Letter from Miller, Tribal Leader of the Auk Kwaan to Janik, Alaska Regional Forester, with attachments (Nov. 10, 1997)
8	Letter from Miller, Tribal Leader of the Auk Kwaan to Senator Lisa Murkowski (July 23, 2003)
9	Letter from Dunn, Dunn Environmental Services to Rosa Miller (March 3, 1997)
10	Memo from Iwamoto, Forest Archaeologist to DeLeeuw, Project Manager (April 1, 1997)
11	Thomas Michael Powers, *The Role of Metal Mining in the Alaskan Economy* (February 2002)
12	Kristin Bigsby, *Mine firm shares optimistic plans*, Chilkat Valley News (July 17, 2003)
13	Executive Summary, *A Critical Review of MEND Studies Conducted to 1991 Subaqueous Disposal of Tailings* (July 1992)

Responses to Comments

Affiliation	***Comment ID***	***Response***
SEACC	BL2-01	Comment noted. See responses to comments below.
SEACC	BL2-02	The Forest Service's appeal regulations found at 36 CFR 215 became effective on June 4, 2003, after extensive public comment and consideration. The regulations include the following requirement to provide legal notice of the opportunity to comment on Environmental Assessments and Draft Environmental Impact Statements: "(ii) Legal notice of the opportunity to comment on a proposed action shall be published in the applicable newspaper of record identified in paragraph (b)(2)(i) for each National Forest System unit. When the Chief is the Responsible Official, notice shall also be published in the Federal Register. The publication date of the legal notice in the newspaper of record is the exclusive means for calculating the time to submit comments on a proposed action to be analyzed and documented in an EA. The publication date of the NOA in the Federal Register is the exclusive means for calculating the time to submit comments on a proposed action that is analyzed and documented in a draft EIS." These regulations are consistent with CEQ Implementing Regulations at 40 CFR 1506.10. Copies of the Draft SEIS, including a cover letter certifying that the document had been distributed to interested and affected parties, were filed with EPA on January 16, 2004. Copies were sent to interested and affected parties, including the commenter, on the same day. EPA published the Notice of Availability in the Federal Register on January 23, 2004, with a comment deadline of March 8, 2004, thus providing the minimum 45-day comment period required.
SEACC	BL2-03	The CEQ's Implementing Regulations for NEPA do not require an agency to hold a public meeting between a draft and final EIS/SEIS (40 CFR 1506.6). The Forest Service often hosts informational meetings during the Draft EIS comment period to clarify information in the Draft EIS and provide an informal forum for discussions. The Forest Service prefers the informal format, rather than a formal hearing format, because it provides a relaxed, nonthreatening environment for interested persons to discuss the project and it allows for a number of individual interactions at the same time. As stated in the January 23, 2004, letter enclosed with the Draft SEIS, the public meetings were planned with an open house format in which the public would have an opportunity to ask questions and submit written comments.
SEACC	BL2-04	See the responses to comments BL2-02, BL2-03, and SC-48. The draft NPDES permit and USACE public notices were released to the public for comment in June 2004. Public hearings were held for the permits and notices, and the comments were reviewed for information pertinent to this analysis.
SEACC	BL2-05	The SEIS was prepared through a third-party contractor, headquartered in Lakewood, Colorado, under the direction of the Forest Service. The contractor was responsible for compilation of a planning record for the project, including producing electronic copies of the record. A compact disc (CD) containing the planning record was provided to the commenter well within established Forest Service time frames for responding to requests for documents. Had the electronic record not been available, it would have been impossible to provide copies of the record within this time frame.
SEACC	BL2-06	A planning record is a living document, and corrections have been made as they have been identified. Copies of entire documents, relevant pages, and in some cases abstracts have been added to the planning record to address the omissions noted in the comment. Furthermore, additional linkages have been developed in the record so that documents can be located from different points within the index. Documents have not been assigned individual numbers because of the difficulty of doing so in a completely electronic environment. A number of the documents contained in the record exist only in digital format.
SEACC	BL2-07	The planning record is maintained in digital form to reduce storage space and facilitate distribution, but it can be printed if necessary. Copies of the materials used to develop the SEIS are included in the record. These materials include entire documents, relevant pages, and in some cases abstracts if the abstract was used as the original source of information presented in the SEIS.

Affiliation	*Comment ID*	*Response*
SEACC	BL2-08	The Forest Service has not requested Coeur Alaska's entire library for inclusion in this planning record. Materials within the studies and reports undoubtedly include information irrelevant to the development of the SEIS, as well as confidential business information. Coeur Alaska has provided numerous documents that include baseline data, ongoing monitoring data, design reports, and modeling results. All information provided by Coeur Alaska, either with its initial submittal or subsequently, is included in the planning record.
SEACC	BL2-09	Mr. Wheeler's definition of a study is not relevant to the Forest Service's guidelines for the quality of regulatory information. See also the response to comment KHSS-03.
SEACC	BL2-10	The cumulative effects of the proposed action and all reasonably foreseeable actions are described in Section 4.21 and have been considered in the decisionmaking process. Any one of the reasonably foreseeable actions considered in the SEIS could occur individually–none is necessarily dependent on any of the others. Therefore, each action is considered an individual action rather than a connected action in terms of NEPA. Outside of the cumulative impacts consideration, no statutory requirement or regulatory pathway exists that would enable the Forest Service and other agencies to consider all reasonably foreseeable actions within the framework of a single action.
SEACC	BL2-11	See the response to comment BL2-10. As noted in the comment, the Kensington and Jualin mines are located within lands designated as Modified Landscape with a Minerals Overlay, meaning that mining operations would not be required to meet the standards and guidelines applicable to the LUD II designation. The cumulative effects discussion does not include the reopening of the Jualin Mine because there is no proposal to do so, nor is an active exploration program for the property in place. The Forest Service considers an action reasonably foreseeable if there has been some type of formal proposal for the action. In the absence of a formal proposal, actions are deemed speculative and therefore not mandated for consideration under NEPA.
SEACC	BL2-12	NEPA requires consideration of cumulative effects as part of the analysis for a proposed action. The proposed action in this case is under consideration by the Forest Service with EPA, the USACE, and ADNR participating as cooperating agencies. The marine terminal at Cascade Point is included in this SEIS because it is part of the proposed action yet outside the jurisdiction of the Forest Service. The other proposals that could occur within Berners Bay are not connected actions, meaning that any one could be built independently of any of the other actions. There is no requirement for developing a comprehensive EIS for multiple independent projects, or a mechanism to conduct such an analysis. The SEIS was developed in response to Coeur Alaska's proposed changes to its Plan of Operations for the Kensington Gold Project. The Forest Service focused the scope of the analysis on the decision to be made, which is whether to approve changes to the approved plan. The Forest Supervisor considered the cumulative effects of the proposed action along with reasonably foreseeable actions in making his decision. The cumulative effects analysis employed data from the Goldbelt's Echo Cove Master Plan, the 1998 Cascade Point Access Road EIS, and, to the extent possible, preliminary technical reports developed for the Juneau Access Improvements Supplemental Draft EIS in order to employ the most current and consistent information available on the actions considered reasonably foreseeable.
SEACC	BL2-13	The Forest Supervisor directly responded to the commenter's letter regarding this issue. The letter dated March 25, 2004, reiterated that the appropriate No Action alternative for a supplemental EIS reflects the status quo. The Plan of Operations for the Kensington Gold Project, as approved in the ROD issued for the 1997 Final SEIS, represents the status quo. The 1997 Final SEIS did not include extensive analysis of the Slate and Johnson creek drainages because the alternatives under consideration were in the Sherman Creek, Sweeny Creek, and terrace area drainages. However, the 1992 FEIS, which included a "no build" no action alternative, presented significant discussion of resources within the Slate Creek drainage because the Berners Bay Access alternative (Alternative C) would have resulted in impacts on resources in the vicinity of Slate Creek Cove. The current SEIS builds on the data presented in the 1992 FEIS, which were adequate to present a baseline characterization at that time. Coeur Alaska has since developed additional data, including surveys of fish, wildlife, water quality, and wetlands, to supplement the information available for the 1992 FEIS, all of which were used in the development of this SEIS. The fact that the proposed action under consideration is different from that studied in 1997 and that none of the facilities proposed in 1997 have been constructed do not change the fact that this is a SEIS and that the No Action Alternative reflects the permitted action.
SEACC	BL2-14	See the response to comment BL2-13.

Affiliation	Comment ID	Response
SEACC	BL2-15	The Forest Service did not consider designs that would increase the capacity of the TSF because such an alternative would not have addressed the significant issues identified by the public, nor would it have been required to support the proposed action. The SEIS discussion of the alternatives not included for further consideration represents the alternatives evaluated by the Forest Service, not every option considered by Coeur Alaska.
SEACC	BL2-16	The SEIS explains that lands outside the State Tidelands in Yankee Cove are privately owned. The Forest Service cannot require a private landowner to provide information in support of, or participate in, the NEPA process. The SEIS further explains that this alternative would not have alleviated the significant issues identified by the public during scoping and therefore it was eliminated from further consideration. The Echo Cove marine terminal also did not alleviate all the significant issues identified by the public, but it represented a viable alternative in terms of location and land ownership.
SEACC	BL2-17	The EPA, USACE, and State of Alaska, all of which have permitting or regulatory responsibilities relative to the TSF, participated in this analysis as cooperating agencies and are satisfied that the Slate Lakes TSF could be a legally permitted facility under their regulatory authorities.
SEACC	BL2-18	There is no inconsistency with state law. As summarized in Section 1.7.1 and documented in EPA's May 17, 2004, memo (USEPA, 2004), and the draft NPDES permit fact sheet, the "conversion" of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notices for the USACE permits and the draft NPDES permit were released to the public for comment in June 2004. The draft notices and permits are part of the planning record and were considered in this analysis. Note that the resuspension modeling cited by Tetra Tech (2003) shows that the tailings would not resuspend, such that turbidity levels in the lake after closure should be equivalent to background levels in Slate Creek and comply with Alaska water quality standards.
SEACC	BL2-19	There is no inconsistency with state law. The discharge from the lake must meet whole effluent toxicity requirements included in the draft NPDES permit. As summarized in Section 1.7.1 and documented in EPA's May 17, 2004, memo (USEPA, 2004), and the draft NPDES permit fact sheet, the "conversion" of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notice for the USACE permit and the draft NPDES permit were released to the public for comment in June 2004. The draft notices and permits are part of the planning record and were considered in this analysis.
SEACC	BL2-20	There is no inconsistency with the Forest Plan or Alaska water quality standards. As summarized in Section 1.7.1 and documented in USEPA 2004 (EPA May 17, 2004, memo) and the draft NPDES permit fact sheet, the "conversion" of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The commenter is correct in noting that the TSF requires permits from both the USACE and EPA. The draft notice for the USACE permit and the draft NPDES permit were released to the public for comment during June 2004. The draft notices and permits are part of the planning record and were considered in this analysis.
SEACC	BL2-21	Under Alternatives B and D with the recycling system, the discharge from the TSF represents the natural inflows to and precipitation falling on the lake. This is consistent with 40 CFR Part 440.
SEACC	BL2-22	The USACE, through its permitting process, will make a determination under the 404(b)(1) guidelines. As discussed in the draft NPDES permit, the operation of the TSF under Alternatives B, C, and D is consistent with applicable Clean Water Act requirements and Alaska's water quality standards.
SEACC	BL2-23	See the responses to comments SC-48, SC-61, and MR2-13. More broadly, the Forest Service does not agree with the commenter that knowing the "exact" regulatory framework necessitates or legally requires a supplement to the SEIS. The public has been afforded the opportunity to comment on the draft NDPES permit and USACE public notices, and these comments are reflected in this Final SEIS, as appropriate.
SEACC	BL2-24	The Draft SEIS provided detailed discussion of the regulatory requirements that apply to the facility. The Final SEIS takes into account comments on the draft permits and notices as well as consultation with other agencies (e.g., the National Marine Fisheries Service and U.S. Fish and Wildlife Service).

Affiliation	***Comment ID***	***Response***
SEACC	BL2-25	Tailings disposal is authorized under 36 CFR Part 228 Subpart A—Locatable Minerals [reference 228.8 (c) Solid Wastes]: "All tailings, dumpage, deleterious materials, or substances and other waste produced by operations shall be deployed, arranged, disposed of or treated so as to minimize adverse impact upon the environment and forest resources." It is clear that tailings disposal is authorized under Forest Service minerals regulations, and therefore special use regulations and lease fees do not apply to this project.
SEACC	BL2-26	As summarized in Section 1.7.1 and documented in USEPA 2004 (EPA May 17, 2004, memo) and the draft NPDES permit fact sheet, the "conversion" of Lower Slate Lake into a waste treatment unit is allowable under the Clean Water Act. The draft notices of the USACE permits and the draft NPDES permit were released to the public for comment.
SEACC	BL2-27	See the response to comment BL2-26.
SEACC	BL2-28	See the response to comment BL2-26.
SEACC	BL2-29	See the response to comment BL2-26.
SEACC	BL2-30	Under Alternatives B and D with the recycling system, the discharge from the TSF represents the natural inflows to and precipitation falling on the lake. This is consistent with 40 CFR Part 440.
SEACC	BL2-31	The Forest Service fulfilled its responsibilities under NEPA and the National Historic Preservation Act. The SEIS discusses cultural sites and the project's potential effects on them based on numerous archaeological and anthropological studies. Two – Bowser's (1998) "Alaska Native Consultation for the Kensington Gold Project, Alaska," and Mobley's (2004) "2003 Alaska Native Consultation for the Kensington Gold Project, Alaska" – are especially pertinent. The latter reference was inadvertently omitted from the Draft SEIS reference list, but both reports were widely circulated to the Native community in 2003 and 2004. The State Historic Preservation Officer (SHPO) has reviewed and concurred with the identification and evaluation of impacts on potentially eligible sites. A Memorandum of Agreement (MOA) has been signed by Coeur Alaska, Forest Service, and the SHPO; it describes monitoring and mitigation to be conducted during operations.

Affiliation	***Comment ID***	***Response***
SEACC	BL2-32	The Forest Service included the Auke in Native consultations although they are not a federally recognized tribe. Because the Auke are not a federally recognized tribe, they have no tribal elections. As a result of having no tribal elections, they have no elected tribal leader and there are competing claims for tribal leadership. The commenter refers to Rosa Miller as the leader of the Auke Kwan, and that title is respected, but as the Wooshketan commenter pointed out at the consultation meeting on May 2, 2003, there is no one universally acknowledged as chief of the Auke Tlingit. Rosa Miller claims the presence of native burials and a sacred site in the form of Lions Head Mountain; however, no other individual consulted has provided substantiating evidence of either. Traditionally the Tlingit cremated their dead and buried only people of high rank (like shamans); the usual topography for shaman burials was on prominent coastal points and islets. In general, a traditional Tlingit burial on Lions Head Mountain in the vicinity of the area of potential effects (APE), other than the marine terminals, would be unusual. No physical evidence of burials has turned up in any of the archaeological surveys done in the APE by the Forest Service or contracted archaeologists since the early 1980s, and inquiries of Rosa Miller by the Forest Service and contracted archaeologists have not generated any information about specific burial locations in the vicinity of the APE (Tlingit burials recorded elsewhere in Berners Bay, outside the APE, are acknowledged). Other knowledgeable Tlingit elders consulted, such as Cecilia Kunz and Anna Katzeek, know of no traditional Tlingit burials on Lions Head Mountain. Therefore, despite Rosa Miller's claim of traditional Native burials on Lions Head Mountain, the Forest Service believes the majority of the evidence – the lack of physical features discovered during ground surveys, the lack of locational specificity on the part of Rosa Miller, and the lack of any supporting oral history statements by other Tlingit elders – leads to the conclusion that the risk of the project disturbing such as-yet-undiscovered burials is low. A similar line of reasoning leads to the conclusion that Lions Head Mountain is not a "sacred site" or otherwise eligible for inclusion in the National Register as a traditional cultural property (TCP). As noted in the comment, the requirements for National Register eligibility as a TCP include that the place must be associated with cultural practices or beliefs of a living community, rooted in that community's history, and important in maintaining the continued cultural identity. In this case the overarching community is that of the Chilkoot, Chilkat, and Auke, since Lions Head Mountain marks the border between their traditional territories. Even within that larger community, only Rosa Miller has identified Lions Head Mountain as a "sacred site," where shaman's spirits enter and dwell forever. Insofar as the 1997-98 and 2003 Native consultations were able to ascertain, this belief is not shared by other Tlingits. Bowser (1998) collected extended oral history accounts of the "Shaman of Point Sherman" and his vision quest from Skagway to Pt. Sherman during consultations at Klukwan. Though the shaman – Geek'ee – was buried elsewhere, the Tlingit place name for the entire ridge containing Lions Head Mountain is derived from the story of his vision quest. Geek'ee is known as the Shaman of Point Sherman and it is Point Sherman – outside the Kensington APE – that local Tlingit and Bowser (1998) considered a candidate for a TCP. To the larger Native community, Lions Head Mountain is but part of a ridge that figures slightly in the important story of Geek'ee; it is not generally viewed as a shaman's grave site where shamans' souls enter and dwell forever. Because this latter view has been expressed only by Rosa Miller, Lions Head Mountain fails to qualify as a TCP – the place is not associated with generally held beliefs of a living community, it is not rooted in community history as a shamans' spirit dwelling, nor is one individual's sole account of the mountain as a shamans' spirit dwelling import ant in maintaining the continued cultural identity of the Chilkat, Chilkoot, or Auke Tlingit.

Affiliation	***Comment ID***	***Response***
SEACC	BL2-33	The 2003 Native consultation effort began with notification on April 14, 2003, to all interested parties (the contact list is presented in Mobley (2004) as Appendix B; Rosa Miller was included). A copy of Bowser (1998) went out with each notification. Dr. Charles M. Mobley, an Alaskan anthropologist with 25 years experience, assisted with the Native consultation. A meeting, to which all contacts – including Auke, Chilkat, and Chilkoot – were invited, was held on May 2, 2003, at the ANB Hall in Juneau (Rosa Miller attended). On the day before, May 1, Dr. Mobley met individually with Rosa Miller and her son, Frank Miller, over coffee, to discuss the project. An attendee of the Wooshketan lineage (which according to Tlingit protocols traditionally claims Berners Bay; Rosa Miller is of the Leeneidi lineage traditionally claiming not the Berners Bay area but rather the Juneau area) rose at the May 2 meeting to declare it a historic event as the first time in recent memory that all groups of the Auke tribe were represented in one room. A follow-up letter describing the results of the meeting was sent to all contacts (including Rosa Miller) on June 6, 2003. Shortly after the Draft SEIS was completed, copies of the final 2003 Native consultation report (Mobley 2004) were sent to all contacts (including Rosa Miller). The consultation report is now part of the project planning record.
SEACC	BL2-34	See the responses to comments BL2-31, BL2-32, and BL2-33.
SEACC	BL2-35	Comment noted.
SEACC	BL2-36	The cumulative effects of the proposed action and all reasonably foreseeable actions are described in Section 4.21 and have been considered in the decisionmaking process. See also the response to comments BL2-10 and BL2-11.
SEACC	BL2-37	The cumulative effects discussion in the SEIS discusses the possibility of an extension of mining activities to account for the additional reserves within the Kensington deposit. Coeur Alaska's Amended Plan of Operations (Coeur Alaska, 2001) indeed states "the tailings facility site can accommodate in excess of 20 million tons of tailings." The reference to a dam that could store 30 million tons of tailings is from a document that is 10 years old and that focuses on tailings storage designs rather than mine production and planning. Coeur Alaska's ultimate proposal to the Forest Service, as described in that very same document, indicates its plan to produce only 7.5 million tons of tailings. The Forest Service is obligated to assess the plan as submitted by the proponent under the NEPA process. To the knowledge of the Forest Service, there is no plan, conceptual or otherwise, to produce more than 20 million tons of tailings. Therefore, the cumulative impact analysis presents the scenario that would involve generating 20 million tons of tailings, which is the same production quantity proposed in the previous NEPA analyses.
SEACC	BL2-38	The SEIS considered the cumulative effect on wetlands within the Berners Bay watershed from a quantitative (acres impacted) and a qualitative (impacts on functions) basis. The effect that wetland impacts would have on recreation, fish, and wildlife is addressed in the discussion of functional impacts. The cumulative effects on recreation, fish, and wildlife are discussed more specifically in the sections on those particular resources.
SEACC	BL2-39	The visual impact of facilities at Cascade Point has been addressed in the Final SEIS, which refers to the analysis conducted for the Cascade Point Access Road Final EIS. The text notes that the dock would result in a strong contrast with the surrounding shoreline. As reported in the Cascade Point Access Road EIS, the lodge and other proposed upland facilities would blend with the surrounding landscape resulting in an overall moderate adverse visual impact on viewers within Echo Cove and from portions of Point Bridget State Park. The Forest Service acknowledges that the dock and breakwater would be located on State Tidelands and public waters and has corrected this statement in the document. The fact remains that the dock and breakwater would not need to meet Forest Service Standards and Guidelines, the measures used to evaluate impacts within this document.
SEACC	BL2-40	NEPA does not require a quantitative assessment of impacts when considering direct, indirect, or cumulative effects. NEPA's intent is to use the best information reasonably obtainable (which we have used) to disclose impacts resulting from past, present, and reasonably foreseeable future actions. The cumulative effects analysis in the Final SEIS includes some additional discussion and incorporates data collected in association with the Juneau Access Improvements Supplemental Draft EIS along with data from the Cascade Point Access Road EIS and Goldbelt's Echo Cove Master Plan. The Forest Service has complied with the NEPA requirement that cumulative effects be considered in the decision making process.

Affiliation	Comment ID	Response
SEACC	BL2-41	The results of monitoring activities associated with the Cascade Point access road are not part of the administrative record for this project because the access road is not being considered as part of the proposed action in this SEIS. The Cascade Point access road has received formal approval and construction permits. For the purposes of this analysis, the assumption is that the road would be built regardless of the outcome of this decision since a road to the marine terminal at Echo Cove would not meet Goldbelt's objectives for the access road. The cumulative effects analysis incorporates the impacts disclosed in the Cascade Point Access Road EIS that would result from construction of the Cascade Point access road and operation of facilities. The selection of the location for the marine terminal (between Cascade Point and Echo Cove) is outside of the jurisdiction of the Forest Service and will be considered by the USACE since it has permitting authority under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.
SEACC	BL2-42	Technical reports for wildlife, wetlands, water quality, anadromous fish, and essential fish habitat developed for the Juneau Access Improvements Supplemental Draft EIS were obtained from the Alaska Department of Transportation and Public Facilities. The discussions of cumulative effects for these resources have been revised by incorporating data from the technical reports as applicable. The Forest Service has worked closely with ADNR to incorporate additional information on Pacific herring into the Final SEIS.
SEACC	BL2-43	There is no reason for the Forest Service to determine, in this SEIS, the value of the lands under consideration in the Cape Fox Land Exchange legislation. As noted in the comment, this is a Congressional action and not subject to NEPA. The effects of the land exchange have been considered as part of the cumulative effects analysis.
SEACC	BL2-44	A discussion of the difference in reclamation under state versus Forest Service jurisdiction has been included in the cumulative effects section.
SEACC	BL2-45	The statement in question has been stricken due to its speculative nature. Should the land exchange legislation be enacted, there are no proposals for the lands other than the mining operation. Because consideration of any other activities on the land would be purely speculative, the only reasonably foreseeable action for that land considered in the cumulative effects analysis is the mining activity.

Affiliation	Comment ID	Response
SEACC	BL2-46	The requirement under Executive Order 11990 for an early public review of plans and proposals for new construction in wetlands is met through the NEPA process, which serves as the review period. Numerous approaches are available to map and identify wetlands. The USFWS maintains the National Wetlands Inventory (NWI), which bases its wetland delineations on the publication Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). Maps of NWI wetlands are available to overlay USGS topographic maps and are also available in digital format. Wetlands subject to Section 404 of the Clean Water Act are considered jurisdictional wetlands and delineated using specific criteria based on soils, vegetation, and hydrologic characteristics of a site. Jurisdictional wetlands may or may not coincide with wetlands mapped under the NWI program. The basis for discussion of wetland impacts for the Kensington Gold Project has changed minimally during the three NEPA analyses beginning in 1992. The wetlands analysis in the 1992 FEIS was based on a Tongass wetland map and a jurisdictional delineation conducted by a contractor (IME). The 1992 FEIS states that “it was decided to utilize the Tongass wetland mapping since it tended to show a larger extent of wetland acreage than did the National Wetland Inventory Mapping.” The 1992 FEIS continues, “except for minor areas, nearly all of the Sherman Creek basin… met the criteria for jurisdictional wetlands. The survey found that wetlands existed on all but the steepest mountain slopes in the study area" (IME, 1991b). The Tongass wetlands map illustrated a combination of wetland, mixed wetland/upland, and upland areas, with the Kensington and Jualin areas being predominantly mapped as wetland and mixed wetland/upland. The 1997 SEIS focused on the Sherman Creek and terrace area drainage basins and considered the entire extent of the project area as wetlands based on Coeur Alaska’s Section 404 permit application, which mapped the entire site as wetland. The approach was similar to the 1992 finding that most of the site met the criteria for jurisdictional wetlands. Based on the project area being 100 percent wetlands, the short-term wetland impacts of the 1997 No Action Alternative (which equated to the 1992 FEIS Alternative F) increased from 234 acres to 271 acres (approximately 16 percent). Assuming that the tailings impoundment was reclaimed as a wetland, the 1997 SEIS reported that the long-term impact on wetlands from the 1997 No Action Alternative would have involved 51 acres. The 1997 Selected Alternative (Alternative D), which corresponds to the 2004 No Action Alternative, would have affected 262 acres of wetlands over the short term and 164 acres of wetlands over the long term. This SEIS encompasses the Sherman Creek, terrace area, Johnson Creek, and Slate Creek drainages. In support of this SEIS, Coeur Alaska submitted a preliminary jurisdictional wetland delineation and functional assessment (ABR, 2000c) focusing on the Johnson Creek and Slate Creek drainages. The level of detail in this report went further than previous wetland information in that it identified wetland communities at a greater level of detail than had been done in previous efforts. Specifically, the Tongass wetlands map and the IME delineation simply identified wetlands (and wetland/upland mix) versus uplands. The ABR mapping effort identified wetlands down to the “subclass” level using terminology from the classification system developed by Cowardin et al. Rather than lose the information available in the ABR document by converting its results to wetlands versus uplands, the USACE worked with the Tetra Tech wetland scientist to refine the information for wetlands within the Sherman Creek and terrace area drainages. The effort by the USACE and Tetra Tech assumed the 100 percent wetland distribution described in the 1997 SEIS and used aerial photographs, soils data, wetland data collected by IME, and information gathered from site visits to categorize and map the Kensington wetlands using Cowardin’s wetland classes. Wetlands within the Sherman Creek and terrace area drainages were categorized into forested, palustrine, and mixed wetland/upland forest classes so that the wetlands identified by ABR could be more closely compared with wetlands on the Kensington side of the proposed operation. The discussion of wetlands in the Final SEIS is supplemented by a brief comparison of wetland impacts based on NWI maps. As noted in the 1992 FEIS, the extent of wetlands identified using the NWI maps is less than other mapping efforts but provides a level of direct comparison of wetlands within the Kensington and Jualin portions of the project area.

Affiliation	Comment ID	Response
SEACC	BL2-47	The Forest Service disagrees with the premise that wetland data in any of the Kensington Gold Project analyses have been incomplete. As explained in the response to comment BL2-46, different types of data are available and have been used in these analyses. Throughout the NEPA analyses, the data available to describe wetland resources and the subsequent assessment of impacts have been adequate for the purposes of the Forest Service and cooperating agencies.
SEACC	BL2-48	Section 4.12.3 now provides additional qualitative discussion of impacts on wetland functions, including additional consideration of fish and wildlife habitat provided by lacustrine and estuarine wetlands. A table highlighting functional losses was also added. The assessment does not provide a quantitative comparison of functional losses because of the subjectivity involved in weighing and comparing the value of losses in function across wetland types. The nomenclature used within the text has also been clarified.
SEACC	BL2-49	A description of the functional impacts on wetlands under Alternative A1 has been included in Section 4.12.3 of the Final SEIS. Alternative A1 is not a selectable alternative because the Forest Service does not have the authority to regulate mining rates or ore volumes, and Alternative A1 is only included to demonstrate one potential outcome should the No Action Alternative be selected; therefore, the omission in the Draft SEIS does not violate NEPA.
SEACC	BL2-50	Coeur Alaska submitted a reclamation plan to supplement its proposed Plan of Operations. The reclamation plan is included as Appendix D and was taken into consideration in the assessment of long-term impacts on water quality, soils/vegetation/wetland, and wildlife resources.
SEACC	BL2-51	The Forest Service will establish financial assurance for reclamation and the long-term integrity of the tailings disposal facility (the DTF or TSF). There is no requirement in NEPA for the public to participate in the calculation of reclamation bonds. The process of establishing financial assurance does not include public input and is carried out after the Plan of Operations is finalized.
SEACC	BL2-52	The Draft SEIS acknowledges the many attributes that contribute to a resident's well-being, including the quality and quantity of recreational opportunities and the natural beauty of the surrounding area. Accordingly, recreational and aesthetic issues are addressed extensively in the land use, recreation, and visual resources sections in the document. The analyses performed for these resource areas indicate relatively minor impacts, which would be well below the magnitude of impacts that would affect socioeconomic indicators such as out-migration of current residents, in-migration of new residents, or property values. Although the proposed action (Alternative B) and Alternatives C and D could alter how some individuals (both residents and nonresidents) view the quality of the area's natural environment, there is no evidence that there would be any impact on demographic patterns or economic output.
SEACC	BL2-53	As noted in the response to comment BL2-52, there is no evidence indicating that the presence of the proposed mine would affect demographic patterns. In the absence of such evidence, it is not feasible to evaluate the potential loss of income from residents who would out-migrate if the proposed alternative were implemented.
SEACC	BL2-54	The Final SEIS estimates the additional workforce required to maintain the current service level (employee/resident). For example, the Final SEIS indicates the number of teachers that would be needed to maintain the overall current student/teacher ratio at CBJ public schools.
SEACC	BL2-55	The economic analysis does not "hitch" the local economy to a "liquidating" industry. The analysis indicates that the construction and operation of the proposed mine would confer modest economic benefits on the regional economy during the life cycle of the project. At full operation, the mine would generate a total of 228 direct jobs or less than 2 percent of the current employed civilian workforce in CBJ. Such a small increase would not likely generate additional instability to the regional economy.
SEACC	BL2-56	Mining operations like most businesses are subject to the vagaries of business cycles, commodity prices, and other economic and financial factors. While extraction industries tend to be more volatile than other industry sectors, it would be too speculative and beyond the scope of the SEIS to evaluate the impacts of premature closure of the facility. The main objective of the economic impact analysis is to determine whether the regional economy can absorb the economic impacts of implementing the alternatives, including impacts on labor and housing markets, and public services. The magnitude of the impacts forecasted by the modeling efforts indicates that the alternatives would not result in effects that could not be reasonably absorbed by the regional economy either in the project construction, operation, or closure phase. This would also likely be true in an early closure scenario.

Affiliation	*Comment ID*	*Response*
SEACC	BL2-57	See the response to comment BL2-52. There is no evidence that the implementation of the alternatives would impact demographic patterns or property values.
SEACC	BL2-58	The commenter is correct that technological advances have transformed mining operations into a more capital-intensive industry and less labor-intensive. The employment estimate used in the economic impact analysis was developed by taking into account the most advanced technologies appropriate for a gold ore mine of Kensington's type and size. The labor requirement of 228 workers is relatively modest and would not likely change during the course of the mine's life cycle.
SEACC	BL2-59	The mining company has indicated that it would establish an outreach program to recruit local hires. This could entail some training for Juneau residents who would otherwise not be qualified to work at the mine. The Final SEIS takes this effort into account by evaluating a scenario in which only 50 percent of the employees in-migrate to the CBJ. The 95 percent estimate provided by the mining company is thought to be unrealistically optimistic given the limited size of the CBJ workforce and the specialized nature of mining activities.
SEACC	BL2-60	NEPA analyses conducted by the Forest Service are subject to the USDA Supplementary Guidelines for the Quality of Regulatory Information Disseminated by USDA Agencies and Offices. Consistent with these guidelines, the SEIS relied on data that were gathered using sound analytical methods and, to the extent it was available, information that was reasonably timely. The document and supporting information disclose the known limitations or sources of error in the data used. To the extent practical, information used in the development of the SEIS came from refereed journals subject to peer review. The SEIS also includes data that have not undergone peer review although such information has been reviewed by specialists within the Forest Service and cooperating agencies through the third-party contractor and determined to be appropriate for inclusion.
SEACC	BL2-61	See the response to comment BL2-60
SEACC	BL2-62	See the responses to comments JH3-7 and JH3-8. Moreover, "peer-review" of studies is not required for the work to be relevant and applicable. Most state and federal studies are not peer-reviewed and are certainly applicable to evaluations such as the one conducted for the Draft SEIS. The process for obtaining a Ph.D., or other advanced degree, also requires significant peer review and concurrence by the graduate school and advisors that the work presented reflects good science and was appropriately conducted. Last, the work has been published in peer-reviewed literature (Kline, E.R, and M.S. Stekoll. 2001. Colonization of mine tailings by marine invertebrates. Marine Environmental Research 51:13-37).
SEACC	BL2-63	The Forest Service agrees that the work conducted in the marine environment did not look at the freshwater species in Lower Slate Lake. The marine work is presented as part of the "weight-of-evidence" approach that was directed at looking at a variety of information that would allow for an assessment of potential risk.
SEACC	BL2-64	The SEIS acknowledges the importance of herring to the Berners Bay ecosystem as well as the current status of the population. As a cooperating agency, ADNR has participated throughout the preparation of the SEIS, including providing herring stock data and input into the analysis.
SEACC	BL2-65	The SEIS uses the vegetation maps available for the Tongass and acknowledges the limitations of the data in terms of timber volume and habitat. The vegetation map (Figure 3-7) has been updated to include the high-productivity old growth, which is outside the project area and would remain unaffected by mining operations.
SEACC	BL2-66	Nontoxic polymers are often added to water treatment ponds, such as those at the TSF, DTF, and mine drainage treatment facility, to enhance settling. The discharges from each of these units will be required to be tested for aquatic toxicity and must meet toxicity limits.
SEACC	BL2-67	There is no backfill at the Galena Mine. This has been noted as a difference. It is, however, reasonable to assume that there is some applicability to Kensington because a significant volume of small particles must be settled at both mines. The intent was only to cite the Galena example as one set of evidence to be considered in conjunction with other information presented. Finally, the question of meeting TSS limits has now been resolved with the inclusion of the treatment system into Alternative D.
SEACC	BL2-68	Comment noted.

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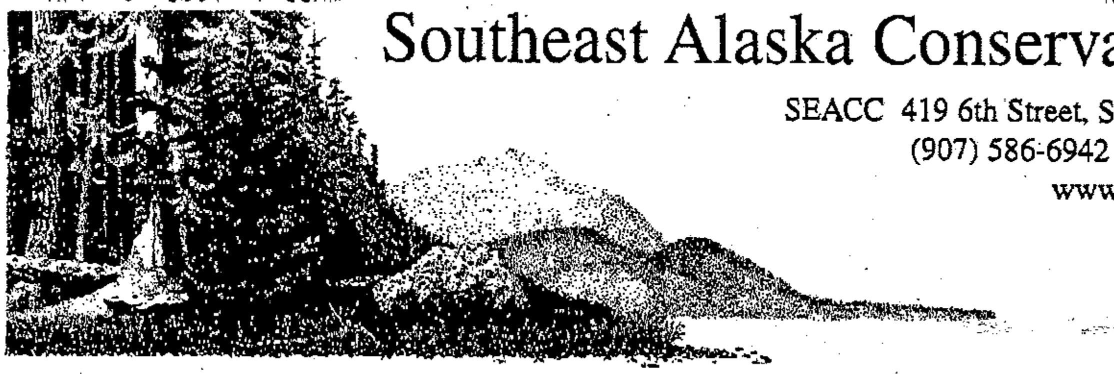

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April 7, 2004

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RECEIVED
APR 07 2004
Juneau Ranger District

RE: Supplemental Comments on the Kensington Gold Project Draft Supplemental Environmental Impact Statement

Dear Steve:

In a Public Notice released the day after the deadline for public comment on the Kensington Gold Project Draft Supplemental Environmental Impact Statement (DSEIS) officially expired, and mistakenly dated March 9, 2003, the Tongass Forest Supervisor extended the public comment period on the DSEIS.[1] This document evaluates the potential environmental consequences associated with the proposed modifications of the 1998 Plan of Operations developed by Coeur Alaska, Inc, which will substantially impact the incredible resources and values of the Berners Bay watershed.

These supplemental comments are submitted by the Southeast Alaska Conservation Council (SEACC) on its own behalf, and the behalf of the Northern Alaska Environmental Center, the Auk Kwaan, and the Mineral Policy Center. They supplement the comments previously submitted on March 8, 2004.

According to the Public Notice, the "additional 30 days for public comment will enable cooperating and reviewing agencies as well as the public additional time to review the project." While the extension did provide additional time for review of the DSEIS, it did not cure the problems noted in our earlier communications concerning the lack of a true no-action alternative in the DSEIS, and the Forest Service's failure as the lead agency to identify and incorporate into this environmental analysis how the EPA and Corps of Engineers intended to regulate the discharge of mine tailings into Lower Slate Lake.[2] To- KHSS-1

[1] *See* USDA, Forest Service, Tongass National Forest, *Public Comment period extended 30 days for the Kensington DSEIS* (Mar. 9, 2003).
[2] *See* Letter to Cole, Tongass Forest Supervisor from Lindekugel, SEACC (Feb. 12, 2004)(attached as Exhibit 6 to the comments from SEACC et al. on the Kensington DSEIS (Mar. 8, 2004)); Letter to Cole, Tongass Forest Supervisor from Lindekugel, SEACC (Mar. 1, 2004)(attached as Exhibit 4 to the comments from SEACC et al., on the Kensington DSEIS (March 8, 2004)).

day, 30 days after the comment period was extended, the public still lacks any information regarding the specific regulatory framework proposed by EPA and the Corps of Engineers for Alternatives B or C, or any of the draft federal and state permits required for operation of this mine. Furthermore, publicizing the extension the day after the previously announced comment deadline simply cannot address the inadequate notice originally provided by the agency for the availability of this DSEIS for public comment, or the basis for how the agency calculated the original, March 8, 2004, comment deadline.

I. THE DSEIS LACKS A TRUE 'NO-ACTION' ALTERNATIVE

KHSS-2

In a letter dated March 25, 2004, Forest Supervisor Cole finally responded to both the letters submitted by SEACC on February 12, 2004, and March 1, 2004. With regard to the no-action alternative issue raised in our February 12th letter, it appears that the Forest Service simply missed the point.

We agree with the agency that "[t]he Forest Service has been consistent in its presentation of No Action Alternatives throughout the three iterations of the Kensington Gold Project."[3] Unlike the first two iterations of this project, however, this DSEIS fundamentally differs in the location of mining operations, and thereby the effects, by relocating milling operations from the Sherman Creek drainage to the Johnson Creek drainage. As importantly, instead of constructing a dry tailings facility above Comet Beach as approved in 1997, the proposed action calls for subaqueous tailings disposal in Lower Slate Lake. None of the previous environmental analysis contained sufficient site-specific baseline data for the Johnson and Slate Creek drainages to provide an adequate benchmark for comparing the magnitude of environmental effects from all the action alternatives for this proposed action. Without this baseline data, the Forest Service can not establish that it took the requisite hard look at the environmental consequences of the action alternatives. Consequently, we renew our request that the Forest Service withdraw this DSEIS and publish a revised DSEIS that includes a true no-action alternative.

II. FOREST SERVICE FAILS TO ENSURE THE USE OF HIGH QUALITY INFORMATION OR THE SCIENTIFIC OBJECTIVITY AND INTEGRITY OF THE ANALYSIS CONTAINED IN THE DSEIS

KHSS-3

As noted in our March 8th comments, we have serious questions about the quality, objectivity, utility, and integrity of the information used by the Forest Service and its NEPA contractor in preparing this DSEIS. As directed by the Office of Management and Budget, the United States Department of Agriculture has adopted Supplementary Guidelines for the quality of scientific research information that "apply to research information that is officially used or produced by USDA agencies and offices."[4] Per these guidelines, USDA agencies should ensure the objectivity and integrity of the scientific research in-

[3] Letter from Tongass Forest Supervisor Cole to Lindekugel, SEACC at 2 (Mar. 25, 2004).
[4] *See* Exhibit 1: Supplementary Guidelines for the Quality of Scientific Research Information Disseminated by USDA Agencies and Offices. Available at: http://www.ocio.usda.gov/irm/qi_guide/scientific_research.htm

formation relied upon by the agency. To ensure objectivity, one or more of the following procedures should be followed: conduct a peer review of the information, either as an independent, external review or an agency-sponsored review; confirm that the information has been peer reviewed by a scientific or professional journal and has been accepted for publication by the journal; or conduct an internal review to determine if the information clearly states the source of the data, what the data are, and reservation or limitations of the data.

For the record, we note the substantial overlap between these guidelines and NEPA requirements. *See* 40 C.F.R. §§ 1500.1(b); 1502.22(b); 1502.24. To what extent has the Forest Service applied these guidelines to the scientific research and analyses utilized in this DSEIS? What scientific research utilized in DSEIS has been peer reviewed? Has the agency conducted an internal review of "influential" scientific research that has not been peer reviewed, such as the Kline studies regarding tailings habitability? What are the results of those "internal reviews." If completed, what were the review's conclusions? Will these internal review's be included in the planning record?

In addition to the examples of questionable data and unsupported premises presented in the DSEIS that we noted in our March 8th comments, another issue that received scant attention in the DSEIS is the effects of polycyclic aromatic hydrocarbons (PAHs) on fish. These effects are significant for evaluating and making a reasoned choice among alternatives because, for example, Alternatives B & C could result in chronic low levels of oil pollution in Slate Cove, as well as Cascade Point or Echo Cove. What could be the oil toxicity effects on the eulachon, herring, and juvenile salmonids in Berners Bay from these chronic, low level discharges from mine-related marine transport activities? KHSS-4

The absence of any meaningful discussion in the DSEIS of the effects of chronic exposure to hydrocarbon compounds on freshwater and marine organisms is illustrated by the statement in the section dealing with effects of spills on nearshore organisms: "assuming that clean-up operations were undertaken, a spill would not be expected to have long-term consequences for the nearshore marine community." DSEIS at 4-42. Please provide the scientific basis for this assumption; without a justification for it, this statement is an absurd generalization that violates both NEPA and the Data Quality Act. KHSS-5

III. THE DSEIS FAILS TO ADEQUATELY ASSESS OIL SPILL PREVENTION AND RESPONSE CAPABILITIES.

A variety of hazardous substances, including diesel fuel, will be used throughout the project site. DSEIS at 2-29; 2-30. Given the high quality of the freshwater and marine habitats within and adjacent to the project area, we are particularly concerned about how spills of hazardous substances will be prevented and responded to. NEPA obligates the Forest Service to fully evaluate the environmental consequences of oil spills in Berners Bay from the proposed action and consider measures necessary to avoid or minimize any possible adverse effects of the proposed action on the environment. *See* 40 C.F.R. §§ 1500.2(f); 1502.14(f); 1502.16(h). KHSS-6

According to the DSEIS, the regulatory threshold for a state Oil Discharge Prevention and Contingency Plan [C-plan] is 420,000 gallons. DSEIS at 1-13. Because "Coeur has advised ADEC that permanent oil storage at the facility would be well below the regulatory threshold," such a plan will not be required. *Id.* (emphasis added). However, it is unclear from the DSEIS just how much fuel will be permanently stored at the project sites, and indeed what sites constitute the "facility." That is, does the "facility" include storage tanks at Comet Beach, the process area, the day tanks "located at several other sites," and the Slate Creek Cove marine terminal? DSEIS at 4-115. Are the storage tanks associated with the marine terminal at Cascade Point or at Echo Cove considered part of the facility, since one of these sites will be chosen for the southern terminus for worker transport and, as such, will be integral to the mining project?

The DSEIS advises the public that "[a] complete list of all fuel tanks at the site would be included in the SPCC [Spill Prevention, Control, and Countermeasure] plan required by USEPA." *Id.* ***What the DSEIS fails to reveal is that the SPCC, while required by the EPA, is NOT approved by the EPA nor even reviewed by the agency.*** *See* 40 CFR §112.3(d). Thus, not even the EPA may know how much fuel is stored at the facility, where it is stored, or what spill prevention measures are in place. It is misleading to continually cite to the SPCC plan throughout the DSEIS as being "required by the USEPA," yet fail to note that Coeur's SPCC plan will neither have to be reviewed nor approved by the EPA or any other federal or state agency. KHSS-7

The DSEIS does supply some storage capacity figures at 4-115. A rough calculation reveals that potentially 375,000 gallons could be stored in the project area, exclusive of Cascade Point. Even though this figure is an estimate due to the lack of detail in the DSEIS, it clearly is not "well below" the regulatory threshold of 420,000 gallons that requires a state C-Plan. The DSEIS should provide details for permanent oil storage for each alternative, including tank capacity and location. To simply trust that Coeur will stay below the 420,000 gallon threshold without verification is imprudent. Why this threshold issue is so critical is obvious. If permanent storage throughout the site does not exceed 420,000 gallons, Coeur is under no legal obligation to prepare spill prevention plans that require any agency review. Whereas, if the storage capacity exceeds 420,000 gallons, Berners Bay will have additional protection ensured by a state-approved C-Plan that is far more detailed than an SPCC. KHSS-8

Regarding storage tank capacity, please clarify an apparent discrepancy: at 2-30, the DEIS states: "isotainers would then be taken to the laydown area near the process area before being pumped into the 5,000-gallon fuel storage tank in the process area;" however, at 4-115, the DEIS relates: "[a]t the process area, the fuel would be transferred from the isotainer into a large (300,000 gallon) fuel tank." KHSS-9

We also request that the Forest Service provide a far more thorough review of the impacts of a fuel spill to the uplands, the freshwater, shoreline, and marine waters of the Berners Bay area. The DSEIS should include a discussion of oil spill response strategies for these areas, based upon the Alaska Department of Environmental Conservation's Geographic Response Strategy, which identifies Slate Creek Cove and the south end of KHSS-10

Berners Bay, including Cowee Creek Lagoon, as sensitive coastal environments.[5] A more detailed review of spill effects is essential to an accurate consideration of the alternatives and a thorough evaluation of the environmental consequences of the alternatives, particularly "the relationship between short-term uses of man's environment and the maintenance and long-term productivity" of Berners Bay. *See* 40 C.F.R. §1502.16.

We also seek clarification relating to where fueling of the worker transport ferries actually will occur. The DSEIS states "fueling operations would occur at the Slate Creek Cove side of the operation." DSEIS at 4-42. This statement seemingly conflicts with two statements contained in the State of Alaska Dept. of Natural Resources, Division of Mining, Land and Water's Application for Purchase or Lease of State Land and Applicant Environmental Risk Questionnaire, signed by Rick Richins on behalf of Goldbelt, Inc. on February 26, 2004.[6] The application, questionnaire, and the attached development plan are for the Cascade Point Marine Terminal Facility. In the Questionnaire at page 2, the applicant states that fuel storage tanks at Cascade Point will be used for "[f]uel refilling of the ferry." The development plan at page 5 states: [i]t is likely that fueling facilities would be provided for the ferries [to transport mine workers] and other water vessels." It is crucial to a thorough understanding of the environmental impacts of the various alternatives to know where exactly Coeur will be refueling the worker transport ferries. The location dictates where additional storage tank capacity would be needed and where additional spill response equipment should be located. The habitat and resources in the vicinity of the fueling location would likely be impacted by the chronic, small diesel spills that occur so frequently during the process of boat refueling. Given the prevailing winds, tidal currents, and waves, any spills occurring at the Slate Creek Cove marine facility would likely be carried into the head of the cove; similarly, spills associated with refueling at Cascade Point would potentially be carried into the sensitive area of Cowee Creek Lagoon. It is insufficient under NEPA for the Forest Service to simply defer details of spill prevention and response strategies to other agencies, such as the EPA, particularly given the fact that the SPCC would not need agency review or approval. KHSS-11

IV. THE DSEIS FAILS TO SUFFICIENTLY ANALYZE THE EFFECTS OF NOISE, PARTICULARLY ON MARINE MAMMALS.

A. Noise Impact Study and Analysis is Confusing and Poorly Documented.

The DSEIS relies heavily on a 1997 noise impact study done by Hart Crowser, Inc., "for the exclusive use of Coeur Alaska, Inc."[7] It is noted that the Hart Crowser, Inc. report is KHSS-12

[5] *See* Exhibit 2: ADEC's Geographic Response Strategy for Berners Bay, SE07-06 and for Point Bridget/Echo Cove, SE07-04. Available from links at: http://www.state.ak.us/dec/spar/perp/grs/home.htm.

[6] *See* Exhibit 3: DNR Application for Purchase or Lease of State Land, Applicant Environmental Risk Questionnaire, and attached Development Plan for the Cascade Point Marine Terminal Facility.

[7] *See* Hart Crowser study in the planning record, section 6.0, line 95, at 5-1.

only in draft form and relates to the earlier configuration of the project that impacted the Comet side only.

KNSS-12 (CONTINUED)

Section 4 of the DSEIS, Environmental Consequences, contains a rather perplexing analysis of noise impacts. In addition to the 1997 Hart Crowser study, there are no cited references for the analysis with the exception of a cryptic website for a "speaker decibel change calculator." DSEIS at 4-104; 105. The link to the "home page" for the calculator provides no additional information to the reader as to whether this "calculator" represents "best available science" or even credible science.[8] The planning record, while it does contain the Hart Crowser study, has no supporting documents listed whatsoever under the heading of Noise. *See* planning record, section 5.17.

The DSEIS states that noise levels were modeled using a "virtual receptor at seven locations." DSEIS at 4-104. The reader is then referred to tables showing noise impacts at the sites in decibels from a variety of sources. Several questions arise that should be clarified:

- where, exactly, is the "shorebird habitat" site?
- what is meant by "the road immediately west" in respect to the shorebird habitat? See DSEIS at 4-108.
- Table 4-32 references "haul trucks" – what is their use under Alt. B or C and why is their impact on Shorebird (road) "not applicable"?
- the DSEIS states: "[p]rocess area activities were modeled and would produce less noise impact at the shorebird habitat (32.3 dBA)" DSEIS at 4-109; 4-110. Why is this figure not included in Table 4-32?

In sum, the discussion of noise contained within section 4.18 is confusing in its presentation and is seemingly based on one old study (Hart Crowser, 1997) and an undocumented modeling technique that uses "virtual receptors." Given the concerns relating to noise from the project that have been raised by the public throughout the NEPA process, we encourage the Forest Service to perform scientifically-defensible noise studies of all the alternatives and present the data and conclusions in format that is understandable.

B. The Analysis of Noise Effects on Marine Mammals is Markedly Insufficient.

KNSS-13

The DSEIS, while acknowledging the research done on the issue of cruise ship noise effects on marine mammals in Glacier Bay, fails to use readily-available, current studies in its analysis of noise effects on marine mammals. For example, in the Final Environmental Impact Statement for Vessel Quotas and Operating Requirements in Glacier Bay (October 2003) [hereinafter *Vessel Quota FEIS*], the National Park Service cites to numerous studies, including several from 1999, 2000, 2002, and 2003 in the discussion of noise impacts on humpback whales. Vessel Quota FEIS at 4-75 through 4-78. The DSEIS for the Kensington Gold Project also references studies that assessed noise impacts on hump-

[8] *See* Exhibit 4: website print-outs for speaker decibel change calculator and associated "home page."

backs, but the DSEIS studies are from 1979, 1982, 1983, and 1989. DSEIS at 4-43. Why is the Forest Service not considering the more current studies in their analysis of this critical issue?

At page 4-43, the DSEIS once again relies upon a generalized statement without supporting analysis: "[humpback] whales enter in much lower numbers....than sea lions, stay farther from shore and are not expected to be affected by construction." What is the rationale for stating that whales "are not expected to be affected by construction?" Likewise, please provide the scientific basis for the conclusions that "construction of the Slate Creek Cove facility at any time other than April-May time frame would not be expected to have any impacts on the humpback whales" and "construction activities at Cascade Point...should not result in impacts on humpbacks, since they generally feed on the western side of Berners Bay." DEIS at 4-44. These statements are significant because they draw conclusions about the effects of the project on the endangered humpback whale and therefore, should be thoroughly qualified by credible science. KHSS-14

The DSEIS fails to consider the effects of ferry and barge noise on marine mammal hearing and communication. These effects potentially could have adverse impacts on humpback whales and Steller sea lions, particularly during intense feeding times during the spring eulachon run. Will these species be exposed to noise levels sufficient to reduce their ability, even temporarily, to feed, avoid predators, or communicate? Please supplement the DSEIS to thoroughly consider noise effects on marine mammal hearing and communication under each alternative. KHSS-15

Related to the effects of noise on marine mammals are the effects of vessel collisions on these species. Animals that habituate to noise may be at greater risk of collision. *See* Vessel Quota FEIS at 4-77. Though it is unlikely that large cruise ships will be frequenting Berners Bay at least in the near future, effects of collisions of whales with smaller vessels "cannot be discounted." Vessel Quota FEIS at 4-81. Nevertheless, the Forest Service does appear to "discount" such effects. According to the DSEIS, "[c]ollisions with whales during ferry operations are also possible. However, adherence to the NMFS guidelines and mitigation measures should minimize or negate this possibility." DSEIS at 4-44. Once again, please clarify the rationale for the conclusion that collisions could be minimized or totally negated. What mitigation measures is the DSEIS referring to? Please specify. KHSS-16

C. The Cumulative Effects Analysis for Noise is Inadequate.

The discussion of noise associated with the projects included in section 4.21, Cumulative Effects, should be expanded beyond the two paragraphs presented in the DSEIS. *See* DSEIS at 4-129. For example, how much noise is "more noise?" *Id.* What is meant by "a small but measurable increase in noise?" *Id.* The Kensington Gold Project may very well be the catalyst for considerable additional development in Berners Bay. This DSEIS should take a much harder look at the significant issue of cumulative noise impacts from reasonably foreseeable activities in Berners Bay, including construction of the Juneau Access Project. KHSS-17

Please explain the basis for the statement "[t]he land exchange would not result in any increases in noise beyond the noise generated by the Kensington Gold Project operations under the current scenario." DSEIS at 4-129. To our knowledge, neither Cape Fox Native Corporation nor Sealaska Native Corporation has indicated what uses they have planned for the land gained in the exchange. KHSS-18

V. THE DSEIS' CUMULATIVE EFFECTS ANALYSIS IS INADEQUATE.

In our March 8th comments, we identified several problems with the cumulative effects analysis in the DSEIS, including the analysis of the Cape Fox/Sealaska Land Exchange. We would like to supplement our discussion on this exchange further. KHSS-19

In April of 2002, Coeur d'Alene Mines stated in a press release that it had negotiated and entered into land-use agreements with Sealaska and Cape Fox corporations for property around the mine site.[9] Why doesn't the DSEIS disclose the terms and conditions are included in these land-use agreements? Has Coeur, Cape Fox, or Sealaska provided this agreement to the Forest Service? Have any of the parties provided the Congress with a copy of the agreement? KHSS-20 ***How can it be in the public interest for 3 private corporations to put their heads together to decide how to divvy up lands that do not belong to them, but to all Americans, and then seek Congressional approval for this "private" deal?*** We believe that the contents of these agreements should be shared with the public before any further action is taken on this proposal.

For the record, we are attaching to these comments an exhibit containing letters, news articles, and citizen petitions.[10] This exhibit shows the widespread opposition from residents of Juneau and Upper Lynn Canal to this proposed land exchange. KHSS-21

VI. THE DSEIS' DESCRIPTION OF BERNERS BAY IS INCOMPLETE.

NEPA requires the Forest Service to describe the environment of the area to be effected by a proposed action. *See* 40 C.F.R. § 1502.15. The EPA has given both Goldbelt Corporation's previous proposals for Cascade Point, and the Juneau Access project's road to Skagway proposal an Environmentally Objectionable (EO-2) rating. EPA, along with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, has recognized Berners Bay as possessing Aquatic Resource of National Importance (ARNI).[11] These agencies have suggested that a management plan for Berners Bay be formed and that this plan might include designation of Berners Bay as a National Marine Sanctuary and its rivers as Wild and Scenic. Has there been a change in the positions of these agencies? What basis do they have for such a change? If the agencies continue to consider Berners KHSS-22

[9] *See* Exhibit 5: Press Release, Coeur d'Alene Mines Corporation, *Kensington gold project moving forward* at 2 (April 25, 2002).

[10] *See* Exhibit 6: Letters, News Articles, and Citizen Petitions Opposing Cape Fox Land Exchange.

[11] *See* Jahn, Sheldon, *DOE Permit Evaluation and Decision Document* at 27 (June 17, 1998)(summarizing comments received from federal agencies).

Bay to possess ARNI, the Forest Service should disclose this information and explain the basis for this designation.

VII. ESSENTIAL FISH HABITAT DISCUSSION IS INCOMPLETE.

The Magnuson-Stevens Fishery Conservation and Management Act requires the Forest Service to consult with the National Marine Fisheries Service on all proposed actions authorized, funded, or conducted by the agency that may adversely affect essential fish habitat (EFH) for those species regulated under a federal fishery management plan (FMP). EFH has been broadly defined in the act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Pacific salmon are managed under an FMP. Appendix B of the DSEIS discusses prey resources, such as benthic organisms and Pacific herring, for FMP species that could be impacted by development in Berners Bay. DSEIS at B-11. Curiously, the discussion completely omits mention of eulachon as a prey species for salmon. To what extent do Pacific salmon, in particular king salmon, prey on eulachon? KHSS-23

VIII. ANALYSIS OF IMPACTS TO WETLANDS IS INSUFFICIENT.

In our March 8th comments, we noted that the DSEIS failed to provide sufficient site-specific information regarding the function of the wetlands affected by the various alternatives. While the DSEIS observes that large concentrations of waterfowl, seabirds, wading birds, and neotropical migratory birds use Berners Bay, the DSEIS does not provide an assessment of the value of affected wetlands under all the alternatives for providing foraging, nesting, and rearing habitat for these birds. To what extent do waterfowl and shorebirds use the wetland habitat surrounding Lower and Upper Slate Lakes? How does that use compare to the use of wetlands that would be affected by dry tailings storage under Alternative A? KHSS-24

IX. CONCLUSION

For the myriad issues raised in both these supplemental comments and our earlier comments, we must repeat our request that the Forest Service prepare an revised draft supplemental EIS for public review and comment. Thank you for your careful consideration of the comments raised by us and others on this controversial proposal. KHSS-

Best Regards,

Kat Hall
Mining & Water Quality Organizer

Sue Schrader
Research Associate

Responses to Comments

Affiliation	*Comment ID*	*Response*
SEACC	KHSS-01	The Forest Supervisor of the Tongass National Forest responded to Buck Lindekugel of your organization on March 25, 2004, regarding the legality of the no action alternative and the extension of the comment period. As summarized in Section 1.7.1 and documented in EPA's policy memo (EPA 2004) and the draft NPDES permit fact sheet, the "conversion" of Lower Slate Lake into a waste treatment facility is allowable under the Clean Water Act. EPA and the USACE, respectively, released the draft NPDES permit for the project and the draft public notices for the Section 404 permits in June 2004. These documents demonstrate the legality of each alternative.
SEACC	KHSS-02	The 1992 Final EIS included a great deal of detail on resources present in the Johnson, Slate, and Sweeny Creek drainages since that analysis considered alternatives in all of the drainages. The data sets were certainly adequate to present a baseline characterization at that time. Coeur Alaska has since developed additional data, including surveys of fish, wildlife, water qualify and wetlands to supplement the information available for the 1992 Final EIS, all of which were used in the development of this SEIS. The fact that this is an SEIS remains the same, as does the fact that the No Action Alternative reflects a permitted action.
SEACC	KHSS-03	The comment suggests that the SEIS is subject to USDA Supplementary Guidelines for the Quality of Scientific Research Disseminated by USDA Agencies and Offices. However, the guidelines applicable to NEPA analyses are the USDA Supplementary Guidelines for the Quality of Regulatory Information Disseminated by USDA Agencies and Offices. The guidelines for regulatory information (including NEPA actions) are less rigorous than those required for scientific research and do not include the requirement to conduct a peer review prior to release. In addition, the regulatory guidelines provide less guidance in using influential scientific information. The SEIS, therefore, did not adhere to the guidelines for scientific research since that was not a requirement, but the SEIS was consistent with the guidelines for regulatory information. Consistent with the regulatory guidelines, the SEIS relied on data that were gathered using sound analytical methods and, to the extent it was available, information that was reasonably timely. The document and supporting information disclose data with known limitations or sources of error. To the extent practical, information used in the development of the SEIS came from refereed journals subject to peer review.
SEACC	KHSS-04	The Final SEIS includes additional discussions about the effect of PAH concentrations on herring, the species for which information is available and arguably the most sensitive of species in the project area. A review of the published literature indicates that concentrations high enough to cause effects are unlikely to occur at any of the marine terminals (see Section 4.10.3).
SEACC	KHSS-05	Many of the studies on the effects of hydrocarbons in the marine environment follow from the Exxon Valdez disaster. While these studies provide some valuable information, the effects of a spill of millions of gallons of heavy crude oil are significantly different compared to a spill of tens of gallons of diesel fuel. According to NOAA Hazardous Materials Response and Assessment Division, diesel fuel readily disperses and evaporates and does not persist for long periods of time within the environment (NOAA, undated), consistent with what is reported in the SEIS. Sections 4.9 and 4.10 and the BA/BE (for marine species; see Appendix J) discuss extensively the potential for and effects of spills on aquatic resources.
SEACC	KHSS-06	The largest potential source of hydrocarbons would be diesel fuel, which would be delivered to the site under Alternatives B, C, and D in individual 6,500-gallon containers specifically designed to withstand the rigors of transport. The SEIS discusses the impacts of low-level leaks and small spills of diesel fuel that could reasonably be expected as part of day-to-day operations; however, determining the size, location, and conditions leading to a large spill of hydrocarbons or other toxic material would be entirely speculative. Further information regarding fueling operations and fuel use, storage, and spill control has been added to the Final SEIS. Coeur Alaska has submitted a Spill Prevention, Control, and Countermeasures Plan, included in this SEIS as Appendix E. ADEC's Geographic Response Strategies have also been noted in the discussion on spills (Section 4.6), and the applicable plans for Echo Cove and Berners Bay have been included in the planning record.

Affiliation	Comment ID	Response
SEACC	KHSS-07	Mitigation measures, including the Spill Prevention, Control, and Countermeasures Plan, have been addressed in Section 2, and the Spill Plan has been added to Appendix E. The ADNR Tidelands Leases will include requirements for mitigation measures associated with fueling and fuel storage. See the response to comment KHSS-06.
SEACC	KHSS-08	As discussed in Section 2.3.13 of the Final SEIS, the total storage capacity at the site would be about twenty-two 6,500-gallon isotainers or a total of approximately 143,000 gallons. This is well below the 420,000-gallon threshold. The Final SEIS specifically notes where the isotainers would be stored. There would be no other diesel fuel storage tanks at the site.
SEACC	KHSS-09	The discrepancy in the storage tank volumes has been corrected.
SEACC	KHSS-10	See the response to comment KHSS-06.
SEACC	KHSS-11	See the response to comment KHSS-06.
SEACC	KHSS-12	The projected noise level at a particular location can either be measured or calculated. The Hart Crowser report provides some measurement of noise levels for the Kensington "side" of the project but does not include the Jualin "side" of the project area. Therefore, calculations were made to determine noise levels in the SEIS analysis. The noise levels of various pieces of equipment proposed for use at the mine site were obtained from the Hart Crowser report; its status as a draft is irrelevant to the analysis. The calculator used in the noise analysis indeed represents best available science because of the simple mathematical relationship between distance and sound. As the distance that sound travels doubles, the decibel (dB) level drops by 6 (dB1 - dB2 = 20 log [d1 – d2]). Therefore, assuming a given noise level coming from a particular piece of equipment at a particular location, the noise level of that piece of equipment at different distances can be calculated. Section 3.11.3 notes that water birds occur throughout Berners Bay including Echo Cove, Sawmill Cove, and Slate Creek Cove. Since the largest concentrations are considered to occur at the head of Berners Bay, the shallows at the head of the bay were considered shorebird habitat for the purposes of the noise analysis. This area is listed twice because of the sources of noise that could reach that location – one from the Slate Creek Cove marine terminal and the other from the access road as it turns up the Johnson Creek drainage from paralleling the shoreline. Haul trucks have been removed from the table since they would be used only to transport waste rock in the vicinity of the process area and would not contribute to noise impacts on receptors in the vicinity of Berners Bay. The table (formerly Table 4-32, currently Table 4-34) has been modified to include the appropriate noise levels. Note that 30 dB is approximately the noise level of a quiet whisper and that a normal conversation would produce a level of approximately 47 dB. In summary, the approach used to determine noise levels was done using the appropriate mathematical relationships based on the distance between the noise sources and the locations of various receptors. This approach is an accepted and practical method used in analyzing noise impacts. The age of the Hart Crowser report is irrelevant in that the noise levels presented in the report for trucks and other pieces of mining equipment have not changed.
SEACC	KHSS-13	The Final SEIS includes additional discussion on the potential impacts of noise on marine mammals, specifically humpback whales (see Section 4.10.3).
SEACC	KHSS-14	Section 4.10.3 and the BA/BE (Appendix J, provided to NMFS in November 2004) describe in detail the available data on humpback whales in Berners Bay and the construction/operation-related impacts of each alternative.
SEACC	KHSS-15	Mitigation measures have been developed for activities in the vicinity of the marine terminals during the eulachon run (Section 2.5.1). These measures are consistent with NMFS requirements governing marine mammals under both the Endangered Species Act and Marine Mammal Protection Act. The Final SEIS, including the BA/BE (Appendix J), provides additional discussion of the impacts of noise on marine mammals, particularly humpback whales.

Affiliation	Comment ID	Response
SEACC	KHSS-16	Collisions can occur between vessels and marine mammals (humpback whales more so than Steller sea lions) regardless of vessel noise, speed, or direction. Mitigation measures included in Section 2.5.1 include the crew shuttle moving at slower speeds and an NMFS-approved observer to minimize the likelihood of collisions. Adherence to NMFS guidelines, in addition to the identified mitigation measures, would indeed minimize the potential for vessel strikes.
SEACC	KHSS-17	The discussion of noise within the cumulative effects section has been revised to include the decibel levels that could result from operation of the Juneau Access Road as described in the Juneau Access Improvements Draft EIS (traffic volume at 210,000 vehicles annually).
SEACC	KHSS-18	The statement has been qualified to indicate that based on the current state of knowledge, the land exchange would not result in any increase in noise over the levels projected by the Kensington Gold Project. As the reviewer notes, no plans have been proposed for the site should Congress approve the land exchange.
SEACC	KHSS-19	Agreements among Coeur Alaska, Cape Fox, and Sealaska have not been provided to the Forest Service. The Forest Service has no way of knowing whether or not they have been submitted to Congress. The SEIS does not include the contents of the agreements because they are beyond the scope of this SEIS. The SEIS discloses the potential impacts of the land exchange with the assumption that mining operations would move forward. The SEIS also states that ADNR and EPA would assume responsibility for the oversight of operations and reclamation of the mine if the land exchange is approved.
SEACC	KHSS-20	Questions and comments regarding the Cape Fox land exchange are best directed to an authority on the subject. The exchange that is under consideration by Congress would be exempt from NEPA and is a totally separate action to the action under consideration here. Legislation concerning the proposed land exchange was not referred out of committee and has not been reintroduced to date.
SEACC	KHSS-21	See the response to comment KHSS-20.
SEACC	KHSS-22	The Forest Service is unaware of the designation of Berners Bay as an Aquatic Resource of National Importance (ARNI) beyond its mention in the cited letter. The Forest Service has met often with the agencies cited in this comment and there has been no mention of special designations. Note that only Congress has the authority to designate wild or scenic rivers. The 1997 TLMP ROD (Appendix A) recommends designation of the lower 9 miles of the Gilkey River as “wild.”
SEACC	KHSS-23	The use of eulachon as prey for salmon has been included in the essential fish habitat assessment. The extent to which king salmon prey on eulachon within Berners Bay is unknown.
SEACC	KHSS-24	The wetlands discussion in the SEIS includes an assessment of wildlife habitat along with a number of other functions. As explained in the text, the functional assessment employed a standardized methodology developed by the USACE for use in southeast Alaska. The assessment is a generalized tool and does not specifically call for the evaluation of foraging, nesting, and rearing habitat of birds. Bird use within the project area is discussed in the wildlife sections (3.11 and 4.11).
SEACC	KHSS-25	Comment noted.

Section 4
Standardized Faxed Letter
And E-mail

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202-887-1875

William Evans

72 Deaver Park Circle , Asheville, NC 28806

February 20, 2004 05:00 PM

SEIS Team Leader Steve Hohensee

Subject: Re: Kensington Draft Supplemental Environmental Impact Statement

Dear SEIS Team Leader Hohensee:

I write to oppose Alternative B of the Kensington Gold Project Draft Supplemental Environmental Impact Statement (DEIS) - which calls for the dumping of mine tailings in a pristine lake and regular transport of employees and supplies across the mouth of the ecologically, culturally, and recreationally significant Berners Bay.

The mine proposal is designed to maximize the temporary economic benefits for Coeur Alaska, Inc., the subsidiary of an Idaho-based multinational mining corporation. Howev,er, as proposed, this mine project is not in the public's interest because it puts short-term benefits for a few above the larger public's interest in safeguarding the immense ecological, cultural, and recreational values of Berners Bay for use by present and future generations.

Please consider the following when deciding whether to trust Coeur with fragile public resources:

Coeur d'Alene Mines Corporation, the parent company of Coeur Alaska, has been operating at a loss since 1998 (with a net loss of $53.5 million for the first 9 months of 2003), and has been millions of dollars in debt during recent years. The corporation's financial viability is closely tied to the volatile price of gold and silver.

In 1996, the U.S. government sued Coeur d'Alene Mines Corporation for dumping mine wastes into the Coeur d'Alene River Basin in northern Idaho. The affected area, a Superfund site, is one of the largest contaminated areas the United States has ever sought to restore and presently costs taxpayers hundreds of millions of dollars.

Coeur is proposing to convert a lake into a mine tailings dump. Nothing in Alaska State law suggests that this is legal. Furthermore, dumping mine tailings into a lake will violate State water quality standards, Alaska's antidegradation policy, and the federal Clean Water Act, and could set a dangerous precedent for mines across the country.

Damage to Berners Bay's eulachon or herring could have irretrievable impacts on a larger ecosystem, which, in turn, would adversely affect commercial and sport fishing. Elevated levels of petroleum pollution, due to increased boat traffic in the bay, threaten herring and eulachon populations. Both species of fish form the base of the food chain that supports salmon, bald eagles, migratory waterfowl, Thayer's gulls, harbor seals, and Steller sea lions. Berners Bay constitutes the last remaining herring spawning area in the region.

Thank you for the opportunity to comment.

Sincerely,

William Evans

maryreed@localnet.com
02/24/2004 11:56 AM

To: shohensee@fs.fed.us
cc:
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SEIS Team Leader Steve Hohensee

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Damage to Berners Bay's eulachon or herring could have irretrievable impacts on a larger ecosystem, which, in turn, would adversely affect commercial and sport fishing. Elevated levels of petroleum pollution, due to increased boat traffic in the bay, threaten herring and eulachon populations. Both species of fish form the base of the food chain that supports salmon, bald eagles, migratory waterfowl, Thayer's gulls, harbor seals, and Steller sea lions. Berners Bay constitutes the last remaining herring spawning area in the region.

Thank you for the opportunity to comment.

Sincerely,

Mary S. Reed
962 Darrow Road
Duanesburg, New York 12056-4108